Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Office of the Secretary Of Defense	Date: April 2022
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603000D8Z *I Joint Munitions Advanced Technology*

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	-	21.625	30.140	34.065	0.000	34.065	38.823	36.359	31.873	25.370	Continuing	Continuing
077: *Enhanced Munitions Advanced Technology*	-	15.373	30.140	34.065	0.000	34.065	38.823	36.359	31.873	25.370	Continuing	Continuing
301: *Enabling Fuze Advanced Technology*	-	6.252	-	-	-	-	-	-	-	-	Continuing	Continuing

Note

New Start (Y/N): Partial (High Reliability Cluster Munition $11M)

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

The JFTP funds applied research efforts from PE 0602000D8Z P204 Enabling Fuze Technology and technology demonstration efforts from PE 0603000D8Z P301. In FY 2022 the JFTP and JEMTP merged and the program scope expanded to exploit technology developments and accelerate their application to enable next generation kinetic weapons capabilities in the areas of energetic materials, propulsion, warhead effects, fuzing, power sources, guidance, navigation & control, communications and munitions airframe applied technologies.

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

A. Mission Description and Budget Item Justification

This program supports the Department's initiatives to Deter Aggression, and Defend the Homeland.

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

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Office of the Secretary Of Defense	Date: April 2022
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603000D8Z *I Joint Munitions Advanced Technology*

The program prioritizes investments from a Joint Service perspective and demonstrates technologies that inform capabilities, thus maximizing efficiencies and ensuring the development of technologies with the broadest applicability to ensure good stewardship of taxpayer dollars. This munitions Science and Technology (S&T) program focuses on enhancements in weapon speed, range, and lethality while largely utilizing existing advanced insensitive munitions (IM) technology to maximize weapon safety.

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

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B. Program Change Summary ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	22.905	23.213	0.000	0.000	0.000
Current President's Budget	21.625	30.140	34.065	0.000	34.065
Total Adjustments	-1.280	6.927	34.065	0.000	34.065
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	7.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.917	-			
• SBIR/STTR Transfer	-0.359	-			
• Other Reprogramming	-0.004	-	-	-	-
• FFRDC	-	-0.073	-	-	-
• Adjustments to Budget Year	-	-	22.269	-	22.269
• Economic Assumption	-	-	0.796	-	0.796
• High Reliability Cluster Munition	-	-	11.000	-	11.000

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2021	FY 2022
Project: 077: *Enhanced Munitions Advanced Technology*		
Congressional Add: *Energetics Revitalization*	-	7.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Office of the Secretary Of Defense	Date: April 2022
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603000D8Z *I Joint Munitions Advanced Technology*

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2021	FY 2022
Congressional Add Subtotals for Project: 077	-	7.000
Congressional Add Totals for all Projects	-	7.000

Change Summary Explanation

FY 2022 funding increase reflects Congressional add of $7.000 million for Energetics Revitalization.

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

Exhibit R-2A, RDT&E Project Justification: PB 2023 Office of the Secretary Of Defense			Date: April 2022
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603000D8Z / *Joint Munitions Advanced Technology*	Project (Number/Name) 077 / *Enhanced Munitions Advanced Technology*	

COST ($ in Millions)	Prior Years	FY 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
077: *Enhanced Munitions Advanced Technology*	-	15.373	30.140	34.065	0.000	34.065	38.823	36.359	31.873	25.370	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

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

Through FY 2021, the Joint Enhanced Munitions Technology Program (JEMTP) investments focus on five Munition Areas: 1) High Performance Propulsion - Alternative propulsion designs and systems for increased range, e.g. rotating detonation engines, solid fuel ramjets, highly loaded grain technology, etc.; 2) Minimum Signature Propulsion – new propellant compositions and hybrid propulsion for reduced time to target/increased range; 3) Area Effects Warheads – high performance explosives, reactive materials, multiphase blast, etc.; 4) Hard Target Effects Warheads – improved penetration for shaped charge jets, lethality enhancements for area effects munitions; and 5) Gun Propulsion – novel ignition schemes, advanced propellant design, etc. Munition Area Technology Groups (MATG), under tri- service leadership, have developed technology roadmaps for each Munition Area which are used to guide investments.

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Enhanced Munitions Advanced Technology	15.373	23.140	23.065
Description: Enhanced Munitions Advanced Technology focuses on the following key areas: - Munitions Versatility: Combined and Collaborative Kinetic Effects - Munitions Readiness: Modularity, Advanced Manufacturing and Materials			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Office of the Secretary Of Defense		Date: April 2022
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603000D8Z / *Joint Munitions Advanced Technology*	**Project (Number/Name)** 077 / *Enhanced Munitions Advanced Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
- Munitions Efficiency: Weapon Survivability - Munitions Effectiveness: • Munitions Kinetic and Tailorable Lethality Effects • Propulsion Systems • Target Detection and Burst Point Control ***FY 2022 Plans:*** - Complete advanced performance testing on half scale improved missile boost motor demonstrator. Conduct motor preparations and static motor firing for air defense system. - Complete testing and down-selection on preliminary designs for missile motor and case assemblies to support an extended range air to ground missile system, and begin final motor manufacturing. Conduct ground and prepare for flight testing of improved ground to ground flight motor. - Complete final design and static testing of an enhanced range small diameter rocket motor system. - Complete inlet and nozzle design for a modular propulsion system for air to ground system with improved range and speed. - Conduct final design testing in multi-warhead configuration using novel high explosive material loaded hardware for improved performance. - Scale up a novel improved propellant formulation and conduct performance testing. Scale-up extended range propellant for indirect fire weapon system and conduct initial full-scale weapon tests. - Demonstrate high energy density, thin film battery with thin film heat source for broad applications including artillery, missiles, and miniature munitions. - Develop and demonstrate robust and survivable target sensor solution for high-speed weapons. - Develop high-speed weapon survivable and quick triggering high voltage Electronics Safe and Arm Devices (ESADs) components. - Develop advanced sub-scale testing method and apparatus to rapidly evaluate survivability of fuzing components in high shock, extreme environments. - Develop new multi-mode ultrafast targeting algorithms exploiting advancements in microelectronics and materials. - Begin advanced collaborative and cooperative munitions design concepts using technologies facilitating communication and networking impacting guidance, target detection, and weapons effectiveness. ***FY 2023 Plans:*** - Complete advanced technology design of Solid Fuel Ramjet missile motor and case assemblies to support an extended range air to ground missile system, and fabricate for a maximum range test. - Complete design and fabrication of hardware and scale up selected propellant for a full-size test of an improved missile boost motor demonstrator for extended range in cruise missiles.			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Office of the Secretary Of Defense		Date: April 2022
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603000D8Z / *Joint Munitions Advanced Technology*	**Project (Number/Name)** 077 / *Enhanced Munitions Advanced Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
- Complete fabrication and deployment of inlet design and down-selection testing of nozzle design for a modular propulsion system for air to ground system with improved range and speed. - Initiate high resolution height of burst radar work leveraging Multiple Input Multiple Output (MIMO) technology currently used in communication and automotive industries by upscaling to handle closing velocities up to Mach 5. - Continue future miniature precision munitions work by completing space claims for fuzing, seeker/sensor, guidance and warhead and initiating integration efforts. - Complete the characterization of Exploding Foil Initiator designs incorporating a Direct Header Deposition (DHD) design to demonstrate superior extreme environment survivability over the current state of the art. - Develop and demonstrate feasibility of cooperative munitions technology incorporating communication and networking impacting guidance, target detection to enhance multiple weapons effectiveness. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** There is no significant change between FY 2022 and FY 2023.			
Title: High Reliability Cluster Munition ***Description:*** Execute enhanced area effects munitions technology development with transition into weapon demonstrators. ***FY 2023 Plans:*** - Conduct system level weapon area effects analyses. - Develop robust and efficient communications and power distribution between the munition's main fuze and individual submunitions. - Model and design optimized distributed munition expulsion, dispersion, and stabilization. - Develop precision submunition target detection and optimized warhead output. - Execute plans and projects through Joint Service and Industry team. Identify and coordinate Service demonstration and transition paths for High Reliability Cluster Munition. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** FY 2023 increase for High Reliability Cluster Munition effort established to develop technology in response to area effects capability gap/opportunity identified through Army and Air Force campaign scenario analysis.	-	-	11.000
Accomplishments/Planned Programs Subtotals	15.373	23.140	34.065

	FY 2021	FY 2022
Congressional Add: Energetics Revitalization	-	7.000

Exhibit R-2A, RDT&E Project Justification: PB 2023 Office of the Secretary Of Defense		Date: April 2022
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603000D8Z / *Joint Munitions Advanced Technology*	**Project (Number/Name)** 077 / *Enhanced Munitions Advanced Technology*

	FY 2021	FY 2022
FY 2022 Plans: Program increase will be used to accelerate modernization of energetic materials research, development and manufacturing. Energetic materials are Defense unique ingredients critical to all kinetic weapons systems. This effort will develop and demonstrate new energetics manufacturing capabilities focused on enhancing production efficiency, speed, and reducing single source risk to meet future warfighter and national security needs.		
Congressional Adds Subtotals	-	7.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Office of the Secretary Of Defense			Date: April 2022
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 0603000D8Z / *Joint Munitions Advanced Technology*	Project (Number/Name) 301 / *Enabling Fuze Advanced Technology*	

COST ($ in Millions)	Prior Years	FY 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
301: *Enabling Fuze Advanced Technology*	-	6.252	-	-	-	-	-	-	-	-	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This program will develop and demonstrate advanced fuze technologies needed to develop weapons that address Joint priority capability areas highlighted by the Office of the Under Secretary of Defense for Research and Engineering (OUSD(R&E)) Technology-Focused Modernization and Service Science and Technology (S&T) priorities including High Speed Weapons, Collaborative/Networked Munitions, Counter Unmanned Aerial System (c-UAS) Air Defense and Scalable Lethality. This effort will take promising integrated technologies to maturity and demonstrate capability utilizing weapon hardware derived from priority munitions capabilities and technologies. Demonstrated mature fuze technology will be transitioned, thereby decreasing acquisition program costs and schedule risk and facilitating spin-offs to other munitions within their portfolios. Under the Joint Fuze Technology Program (JFTP), investments are focused on specific capability areas that have been identified by Department strategic guidance and are focused on capability areas that are driven by next generation high speed and advanced weapons. The four capability areas are: 1) Extreme Environment Survivable Fuzing, 2) Tailorable Effects Fuzing and Warhead Initiation, 3) High Reliability Safe and Arm Technology, and 4) Target Detection and Burst Point Control.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: Enabling Fuze Advanced Technology	6.252	-	-
Description: Enabling Fuze Advanced Technology focuses on the following key areas: - Extreme Environment Survivable Fuzing - develops fuze components to increase the effectiveness of high-speed munitions by improving the prediction tools and testing methodologies to evaluate the survivability and functionality of future fuzes. - Tailorable Effects Fuzing and Warhead Initiation - develops fuzing for tailorable effects weapons that encompasses the ability to selectively vary the output of the weapon (Dial-a-Yield) and/or the ability to generate selectable effects (e.g., directed blast, fragmentation). - High Reliability Safe and Arm Technology - develops high reliability fuzing architectures, fuzing components, and Unexploded Ordnance (UXO) reduction features enabling the next generation of cluster munitions to achieve the required <1% UXO goal while Increasing the reliability across the board for future weapon systems. - Target Detection and Burst Point Control develops sensing and algorithm solutions to demonstrate smaller, more capable target detection while meeting or exceeding the performance of existing technologies in order to operate in extreme and challenging weapon environments.			
Accomplishments/Planned Programs Subtotals	6.252	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2023 Office of the Secretary Of Defense		Date: April 2022
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 0603000D8Z / *Joint Munitions Advanced Technology*	**Project (Number/Name)** 301 / *Enabling Fuze Advanced Technology*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A