Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Office of the Secretary Of Defense	Date: February 2016
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602000D8Z / *Joint Munitions Technology*

COST ($ in Millions)	Prior Years	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
Total Program Element	56.692	19.491	19.314	17.745	-	17.745	19.128	19.348	19.615	20.000	Continuing	Continuing
P000: *Insensitive Munitions*	39.657	13.310	13.044	11.993	-	11.993	12.927	13.076	13.256	13.516	Continuing	Continuing
P204: *Enabling Fuze Technology*	17.035	6.181	6.270	5.752	-	5.752	6.201	6.272	6.359	6.484	Continuing	Continuing

A. Mission Description and Budget Item Justification

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

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

The Insensitive Munitions (IM) effort will demonstrate enabling technologies needed to develop weapons in compliance with requirements established in United States Code, Title 10, Chapter 141, Section 2389 and DoD Instruction 5000.1. This effort will take promising technologies demonstrated at the laboratory scale and transition them into demonstration programs utilizing generic hardware based on priority munitions identified in the PEO IM Strategic Plans. Mature demonstrated IM technology can be transitioned, thereby decreasing their program costs and schedule risk and facilitating spin-offs to other non-compliant munitions within their portfolios.

The JIMTP investments focus on five Munition Areas: 1) High Performance Rocket Propulsion (HPP), 2) Minimum Signature Rocket Propulsion (MSP), 3) Blast and Fragmentation Warheads (BFW), 4) Anti-Armor Warheads (AAW), and 5) Gun Propulsion (GP). MATGs, under tri-service leadership, have developed technology roadmaps for each Munition Area that are used to guide investments based on goals consistent with the DoD IM Strategic Plan. These IM technologies, alone or in combination, will be developed and tested at the small-scale, and for eventual incorporation in hardware, simulating real-world munitions, to demonstrate their utility and feasibility.

The Enabling Fuze Technology effort will also demonstrate fuze enabling technologies needed to develop weapons that address priority capability areas identified in the Guidance for Development of the Force (GDF), the Secretary of Defense Memorandum, DoD Policy on Cluster Munitions and Unintended Harm to Civilians, and shortfalls in current weapon systems. This effort will develop fuzing technologies and mature them for transition into advanced technology (Budget Activity (BA)

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6.3) programs and/or design tools and protocols for weapon fuzing. In this way, the Service and Industrial base weapon and fuze communities will be able to heavily leverage and apply these emerging and promising technologies in fuzing modeling and simulation tools, multi-point initiation, high reliability fuze architectures, survivable components, modular fuze packaging, and fuze sensor.

The Joint Fuze Technology Program investments focus on four specific capability areas that have been identified by Department's strategic guidance and current shortfalls in weapon systems and will be validated by the PEOs and the Heads of the Service Science and Technology (S&T) communities. The capability areas are: 1) Hard Target Survivable Fuzing, 2) Tailorable Effects Weapon Fuzing, 3) High Reliability Fuzing, and 4) Enabling Fuze Technologies and Common Architecture.

B. Program Change Summary ($ in Millions)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Previous President's Budget	20.037	19.352	19.388	-	19.388
Current President's Budget	19.491	19.314	17.745	-	17.745
Total Adjustments	-0.546	-0.038	-1.643	-	-1.643
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.351	-			
• Realignment for Higher Priority Programs	-	-	-1.506	-	-1.506
• FY15 Reprog. for Cancelled Account	-0.007	-	-	-	-
• Other Reprogrammings	-0.188	-	-	-	-
• FFRDC Reduction	-	-0.038	-	-	-
• Economic Assumptions	-	-	-0.137	-	-0.137

Change Summary Explanation

FY 2017 internal realignment reflects funding for higher Departmental priorities and requirements.

Exhibit R-2A, RDT&E Project Justification: PB 2017 Office of the Secretary Of Defense			Date: February 2016
Appropriation/Budget Activity 0400 / 2	R-1 Program Element (Number/Name) PE 0602000D8Z / *Joint Munitions Technology*	Project (Number/Name) P000 / *Insensitive Munitions*	

COST ($ in Millions)	Prior Years	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
P000: *Insensitive Munitions*	39.657	13.310	13.044	11.993	-	11.993	12.927	13.076	13.256	13.516	Continuing	Continuing

A. Mission Description and Budget Item Justification

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

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

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Title: High Performance Rocket Propulsion (HPP)	3.628	3.549	3.349
Description: HPP focuses on the development of technologies to improve the IM response of HPP systems, rocket motors with Ammonium Perchlorate and with or without a metal fuel, for rockets and missiles launched from air, ground, and sea platforms. These technologies, when applied to rocket motors, improve to one or more threats, while not degrading the response to other IM threats and, at minimum, maintaining munition performance. Technologies include, but are not limited to, rocket propellant ingredients, including synthesis, characterization and scale-up; reduced smoke or smoky propellants, including formulation, characterization and scale-up; rocket motor case design; materials for active and passive thermal mitigation; shock mitigation materials and techniques; passive and active coatings; active and passive venting techniques for motor cases or containers; ignition systems; sensors; and thrust mitigation techniques. Operating conditions may be controlled or widely varying in both temperature and vibration. The 2018 and 2023 year goals of the HPP MATG are concentrated on solving the IM response of missile propulsion systems due to Fragment Impacts and Slow Cook Off for the majority of HPP rocket motors, and solving the Fast Cook Off response of very large HPP motors.			
FY 2015 Accomplishments: - Synthesized and characterized less reactive ingredients for high performance rocket motor propellant that will maintain missile performance.			

Exhibit R-2A, RDT&E Project Justification: PB 2017 Office of the Secretary Of Defense		Date: February 2016
Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602000D8Z / *Joint Munitions Technology*	**Project (Number/Name)** P000 / *Insensitive Munitions*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
- Conducted bench-top testing of motor case venting devices. - Conducted sub-scale testing and analysis to validate a new sub-scale test to predict full-scale reactions in cook-off and impact testing. - Conducted small scale testing on energetic materials to assess pre-ignition processes and novel mitigation device. ***FY 2016 Plans:*** - Formulate and conduct characterization, aging, and small scale performance testing on rocket propellant formulation composed of less reactive ingredients. - Optimize novel mitigation device design and conduct small scale tests. - Produce 25 gram batches and complete characterization data on new slow cook-off propellant formulation. - Conduct critical temperature and auto ignition tests on formulations and down select best performing modifications for year 2 formulation effort using a new sub-scale test to predict full-scale reactions in cook-off and impact testing. - Conduct preliminary testing on remote sensing device and interface sensing unit with venting device. - Establish baseline thermal history model to optimize current code to create a baseline model to correctly simulate the heat transfer and propellant decomposition chemistry. ***FY 2017 Plans:*** - Demonstrate acceptable small scale SCO properties and demonstrate acceptable safety, tensile, and ballistic properties at the pint scale for new slow cook-off propellant formulation. - Demonstrate the concept and feasibility of a plateau burning propellant that will not maintain a reaction at elevated pressure - Integrate di-electric sensors into subscale motor test article. - Collect thermally damaged propellant burning rates to measure burning rate as a function of thermal exposure.			
Title: Minimum Signature Rocket Propulsion (MSP)	2.530	2.464	2.254
Description: MSP focuses on the development and demonstration of technologies to improve the IM response of MSP systems. The development and demonstration of minimum signature (MS) rocket technologies, when applied to munition systems, will improve munition IM response to one or more threats, while not degrading the response to other IM threats and, at minimum, maintaining munition performance. Technologies include, but are not limited to, MS rocket propellant formulations, ingredients for MS propellant formulations (including synthesis, characterization and scale-up), case and packaging design, active and passive venting techniques, rocket motor case design, ignition systems, and thrust mitigation techniques. Of particular interest are technologies that provide a higher burning rate minimum signature propellant with state-of-the-art energy and reduced shock sensitivity. The 2018 and 2023 year goals of the MSP MATG are concentrated on solving the IM response of missile propulsion systems due to Fragment Impact, Slow Cook Off, and Shaped Charge Jet (SCJ) threats. ***FY 2015 Accomplishments:***			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
- Conducted mechanical, safety, and card gap testing, and determined ballistic properties of novel coated material minimum signature propellant. - Conducted design of experiments of candidate coated formulations and down-selected to most promising candidate to provide desired performance characteristics. - Conducted final characterization tests and slow cook-off tests to validate new coated formulation in preparation for transition to BA3 for a demonstration. - Built and tested unique venting mechanisms in various configurations in environmental and cook-off tests. - Characterized baseline and novel MS propellant using ABVR screening test. - Developed an analysis tool and conducted composite material testing that will provide mitigation of shock response for fragment impact while providing the necessary material strength for solid rocket motors and launch tubes. ***FY 2016 Plans:*** - Conduct impact testing on baseline and novel MS propellants in representative cylindrical container to investigate propellant reactions relative to ABVR test result predictions. - Fabricate and test composite materials to validate modeling and analysis. Optimize materials and optimize design for future testing. - Synthesize and scale up newly selected propellant ingredient to one kilogram batch for initial characterization studies. - Analyze and fabricate composite material launch tube and perform fragment impact testing to gain data on material and fragment response. Optimize design based upon results. - Conduct cylindrical configuration propellant response testing to validate testing conducted on flat samples. - Scale up to one pint mix new minimum signature propellant formulations and conduct safety testing. - Produce 250 gram batches of novel material for propellant formulation. ***FY 2017 Plans:*** - Fabricate baseline and optimized configurations with inert energetic and embedded sensors and conduct fragment impact testing of baseline and optimized configurations. - Validation of modeling will be conducted using a full scale propellant subjected to fragment impact testing. Comparison of data to predicted results will determine success of model. - Formulate extruded double base (NC/NG) types of energy levels without the use of nitro glycerin (NG) making the propellant much safer and resistant to shock - Develop predictive test tools for evaluation of novel propellant materials based on web thickness and bore size.			
Title: Blast and Fragmentation Warheads (BFW)	2.676	2.625	2.415
Description: BFW focuses on the development of technologies to improve the IM response of Blast/Fragmentation munitions. These technologies, when applied to munitions, improve IM response to one or more threats, while not degrading the response			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
to other IM threats and, at minimum, maintain munition performance. Munition operating conditions may be controlled or have widely varying environmental conditions, such as temperature and vibration, and other factors such as cost, availability and reliability may be critically important depending on the intended munition application. Technologies include, but are not limited to, new ingredient synthesis and characterization, initial formulation development, scale-up, warhead/charge configuration, venting techniques for both munitions and their containers, protection or packaging materials and systems, shock mitigation liners, initiation devices, techniques, and technologies. Applications vary but include high performance warhead fills, booster explosives, bulk demolition charges, and bulk fills for blast and/or fragmentation charges. The 2018 and 2023 year goals of the BFW MATG are concentrated on solving the IM response of blast fragment warheads to the Sympathetic Detonation, Fast Cook Off, and SCJ threats. ***FY 2015 Accomplishments:*** - Scaled up synthesis process of novel energetic material to produce one kilogram batches to provide multiple grain size material. Examined fundamental properties and conducted characterization testing on manufactured materials. - Performed safety, IM, and performance testing on novel energetic formulations. Analyzed results to define failure diameter and establish baseline data for designing IM formulations for transition to a possible BA 6.3 demonstrator. - Scaled up to 40 gram batches unique energetic material and conducted performance and thermal response testing. - Proved concept for detonation train for IM fills for large warheads. Analyzed data for formulation to assess the insensitivity to an IM threat. - Predicted the potential for passing sympathetic reaction testing based on explosive data gathered during preliminary small-scale testing. ***FY 2016 Plans:*** - Conduct large scale gap experiment, as well as bullet and fragment impact testing on unique explosive formulation for large warheads. - Continue to mature explosive initiation device design and conduct small-scale performance testing. Down-select design and begin design refinement. - Utilize novel coating process and scale up formulations of high energy explosive. Prepare samples and conduct screening tests. - Refine fuze booster design, conduct M&S to develop companion auxiliary booster to complete the explosive train, and include implications to future cost and manufacturing process. - Investigate unique initiation method environmental operating range while meeting IM criteria. - Conduct small scale experiments to investigate impact on performance and sensitivity of novel lining material for air to air warhead - Conduct baseline testing with known explosive materials to validate new model. ***FY 2017 Plans:***			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
- Conduct verification tests on fuze booster design in preparation for transition to BA3 demonstration. - Develop replacement explosives for higher power Artillery and mortar systems such as the M1130 and MAPAM - develop and scale up novel meltable materials to improve munitions responses to slow cook off. - Conduct fragment impact tests on materials after unique initiation method exposure. - demonstrate the possibility of fully insensitive materials (off) that can be “activated” (on) before being used to improve the safety and logistics burden. - Validate the predicted results with experimental results from two explosive materials, at two different sizes. Compare to existing data.			
Title: Anti-Armor Warheads (AAW)	2.438	2.395	2.185
Description: AAW focuses on the development of explosive ingredients, explosives, and warhead and fuze technologies for improving IM of AAW munitions. The development of explosive ingredients, explosives, and warhead and fuze technologies, when applied to munitions, improve IM response to one or more threats, while not degrading the response to other IM threats and, at minimum, maintain munition performance. Technologies include, but are not limited to, new ingredient synthesis and characterization, initial formulation development, scale-up, warhead/charge configuration, venting techniques for both munitions and their containers, protection/packaging materials and systems, shock mitigation liners, and initiation devices, techniques, and technologies. Applications vary but include high performance warhead fills, booster explosives, and all other technology to mitigate the violent response of AAW munitions to IM threats. Munition operating conditions may be controlled or have widely varying environmental conditions, such as temperature and vibration, and other factors such as cost, availability, and reliability may be critically important depending on the intended munition application. The 2018 and 2023 year goals of the AAW MATG are concentrated on solving the IM response of anti-armor warheads to the Fragment Impact, Sympathetic Reaction, and Shaped Charge Jet threats for larger munitions and the Fragment Impact, Slow Cook-off, and Sympathetic Reaction / Shaped Charge Jet threats for Medium Caliber Munitions. ***FY 2015 Accomplishments:*** - Scaled up synthesis of newly identified explosive ingredient with high performance and low sensitivity potential. - Developed and characterized explosive formulations using a recently scaled-up newly identified explosive ingredient. - Conducted slow cook-off and small scale sympathetic detonation test on unique combined effects explosive formulation. - Down-selected formulations of energetic materials composed of finer particle size nitramine content and enhanced insensitivity and conducted small scale cookoff and fragment impact testing. Prepared five pound batches of selected formulation. - Conducted small scale slow cook-off, fragment impact and shaped charge testing on unique high energy melt cast explosive formulation for transition to BA 6.3 project.			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
- Designed surrogate munition and shaped charge jet impact initiation testing configurations to demonstrate models utility for weapon design. ***FY 2016 Plans:*** - Conduct tests using surrogate munition and shaped charge jet impact initiation testing configurations to validate models utility for weapon design. - Complete design of experiments, manufacture of down-selected formulations, and do characterization study of newly identified explosive ingredient with high performance and low sensitivity potential. - Investigate and predict initiation response of explosive due to SCJ stimuli using the model. - Mature formulation and process ability using new production technique. - Produce 100 pounds of a unique material and conduct formulation studies using a design of experiments to optimize the IM response. - Conduct small-scale mixtures to assist design of experiments for formulation of plastic explosive. ***FY 2017 Plans:*** - Complete in-situ mixing and casting of warheads in preparation for component testing using RAM technology. - Prepare and demonstrate an IM shock improvement by creation of nano explosive composites. - Demonstrate a ground to air weapon with improved shock sensitivity to the current Javelin system.			
Title: Gun Propulsion (GP) ***Description:*** GP focuses on the development and demonstration of technologies in the area of GP systems. The development and demonstration of gun propulsion technologies, when applied to munition systems, will improve munition IM response to one or more threats, while not degrading the response to other IM threats and, at minimum, maintaining munition performance. Technologies include, but are not limited to, gun propellant formulations, ingredients for gun propellant formulations, including synthesis, characterization and scale-up, cartridge case and packaging design, active and passive venting techniques, reduced sensitivity primer propellant and primer systems, and robust primers for insensitive propellants. Applications vary, but include both large and medium caliber munitions, as well as propelling charges for mortars and shoulder launched munitions. Operating requirements vary, and other factors such as barrel life and operation over varying environmental conditions may be critically important depending on the intended munition application. The 2018 and 2023 year goals of the GP MATG are concentrated on solving the IM response of gun propulsion munitions to Fragment Impact and Slow Cook Off threats. ***FY 2015 Accomplishments:*** - Conducted slow cook-off tests in new apparatus to validate test small scale test protocol for propellant formulations. - Established data set of required material characteristics after exposure to novel ignition methodology. - Down selected unique process ingredients and completed sub-scale IM testing of propellant.	2.038	2.011	1.790

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
- Optimized propellant candidates for new projectile and evaluated performance and sensitivity. Scaled-up and characterized new primer to conduct modeling and to optimize the configuration to enable full scale testing. ***FY 2016 Plans:*** - Mature unique process ingredient propellant formulation, conduct gun testing and prepare for large scale manufacturing of propellant to prepare for slow cook-off testing. - Conduct impact performance testing of propellant and primer for new projectile. - Compile ballistic performance data on coated propellant for modelers. - Scale up two candidate materials for manufacturing and characterization studies for new propellant. - Prepare propellant formulations using three different methods, to compare product sensitivity and processing characteristics. - Develop two new large caliber propellant production techniques and use modeling and simulation to down select the formulations that will produce the least sensitive materials. ***FY 2017 Plans:*** - Integrate primer and conduct full scale gun testing on new propellant for fragment impact and slow cook-off response. - Prepare advanced coating materials and mixing methods to improve sensitivity to shock. - Conduct characterization studies on new large caliber propellant formulations, down select and conduct sub-scale IM testing. - Demonstrate a new gun propellant and cook off system for the 120mm rifled mortar system that can also improve the response of the HEGM system.			
Accomplishments/Planned Programs Subtotals	13.310	13.044	11.993

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
• 0603000D8Z P002: *BA 3 Insensitive Munitions Advanced Technology*	17.826	19.229	17.756	-	17.756	19.200	19.398	19.598	19.984	Continuing	Continuing

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

1) Transition of technologies developed by the Program are tracked and documented by technology maturity.

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2) Munition Area Technology Group (MATG) Technology Roadmaps are prepared, evaluated, and analyzed by Joint Insensitive Munitions Technology Program management and technical staff.
3) Chairman's Annual Assessments for each MATG are critically reviewed by the Technical Advisory Committee to determine progress, transition plans, and relevance of each project.
4) Project progress toward goals and milestones is assessed at each MATG meeting.
5) Annual technical reports and papers are tracked and documented for the Program.
6) External Peer Review of Projects conducted as part of Joint Army/Navy/NASA/Air Force meetings.

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COST ($ in Millions)	Prior Years	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
P204: *Enabling Fuze Technology*	17.035	6.181	6.270	5.752	-	5.752	6.201	6.272	6.359	6.484	Continuing	Continuing

A. Mission Description and Budget Item Justification

This RDT&E effort will demonstrate fuze enabling technologies needed to develop weapons that address priority capability areas identified in the Guidance for Development of the Force (GDF), the Secretary of Defense Memorandum, DoD Policy on Cluster Munitions and Unintended Harm to Civilians, and shortfalls in current weapon systems. This effort will develop enabling technologies at the laboratory scale and transition them into Budget Activity (BA) 6.3 demonstration programs for weapons where priority capabilities and technology needs have been identified and validated by the Program Executive Officers (PEOs) and the Heads of the Service Science and Technology (S&T) communities. Mature BA 6.2 fuze technologies will be transitioned, thereby decreasing their program costs and schedule risk and facilitating spin-offs to other munitions within their portfolios.

Under the Joint Fuze Technology Program (JFTP), investments are focused on specific capability areas that have been identified by the Department's strategic guidance and current shortfalls in weapon systems and validated by the PEOs and Heads of the Service S&T communities. The four capability areas are: 1) Hard Target Survivable Fuzing, 2) Tailorable Effects (TE) Weapon Fuzing, 3) High Reliability Fuzing, and 4) Enabling Fuze Technologies and Common Architecture.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Title: Hard Target Fuzing	1.586	1.617	1.504
Description: The Hard Target Fuzing challenges are grouped into three Technology Areas. First, improved modeling and simulation capabilities provide the validated computational tools necessary for hard target applications. Second, basic phenomenology & understanding of the Fuze Environment is the science-based endeavor of providing the test equipment, instrumentation, and analysis techniques for experimentation and data gathering necessary for next generation fuzing. Third, hard target survivable fuze components are developed to increase the effectiveness of facility denial munitions by improving the prediction tools and testing methodologies to evaluate the survivability and functionality of legacy and future fuzes. Development of these technologies will enable next generation boosted and hypersonic penetrators to execute missions against hardened and deeply buried targets.			
FY 2015 Accomplishments: - Developed and tested alternative packaging technology for the electronic components of a fireset to improve fuze survivability and reliability for legacy free-fall penetrating weapon applications.			
FY 2016 Plans: - Continue development of advanced fuze packaging and alternate low-cost media detection sensor for to measure post impact weapon environments.			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
- Develop modeling & simulation tools to enable prediction within 10 percent of experimental results for peak acceleration and duration at the fuze level in free fall penetrating weapons. ***FY 2017 Plans:*** - Develop and demonstrate 3-D printed fuze electronic components and packaging technologies for survivability and reliability in DoD hypersonic penetrating weapons. - Develop fuze energetic and firing components to reliably and function in boosted and hypersonic penetrators munitions.			
Title: Tailorable Effects Fuzing ***Description:*** Develop fuzing for tailorable effects weapons that encompasses the ability to selectively vary the output of the weapon (Dial-a-Yield) and/or the ability to generate selectable effects (directed blast, fragmentation). Develop initiation and multi-point technologies; electronic safe and arm based multi-point initiators for tunable output – scalable yield warheads; MicroElectro-Mechanical Systems (MEMS) based multi-point initiators for tunable output/scalable yield warheads; and smart fuzing for tailorable effects weapons. These technologies will enable weapons that can effectively defeat a variety of targets while minimizing unintentional collateral effects. ***FY 2015 Accomplishments:*** - Developed and demonstrated primary explosive ink micro-detonators with high output and low sensitivity for use in MEMS fuzes in Med—Caliber rounds and future miniature weapons. ***FY 2016 Plans:*** - Development of multi-point inline firing system in simultaneous and/or post-impact delay into Double Reinforced Concrete (DRC) / Brick over Block (BOB) or equivalent target IAW Redstone Test Center (RTC) standards. ***FY 2017 Plans:*** - Develop wirelessly powering and functioning distributed detonating output nodes in a multi-output safe, arm, and fire system for distributed weapon fuzing and initiation systems, eliminating the need for complex cable assemblies and adding flexibility for easily customizing. - Demonstrate and transition into 6.3 advanced technology development of Hardened Selectable Multipoint Fireset technologies that provides reliable, selectable detonation of tailorable effects warheads.	1.568	1.512	1.303
Title: High Reliability Fuzing ***Description:*** Develop high reliability fuzing architectures, fuzing components, and Unexploded Ordnance (UXO) reduction features. These technologies will enable the next generation of cluster munitions to achieve the required greater than 99 percent reliability goal. Evolving DoD emphasis on increased weapon system reliability is driving the need to consider new and novel approaches for achieving increased fuze reliability while maintaining or enhancing fuze design safety. DoD policy, higher weapon	1.528	1.595	1.475

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Appropriation/Budget Activity 0400 / 2	**R-1 Program Element (Number/Name)** PE 0602000D8Z / *Joint Munitions Technology*	**Project (Number/Name)** P204 / *Enabling Fuze Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
reliability expectations and harsher weapon system operational requirements are dictating the need for higher fuze reliability than available using current technologies. ***FY 2015 Accomplishments:*** - Developed and demonstrated MEMS structures that give existing MEMS Fuzes the ability to self-report safety and reliability compromises in an effort to improve reliability. ***FY 2016 Plans:*** - Complete testing and characterization of MEMS safety and arming (S&A) micro scale materials and energetics to transition into high reliability low cost munitions technology applications. - Develop experimental techniques and apply M&S tools to analyze and evaluate fuze components and explosive trains to increase margin of reliability in fuze design. ***FY 2017 Plans:*** - Develop and demonstrate energy harvesting and free fall sensor technologies to power an electronic safe-arm fuze resulting in an increased margin of reliability in general purpose bomb fuzes. - Investigate reactive growth process at ideal and marginal conditions to guide the quantification of fuze explosive train margin and performance. Applications include: Air Force penetrator weapon demo programs and Army M935 and PGK fuzes.			
Title: Enabling Fuze Technologies ***Description:*** Develop common/modular fuze architecture; innovative fuze component technologies; sensors; next generation fuze setting capability, tools and modeling; and fuzing power sources. These fuzing technologies will provide smaller, more cost effective solutions while meeting or exceeding the performance of existing technologies. Development of these technologies will enable future weapon applications to be more mission adaptive and smaller along with improved target detection capabilities. ***FY 2015 Accomplishments:*** - Researched and identified failure modes in flash programmable logic devices (F-PLD) that enables reliable, safe, and effective use of F-PLDs as fuze components. ***FY 2016 Plans:*** - Develop and demonstrate low cost, small energy harvesting and event detection sensors for application in cannon fire projectile fuzing that improves safety. - Continue development of prototype wireless technology system so as to provide power and data transfer to aerial rockets and small guided munitions for use on US Army rotary aircraft. ***FY 2017 Plans:***	1.499	1.546	1.470

Exhibit R-2A, RDT&E Project Justification: PB 2017 Office of the Secretary Of Defense		Date: February 2016
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
- Develop fast radar signature simulation tool for application in fuzing sensor algorithms that will enables rapid detection and processing of complex targets during weapon end-game. - Develop a reliable, low cost (reduce by 40%) pulse discharge switch for application in electronic safe/arm fuzes (ESAFs).			
Accomplishments/Planned Programs Subtotals	6.181	6.270	5.752

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
• 0603000D8Z P301: *BA 3 Enabling Fuze Advanced Technology*	6.306	6.686	6.146	-	6.146	6.658	6.706	6.797	6.930	Continuing	Continuing

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

1) Transition of technologies developed by the Program are tracked and documented by technology maturity.
2) Fuze Area Technology Group (FATG) Technology Roadmaps are prepared, evaluated, and analyzed by Joint Fuze Technology Program management and technical staff.
3) Chairman's Annual Assessments for each FATG are critically reviewed by the Technology Advisory Committee to determine progress, transition plans, and relevance of each project.
4) Project progress toward goals and milestones is assessed at each FATG meeting.
5) Annual technical reports and papers are tracked and documented for the Program.
6) Technology Transition Agreements in place with Munitions programs.