Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Army											Date: February 2018	
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 2: *Applied Research*					R-1 Program Element (Number/Name) PE 0602624A / *Weapons and Munitions Technology*							
COST ($ in Millions)	**Prior Years**	**FY 2017**	**FY 2018**	**FY 2019 Base**	**FY 2019 OCO**	**FY 2019 Total**	**FY 2020**	**FY 2021**	**FY 2022**	**FY 2023**	**Cost To Complete**	**Total Cost**
Total Program Element	-	118.068	41.455	40.444	-	40.444	46.783	43.044	62.028	63.269	0.000	415.091
H18: *Weapons & Munitions Technologies*	-	20.936	21.455	18.243	-	18.243	20.910	14.661	16.972	17.312	0.000	130.489
H19: *Asymmetric & Counter Measure Technologies*	-	14.350	5.353	0.000	-	0.000	0.000	0.000	11.769	12.005	0.000	43.477
H1A: *WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE*	-	66.500	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	66.500
H28: *Warheads/ Energetics Technologies*	-	16.282	14.647	22.201	-	22.201	25.873	28.383	33.287	33.952	0.000	174.625

A. Mission Description and Budget Item Justification

This Program Element (PE) investigates, designs and evaluates enabling technologies to develop lethal weapons and munitions with increased performance and the potential for lower weight, reduced size, and improved affordability. Project H18 focuses on weapons and munitions development. Project H19 researches technologies to maintain and enhance weapons lethality. Project H28 evaluates munition components such as fuzes, power, warheads with tailorable effects, and munition compliant energetic materials.

Work in this PE is related to, and fully coordinated with, PE 0602303A (Missile Technology), PE 0602105A (Materials Technology), PE 0602618A (Ballistics Technology), PE 0602772A (Advanced Tactical Computer Science and Sensor Technology), PE 0602782A (Command, Control, Communications Technology), and PE 0603004A (Weapons and Munitions Advanced Technology).

The cited work is consistent with the Lethality Portfolio and the Assistant Secretary of Defense for Research and Engineering Science and Technology priority focus areas and the Army Modernization Strategy.

The work in this PE is performed by the Army Research, Development and Engineering Command (RDECOM).

Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Army	Date: February 2018
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army I* BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602624A *I Weapons and Munitions Technology*

B. Program Change Summary ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Previous President's Budget	53.581	41.455	48.825	-	48.825
Current President's Budget	118.068	41.455	40.444	-	40.444
Total Adjustments	64.487	0.000	-8.381	-	-8.381
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	66.500	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.988	-			
• Adjustments to Budget Years	-	-	-8.381	-	-8.381
• FFRDC	-0.025	-	-	-	-

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2017	FY 2018
Project: H1A: *WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE*		
Congressional Add: *Program Increase*	18.000	-
Congressional Add: *High-speed vehicle mounted fire detection technology*	5.000	-
Congressional Add: *Railgun weapon technology*	20.000	-
Congressional Add: *Medium caliber lightweight composite barrel technology*	5.000	-
Congressional Add: *Guided tank fired round development for high mobility targets*	8.500	-
Congressional Add: *Armament systems concepts*	5.000	-
Congressional Add: *hybrid projectile technology*	5.000	-
Congressional Add Subtotals for Project: H1A	66.500	-
Congressional Add Totals for all Projects	66.500	-

Change Summary Explanation

Congressional increase in H1A Weapons & Munitions Tech Program Initiative; funding decreased in this PE to address higher priority Army Modernization efforts in the area of Long Range Precision Fires.

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army			Date: February 2018
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602624A / *Weapons and Munitions Technology*	Project (Number/Name) H18 / *Weapons & Munitions Technologies*	

COST ($ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
H18: *Weapons & Munitions Technologies*	-	20.936	21.455	18.243	-	18.243	20.910	14.661	16.972	17.312	0.000	130.489

A. Mission Description and Budget Item Justification

This Project designs, investigates, and evaluates component technologies to enable affordable precision munitions as well as provide increased lethality and performance with reduced logistics and advanced direct/indirect fire capabilities for Soldier, ground vehicle and aviation platforms.

Efforts in this Project support the Army Science and Technology Lethality Portfolio.

The cited work is consistent with the Assistant Secretary of Defense for Research and Engineering Science and Technology priority focus areas and the Army Modernization Strategy

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019
Title: Novel Propulsion Technology for the Future	3.213	3.429	2.921
Description: This effort explores propellant technologies such as powder coextrusion and grain coatings, while retaining insensitive properties, for employment in gun launch environments as well as directional thrusters including those that deliver a broad spectrum of effects. It also conducts experiments with these propellants to increase the range of artillery and mortar rocket assisted projectiles.			
FY 2018 Plans: Optimize formulation and design electrode configurations for electrically controlled energetic materials (ECEM) which could enable extended range and improve precision and temperature compensation; design and develop igniter materials and characterize interaction between coated propellant grains and ignition system in development of a temperature invariant propulsion system; conduct experiments to transform feed stock propellant formulations into spheroidal geometries using advanced processing techniques; mature the die design and formulation developed organically for co-extrusion processing; mature novel propellant formulations and validate models and experiments while investigating increased propellant masses for use in co-developed foam celluloid combustible case; continue to investigate, research, and mature new rocket motor formulations for use in emerging rocket assisted projectiles to determine potential range increases.			
FY 2019 Plans: Will investigate alternative processing methods amenable to achieving high-energy formulations in spheroidal and/or pancake geometries in conjunction with development of high-energy propellant formulations; will investigate processing methods, material synthesis and formulation to support development of encapsulated propellant, which could result in improved stability/sensitivity			

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army		Date: February 2018
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602624A / *Weapons and Munitions Technology*	**Project (Number/Name)** H18 / *Weapons & Munitions Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019
and combustion profiles without sacrificing combustion performance; will validate the optimized electrode configuration and formulation for electrically controlled energetic materials (ECEM). ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Decrease is due to propellant design formulations completed and available for processing and synthesis validation.			
Title: Advanced Weapons Technology ***Description:*** This effort investigates innovative weapon technologies such as recoil energy mitigation, affordable precision, extended range/guided technologies, and advanced propellant for future medium caliber direct fire systems that could provide similar or greater lethality than current systems. ***FY 2018 Plans:*** Investigate novel weapon technologies that will allow for heat check techniques of cracks in explosives; conduct experiments to develop cold spray deposition processes for erosion resistant metal coatings. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Effort completed in FY18.	1.420	0.824	-
Title: Affordable Precision Technologies ***Description:*** This effort investigates technologies that provide affordable precision capabilities for projectiles fired into Global Positioning System (GPS) denied environments. ***FY 2018 Plans:*** Characterize thoroughly the image navigation component and subsystem technologies across the operational conditions in order to ensure a robust Technology Readiness Level 5 (TRL-5) is achieved for all of the enabling subsystems; a new low Size, Weight, and Power (SWaP) Tactical Grade Gun Hardened Inertial Measurement Unit (IMU) will be demonstrated to a TRL-5. ***FY 2019 Plans:*** Will investigate the optimal architecture for an Automatic Target Recognition (ATR) capable Precision Guided Munition (PGM); will include initial system trade studies, modeling of various seeker types on candidate indirect fire platform systems and experimental assessments of high risk critical components. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Decrease is due to project completing the phase of component technologies characterization.	2.809	3.015	2.652
Title: Extended Range Indirect Fire Weapon Technology	2.809	2.783	-

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army		Date: February 2018
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602624A / *Weapons and Munitions Technology*	**Project (Number/Name)** H18 / *Weapons & Munitions Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019
Description: This effort initially investigates and determines the viability of candidate extended range indirect fire weapon technologies that facilitate light weight armaments with launch velocities resulting in ranges of 70km and beyond with emerging ammunition. Technologies will be applied at the system and sub-system level to address technology gaps. ***FY 2018 Plans:*** Continue to mature extended range indirect fire component technologies and conduct integrated experiments to validate technologies for use with the M109A7 howitzer system to determine system impacts of the extended range capability as well as investigate the application of these technologies to other indirect fire systems such as the M777A2 and M119A3. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Applied Research phase completed.			
Title: Force Protection Technologies ***Description:*** This effort accelerates the development of disruptive technologies that enable transformational protection capabilities for vital assets, forces and civilian populations, increasing safety, decreasing collateral damage and minimizing fratricide.	0.472	-	-
Title: Long Range Gun Technology Development ***Description:*** This effort investigates and develops candidate extended range artillery weapon system and projectile technologies that increase the range up to 2x with increased precision. Resulting component technologies will be evaluated and matured in the fully coordinated effort of the same name in PE/Project 0603004A/232. ***FY 2018 Plans:*** This effort is conducted in concert with the Extended Range Indirect Fire Weapon Technology effort to determine weight reduction of common 155mm armament concepts integrated with advanced micro-common fire control concepts to achieve extended range for demonstration mentioned in PE/Project 0603004A/232; validates post launch propulsion methods for next generation extended range munitions and determine range extension gains that could be achieved by new designs of post launch projectile lifting surfaces. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Effort completed the Applied Research phase.	2.317	1.500	-
Title: Fuze and Power Technologies for Munitions	1.896	2.080	1.054

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army		Date: February 2018
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602624A / *Weapons and Munitions Technology*	**Project (Number/Name)** H18 / *Weapons & Munitions Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019
Description: This effort investigates and designs innovative fuze and power technologies for enhanced environment and target sensing/classification, warhead initiation schemes and advanced fuze setting to provide enhanced lethality combined effects on targets and advanced initiation schemes for the next generation munitions. ***FY 2018 Plans:*** Continue to mature advanced sensor components and devices; mature advanced initiation systems applicable to insensitive munitions; mature and validate advanced power technologies for medium and large caliber munitions; and mature airburst fuzing technologies for reduced range error in medium caliber fuzing. These technologies continue to support the Joint Munitions Program TCG ? 5 and TCG-10 and the JFTP. ***FY 2019 Plans:*** Will advance the capability of state of the art in fuze proximity sensors to track targets in order to improve burst point accuracy and countermeasure robustness; will maximize usage of all real time battlefield targeting data and integrate with fuze setters, fuze sensors, power sources, component protective technologies and unique fuze ignition schemes to design and develop extremely reliable and versatile fuzes; will investigate these new fuze designs to support hypersonics, autonomous fuzing for varied targets as well as Counter-Unmanned Aerial Systems. These technologies will continue to leverage the OSD Joint Munitions Program TCG - 5 and TCG-10 and the OSD Joint Fuze Technology Program. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Decrease is due to maturation of sensor components and airburst technologies.			
Title: Cluster Munitions Replacement Acceleration ***Description:*** This effort will design and develop the critical components that will aid in the maturation of a materiel solution designed to replace 155mm dual purpose improved conventional munition (DPICM) artillery. The components will include the design, development and component testing of fuzing, warhead and stabilization technologies. ***FY 2018 Plans:*** Investigate and mature fuze initiation train design; research and develop novel designs of arming, warhead and stabilization architectures; conduct lab experiments for critical components to validate reliability and functionality claims; fund research looking at the effectiveness of materiel solutions for various concepts. ***FY 2019 Plans:***	6.000	7.000	1.050

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army		Date: February 2018
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602624A / *Weapons and Munitions Technology*	**Project (Number/Name)** H18 / *Weapons & Munitions Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019
This effort will begin to validate the tactical designs for all concepts, and will investigate incorporating additional features into the design of critical components; will improve insensitive munitions (IM) performance as well as investigate and determine what other technologies could be incorporated into the materiel solutions as a potential improvements. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Decrease is due to cluster munition replacement technology transitioning from Applied Research to Advanced Demonstration in FY19.			
Title: Programmable Intelligent Collaborative Engagement Munition ***Description:*** This effort develops, matures and integrates a gun hardened suite of components (software, sensors, navigation and communications) that enable the application of distributed, cooperative and collaborative tactics for munitions. ***FY 2018 Plans:*** Develop collaborative algorithms, which will include a set of tools like target assignment based on probability of kill scoring, target assignment with must hit priority where total probability of kill priority is applied after must hit criteria are achieved, and 3D pattern goals with arrival time objectives. ***FY 2019 Plans:*** Will design and develop hardware and mature algorithms and concepts validated in the prior year to a breadboard state; will utilize hardware and software in the loop testbed to validate collaboration across multiple munitions in flight. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Increase is due to the efforts needed for the building of hardware and generation of algorithms to demonstrate munition collaboration capability.	-	0.824	1.500
Title: Advanced Rotorcraft Armaments Protection System ***Description:*** The Advanced Rotorcraft Armament and Protection System (ARAPS) effort designs and develops Future Vertical Lift (FVL) technologies for lightweight armament systems and multi-role munitions with enhanced lethality at extended ranges. The effort investigates and determines the feasibility of a holistic fire control system that integrates all aspects of offensive and defensive capabilities for advanced protection and enhanced survivability. ***FY 2019 Plans:*** Will investigate integrated armament and advanced protection designs for Future Vertical Lift (FVL) offensive and defensive applications; will design critical component technologies in order to develop advanced lethality and survivability capabilities in	-	-	4.566

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army		Date: February 2018
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602624A / *Weapons and Munitions Technology*	**Project (Number/Name)** H18 / *Weapons & Munitions Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019
fire control, weapon systems, munitions and countermeasures; will investigate system architecture solutions for an integrated armament and advanced protection system. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** First year of effort.			
Title: Radio Frequency Guided Munition ***Description:*** This effort investigates technologies that provide a Radio Frequency (RF) seeking capability for gun-launched projectiles to enable engagement of RF emitting sources and similar targets of interest. ***FY 2019 Plans:*** Will investigate RF seeker component technologies with a focus on projectile payload performance, size, weight, power, and gun launch survivability; will perform systems engineering and detailed performance analyses to determine the trade space when integrating these RF seeker technologies in gun-launched environments. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** First year of effort.	-	-	1.500
Title: ARCHER ***Description:*** This effort designs and develops advanced fire control algorithms and a multirole warhead guided projectile for area defense against medium (Groups 2 and 3) sized unmanned aerial systems (UAS) and aerial rotary wing platforms, point defense against rocket propelled grenades (RPGs), anti-tank guided missiles (ATGMs), and rocket, artillery, and mortars threats as well as precision fires against dismounts in defilade. ***FY 2019 Plans:*** Will investigate and mature command guided, medium caliber projectile designs on a tactical turret platform; will research and develop novel warhead and projectile stabilization architectures; will conduct lab experiments to mature designs of projectile critical components; will validate reliability, functionality and performance of various projectile component technologies; will research the target defeat effectiveness of material solutions for various concepts and develop algorithms based on armament system requirements. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** First year of effort.	-	-	3.000
Accomplishments/Planned Programs Subtotals	20.936	21.455	18.243

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army		Date: February 2018
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602624A / *Weapons and Munitions Technology*	**Project (Number/Name)** H18 / *Weapons & Munitions Technologies*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army			Date: February 2018
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602624A / *Weapons and Munitions Technology*	Project (Number/Name) H19 / *Asymmetric & Counter Measure Technologies*	

COST ($ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
H19: *Asymmetric & Counter Measure Technologies*	-	14.350	5.353	0.000	-	0.000	0.000	0.000	11.769	12.005	0.000	43.477

A. Mission Description and Budget Item Justification

This Project designs and develops technologies to support asymmetric countermeasures such as efforts to maintain the lethality and overmatch of United States (US) weapons against current and future threat systems. Work in this Project is related to, and fully coordinated with, efforts in Projects H18 and H28 (also in Program Element (PE) 0602624A), PE 0602618A (Ballistics Technology), and projects 232 and L94 in PE 0603004A (Weapons and Munitions Advanced Technology).

Efforts in this Project support the Army Science and Technology Lethality Portfolio.

The cited work is consistent with the Assistant Secretary of Defense for Research and Engineering Science and Technology priority focus areas and the Army Modernization Strategy.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019
Title: Novel Battlefield Effectors ***Description:*** This effort investigates unique weapon and munitions enabling technologies to achieve tunable effects on targets and that are capable of providing a full range of effects from non-lethal to highly lethal via a single weapon or munition.	2.268	-	-
Title: Counter-Countermeasure (CCM) Technologies for Weapons and Munitions ***Description:*** This effort investigates guidance signal reduction, inertial measurement unit, and antenna design technologies to enable continued effectiveness of US weapon systems against enemy countermeasures including Active Protection Systems (APS), Global Positioning System (GPS) jamming, and active seeker jamming. ***FY 2018 Plans:*** Mature technologies providing active counter-countermeasures against radio frequency (RF) threats; develop advanced materials for passive protection and structural enhancements; conduct designs of experiments to isolate key variables for design enhancements; integrate technologies for performance characterization against simulated threats. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Decrease due to realignment of funding in support of the Accelerated Extended Range Artillery Munition Suite effort (PE 0603004A/Project 232)	1.407	1.309	-
Title: Enhanced Fire Control for Indirect Fires	1.923	2.044	-

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army		Date: February 2018
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602624A / *Weapons and Munitions Technology*	**Project (Number/Name)** H19 / *Asymmetric & Counter Measure Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019
Description: This effort evaluates the applicability and integration of state-of-the-art acquisition and engagement technologies for data and image processing, weapon orientation sensors and methodologies to enhance fire control capability, and therefore weapon effectiveness, at various ranges and under battlefield conditions. Investigates components and architectures that will reduce size, weight, power and cost (SWaP-C), and increase commonality and operation across direct and indirect fire control systems. ***FY 2018 Plans:*** Mature extended range tracking, in flight communications and miniaturization of components for use in Global Positioning System (GPS)-denied environments as well as navigation and pointing technologies/compensation components; validate improved conventional munition accuracy and develop common graphical user interfaces for fire control systems to allow for cross platform use and enable multi-role functionality. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Effort completed in FY18.			
Title: High Powered Radio Frequency ***Description:*** This effort in High Power RF technology focuses on addressing the SWaP-C of High Power RF systems and their components so as to allow tactically useful systems.	1.925	-	-
Title: Terrain Shaping Munition Technologies ***Description:*** This effort develops an improved munition capability, remote delivery, and man-in-the-loop control technologies that will allow the warfighter to maintain dominance in the battlefield by denying adversaries access to an area of operations. ***FY 2018 Plans:*** Validate munition architectures across delivery ranges against safety, reliability, and performance requirements; conduct experiments of large area coverage anti-personnel effects; investigate and confirm design with use of new dielectric and de-poling materials and conduct experimentations to validate different configurations and field layouts capable of handling high voltages in very compact form factor; collect validation data for effects study to identify output requirement and design tuning; conduct study on delivery mechanisms; and provide data for improving performances. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Effort completed in FY18.	1.923	2.000	-
Title: Small Arms Fire Control	4.039	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army		Date: February 2018
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602624A / *Weapons and Munitions Technology*	**Project (Number/Name)** H19 / *Asymmetric & Counter Measure Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019
Description: This effort focuses on providing the soldier a set of small arms capabilities to increase the accuracy at extended ranges, probability of hit, improve time of engagement, and enhance situational awareness. By achieving these objectives, the soldier will be able to improve their operational effectiveness in reduced time.			
Title: Indirect Fire Aiming Techniques ***Description:*** This effort supports future integrated aiming technologies for indirect fires with enhanced capabilities and a simplified user interface while reducing size, weight and power.	0.865	-	-
Accomplishments/Planned Programs Subtotals	14.350	5.353	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army											Date: February 2018	
Appropriation/Budget Activity 2040 / 2					R-1 Program Element (Number/Name) PE 0602624A / *Weapons and Munitions Technology*				Project (Number/Name) H1A / *WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE*			
COST ($ in Millions)	**Prior Years**	**FY 2017**	**FY 2018**	**FY 2019 Base**	**FY 2019 OCO**	**FY 2019 Total**	**FY 2020**	**FY 2021**	**FY 2022**	**FY 2023**	**Cost To Complete**	**Total Cost**
H1A: *WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE*	-	66.500	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	66.500

Note

Congressional increases for Program increase ($18M); High-speed vehicle mounted fire detection technology ($5M); Railgun weapon technology ($20M); Medium caliber lightweight composite barrel technology ($5M); Guided tank fired round development for high mobility targets ($8.5M); Armament systems concepts ($5M); Hybrid projectile technology ($5M)

A. Mission Description and Budget Item Justification

Congressional Interest Item funding for Weapons and Munitions Technology applied research.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018
Congressional Add: Program Increase ***FY 2017 Accomplishments:*** N/A	18.000	-
Congressional Add: High-speed vehicle mounted fire detection technology ***FY 2017 Accomplishments:*** N/A	5.000	-
Congressional Add: Railgun weapon technology ***FY 2017 Accomplishments:*** N/A	20.000	-
Congressional Add: Medium caliber lightweight composite barrel technology ***FY 2017 Accomplishments:*** N/A	5.000	-
Congressional Add: Guided tank fired round development for high mobility targets ***FY 2017 Accomplishments:*** N/A	8.500	-
Congressional Add: Armament systems concepts ***FY 2017 Accomplishments:*** N/A	5.000	-
Congressional Add: hybrid projectile technology ***FY 2017 Accomplishments:*** N/A	5.000	-
Congressional Adds Subtotals	66.500	-

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army		Date: February 2018
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602624A / *Weapons and Munitions Technology*	**Project (Number/Name)** H1A / *WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army			Date: February 2018
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602624A / *Weapons and Munitions Technology*	Project (Number/Name) H28 / *Warheads/ Energetics Technologies*	

COST ($ in Millions)	Prior Years	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
H28: *Warheads/ Energetics Technologies*	-	16.282	14.647	22.201	-	22.201	25.873	28.383	33.287	33.952	0.000	174.625

A. Mission Description and Budget Item Justification

This Project investigates and designs enabling warhead and energetic technologies such as novel warhead architectures, new propellant techniques, and high-density explosives to produce smaller, lighter, more effective, multi-role warheads, flare and pyrotechnic countermeasures, and novel approaches for ammunition demilitarization and combat in complex environments.

Efforts in this Project support the Army Science and Technology Lethality Portfolio.

The cited work is consistent with the Assistant Secretary of Defense for Research and Engineering Science and Technology priority focus areas and the Army Modernization Strategy.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019
Title: Scalable Warhead Technology	5.771	5.250	6.001
Description: This effort designs scalable and adaptive explosives and reactive materials technology for either gun or missile-launched weapons and munitions that can deliver a broad spectrum of effects with reduced collateral damage. In addition, this effort will facilitate the design and development of improved area clearance technologies.			
FY 2018 Plans: Mature warheads to higher levels of technology readiness through the iterative design and development process and validate previous work in modeling and simulation. Among these are novel designs that can enable multi-role munitions (e.g. Counter Rocket, Artillery, and Mortar, Counter Unmanned Aircraft System) such as shaped charge (SC) and multi explosively formed penetrators (MEFP?s) developed to address emerging threats. In addition, further designs in controlled and scalable blast fragmentation are pursued to concentrate lethality while reducing collateral damage. Continue the design process to provide lethality solutions to cluster munition replacements as well as continue maturing novel area clearance concepts; validate component technologies in a relevant environment.			
FY 2019 Plans: Will mature and down select various warhead components (mini SC liners, mini EFPs and multi-EFPs) for insertion into follow-on 6.3 efforts; validate effectiveness of selected concepts against simulated and actual threats.			
FY 2018 to FY 2019 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army		Date: February 2018
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602624A / *Weapons and Munitions Technology*	**Project (Number/Name)** H28 / *Warheads/ Energetics Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019
Increase due to maturation of technologies for mini shaped charge liners, mini-explosively formed penetrators, and multi-explosively formed penetrators.			
Title: Advanced Energetics (formerly named Explosives Research) ***Description:*** This effort develops advanced energetic materials and novel processing techniques for future explosives and propulsion applications that enable an increase in range, lethality, and utility of ammunitions. ***FY 2018 Plans:*** Conduct research to investigate a new class of energetic materials, amorphous energetics, capable of on-demand activation for improved sensitivity and performance; investigate the synthesis of energetic materials tailored to additive manufacturing applications; design explosives charges with integrated electronics; model next-generation gun-propulsion charge design concepts achievable as a result of additive manufacturing capabilities; conduct research with advanced processing methods to synthesize energetic materials in safer, more efficient and environmentally-conscious manners. ***FY 2019 Plans:*** Will mature technologies focused in nano-energetics designs for use in melt-cast formulations; will mature the polymer kinetics for amorphous energetics; will investigate next-generation melt-cast and cast-cure ingredients for higher energy formulations; will investigate reaction kinetics for ingredient synthesis applicable to advanced flow reactors; will design and develop processing parameters necessary to produce energetic materials for additive manufacturing; will develop novel modeling and simulation tools required to accurately predict energetic materials performance in novel and unique geometries. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Increase due to research into advanced nano energetics and mature new formulations for the next generation energetics.	7.526	6.349	8.338
Title: Tunable Pyrotechnics ***Description:*** This effort develops smoke and flare countermeasure for passive protection for ground and air combat platforms, and hand held signals for illumination and signaling. These capabilities will increase warfighter and aircraft survivability. ***FY 2018 Plans:*** Integrate and test designs for dazzler Counter Measure (CM) for both night time and day time solutions; refine M&S for reliability to evaluate if requirements can be met; produce scaled-up quantities for cloud countermeasure for down selected flare formulations; investigate and verify effectiveness of formulations; mature formulations of ASCM to obtain effectiveness data; validate cloud CM to Technology Readiness Level 5 (TRL-5). ***FY 2019 Plans:***	2.985	2.048	3.721

Exhibit R-2A, RDT&E Project Justification: PB 2019 Army		Date: February 2018
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602624A / *Weapons and Munitions Technology*	**Project (Number/Name)** H28 / *Warheads/ Energetics Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2017	FY 2018	FY 2019
Will develop an integrated solution for the Dazzler Counter Measure to include new pyrotechnic formulations; will develop and modify ASCM formulations based on static and functional tests to assess viability of technology candidates; will investigate new countermeasure designs in the electromagnetic (EM) spectrum to address emerging threats. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Increase due to maturation of complex pyrotechnic formulations to address future threat.			
Title: Novel Demilitarization Technologies ***Description:*** This effort develops smoke and flare countermeasure for passive protection for ground and air combat platforms, and hand held signals for illumination and signaling. These capabilities will increase warfighter and aircraft survivability ***FY 2018 Plans:*** Investigate contained release agents for weapons demilitarization; design demilitarization-ready ammunition using embedded agents that modify explosives on-demand and render munitions safe and unusable for military purposes. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Effort completed in FY18.	-	1.000	-
Title: Advanced Warheads ***Description:*** This effort explores multiple pathways to enhance lethal efforts for future warheads against emerging peer/near peer target sets. Investigates synergistic effects of novel micro warheads using advance materials. ***FY 2019 Plans:*** Will characterize new family of materials for designs of novel micro warheads to achieve fragmentation, explosively formed penetrators (EFP) and shaped charge effects; will conduct parametric study to establish the performance and lethal effects of novel warhead designs. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** Effort begins in FY19.	-	-	4.141
Accomplishments/Planned Programs Subtotals	16.282	14.647	22.201

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

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D. Acquisition Strategy

N/A

E. Performance Metrics

N/A