Exhibit R-2, RDT&E Budget Item Justification: PB 2015 Army											Date: March 2014	
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 2013**	**FY 2014**	**FY 2015 Base**	**FY 2015 OCO #**	**FY 2015 Total**	**FY 2016**	**FY 2017**	**FY 2018**	**FY 2019**	**Cost To Complete**	**Total Cost**
Total Program Element	-	46.097	52.778	38.069	-	38.069	42.686	49.902	49.000	57.578	-	-
H18: *Weapons & Munitions Technologies*	-	16.281	13.194	18.792	-	18.792	21.127	22.277	21.998	25.581	-	-
H19: *Asymmetric & Counter Measure Technologies*	-	7.562	9.044	6.988	-	6.988	7.302	7.933	8.046	11.454	-	-
H1A: *WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE*	-	11.567	15.000	-	-	-	-	-	-	-	-	-
H28: *Warheads/ Energetics Technologies*	-	10.687	15.540	12.289	-	12.289	14.257	19.692	18.956	20.543	-	-

The FY 2015 OCO Request will be submitted at a later date.

Note

FY 13 resource adjustments attributed to Congressional Add funding (15.000 million); Congressional General Reductions (-88 thousand); SBIR/STTR transfers (-620 thousand); and Sequestration Reductions (-3.413 million)

A. Mission Description and Budget Item Justification

This program element (PE) investigates, designs and evaluates enabling technologies to develop lethal and nonlethal 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 19 researches technologies to maintain the lethality of US weapons as well as directed energy (DE) capabilities and subsystems to support the weaponization of high power microwave (HPM), and short pulse lasers. Project H28 evaluates munition components such as fuzes, power, warheads with tailorable effects, and insensitive munition compliant energetic materials.

Work in this PE is related to, and fully coordinated with, PE 0602303A (Aviation Advanced Technology), 0602105A (Materials Technology), PE 0602618A (Ballistics Technology), PE 0602772A (Advanced Tactical Computer Science and Sensor Technology), PE 0602782A (Command, Control, Communications Technology), PE 0603004A (Weapons and Munitions Advanced Technology), and PE 0603008A (Electronic Warfare Advanced Technology).

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.

Work in this PE is primarily performed by the Armament Research, Development, and Engineering Center (ARDEC) at Picatinny Arsenal, NJ, in cooperation with the Army Research Laboratory (ARL) at Aberdeen Proving Ground, MD; the Communications-Electronics Research, Development, and Engineering Center (CERDEC), Fort

Exhibit R-2, RDT&E Budget Item Justification: PB 2015 Army	Date: March 2014
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*

Belvoir, VA; the Tank Automotive Research, Development, and Engineering Center (TARDEC), Warren, MI; and the Aviation and Missile Research, Development, and Engineering Center (AMRDEC), Huntsville, AL.

B. Program Change Summary ($ in Millions)	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO	FY 2015 Total
Previous President's Budget	35.218	37.798	40.431	-	40.431
Current President's Budget	46.097	52.778	38.069	-	38.069
Total Adjustments	10.879	14.980	-2.362	-	-2.362
• Congressional General Reductions	-0.088	-0.020			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	15.000	15.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.620	-			
• Adjustments to Budget Years	-	-	-2.362	-	-2.362
• Sequestration	-3.413	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army											Date: March 2014	
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 2013**	**FY 2014**	**FY 2015 Base**	**FY 2015 OCO #**	**FY 2015 Total**	**FY 2016**	**FY 2017**	**FY 2018**	**FY 2019**	**Cost To Complete**	**Total Cost**
H18: *Weapons & Munitions Technologies*	-	16.281	13.194	18.792	-	18.792	21.127	22.277	21.998	25.581	-	-

The FY 2015 OCO Request will be submitted at a later date.

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.

This project sustains Army science and technology efforts supporting the Ground and Lethality portfolios.

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

Work in this project is performed by the Armament Research, Development, and Engineering Center (ARDEC), at Picatinny Arsenal, NJ in collaboration with a the Army Research Laboratory (ARL), Aberdeen Proving Ground, MD; the Aviation and Missile Research, Development, and Engineering Center (AMRDEC), Huntsville, AL; and the Communications-Electronics Research, Development, and Engineering Center (CERDEC), Fort Belvoir, VA.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Title: Novel Propulsion Technology for the Future	3.958	3.521	3.614
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 2013 Accomplishments: Investigated new propulsion ingredients for scale up of formulations to provide extended range; designed, fabricated and evaluated new charge systems using coextrusion of multiple materials as well as coatings for burn rate modification.			
FY 2014 Plans: Conduct experiments on rocket propulsion systems concepts to extend the range of 155mm artillery and 120mm mortar; determine ballistic applications for co-extruded propellants; leverage advancements in combustible cartridge case technologies to improve projectile propulsion; design and develop optimal propellant configurations for specific applicable systems; develop			

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army		Date: March 2014
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 2013	FY 2014	FY 2015
120mm mortar propellant for 120mm systems for improved range and cost; develop and optimize advanced propellant for 81mm extended range system compliant with automated direct/indirect fire mortar (ADIM). ***FY 2015 Plans:*** Will conduct initial experiments on non ammonium perchlorate propellant formulations for rocket assisted projectile indirect fire solutions; will design and develop propellant technologies for next generation artillery and tank applications; will scale up materials for advanced propellants, igniters and combustible materials for propellant charges.			
Title: Advanced Weapons Technology ***Description:*** This effort investigates innovative weapon technologies such as recoil energy mitigation, affordable precision, extended range/guided technologies, and advanced propelling for future medium caliber direct fire systems that could provide similar or greater lethality than current systems. ***FY 2013 Accomplishments:*** Continued to mature hydrogen propellant ignition and remote automated gun firing in medium caliber weapons for transition to advanced development; conducted additional small scale research into multiple novel weapon system candidate technologies; developed precision technologies for extended/guided range applications. ***FY 2014 Plans:*** Mature most promising weapon technologies to enable swarming munitions that provide highly lethal target tailorable effects such as advanced miniature fuze and power systems and munition architectures for synergistic effects; evaluate for transition to advanced development; conduct additional small scale research into multiple novel weapon system candidate technologies, including fire control decision support services, and enhanced sniper technologies for improved precision at extended ranges. ***FY 2015 Plans:*** Will investigate multiple promising innovative weapon technologies that could provide greater lethality; will develop weapon technologies that incorporate emerging materials (e.g. nanotechnology, additive manufacturing); will develop weapon, munition and fire control technologies that support advanced forms of engagement, such as collaborative munitions.	3.118	2.291	2.174
Title: Fire Control Target Recognition ***Description:*** This effort designs and develops networked fire control hardware and software that can be integrated with existing command and control architectures. ***FY 2013 Accomplishments:***	2.256	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army		Date: March 2014
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 2013	FY 2014	FY 2015
Designed and investigated target data and weapon effects for improved mission planning; designed and investigated weapon placement coordination; designed weapons and effects database; investigated small unit fire control hardware; conducted experiments to validate design efforts.			
Title: Line-of-Sight (LOS) Course Correction Munition Technology ***Description:*** This effort investigates and evaluates technologies such as small thrusters fired to the side of the round to correct trajectory and to improve precision and lower collateral damage in munitions. ***FY 2013 Accomplishments:*** Integrated line-of-sight (LOS) course correction subsystem for ballistic testing; measured both structure and function of LOS course correction subsystem integrated into surrogate munition for performance and success.	2.747	-	-
Title: Precision Munition Technologies ***Description:*** This effort designs and investigates scalable and modular enabling technologies such as novel decelerators, advanced explosive detonators, and advanced control actuators for gun-launched munitions. ***FY 2013 Accomplishments:*** Investigated sensor targeting algorithm solutions for all-weather operations (to include experiments with semi-active laser sensors and other suitable options); investigated and matured affordable control actuation system components; conducted high-g survivability experiments.	4.202	-	-
Title: Novel Penetrator Designs ***Description:*** This effort provides novel direct fire capabilities against advanced heavy armor threats by investigating several projectile configurations and non depleted uranium (DU) materials to achieve flight stability and effectiveness against new armored targets. ***FY 2014 Plans:*** Optimize components for better function and launch survival; design and modify non-DU kinetic energy (NexGen KE) functional projectile leading to the tech demo	-	1.691	-
Title: Extended Range Projectile Technology ***Description:*** This effort develops various methods of low cost extended range technologies for 60mm through 120mm mortar. Target acquisition will improve with the incorporation of semi-active laser (SAL), video and GPS Guidance, Navigation and Control (GNC) state of the art technologies. The warfighter/Command & Control on a PDA and/or computer will be able to see beyond line-of-sight targets and change directions of projectiles while in flight.	-	0.997	0.991

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army		Date: March 2014
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 2013	FY 2014	FY 2015
FY 2014 Plans: Mature component technologies such as aerodynamic shapes, tail fins, lift surfaces,improved propellant and base bleed for 60mm through120mm mortar projectiles; conduct experiments for directing the projectile onto target at ranges beyond 500 meters; validate and mature electronic components for insertion into projectiles. ***FY 2015 Plans:*** Will mature and validate the improved aerodynamic shapes, propellant, guidance/navigation and control, auto pilot and low pressure gas technologies, into 60mm/120mm mortar projectiles with a goal of up to a 75% increase in range with guidance; will conduct an experimental flight of a guide to hit projectile at 75% increased range.			
Title: Affordable Precision Technologies ***Description:*** This effort investigates technologies that provide affordable precision capabilities for projectiles fired into GPS denied environments. ***FY 2014 Plans:*** Conduct experiments to validate the concept of utilizing commercial-off-the-shelf (COTS) inertial sensors for guided munition applications; determine the feasibility of applying arrayed sensor concepts to gun launched munitions in order to determine position within navigation grade accuracies; validate target recognition algorithms adapted for use with the imaging modalities selected. ***FY 2015 Plans:*** Will validate inertial sensor array design and processing algorithms developed: will conduct various experiments with the long-wave/near-IR imagers used for terminal guidance in GPS denied environments. Nature of the experiments will be to collect real time imagery data for the purpose of navigation algorithm development. This effort is being conducted in collaboration with AMRDEC through the ATR Working Group and with the Army Research Laboratory (ARL) through a technology transition agreement. This effort will spin out component technologies that will be evaluated and matured in the fully coordinated effort of the same name in PE/Project 0603004A/232.	-	1.695	3.282
Title: Enabling Printed Explosives, Power Sources & Electronics for Munitions ***Description:*** This effort develops and accelerates the state-of-the-art in materials printing, direct write, flexible electronics, and conformal systems for the warfighter. ***FY 2014 Plans:***	-	0.704	0.700

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army		Date: March 2014
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 2013	FY 2014	FY 2015
Develop Printed Electronics, Energetics, Materials, & Sensors (PEEMS) technologies for armament applications; investigate ink development, device fabrication, and testing of printed electronics for current and future armament system; determine the utility of PEEMS technologies for munitions fuzing, sensing, security, and logistics. ***FY 2015 Plans:*** Will investigate, design, develop and validate printed electronics, energetics, and power sources for Munitions and other armament applications; will mature materials and printing techniques to add capabilities to munitions and fuze systems, while reducing the size, weight, and cost of conventional electronics; will conduct experiments to determine applicability of printing techniques for antennas, sensors, electrical components, and other components printed onto windscreens, radomes, munitions, and weapon systems. This effort is being conducted in collaboration with CERDEC, AMRDEC and the Army Research Laboratory (ARL) through both the integrated project team and technical working groups.			
Title: Air Dropped Guided Munition Technology ***Description:*** This effort develops and integrates component technologies that enable the precision delivery and function of an 81mm mortar to defeat moving targets of opportunity in complex terrain. ***FY 2014 Plans:*** Mature designs and analyze integration of Proximity Fuze system, with a wrap around antenna, and semi active laser seeker components, designed and developed to fit the volume and form factor of low cost and light weight air drop 60-81mm munitions.	-	1.295	-
Title: Extended Range Indirect Fire Weapon Technology ***Description:*** This effort initially investigates and determines the viability of candidate extended range indirect fire weapon technologies that facilitate hyper-velocity launch and result in ranges beyond 60km. The effort subsequently addresses the component level technological gaps. ***FY 2014 Plans:*** Identify candidate technologies that can be used to facilitate hyper-velocity launch; investigate viability of candidate technologies; develop concepts utilizing the most promising technologies; identify the subcomponent technological gaps that need to be addressed early. ***FY 2015 Plans:*** Will mature the concepts of an extended range armament system; will continue the investigation of unconventional materials and processes to allow a new system to have no significant weight increase compared to existing systems; will develop a detailed	-	1.000	1.021

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army		Date: March 2014
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 2013	FY 2014	FY 2015
design of a lightweight armament system for use in extended range weapons that addresses the current Army capability gaps with minimal system impact.			
Title: Force Protection Technologies ***Description:*** This effort accelerates the development of disruptive technologies that enable transformational protection capabilities protection for vital assets, forces and civilian populations, increasing safety, decreasing collateral damage and minimizing fratricide. ***FY 2015 Plans:*** Will investigate and develop armament technologies to provide protection to vital National assets including vehicles, facilities, weapons, and personnel; will develop precision weapons, munitions and fire control technologies to reduce collateral damage to non-combatants; will develop armament technologies that provide greater standoff distance between incoming threats and vital assets.	-	-	3.010
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 by 100% with increased precision. ***FY 2015 Plans:*** Will investigate candidate projectile and weapon systems technologies that provide extended range by leveraging novel materials, innovative propulsion technologies and advanced design concepts.	-	-	2.000
Title: Fuze and Power Technologies for Munitions ***Description:*** This effort investigates and develops innovative fuze and power technologies for enhanced environmental 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 2015 Plans:*** Will identify candidate technologies that can be used to facilitate advanced high-g target sensing/classification that are miniaturized, integrated and packaged into existing fuze form factors which are currently not available for advanced munitions; new miniaturized safe and arm architectures that can enable the next generation of enhanced lethality; and advanced fuze setting for size and weight reduction through advanced electronic packaging schemes and efficient setting technologies; will	-	-	2.000

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army		Date: March 2014
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 2013	FY 2014	FY 2015
investigate viability of candidate technologies; will develop initial concepts and determine feasibility to known technological gaps. Through collaboration with ARL will seek innovative miniaturized munitions power source candidate technologies.			
Accomplishments/Planned Programs Subtotals	16.281	13.194	18.792

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 2015 Army			Date: March 2014
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 2013	FY 2014	FY 2015 Base	FY 2015 OCO #	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost
H19: *Asymmetric & Counter Measure Technologies*	-	7.562	9.044	6.988	-	6.988	7.302	7.933	8.046	11.454	-	-

The FY 2015 OCO Request will be submitted at a later date.

A. Mission Description and Budget Item Justification

This project designs and develops technologies to support asymmetric countermeasures such as radio frequency and ultra-short pulse directed energy and efforts to maintain the lethality and overmatch of US weapons. Work in this project is related to, and fully coordinated with, efforts in projects H18 and H28 (also in PE 0602624A), PE 0602618A (Ballistics Technology), and projects 232 and L94 in PE 0603004A (Weapons and Munitions Advanced Technology).

The cited work is consistent with the Director, Defense Research and Engineering Strategic Plan, the Army Modernization Strategy, and the Army Science and Technology Master Plan.

This work is performed by the Armament Research, Development, and Engineering Center (ARDEC), at Picatinny Arsenal, NJ, and the Army Research Laboratory (ARL) at Aberdeen Proving Ground, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Title: Novel Battlefield Effectors	0.779	1.208	1.603
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. ***FY 2013 Accomplishments:*** Continue to investigate most promising effector technologies and evaluate for transition to advanced development; conduct additional research into multiple novel battlefield effector candidate technologies. ***FY 2014 Plans:*** Continue to investigate additional new and promising effector technologies and evaluate them for transition to advanced development; conduct experiments to enable size, weight, power and cost (SWaP-C) reduction of solid state active denial technologies to allow for handheld applications and for use on the design of other novel battlefield effector candidate technologies. ***FY 2015 Plans:*** Will develop most promising effector technologies for transition to advanced development; will investigate size, weight, power and cost benefits of those technologies; will explore the use of non-traditional technologies in new applications.			
Title: Active Denial Technologies	1.716	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army		Date: March 2014
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 2013	FY 2014	FY 2015
Description: This effort develops non-lethal, counter-personnel directed energy (DE) technology that can repel personnel up to 100 meters. . ***FY 2013 Accomplishments:*** Completed integration and conduct experiments of the solid state active denial technology system to achieve the desired range of 100 meters.			
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 2013 Accomplishments:*** Continued to investigate most promising CCM technologies and evaluate for transition to advanced development; conducted additional small scale research into multiple counter countermeasure candidate technologies; conducted various experiments to determine effectiveness against future threats. ***FY 2014 Plans:*** Design CCM systems to protect against known vulnerabilities and evaluate for transition to advanced development; investigate multiple counter countermeasure candidate technologies; explore susceptibilities and remediation techniques for armament systems; conduct various experiments to measure effects of directed energy and develop modeling and simulation to understanding underlying physics. ***FY 2015 Plans:*** Will develop most promising technologies that protect munitions and weapons technologies against emerging threat countermeasure technologies; will explore disruptive directed energy as a means of providing CCM; will investigate most promising CCM technologies for transition to advanced development.	2.183	0.907	1.369
Title: Novel Penetrator Designs ***Description:*** This effort provides novel direct fire capabilities against advanced heavy armor threats by investigating several projectile configurations and non depleted uranium materials to achieve flight stability and effectiveness against new armored targets ***FY 2013 Accomplishments:***	2.884	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army		Date: March 2014
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 2013	FY 2014	FY 2015
Down selected to one penetrator design based on FY12 penetrator experiments and integrate into projectile cartridge for functional testing; executed a ballistic test to validate range and penetration requirements that support system performance and lethality goals.			
Title: Enhanced Fire Control for Indirect Fires ***Description:*** This effort evaluates the applicability and integration of state-of-the-art acquisition and engagement technologies, sensors and methodologies to enhance fire control capability, and therefore weapon effectiveness, at various ranges and under battlefield conditions. It 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 2014 Plans:*** Utilize systems engineering to investigate the state-of-the-art of optics, microprocessors and target recognition/classification algorithms based on market surveys of private industry/academia/other government agencies' sensor technologies; establish, develop and mature the associated fire control system requirements and performance goals; generate and evaluate concepts for software and hardware architectures for optimal fire control system performance and size, weight and power considerations. ***FY 2015 Plans:*** Will develop novel methods and algorithms for improved ballistics, for data and image processing, and for sensing battlefield, weapon and target environment; will investigate small, accurate, survivable weapon orientation sensors, technologies and compensation methodologies to improve the weapon pointing; will refine concepts for hardware and software architectures for optimum physical and functional integration, increased commonality, lower weight, and faster engagement times.	-	2.009	2.011
Title: Recoil Reduction Disruptive Technologies ***Description:*** This effort investigates technologies to reduce recoil momentum and energy waste for integration onto lighter vehicle platforms for increased mobility, using rarefaction wave gun and supporting technologies. ***FY 2014 Plans:*** Investigate fundamental means of radical recoil reduction to enable large caliber weapons to be lightweight and integrated to lightweight manned and unmanned vehicles; fund research into rarefaction wave gun and supporting technologies for use in supersonic up to hypervelocity launchers.	-	2.002	-
Title: Improvised Explosive Device (IED) Neutralization Technologies ***Description:*** This effort investigates multiple radio frequency (RF) functions to neutralize IEDs utilizing a common set of hardware and software, on a ground vehicle. It develops novel RF waveforms to neutralize a broad spectrum of IEDs and their electronic triggering devices. Results to transition to explosive hazard predonation system effort in PE 0603004A/Project 232 in FY2014/15.	-	2.014	-

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army		Date: March 2014
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 2013	FY 2014	FY 2015
FY 2014 Plans: Mature existing IED neutralization systems; conduct research to include the development of IED neutralization waveforms utilizing a modular exciter architecture, and development of a beam steering directional antenna to focus high power RF towards predicted threat zones to neutralize the IED; validate the increased performance of a convoy / route clearance based IED neutralization system by interfacing with IED detection sensor systems.			
Title: Integrated Decision Enhancing Capabilities for Fire Control ***Description:*** This effort develops target database and target management capability for company and below operations ***FY 2014 Plans:*** Develop software for integration and collaboration of remote weapon station for lethal/non lethal effects; develop software for the processing and integration of sensor/target information; develop LOS/BLOS fires capability for company and below within program of record architecture.	-	0.904	-
Title: High Powered Radio Frequency ***Description:*** The use of High Power Radio Frequency (RF) has been demonstrated to provide desired target effects against various targets; however such systems are still too large and consume too much power to make them tactically useful for Army applications. This effort will focus on addressing the Size, Weight, Power and Cost (SWAP - C) of High Power RF systems and their components so as to allow tactically useful systems. ***FY 2015 Plans:*** Will focus on reducing antenna size for high power RF transmission; will investigate high dielectric constant composites (nano-dielectics) to produce 60-80% size reduction in antenna array elements; develop the antenna array elements to transmit known RF waveforms (frequency, pulse width, and amplitude) to cause a desired target effect of interest.	-	-	2.005
Accomplishments/Planned Programs Subtotals	7.562	9.044	6.988

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army		Date: March 2014
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*

E. Performance Metrics

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army												Date: March 2014
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 2013**	**FY 2014**	**FY 2015 Base**	**FY 2015 OCO #**	**FY 2015 Total**	**FY 2016**	**FY 2017**	**FY 2018**	**FY 2019**	**Cost To Complete**	**Total Cost**
H1A: *WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE*	-	11.567	15.000	-	-	-	-	-	-	-	-	-

The FY 2015 OCO Request will be submitted at a later date.

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 2013	FY 2014	FY 2015
Title: Program Increase	11.567	15.000	-
Description: This is a Congressional Interest Item ***FY 2013 Accomplishments:*** Investigated, designed and evaluated enabling technology to develop lethal and nonlethal weapons and munitions with increased performance and the potential for lower weight, reduced size, and improved affordability. ***FY 2014 Plans:*** Investigate, design and evaluate enabling technology to develop lethal and nonlethal weapons and munitions with increased performance and the potential for lower weight, reduced size, and improved affordability.			
Accomplishments/Planned Programs Subtotals	11.567	15.000	-

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 2015 Army												Date: March 2014
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 2013**	**FY 2014**	**FY 2015 Base**	**FY 2015 OCO #**	**FY 2015 Total**	**FY 2016**	**FY 2017**	**FY 2018**	**FY 2019**	**Cost To Complete**	**Total Cost**
H28: *Warheads/ Energetics Technologies*	-	10.687	15.540	12.289	-	12.289	14.257	19.692	18.956	20.543	-	-

The FY 2015 OCO Request will be submitted at a later date.

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.

This project sustains Army science and technology efforts supporting the Ground and Lethality portfolios.

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

This work is performed by the U.S. Army Armament Research, Development, and Engineering Center (ARDEC), at Picatinny Arsenal, NJ in collaboration with the Army Research Laboratory (ARL) at Aberdeen Proving Ground, MD; and the Aviation and Missile Research, Development, and Engineering Center (AMRDEC), Huntsville, AL.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Title: Scalable Warhead Technology	4.143	4.176	4.395
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.			
FY 2013 Accomplishments: Designed and tested brassboard designs for shaped charge and explosively formed penetrator (EFP) with scaled up lethality; determined through modeling and simulation the range of lethal to less than lethal effects for scalable warheads.			
FY 2014 Plans: Design and conduct experiments for spin compensated shaped charges, enhanced fragmentation and multiple explosively formed penetrator (MEFP) warheads; investigate scalable technologies as they relate to lethal to less than lethal effects; develop designs for non-axisymmetric EFP warheads.			
FY 2015 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2015 Army		Date: March 2014
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 2013	FY 2014	FY 2015
Will mature designs and conduct experiments in the area of spin compensated shaped charges, enhanced fragmentation, directional lethality and multiple explosively formed penetrator (MEFP) warheads; will validate scalable technologies as they relate to lethal to less than lethal effects.			
Title: Energetic Materials and Warheads ***Description:*** This effort designs energetic materials with controlled energy release for precision munition and counter-munition applications. ***FY 2013 Accomplishments:*** Continued to investigate most promising technologies like structural energetics, solventless propellants, and nanoinsensitive nitramines and evaluate them for transition to advanced development; conducted additional small scale research into multiple energetic materials and warheads candidate technologies for medium and large cal ammunition. ***FY 2014 Plans:*** Continue to investigate most promising technologies such as disruptive energetics, micro-thrusters and tailorable propellants,highly effective miniature lethal mechanisms, and nano insensitive nitramines; also conduct evaluation for transition into novel swarming munitions, advanced warheads, medium and large cal ammunition;seek new applications based on measured performance.	1.919	2.893	-
Title: Insensitive Munitions Multi-Scale Reactive Modeling (IM-MSRM) ***Description:*** The IM-MSRM effort designs and investigates new M&S tools for the design and development of insensitive munitions. ***FY 2013 Accomplishments:*** Continued to investigate and develop atom level computer code modifications to create material models; developed mixed mode (blast/fragmentation) analytical capability and detonation shock dynamics to improve the representations of physics and chemistry in explosives and provide more accurate supercomputer design tools for the U.S. insensitive munitions design community.	0.689	-	-
Title: Explosives Research ***Description:*** This effort develops high energy/high performance, multi-purpose insensitive munitions (IM) explosives. ***FY 2013 Accomplishments:***	3.936	3.996	4.064

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Began optimization and scale-up of promising ingredients formulations and tailored explosives for mixed-mode and combined effects; conducted baseline design and testing of novel components as well as structures based on nano-energetics, energetic fibers and reactive alloys, explosive inks, multipoint initiation. ***FY 2014 Plans:*** Determine most promising compounds to enable tailored energy release and combined effects; investigate and characterize new insensitive energetic ingredients; design and develop novel concepts for explosive initiation and formulation; scale up and test Nano energetic materials in TRL-4-5 experiments; develop nano-enhanced melt pour ingredients for reduced sensitivity and cost. ***FY 2015 Plans:*** Will formulate and process combined effects and high efficiency explosives; will validate affordable new energetic binders for enhanced blast formulations; will investigate new synthetic processes to enable low-cost, high energy solid crystal explosive ingredients; will mature processing techniques for nano-enhanced organic energetics formulations; will conduct experiments on electrically-induced tailored energy release for proof of chemistry-based variable warhead fragmentation and the possibility of an on/off energetic capability. This effort is being conducted in collaboration with the Army Research Laboratory (ARL) through both the integrated project team and technical working groups.			
Title: Material Development for Water Purification ***Description:*** This effort originated from a material development for armament systems and was found to have a dual use application. The effort (also known as Adaptive Armament Reactive Interface Domains/AARID) is intended to provide a capability to enhance contingency basing water efficiency via recycling with secondary contributions to reduction of waste and power. Lesser focus advantages are on sustainment, greater logistics flexibility, and reduced Warfighter threat from supply convoys. ***FY 2014 Plans:*** Investigate cycle time and water flow, determining rate of reaction for decontamination, validate the coating to lend itself useful for robustness of current filters, and design and develop laboratory systems for conducting experiments. ***FY 2015 Plans:*** Will design and develop a method to collect real time data to determine flow rates and validate water purity; will conduct experiments to compare coated filters to uncoated filters to determine the benefits of the coating in purifying water.	-	0.495	0.248
Title: Explosives Safety for Automated Base Camp Planning ***Description:*** This effort determines data interoperability requirements between explosive safety and base camp planning software tools; designs an integrated tool that increases explosive safety for base camps by managing the risk due to interaction between changes in Net Explosive Weight, geography, facilities and force structure.In FY 2014 this effort supports the Demonstration of Force Protection for Basing.	-	0.300	0.497

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
FY 2014 Plans: Determine data interoperability requirements of explosives safety, risk assessment, and base camp planning tools leading to the development of the design architecture for an automated comprehensive base camp planning software suite. ***FY 2015 Plans:*** Will develop and evaluate ammunition explosives safety planning and management modules within the base camp planner design architecture. This task is fully coordinated with the effort of the same name in PE/Project 0603001A/543.			
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. This will increase warfighter and aircraft survivability. ***FY 2014 Plans:*** Investigate ultraviolet countermeasure (UVCM) flare reformulation with modeling & simulation and validate in scale up experiments; develop and validate laser beam rider countermeasure (LBRCM) designs with functional experiments; design & develop image seeking countermeasure (ISCM) flare configurations;. mature and validate white illumination hand held signal designs. ***FY 2015 Plans:*** Will assess formulations and functional concepts for dazzler, cloud and seeker countermeasures; will conduct experiments on dazzler flares and prepare for flight tests; will conduct experiments on cloud countermeasures; will analyze dazzler and cloud countermeasure performance using experiment and simulation results for application to multiple aircraft and aspect angles; will identify threats and develop concepts for seeker countermeasure.	-	3.680	3.085
Accomplishments/Planned Programs Subtotals	10.687	15.540	12.289

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

N/A