Exhibit R-2, PB 2010 Army RDT&E Budget Item Justification								DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY 2040 - Research, Development, Test & Evaluation, Army/BA 2 - Applied Research					R-1 ITEM NOMENCLATURE PE 0602624A Weapons and Munitions Technology					
COST ($ in Millions)	**FY 2008 Actual**	**FY 2009 Estimate**	**FY 2010 Estimate**	**FY 2011 Estimate**	**FY 2012 Estimate**	**FY 2013 Estimate**	**FY 2014 Estimate**	**FY 2015 Estimate**	**Cost To Complete**	**Total Cost**
Total Program Element	100.973	102.339	41.085						Continuing	Continuing
H1A: WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE	64.461	71.862	.000						Continuing	Continuing
H18: ARTY & CBT SPT TECH	14.263	12.123	17.281						Continuing	Continuing
H19: CLOSE COMBAT WEAPONRY	5.309	7.253	12.260						Continuing	Continuing
H28: MUNITIONS TECHNOLOGY	16.940	11.101	11.544						Continuing	Continuing

A. Mission Description and Budget Item Justification

The objective of this program element (PE) is to design and develop enabling technology for improved lethal and nonlethal weapons and munitions with increased performance and the potential for lower weight, reduced size, and improved affordability. This PE supports weapons and munitions development (project H18); technologies to maintain the lethality of US weapons and directed energy (DE) technologies and subsystems to support the weaponization of high power microwave (HPM), and short pulse lasers (project H19), and development of munition components such as fuzes and power, warheads with tailorable effects, and insensitive munition compliant energetic materials (project H28). Project H1A funds congressional special interest items.

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.

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.

Exhibit R-2, PB 2010 Army RDT&E Budget Item Justification	DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY 2040 - Research, Development, Test & Evaluation, Army/BA 2 - Applied Research	**R-1 ITEM NOMENCLATURE** PE 0602624A Weapons and Munitions Technology

B. Program Change Summary ($ in Millions)

	FY 2008	FY 2009	FY 2010	FY 2011
Previous President's Budget	102.681	30.576	30.384	
Current BES/President's Budget	100.973	102.339	41.085	
Total Adjustments	-1.708	71.763	10.701	
Congressional Program Reductions	.000	-.337		
Congressional Rescissions	.000	.000		
Total Congressional Increases	.000	72.100		
Total Reprogrammings	.828	.000		
SBIR/STTR Transfer	-2.536	.000		

Change Summary Explanation

FY09 funding increases are due to congressional adds.

FY10 increases funding to investigate technology options which will reduce or eliminate unexploded ordnance (UXO) threats from current submunitions.

Exhibit R-2a, PB 2010 Army RDT&E Project Justification								DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY 2040 - Research, Development, Test & Evaluation, Army/BA 2 - Applied Research				R-1 ITEM NOMENCLATURE PE 0602624A Weapons and Munitions Technology					PROJECT NUMBER H1A	
COST ($ in Millions)	**FY 2008 Actual**	**FY 2009 Estimate**	**FY 2010 Estimate**	**FY 2011 Estimate**	**FY 2012 Estimate**	**FY 2013 Estimate**	**FY 2014 Estimate**	**FY 2015 Estimate**	**Cost To Complete**	**Total Cost**
H1A: WEAPONS & MUNITIONS TECH PROGRAM INITIATIVE	64.461	71.862	.000						Continuing	Continuing

A. Mission Description and Budget Item Justification

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

B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
Green Armaments/RangeSafe	2.318	2.325	.000	
Advanced Materials & Process for Armament Structures (AMPAS)	5.409	2.325	.000	
Armament System Engineering and Integration Initiative (ASEI2)	2.319	3.100	.000	
Electroconversion of Energetic Materials	5.602	3.488	.000	
Army Center of Excellence in Acoustics	3.168	4.263	.000	
Developmental Mission Integration	3.865	3.875	.000	
Engineered Surfaces for Weapons Life Extension	2.898	.000	.000	
Fatigue Odometer for Vehicle Components and Gun Barrels Project Cannon Systems	2.551	.000	.000	
Remotely Operated Weapons and Sensor Technology	3.092	4.844	.000	
SLEUTH Tungsten Heavy Alloy Penetrator and Warhead Development	1.546	.000	.000	
Electrolytic Super-Capacitor	2.319	.775	.000	
Energetic Formulation and Fabrication	3.864	.000	.000	
Ripsaw Unmanned Ground Vehicle Weaponization	1.546	1.162	.000	
Advanced Rarefaction Weapon Engineered System	1.546	2.325	.000	
Hospital Emergency Planning and Integration (HEPI) Letterkenny Army Depot and Chambersburg Hospital	1.546	.775	.000	

Exhibit R-2a, PB 2010 Army RDT&E Project Justification		DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY 2040 - Research, Development, Test & Evaluation, Army/BA 2 - Applied Research	R-1 ITEM NOMENCLATURE PE 0602624A Weapons and Munitions Technology	PROJECT NUMBER H1A

B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
CZT-Based Liquid Explosives Detections Systems	1.314	.000	.000	
Effects Based Operations Decision Support Services (EBODSS)	.774	7.750	.000	
Long Range Initiator	1.353	.000	.000	
Mitigation of Energetics Single Point Failures	2.319	2.325	.000	
Center for Borane Technology	1.933	1.938	.000	
Development and Demonstration of Multi-use/Urban Operations Joint Training System at Fort Dix	2.319	.000	.000	
Exploding Foils Initiators with Nanomaterial-based Circuits	2.319	1.550	.000	
Research for Army Cannon Systems	1.778	2.422	.000	
Remote Sensor Station (RSS) for Special Wapons Observation Reconnaissance Detection System (SWORDS)	.772	.000	.000	
Strategic Tech Dev & Integration for the Jt Munitions & Lethality Life Cycle Management Command	.966	.000	.000	
Wyoming Valley Integrated Command Operations Program (ICOP)	.000	1.550	.000	
MATRIC- Project National Shield Integration Center	.000	1.938	.000	
Specialized Compact Automated Mechanical Clearance Platform	.000	1.550	.000	
Regional Integrated Command Center (RICC)	.000	.775	.000	
Advanced Technologies Energy and Manufacturing Science	.000	4.844	.000	
Rapid Prototyping for Special Programs (pending transfer to 63004)	.000	3.100	.000	
Threat Detection and Neutralization Project	.000	3.100	.000	
Northern Ohio Integrated Command Operations Program	.000	1.550	.000	
Heavy Metals Total Life-Cycle Initiative	.000	.775	.000	
Munitions Evaluation for Composite Electric Armor	.000	1.162	.000	
SBIR/STTR	.000	2.013	.000	
Rapid Response Force Protection System (Remote Weapons Platform)	3.092	2.325	.000	

Exhibit R-2a, PB 2010 Army RDT&E Project Justification		DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY 2040 - Research, Development, Test & Evaluation, Army/BA 2 - Applied Research	R-1 ITEM NOMENCLATURE PE 0602624A Weapons and Munitions Technology	PROJECT NUMBER H1A

B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
Renewable Energy Testing Center	1.933	.000	.000	
Kinetic Energy Enhanced Lethality and Protection Materials	.000	1.938	.000	
Total	64.461	71.862	.000	

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2a, PB 2010 Army RDT&E Project Justification								DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY 2040 - Research, Development, Test & Evaluation, Army/BA 2 - Applied Research				R-1 ITEM NOMENCLATURE PE 0602624A Weapons and Munitions Technology					PROJECT NUMBER H18	
COST ($ in Millions)	**FY 2008 Actual**	**FY 2009 Estimate**	**FY 2010 Estimate**	**FY 2011 Estimate**	**FY 2012 Estimate**	**FY 2013 Estimate**	**FY 2014 Estimate**	**FY 2015 Estimate**	**Cost To Complete**	**Total Cost**
H18: ARTY & CBT SPT TECH	14.263	12.123	17.281						Continuing	Continuing

A. Mission Description and Budget Item Justification

This project designs and develops component technologies to enable affordable smart munitions that can be launched from multiple platforms and provide increased lethality with reduced logistics and advanced direct/indirect fire capabilities.
Work in project H18 is related to, and fully coordinated with, efforts in projects H19 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.

The work in this project is performed by the US Army 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 Program ($ in Millions)	**FY 2008**	**FY 2009**	**FY 2010**	**FY 2011**
Affordable Precision Technology: This effort develops and incorporates technologies to provide affordable precision to the full spectrum of gun calibers. In FY10, will identify technologies which can potentially increase delivery accuracy and lethal performance of weapons.	.000	.000	.885	
Advanced Weapons Technology: This effort investigates innovative weapon technologies for future medium caliber direct fire systems that provide similar or greater lethality than current systems. In FY10, will assess detailed designs of distributive technologies for new weapon delivery effects; will conduct detailed analysis to select novel weapon schemes for use in recoilless medium caliber weapons such as rarefactory wave gun and novel light gas guns; develop critical design factors for launch survivability, component reliability and recoil energy management.	.000	.000	3.285	
Common Smart Submunition (CSS): This effort designs and evaluates component technologies for a next generation precision kill and target-discriminating sub-munition that can be used in a variety of delivery systems.	3.068	.000	.000	

Exhibit R-2a, PB 2010 Army RDT&E Project Justification		DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY 2040 - Research, Development, Test & Evaluation, Army/BA 2 - Applied Research	R-1 ITEM NOMENCLATURE PE 0602624A Weapons and Munitions Technology	PROJECT NUMBER H18

B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
In FY08, quantified and baselined post-test operational performance metrics. Specific metrics were the sensor transmit/ receive performance, algorithm/Autonomous Target Recognition (ATR) discrimination capability, Orientation and Stabilization (O&S) samara blade performance for both slow and high speed deployments, and High-G survivability of components/sub-systems (sensor module, electronics, Safe and Arm (S&A) module, battery, and O&S module.) Developed interface for submunition electronics, sensors, and warhead; conducted structural integrity testing and captive flight test (Phase 1) to facilitate development of form-factored components; evaluated tactical hardware and dynamic environment through modeling and simulation (M&S) and verification testing. Efforts described here are coordinated and complimentary to related efforts in PE 0602624A/project H19 and PE 0603004A/project 232.				
Insensitive Munitions (IM) Technologies Initiatives: This effort focuses on identifying, maturing, and applying technologies that will reduce unplanned, accidental, and/or sympathetic detonation of munitions in order to meet IM requirements. In FY08, demonstrated the ability to maintain the lethality of a warhead after insertion of venting and reactive liner technologies designed to increase IM performance; and conducted sympathetic detonation (SD) modeling and laboratory characterization of a munitions reaction after IM techniques have been applied to the munition. In FY09, complete sympathetic detonation (SD)/bullet impact (BI) modeling of Precision Attack Missile (PAM) warhead after IM techniques have been added to the rounds. Beginning in FY10 the funding for this effort is in PE 0602624/project H28 in FY10.	1.027	.249	.000	
Fuze and Power for Advanced Munitions: This effort researches and evaluates technologies that reduce munition size and add tailorable effects for advanced munitions. In FY08, evaluated performance and safety of electronic safe and arm devices (ESAD) and micro electro-mechanical system (MEMS) sub-assemblies. Efforts described here are coordinated and complimentary to related efforts in PE 0603004A/project 232.	2.911	.000	.000	
Small Business Innovative Research/Small Business Technology Transfer Programs	.000	.160	.000	
Novel Propulsion Technology for the Future: In FY08, designed and developed advanced propulsion and ignition technologies for gun launched munitions; evaluated existing modeling and simulation (M&S) tools for advanced propellants, igniters and thrusters; developed and characterized novel propellants for igniter based upon M&S results.	1.512	2.019	1.857	

Exhibit R-2a, PB 2010 Army RDT&E Project Justification		DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY 2040 - Research, Development, Test & Evaluation, Army/BA 2 - Applied Research	R-1 ITEM NOMENCLATURE PE 0602624A Weapons and Munitions Technology	PROJECT NUMBER H18

B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
In FY09, fabricate novel igniters and demonstrate them against current baseline igniters; optimize propulsion technologies at the component level for integration into scalable and adaptive response munitions; and develop M&S tools for scalable and adaptive propulsion prediction capabilities across the full range of munition applications. In FY10, will fabricate optimized propulsion components and integrate them into gun launched munitions; will employ and verify advanced M&S tools to predict munition component performance; will conduct static and subscale tests to verify models and design performance. Efforts described here are coordinated and complimentary to related efforts in PE/Project 0602624/H28 and 0603004/232.				
High Powered Microwave (HPM) - Anti-Material Munitions: This effort designs and develops HPM technology for use in non-lethal (NL) munitions. In FY08, modeled component behavior and fabricated individual components of the system; conducted component demonstrations for antenna, prime power, pulsed power, and microwave source. In collaboration with Department of Energy, modeled effects of HPM on infrastructure targets such as communications networks; integrated the effects of HPM on infrastructure targets into battlefield effectiveness models to determine potential operational effectiveness in order to inform the requirements generation process. Evaluated G-Hardened design of NL munition to address structural integrity in a gun launch environment; and determined optimal delivery method through use of various design codes. In FY09, commence integration of individual components; perform analysis of the systems ability to generate power while in flight and operate in a gun launch environment; and commence laboratory effects testing of an integrated laboratory demonstrator against relevant simulated targets. In FY10, will develop non-fragment producing materials for carriers to achieve NL effects; will develop, test and integrate demonstrator capacitor technology to obtain high energy density, high voltage, with nano-second discharge times, and solid state switches for nano-second discharge rates; will identify components which provide the greatest ability to tune the system in flight to get the desired effects; will test components integrated into a system to characterize defeat mechanisms for target sets.	5.745	6.730	3.902	
Pulsed Laser technologies: This effort develops and miniaturizes key directed energy (DE) technologies for use in munitions and subsystems. The laser induced plasma channel(LIPC) effort explores the ability to use a short pulse laser to generate a cavity in the air in which electricity from high powered microwaves is channeled to produce tailored effects on targets. In FY09, perform laser induced plasma channel (LIPC) modeling and simulation to define the optimum filament geometries for effective energy transmission; investigate the interaction of RF fields in custom waveguides; conduct	.000	2.965	.000	

Exhibit R-2a, PB 2010 Army RDT&E Project Justification		DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY 2040 - Research, Development, Test & Evaluation, Army/BA 2 - Applied Research	R-1 ITEM NOMENCLATURE PE 0602624A Weapons and Munitions Technology	PROJECT NUMBER H18

B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
verification tests for LIPC that provide insight to expected increases in performance. Efforts described here will be consolidated starting in FY10 in PE 0602624A/project H19 and are coordinated and complimentary to related efforts in PE 0603004A/project 232. This effort moves to PE 0602624/project H19 in FY10.				
Advanced Munition Components: This effort designs and develops individual components in the firing chain for gun launched munitions. In FY10, will focus on designing and developing scalable adaptable munition components; will evaluate various munition components and determine options to modify components to support scalable munition development; and will evaluate performance through modeling and simulation tools and select a munition to caliber to design initial scalable munition around and initiate design. Efforts described here are coordinated and complimentary to related efforts in PE 0602624A/project H28 and PE 0603004A/project 232.	.000	.000	2.581	
Advanced Munition Payloads: This effort designs and develops new and novel payloads and related components for integration into gun-fired munitions and missiles. In FY10, will assess advanced fuze technologies capable of either detonating or deflagrating submunitions such as Dual-Purpose Improved Conventional Munitions (DPICM) in selected environments; will conduct study concepts of extremely insensitive energetics and sensor fuzed munitions to determine optimal design configurations that will reduce and eliminate unexploded ordnance (UXO) on the battlefield while retaining area denial capability.	.000	.000	4.771	
Total	14.263	12.123	17.281	

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2a, PB 2010 Army RDT&E Project Justification								DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY 2040 - Research, Development, Test & Evaluation, Army/BA 2 - Applied Research				R-1 ITEM NOMENCLATURE PE 0602624A Weapons and Munitions Technology					PROJECT NUMBER H19	
COST ($ in Millions)	**FY 2008 Actual**	**FY 2009 Estimate**	**FY 2010 Estimate**	**FY 2011 Estimate**	**FY 2012 Estimate**	**FY 2013 Estimate**	**FY 2014 Estimate**	**FY 2015 Estimate**	**Cost To Complete**	**Total Cost**
H19: CLOSE COMBAT WEAPONRY	5.309	7.253	12.260						Continuing	Continuing

A. Mission Description and Budget Item Justification

This project designs and develops technologies to support asymmetric countermeasures such as RF 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 US Army 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 Program ($ in Millions)	**FY 2008**	**FY 2009**	**FY 2010**	**FY 2011**
Counter Countermeasure (CCM) Technologies for weapons and munitions: This effort develops technology to enable continued effectiveness of US weapon systems against enemy countermeasures including Active Protection Systems (APS), GPS jamming, and active seeker jamming. Technology areas investigated include reducing radar cross section of gun fired rounds and increasing performance of warheads. In FY10, will conduct systems effectiveness analysis to determine which weapons/rounds are most susceptible to countermeasures; investigate potential counter-countermeasure techniques/technologies and identify the most promising that reduce the effectiveness of threat countermeasure technologies.	.000	.000	4.420	
Ground Based Munitions Technologies: This effort optimizes smart ground based munitions for the urban and complex fight. In FY09, evaluate urban technologies for ground based munitions for use with the intelligent munitions system (IMS) (PE 0654808A/D016); optimize a set of sensor suites for the urban environment and evaluate merging sensor modalities; evaluate target engagement approaches from a ground based munition that can engage both personnel and light vehicles while minimizing collateral damage. Efforts described here are coordinated and complimentary to related efforts in PE 0654808A/project D016, PE 0603004A/project 232, and PE 0603606A/project 683.	.000	3.044	.000	

Exhibit R-2a, PB 2010 Army RDT&E Project Justification		DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY 2040 - Research, Development, Test & Evaluation, Army/BA 2 - Applied Research	R-1 ITEM NOMENCLATURE PE 0602624A Weapons and Munitions Technology	PROJECT NUMBER H19

B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
Near Autonomous Unmanned Systems (NAUS): This effort designs and evaluates a remote weapon station optimized for high-reliability on an unmanned vehicle and addresses the safe operation of weapons on robotic vehicles. In FY08, fabricated demonstrator robotic weapon and ammo handling subsystems; conducted laboratory evaluations to assess interface and functionality of subsystems; and simulated functionality of complete system design via hardware-in-the-loop emulation. In FY09, fabricate and integrate critical sub-systems; and conduct baseline system level tests. Efforts described here are coordinated and complimentary to related efforts in PE 0602601A/project H91; PE 0602618A/project H03; PE 0602120A, and PE 0603005A/project 515.	1.911	1.985	.000	
Small Business Innovative Research/Small Business Technology Transfer Programs	.000	.161	.000	
Novel Battlefield Effectors: This effort develops unique weapon and munitions technologies to achieve "tunable" effects on targets and capable of including providing a full range of effects from non-lethal to highly lethal via a single weapon or munition. In FY10, will select the most promising munitions/weapons to achieve the projection of tunable effects for line-of-sight (LOS), beyond-line-of sight (BLOS) and non-line-of-sight (NLOS) missions; will develop the technologies into bread board system and begin target effectiveness studies; will conduct trade studies to determine the proper power, size, and weight to achieve required lethal effects on	.000	.000	3.929	
Pulsed Laser Component Technologies: This effort matures short pulse laser components for use in laser induced plasma channel (LIPC) systems. In FY08, performed target vulnerability analysis based on target modeling and follow on live-fire validation testing against simulated targets to demonstrate effectiveness; developed compact and frequency agile HPM sources that reduced overall system footprint and volume by at least 10-20% as well as increase effectiveness and tactical suitability. In FY09, characterize and optimize high voltage and radio frequency waveforms to produce multiple target effects on buried or surface threats. In FY10, will mature model of LIPC target engagement to optimize interaction between next generation LIPC and high voltage waveform; will optimize advanced short pulsed LIPC laser system parameters to enhance transmission of the high voltage waveform required for target effects; will initiate design of advanced high quality critical subcomponents for an optimal LIPC laser system. Efforts are coordinated and complimentary to related efforts in PE 0602624A/project H18 and PE 0603004A/project 232.	3.398	2.063	3.911	

Exhibit R-2a, PB 2010 Army RDT&E Project Justification		DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY 2040 - Research, Development, Test & Evaluation, Army/BA 2 - Applied Research	R-1 ITEM NOMENCLATURE PE 0602624A Weapons and Munitions Technology	PROJECT NUMBER H19

B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
Total	5.309	7.253	12.260	

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.

Exhibit R-2a, PB 2010 Army RDT&E Project Justification								DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY 2040 - Research, Development, Test & Evaluation, Army/BA 2 - Applied Research				R-1 ITEM NOMENCLATURE PE 0602624A Weapons and Munitions Technology					PROJECT NUMBER H28	
COST ($ in Millions)	**FY 2008 Actual**	**FY 2009 Estimate**	**FY 2010 Estimate**	**FY 2011 Estimate**	**FY 2012 Estimate**	**FY 2013 Estimate**	**FY 2014 Estimate**	**FY 2015 Estimate**	**Cost To Complete**	**Total Cost**
H28: MUNITIONS TECHNOLOGY	16.940	11.101	11.544						Continuing	Continuing

A. Mission Description and Budget Item Justification

This project designs and develops 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. Work in project H28 is related to, and fully coordinated with, efforts in projects H18 and H19 in this PE, 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 U.S. Army Armament Research, Development, and Engineering Center (ARDEC), at Picatinny Arsenal, NJ, and the Army Research Laboratory (ARL) at Aberdeen Proving Ground, MD. The active protection system (APS) countermunition efforts are developed in collaboration with the Tank Automotive Research, Development, and Engineering Center (TARDEC), Warren, MI, PE 0603005A and the Aviation and Missile Research, Development, and Engineering Center (AMRDEC), Huntsville, AL, PE 0603313A.

B. Accomplishments/Planned Program ($ in Millions)	**FY 2008**	**FY 2009**	**FY 2010**	**FY 2011**
Extended Area Protection and Survivability (EAPS): This effort demonstrates the use of command-guided medium caliber projectiles for the interception and destruction of incoming rockets, artillery, and mortar rounds. In FY08, evaluated the effectiveness of a lethality round (the standard projectile envelope configured for an enhanced warhead technology kill mechanism), and a course correction round (the standard projectile envelope containing course correction technology for increased accuracy), as the basis for the final decision on the integration of the EAPS projectile. Efforts described here are coordinated and complimentary to related efforts in PE 0603004A/project 232 and PE 0603313A/project 704.	2.918	.000	.000	
G-Hardened Sensors Technology for Munitions: This effort develops ground sensors hardened to resist the forces of gun-launch and ground impact. In FY08, conducted tests and demonstrated survivability of individual and integrated component technologies in > 20kG environments against established metrics; developed architecture for networking sensors from different G-hardened nodes for target localization; conducted fabrication of hardware and demonstrated ruggedness of sensors through testing	1.787	1.899	.000	

Exhibit R-2a, PB 2010 Army RDT&E Project Justification		DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY 2040 - Research, Development, Test & Evaluation, Army/BA 2 - Applied Research	R-1 ITEM NOMENCLATURE PE 0602624A Weapons and Munitions Technology	PROJECT NUMBER H28

B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
conducted with air gun testing; performed initial demonstration of miniaturized highly-integrated components embedded in munitions to include 40mm grenades. In FY09, refine integrated design approach and G-hardened packaging; investigate survivability of individual and integrated component technologies in > 30kG environment and investigate (through live fire of munitions) the remote deployment of fully integrated sensor packaged into mortars and 40mm grenades; implement architecture for distributed, power efficient decentralized network fusion of data from multiple G-hardened sensor nodes to enable target localization.				
Scalable Warhead Technology: 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 FY09, conduct modeling and simulation studies of warhead concepts for baseline performance against multiple target set configurations. In FY10, will design and develop enhanced fragmentation, reactive materials technologies, multipurpose explosives, and initiation trains for warheads and scalable and adaptive munitions; will compare performance of designs against predictive models, simulations and baselines; will fabricate, test and evaluate component technologies in static munition tests. Efforts described here are coordinated and complimentary to related efforts in PE 0602624A/project H18 and PE 0603004A/project 232.	.000	2.749	7.670	
Insensitive Munitions Multi-Scale Reactive Modeling (IM-MSRM): The IM-MSRM effort designs and develops new modeling and simulation tools for the design and development of insensitive munitions. In FY10, will evaluate the structure and density predictions for insensitive energetic materials resulting from the modeling and simulation analysis.	.000	.000	.594	
Future Force Gun and Munition Technology (Nanotechnologies for Future Force Armaments & Munitions): This effort is investigating nanoscale and nanostructured multifunctional materials for armament applications. In FY08, optimized process parameters to process nanoscale iron; began fabrication of oxide nano-ceramic powder; developed process parameters to fabricate nano-structured tungsten powder and tungsten-based composite powders (dry high energy technique); and conducted metallurgical characterization of high energy milled nano-structured tungsten powder. In FY09, optimize process parameters to fabricate large quantities of nanostructured and nano-scale tungsten powders; develop wet milling technology to fabricate nano-scale/nanostructured tungsten powders & compare results to those	1.266	2.543	.000	

Exhibit R-2a, PB 2010 Army RDT&E Project Justification		DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY 2040 - Research, Development, Test & Evaluation, Army/BA 2 - Applied Research	R-1 ITEM NOMENCLATURE PE 0602624A Weapons and Munitions Technology	PROJECT NUMBER H28

B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
powders obtained using dry milling technology; develop powder consolidation technology to fabricate nanostructured bulk materials; conduct metallurgical characterization/mechanical property evaluations of bulk nanostructured materials.				
Hardened Combined Effects Penetrator Warhead Technology: This effort designs and develops enhanced warhead liners to more efficiently defeat existing and projected targets. In FY08, tested and evaluated optimized blast fragmentation, optimized warhead penetration, and blast/fragmentation penetrator warheads against a broad target set including armor, personnel, material, and fortified structures. Efforts described here are coordinated and complimentary to related efforts in PE 0603004A/project 232.	4.170	.000	.000	
Kinetic Energy Active Protection System (KEAPS) Warhead: This effort investigates and validates a warhead designed by the Army Research Laboratory (ARL) for use in an active protection system (APS) designed to defeat tank-fired rounds. In FY08, refined design of warhead, fuze and safe and arm (S&A) device integrated with countermeasure technologies; evaluated critical warhead parameters in near tactical environments; evaluated performance of integrated warhead and fuze S&A interface in a lab environment; evaluated integrated fuze S&A and the correspondent countermeasure performance in near tactical environments. In FY09, finalize design of warhead/fuze S&A demonstrator integrated with the KEAPS interceptor; evaluate warhead and fuze S&A demonstrator against primary threat class and use M&S to evaluate performance against remaining classes of threats. Efforts described here are coordinated and complimentary to related efforts in PE 0603004A/project 232 and are developed and collaborated with efforts in PE 0603005A/project 221 and PE 0603313A/project 550.	6.799	3.757	.000	
Small Business Innovative Research/Small Business Technology Transfer Programs	.000	.153	.000	
Energetic Materials and Warheads: This effort designs energetic materials with controlled energy release for precision munition and counter-munition applications. In FY10, will investigate the use of exotic ingredient materials including nano-scale oxidizers and fuels in high fidelity models for the design of extremely high energy, low sensitivity initiation, propulsion, explosive and pyrotechnic formulations; will down-select promising ingredient materials for fabrication and characterization studies; will fabricate ingredient materials. Efforts described here are coordinated and complimentary to related efforts in PE 0602624A/project H18 and PE 0603004A/project 232 and PE 0602618A/project H80.	.000	.000	3.280	

Exhibit R-2a, PB 2010 Army RDT&E Project Justification		DATE: May 2009
APPROPRIATION/BUDGET ACTIVITY 2040 - Research, Development, Test & Evaluation, Army/BA 2 - Applied Research	R-1 ITEM NOMENCLATURE PE 0602624A Weapons and Munitions Technology	PROJECT NUMBER H28

B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
Total	16.940	11.101	11.544	

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

E. Performance Metrics

Performance metrics used in the preparation of this justification material may be found in the FY 2010 Army Performance Budget Justification Book, dated May 2010.