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 0602618A BALLISTICS 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	89.526	87.960	61.843						Continuing	Continuing
HB1: SURVIVABILITY AND LETHALITY TECHNOLOGIES (CA)	16.520	16.645	.000						Continuing	Continuing
H03: ROBOTICS TECHNOLOGY	14.697	16.348	.000						Continuing	Continuing
H75: ELECTRIC GUN TECHNOLOGY	3.867	4.038	4.086						Continuing	Continuing
H80: Survivability and Lethality Technology	54.442	50.929	57.757						Continuing	Continuing

A. Mission Description and Budget Item Justification

This program element (PE) provides ballistic technologies required for armaments and armor that will enable enhanced lethality and survivability for the Soldier. The PE supports applied research on autonomous mobility technology for future land combat systems (project H03); applied research on technologies for electric armaments and penetrators that offer the potential to achieve leap-ahead lethality capability by providing hypervelocity and hyper-energy launch well above the ability of the conventional cannon (project H75); and applied research on lightweight armors and structures for the Soldier and vehicles, kinetic energy active protection, crew and component protection from ballistic shock and mine-blast, insensitive propellants/munitions, novel multi-function warhead concepts, affordable precision munitions technologies, and physics-based techniques, methodologies, and models to analyze combat effectiveness of future technologies (project H80). Project HB1 funds congressional special interest items.

Work in this PE is related to and fully coordinated with efforts in PE 0602105A (Materials Technology), PE 0602120A (Sensors and Electronic Survivability), PE 0602601A (Combat Vehicle and Automotive Technology), PE 0602624A (Weapons and Munitions Technology), PE 0602705A (Electronics and Electronic Devices), PE 0602716A (Human Factors Engineering), PE 0602782A (Command, Control, Communications Technology), PE 0603004A (Weapons and Munitions Advanced Technology), and PE 0603005A (Combat Vehicle 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.

Work in this PE is performed by the Army Research Laboratory (ARL), Aberdeen Proving Ground, MD and Hampton, VA.

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 0602618A BALLISTICS TECHNOLOGY

B. Program Change Summary ($ in Millions)

	FY 2008	FY 2009	FY 2010	FY 2011
Previous President's Budget	68.899	71.550	75.526	
Current BES/President's Budget	89.526	87.960	61.843	
Total Adjustments	20.627	16.410	-13.683	
Congressional Program Reductions	.000	-.290		
Congressional Rescissions	.000	.000		
Total Congressional Increases	20.000	16.700		
Total Reprogrammings	1.744	.000		
SBIR/STTR Transfer	-1.117	.000		

Change Summary Explanation

FY08 funding increase was due to transfer of congressional interest items.

FY09 funding increase is due to congressional adds.

Beginning in FY10, funds transferred to PE 0602120A, project TS2 (Robotics Technology), and adjustments made to Electromagnetic Armor and Individual Warfighter Technologies to support higher priority efforts.

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 0602618A BALLISTICS TECHNOLOGY					PROJECT NUMBER HB1	
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**
HB1: SURVIVABILITY AND LETHALITY TECHNOLOGIES (CA)	16.520	16.645	.000						Continuing	Continuing

A. Mission Description and Budget Item Justification

These are Congressional Interest Items

B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
Advanced Tungsten Penetrators and Ballistic Materials	1.545	.000	.000	
Laser Based Explosives and Chem/Bio Standoff and Point Detector	3.091	3.875	.000	
Advanced Composite Materials Research for Air and Ground Vehicles	1.545	.000	.000	
Beneficial Infrastructure for Rotorcraft Risk Reduction Demonstrations (BIRRRD)	.774	.775	.000	
Multi Mission Armored Watercraft (MMAW) Project	1.159	.000	.000	
Small Unmanned Aerial Vehicles (UAVs) and Sensors	.484	.484	.000	
Super High Accuracy Range Kit - 105mm Artillery Technology	3.091	3.487	.000	
Advanced Composite Armor For Force Protection	2.898	1.550	.000	
Next Generation Lightweight Electric Drive Systems for Army Weapons	1.933	1.550	.000	
Globally Accessible Manufacturing and Maintenance Activity (pending transfer to 62601)	.000	1.550	.000	
Eye-Safe Standoff Fusion Detection of CBE Threats	.000	1.938	.000	
5.56mm Aluminum Cartridge Case, Lake City Army Ammunition Plant	.000	.969	.000	
SBIR/STTR	.000	.467	.000	
Total	16.520	16.645	.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 0602618A BALLISTICS TECHNOLOGY	PROJECT NUMBER HB1

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 0602618A BALLISTICS TECHNOLOGY					PROJECT NUMBER H03	
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**
H03: ROBOTICS TECHNOLOGY	14.697	16.348	.000						Continuing	Continuing

A. Mission Description and Budget Item Justification

This project funds applied research on autonomous mobility. The research focuses on investigation of advanced perception for autonomous ground mobility, intelligent vehicle control and behaviors; and human supervision of unmanned ground systems. Research results will enable both semi-autonomous and near autonomous unmanned ground vehicles (UGVs) with products transitioning to advanced development efforts. The work within this project provides the basis for the Collaborative Technology Alliance (CTA) in robotics. The applied research conducted in this program will be transitioned to technology development, demonstration, and materiel acquisition programs being conducted by the Office of the Secretary of Defense Joint Robotics Program and each of the Services.

Work in this PE is related to and fully coordinated with efforts in PE 0603005A (Combat Vehicle 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.

Work in this project is performed by the Army Research Laboratory (ARL), Aberdeen Proving Ground, MD and Hampton, VA.

B. Accomplishments/Planned Program ($ in Millions)	**FY 2008**	**FY 2009**	**FY 2010**	**FY 2011**
UGV Integration: Integrate technology on unmanned ground vehicle (UGV) test beds and conduct extensive field testing and technology characterization to establish improved capability for near autonomous UGVs. Leverage algorithms being conducted under DARPA sponsored research, e.g., learning applied to ground robotics (LAGR). Conduct regular, periodic testing at Ft. Indiantown Gap, PA, and other military facilities that will test the technology in complex environments. The results of the tests will be used to further focus CTA sponsored research, assess performance, and provide the opportunity for US Army Training and Doctrine Command to engage in the early development of the tactics, techniques, and procedures required for successful utilization of unmanned systems in future conflicts. In FY08, evaluated technologies to enable collaborative operation of near-autonomous unmanned systems, including networked air and ground unmanned vehicles, managed by a single Soldier. In FY09, evaluate the ability of unmanned ground vehicles to autonomously adapt to dynamic tactical environments.	3.758	3.987	.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 0602618A BALLISTICS TECHNOLOGY	PROJECT NUMBER H03

B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
CTA: Execute CTA for advanced perception, control/behavior, and man-machine interface technology required for high-speed mobility (including robotic-follower operations) and basic tactical behaviors common to multiple military missions. Research focuses on new sensor and sensor processing algorithms for rapid detection and classification of objects in the environment enabling safe high-speed mobility and intelligent tactical behavior by future unmanned systems; implementing adaptive control strategies that will enable unmanned systems to display intelligent tactical behavior, and development of human-robot interaction (HRI) scalable, intuitive, multi-modal control interfaces that will minimize the additional cognitive workload for Soldiers controlling unmanned assets. In FY08, researched improved object recognition and feature detection to enable tactical behavior and initiated creation and integration of mechanisms to adapt to intelligent adversaries. In FY09, develop technology for scene understanding and autonomous tactical behavior in the context of reconnaissance mission scenarios.	7.000	7.220	.000	
Small Business Innovative Research/Small Business Technology Transfer Programs	.000	.420	.000	
Perception and Intelligent Control: Develop perception and intelligent control technologies required to meet objective capabilities for the armed robotic vehicles and to transition this technology to advanced development programs being conducted under PE 0603005A (Combat Vehicle Advanced Technology) project 515 for integration into test bed systems. Leverage Defense Advanced Research Projects Agency (DARPA) sponsored research for control of collaborating agents to enable mixed teams (manned/unmanned) to conduct military missions. In FY08, developed perception and control technology to permit initial implementation of behaviors to enhance the operational effectiveness of robotic vehicles, including safe operations in populated environments. In FY09, develop robotics technology that will permit unmanned vehicles to adapt to dynamic situations found in tactical environments.	3.939	4.721	.000	
Total	14.697	16.348	.000	

C. Other Program Funding Summary ($ in Millions)

N/A

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 0602618A BALLISTICS TECHNOLOGY	PROJECT NUMBER H03

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 0602618A BALLISTICS TECHNOLOGY					PROJECT NUMBER H75	
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**
H75: ELECTRIC GUN TECHNOLOGY	3.867	4.038	4.086						Continuing	Continuing

A. Mission Description and Budget Item Justification

This project conducts applied research for Electromagnetic (EM) Guns. This project evaluates the potential of EM guns to provide such leap-ahead armaments capabilities that are fully integrated with electric propulsion and electromagnetic armor systems to provide the efficient, highly mobile, and deployable armored force. Focus is placed on addressing advanced materials for pulsed power; robust, compact, and lightweight launchers; full-scale, hypervelocity utility of novel kinetic energy penetrators (NKEPs) against a range of present and future threats; and efficient high energy launch packages. The results are transitioned to the Armament Research, Development, and Engineering Center (ARDEC) where they are being incorporated into an EM gun demonstration system.

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 project is performed by the Army Research Laboratory (ARL), Aberdeen Proving Ground, MD.

B. Accomplishments/Planned Program ($ in Millions)	**FY 2008**	**FY 2009**	**FY 2010**	**FY 2011**
Small Business Innovative Research/Small Business Technology Transfer Programs	.000	.076	.000	
Analysis: In FY08, analyzed utility of EM guns on the battlefield. In FY09, define the guidance and control parameters needed to increase hypervelocity hit probability. In FY10, will provide system analysis for precision fire application and document the EM armament system technical barriers.	.370	.350	.509	
Pulsed Power: Evolve the high strength composite materials critical for compact pulsed alternators. In FY08, proved high-strength, low-density, high-conductivity conductor technology and investigated high current switch materials. In FY09, study advanced materials (bandings, conductors, and switches) to reduce pulsed alternator size and mass. In FY10, will evaluate technology for rotor design, components, and assembly, which are required for next generation pulsed alternator. Provide assessment on improvements to pulsed alternator design that uses advanced materials.	1.397	1.512	1.961	

Exhibit R-2a, PB 2010 Army RDT&E Project Justification		DATE: May 2009
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B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
Launcher/Projectile: Research technologies needed to incorporate high strength, low density materials necessary for a long life, field-worthy EM cannon and develop lethal mechanisms that take advantage of the hypervelocity capability of EM guns and provide the armature and sabot technologies needed for accurate, low parasitic mass launch packages. In FY08, established technologies to eliminate arcing at the projectile/launcher interface. In FY09, demonstrate large-caliber (>5 MJ) kinetic energy and multipurpose projectiles launched from an EM gun. In FY10, will provide an analysis of thermal management techniques that are needed to cool rails for repetitive launch. Provide a projectile concept that is capable of meeting the precision fire mission as specified by the ARDEC Electromagnetic Gun advanced technology development effort.	1.300	1.300	1.616	
Full-Scale Hypervelocity Lethality: In FY08, validated reactive material (RM) multipurpose round at 2 MJ muzzle energy. In FY09, demonstrate full scale (>5MJ muzzle energy) RM warhead and transition to ARDEC.	.800	.800	.000	
Total	3.867	4.038	4.086	

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 0602618A BALLISTICS TECHNOLOGY					PROJECT NUMBER H80	
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**
H80: Survivability and Lethality Technology	54.442	50.929	57.757						Continuing	Continuing

A. Mission Description and Budget Item Justification

This project provides materials and armor/anti-armor terminal ballistic mechanisms that will provide better armor and armorments. Specific technology thrusts include: lightweight armors (Soldier/vehicle) and structures; active protection systems (APS); crew and component protection from ballistic shock, mine-blast; insensitive high energy propellants/munitions to increase lethality and reduce propellant/munitions vulnerability to attack; novel kinetic energy (KE) penetrator concepts to maintain/improve lethality; novel multi-function warhead concepts to enable defeat of full-spectrum of targets (anti-armor, bunker, helicopter, troops); and physics-based techniques, methodologies, and models to analyze combat effectiveness of future technologies for improved ballistic lethality and survivability.

Work in this PE builds on the materials research transitioned from PE 0601102A (Defense Research Sciences), project H42 (Materials and Mechanics), and PE 0602105A (Materials Technology) and applies it to specific Army platforms and the individual Soldier. The work is related to and fully coordinated with efforts in PE 0602601A (Combat Vehicle and Automotive Technology), PE 0602786A (Warfighter Technology), PE 0603001A (Warfighter Advanced Technology), PE 0603004A (Weapons and Munitions Advanced Technology), PE 0603005A (Combat Vehicle Advanced Technology), and PE 0708045A (Manufacturing 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.

Work in this project is performed by the Army Research Laboratory (ARL), Aberdeen Proving Ground, MD.

B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
Mine blast Protection: Develop mine blast, ballistic shock mitigation, and crew protection technologies to enable survivability of current and future platforms, ground tactical vehicles, and the individual Soldier. In FY08, designed lightweight, easily installed blast-penetrator protection (to include better seat designs) for occupants of current and future vehicles. In FY09, devise models for mine protection using advanced-electromagnetic armor (A-EMA) and support validation of A-EMA mine kits; prove full-scale explosive loading with test apparatus to simulate vehicle borne or roadside blast fragment loading; transition second generation flexible protection equipment for individual Soldier development community.	3.500	3.550	4.012	

Exhibit R-2a, PB 2010 Army RDT&E Project Justification		DATE: May 2009
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B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
In FY10, will analyze the ballistic shock effects of objective threat defeat on future vehicles. Will computationally address the interaction of blast waves from objective blast threat with magnetic plate materials investigated in PE 0602105A/ project H84.				
Armor Formulations: In FY09, research and investigate composite ceramic materials (from PE 0602105A/project H84) to increase body armor performance while reducing weight. For ground combat vehicles, design and develop reactive armor and electromagnetic armor solutions for defeat of emerging kinetic energy (KE) and chemical energy (CE) threats. Assess new explosive materials for reactive armors (RA) with modeling, simulation, and tests to characterize performance as well as sensitivity. Conduct modeling and simulation and experiments of lightweight brass board electromagnetic (EM) armor solutions using advanced materials to include hybrid armor designs that provide dual threat protection capability. In FY10, will continue composite ceramic materials investigations for personnel protection applications; will conduct tests with candidate single and dual-threat (CE & KE) defeat armor components (RA and EM) to design vehicle armor concepts; will conduct first proof of principle test with hybrid armor components (combines RA and EM technologies) for dual threat defeat; will develop new test methodologies, diagnostics, and modeling and simulation tools to better support active and hybrid armor development.	.000	15.976	20.789	
Structural Armor: Optimize advanced lightweight structural, ceramic, and electromagnetic armor technologies for transition to current and future tactical and combat vehicle designers. In FY08, developed passive armor designs with lower densities that defeat tactical vehicle threats; validated optimized second generation armor and structure configurations for future threats; explored novel electrical protection system (EPS) mechanisms for full spectrum defeat. In FY09, prove passive armor designs that defeat future tactical vehicle threats with further density reductions; validate objective threat defeat at goal vehicle weights; couple modeling and simulation with ballistic characterization to validate third generation armor concepts for future threats. In FY10, will confirm multi-hit capabality of third generation armor concepts designed from emerging materials in PE 0602105/project H84 at goal weights against objective threats for vehicles. Will validate EPS performance for tactical vehicles, both computationally and with tests in relevant environment.	9.434	11.808	12.328	
Energetics:	4.650	4.450	4.606	

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APPROPRIATION/BUDGET ACTIVITY 2040 - Research, Development, Test & Evaluation, Army/BA 2 - Applied Research	R-1 ITEM NOMENCLATURE PE 0602618A BALLISTICS TECHNOLOGY			PROJECT NUMBER H80	
B. Accomplishments/Planned Program ($ in Millions)		**FY 2008**	**FY 2009**	**FY 2010**	**FY 2011**
Develop propulsion and energetics technologies. Evaluate, select, and validate novel/nanostructural insensitive energetic materials concepts that exploit managed energy release and are required for improving the effectiveness and reducing the vulnerability of future gun/missile systems and warheads. In FY08, utilized reactive materials, novel energetics, and nano-structured materials to enhance propellant, igniter, explosive performance, reduced sensitivity, and provided increased multipurpose applications; formulated, evaluated, and characterized propulsion and detonation performance of common low-cost novel insensitive formulations; employed testing, modeling, and simulation to reduce munitions vulnerability and enhanced performance and effectiveness. In FY09, apply ballistic modeling and simulation to evaluate low-vulnerability propulsion charge configurations at reduced caliber for MOUT and gun launched rockets; apply reactive materials and nano-structured materials to enhance energy output with less propellant and explosive material; derive and apply chemical and physical mechanisms to reduce erosion via dynamic nitriding; determine the effects of physical modification and compartment packing design of munitions on the vulnerability of propellants and explosives to fast and slow cook-off, bullet and fragment impact, shaped charge jet impact; evaluate performance of advanced enhanced blast explosive formulations and munitions. In FY10, will provide technology assessment of reactive material as structural components for Army munition systems. Will incorporate reactive materials into structural components for Army munition systems and will test their performance of the system. Will transition hypergolic rocket motor and understanding to RDECs.					
Precision Munitions: Develop advanced technologies to enable a broad spectrum of affordable precision munitions. Develop a multi-disciplinary approach to munitions system design by coupling physics-based models of interior ballistics, launch dynamics, flight mechanics, and high-G guidance, navigation, and control (GN&C) technologies to enable smaller, cheaper, and lighter low-collateral-damage precision munitions for future asymmetric operations in military operations on urban terrain (MOUT). In FY08, performed an integrated flight demonstration of a supersonic medium-caliber interceptor; validated smaller, lighter, cheaper munitions components and transition to development community. In FY09, address technology that enables precision fires for small unit MOUT operations. In FY10, will validate reduced state GN&C methods that will significantly reduce cost of precision munitions. Will validate low cost robust actuator technology for indirect fire application.		4.350	4.200	4.557	
Active Protection:		1.600	.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 0602618A BALLISTICS TECHNOLOGY	PROJECT NUMBER H80

B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
Develop active protection counter-munitions and sensor technologies to effectively defeat all anti-armor munitions including kinetic energy (KE) projectiles, which is critical to enable survivability of future platforms. In FY08, developed enhanced explosive warhead technology and validated the warhead technology versus KE and shaped charge threats.				
Advanced Munitions: Develop advanced ammunition and lethality technologies. Identify and model preferred options to reduce energy/mass required to defeat emerging armor threats and to provide multi-purpose capabilities for revolutionary future lethality. In addition, investigate technology options for scaling warhead lethality to enhance MOUT war fighting including control of collateral damage. In FY08, performed end-to-end validation of multi-threat objective projectile (M-TOP) warhead; transitioned M-TOP technologies (including analytic and numerical models for weapons effects) to ARDEC and AMRDEC; developed scalable warhead component technologies and prepared for possible technology transitions. In FY09, prove integrated scalable warhead technology for blast, fragmentation, and penetration effects in urban environments. In FY10, will research advanced scalability concepts for medium and large caliber projectiles and missiles.	4.175	3.575	3.863	
Survivability/Lethality Analyses: Devise state-of-the-art survivability/lethality/vulnerability (SLV) methodologies to dynamically model the interaction of conventional ballistic threats versus future systems. In FY08, developed methodologies to analyze emerging technologies and survivability in a networked, system of systems context and validated for production. In FY09, develop novel blast and combined-effects methodologies for non-traditional, emerging synergistic threats; demonstrate an early Modular UNIX-based Vulnerability Estimation Suite (MUVES) 3 analysis capability, and deliver advanced crew-casualty metrics for assessing body armor. In FY10, will investigate alignment of methodology development to the coupling of emerging and predicted threats with advancing armor materials/recipes and medical community inputs.	6.733	6.810	7.602	
Small Business Innovative Research/Small Business Technology Transfer Programs	.000	.560	.000	
GWOT Request:	20.000	.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 0602618A BALLISTICS TECHNOLOGY	PROJECT NUMBER H80

B. Accomplishments/Planned Program ($ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
In FY08, explored proven, expedient armor solutions at reduced weights against emerging threats using a combination of standard ballistic instrumented test protocols and high performance computing. Overall goal is to achieve weight neutral or enhanced performance armor solutions relative to current armor being pursued. Demonstrated and matured high performing reduced weight/alternate materials for armor designs. Performed integration and automotive assessments of additional weight impact on Mine Resistant Ambush Protected (MRAP) platforms due to the improved armor designs. Continued threat characterization along with vulnerability analysis to support design decisions as well as address evolving threats. Evaluated current and enhanced seating technologies to provide enhanced crew survivability from blast. Augmented armor with emerging protection technologies to include detection and neutralization systems. Selected armor/ non-armor solutions have undergone testing at ATEC on MRAP platforms for the purpose of fulfilling Urgent Material Release (UMR) requirements/safety certification/Capabilities and Limitations Report.				
Total	54.442	50.929	57.757	

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.