Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army										DATE: February 2011	
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602105A: *MATERIALS TECHNOLOGY*							
COST ($ in Millions)	**FY 2010**	**FY 2011**	**FY 2012 Base**	**FY 2012 OCO**	**FY 2012 Total**	**FY 2013**	**FY 2014**	**FY 2015**	**FY 2016**	**Cost To Complete**	**Total Cost**
Total Program Element	88.022	29.882	30.258	-	30.258	27.999	28.898	29.164	29.630	Continuing	Continuing
H7B: *Advanced Materials Initiatives (CA)*	61.341	-	-	-	-	-	-	-	-	Continuing	Continuing
H7G: *NANOMATERIALS APPLIED RESEARCH*	4.968	5.238	5.299	-	5.299	5.411	5.509	5.593	5.671	Continuing	Continuing
H84: *MATERIALS*	21.713	24.644	24.959	-	24.959	22.588	23.389	23.571	23.959	Continuing	Continuing

Note

FY10 funding decrease to support higher priority efforts.

A. Mission Description and Budget Item Justification

The objective of this program element (PE) is to evaluate materials for lighter weight and more survivable armor and for more lethal armaments. Project H7G supports the design, development, and evaluation of nanostructure materials and project H84 supports the design, development and evaluation of materials for more survivable and lighter weight armor and armaments.

Work in this PE builds on the materials research transitioned from PE 0601102A (Defense Research Sciences), project H42 (Materials and Mechanics) and PE 0601104A (University and Industry Research Centers), project J12 (Institute for Soldier Nanotechnologies) and applies it to specific Army platforms and the individual Soldier.

This work complements and is fully coordinated with efforts in PE 0602618A (Ballistics Technology), 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 is performed by the Army Research Laboratory (ARL), Adelphi, MD and Aberdeen Proving Ground, MD.

Project H7B funds congressional special interest items.

Exhibit R-2, RDT&E Budget Item Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602105A: *MATERIALS TECHNOLOGY*	

B. Program Change Summary ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	99.447	29.882	30.155	-	30.155
Current President's Budget	88.022	29.882	30.258	-	30.258
Total Adjustments	-11.425	-	0.103	-	0.103
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	-11.042	-			
• SBIR/STTR Transfer	-0.383	-			
• Adjustments to Budget Years	-	-	0.103	-	0.103

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602105A: *MATERIALS TECHNOLOGY*	PROJECT H7B: *Advanced Materials Initiatives (CA)*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H7B: *Advanced Materials Initiatives (CA)*	61.341	-	-	-	-	-	-	-	-	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

Congressional Interest Item funding provided for Advanced Materials Initiatives.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Future Affordable Multi-Utility Materials for the Army Future Combat Systems. ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated rapid composite manufacturing process for vehicle materials, Unmanned Air Vehicles (UAVs), and prosthetics fabrication.	7.162	-	-
Title: Nanomanufacturing of Multifunctional Sensors. ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated materials and process methodologies for affordably producing nano to micro-scale multifunctional chemical/biological warfare agent sensors and structural health monitoring sensors.	3.979	-	-
Title: One-Step JP-8 Bio Diesel Fuel. ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated means for producing JP-8 biodiesel in a single step using enzymatic or chemical methods, and utilizing northern climate plants.	1.592	-	-
Title: Composite Applied Research and Technology for Future Combat System and Tactical Vehicle Survivability. ***Description:*** This is a Congressional Interest Item.	3.182	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602105A: *MATERIALS TECHNOLOGY*	PROJECT H7B: *Advanced Materials Initiatives (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
FY 2010 Accomplishments: Investigated approaches to advance lightweight multifunctional composites for combat, tactical, air manned/unmanned vehicles, and individual soldier systems.			
Title: Capability Expansion of Spinel Transparent Armor Manufacturing. ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated approaches to producing large, low cost magnesium aluminate (MgAl2O4) spinel transparent armor for lightweight armor technologies.	1.591	-	-
Title: Ultrasonic Impact Technology. ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated a portable device that uses ultrasonic impact technology to restore residual comprehensive stresses in materials.	1.990	-	-
Title: Dual Stage Variable Energy Absorber. ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated technology options to protect soldiers traveling in ground vehicles from mine and Improvised Explosive Device (IED) blasts and vehicle crashes.	2.388	-	-
Title: Modeling and Testing of Next Generation Body Armor. ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated multi-scale modeling capabilities related to personnel protective materials and systems.	1.990	-	-
Title: Development of Improved Lighter-Weight Armor Solutions for Improvised Explosive Devices/Explosively Formed Penetrators ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:***	1.592	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602105A: *MATERIALS TECHNOLOGY*	PROJECT H7B: *Advanced Materials Initiatives (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Investigated prospective high performance ballistic armor applications.			
Title: Advanced Conductivity Program (ACP). ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Fabricated transparent, conductive coatings intended to reflect in the infrared and evaluated their performance.	0.995	-	-
Title: Affordable Light-Weight Metal Matrix Composite (MMC) Armor ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Established a lightweight MMC production facility.	2.487	-	-
Title: Ballistic Armor Research ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Conducted research into advanced, lightweight, multifunctional composites.	3.183	-	-
Title: Lattice Block Structures for AM2 (aluminum matting) Matting Replacement ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated approaches for a lightweight, strong and easy to install replacement for AM-2.	1.592	-	-
Title: Moldable Fabric Armor ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated a moldable fabric technology.	2.228	-	-
Title: Renewable Jet Fuel from Lignocellulosic Feedstocks ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:***	2.388	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602105A: *MATERIALS TECHNOLOGY*	PROJECT H7B: *Advanced Materials Initiatives (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Investigated a bio-oil production process using lignocelluloses (refers to plant biomass that is composed of cellulose) materials.			
Title: Dev, Opt, & Trf of Reliable Test Tech for Materials Designed to Protect WF Against Toxic Chem Agents ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated approaches to assess the protective capabilities of different materials against permeation/penetration by chemical warfare agents.	0.478	-	-
Title: Ultra Lightweight Metallic Armor ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated materials technology for preliminary characterization, testing, and qualification of high strength magnesium alloy wrought materials.	0.796	-	-
Title: Aluminum Armor Project ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated technology options for providing better protection against attacks.	0.836	-	-
Title: Smart Integrated Systems: Materials, Manufacturing Methods, and Structures ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated options for implementing an integrated approach to smart materials, manufacturing methods, and structures.	0.995	-	-
Title: Reactive Materials ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated technologies for reactive materials.	1.194	-	-
Title: Large-Scale Manufacturing of Revolutionary Nanostructured Materials	1.194	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602105A: *MATERIALS TECHNOLOGY*	PROJECT H7B: *Advanced Materials Initiatives (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Assessed advanced materials concepts for military components.			
Title: Next Generation High Strength Glass Fibers for Ballistic Armor Applications ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated high strength glass fibers for use in composite armoring materials.	1.592	-	-
Title: High Strength Glass Production and Qualification for Armor Applications ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated development of alternative sources for high strength glass production.	1.592	-	-
Title: Advanced Nanocomposite Materials for Lightweight Integrated Armor Systems ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated technology options for lightweight nanocomposite materials.	1.592	-	-
Title: Materials Technology for light-emitting diode (LED) Lighting Applications ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated materials for improved thermal interface adhesive for LED lighting applications.	2.388	-	-
Title: Fused Silica for Large-Format Transparent Armor ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated new transparent armor materials technologies.	3.183	-	-
Title: Lightweight Metal Alloy Foam for Armor	3.183	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602105A: *MATERIALS TECHNOLOGY*	PROJECT H7B: *Advanced Materials Initiatives (CA)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Description: This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Investigated approaches to produce small hollow shapes (spheres) of various metal alloys including stainless steel.			
Title: Advanced Composite Research for Vehicles ***Description:*** This is a Congressional Interest Item. ***FY 2010 Accomplishments:*** Performed research on composite materials with potential military applications.	3.979	-	-
Accomplishments/Planned Programs Subtotals	61.341	-	-

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, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602105A: *MATERIALS TECHNOLOGY*	PROJECT H7G: *NANOMATERIALS APPLIED RESEARCH*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H7G: *NANOMATERIALS APPLIED RESEARCH*	4.968	5.238	5.299	-	5.299	5.411	5.509	5.593	5.671	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

The objective of this project is to support the design, development, and evaluation of nanostructure materials that improve the Soldier's survivability. This project funds collaborative applied research and integration of government, academic, and industry scientific research on nanomaterials derived from PE 0601104A/project J12 (Institute for Soldier Nanotechnologies (ISN)) to advance innovative capabilities.

The work is a collaborative effort between the ISN at the Massachusetts Institute of Technology, the Army Laboratories and Research, Development, and Engineering Centers, and the ISN industrial partners.

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), Adelphi, MD and Aberdeen Proving Ground, MD.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Nanomaterials Applied Research	4.968	5.238	5.299
Description: Devise and validate improved, physics-based, materials property models and concepts for multifunctional, lightweight, and responsive hierarchical material technologies. Exploit breakthroughs in nanomaterials and multifunctional fiber processing technologies (e.g., scale-up of processes and fabrication into woven materials) to enable revolutionary future Soldier program's protection capabilities. Coordinated research program is conducted internally by ARL and externally through a collaborative effort with ISN and ISN industry partners.			
FY 2010 Accomplishments: Examined concepts for the absorption of energy in personnel protection applications.			
FY 2011 Plans: Research novel materials and hybridization of materials for personnel protection in ballistic environments.			
FY 2012 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602105A: *MATERIALS TECHNOLOGY*	PROJECT H7G: *NANOMATERIALS APPLIED RESEARCH*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will investigate the incorporation of nanoparticles, nanotubes and nanofibers into materials systems to produce novel sensing capabilities for enhanced situational awareness.			
Accomplishments/Planned Programs Subtotals	4.968	5.238	5.299

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, RDT&E Project Justification: PB 2012 Army			DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602105A: *MATERIALS TECHNOLOGY*	PROJECT H84: *MATERIALS*	

COST ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total	FY 2013	FY 2014	FY 2015	FY 2016	Cost To Complete	Total Cost
H84: *MATERIALS*	21.713	24.644	24.959	-	24.959	22.588	23.389	23.571	23.959	Continuing	Continuing

Note

Not applicable for this item.

A. Mission Description and Budget Item Justification

The objective of this project is to support the design, development, and evaluation of materials that enable more survivable and lighter weight armor and armaments. This project provides the technical foundation for materials technologies in metals, ceramics, polymers, and composites. This project addresses the need for more survivability and lighter weight armaments through nanomaterials research across the spectrum of applications to improve performance, improved, physics-based, material, mechanical, and structural models; high strain rate material characterization techniques, non-destructive inspection/evaluation technologies, new high strength/temperature materials and coatings; and advanced fabrication/processing methodologies. Applied research efforts are focused on armor/armament materials, as well as lightweight structural/electronic materials and materials affording protection against chemical, biological, or directed energy threats. The overarching goals of this research are to provide optimized lightweight armor structures, improved affordable processing methods, and the development of modeling and simulation tools to facilitate future design efforts in support of current and future force systems.

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 is conducted by the Army Research Laboratory (ARL) at its Aberdeen Proving Ground, MD, and Hampton, VA, locations.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Structural Armor	5.225	5.913	6.975
Description: Optimize lightweight armor materials/structures, processing methodology, and modeling and simulation tools to enable formulation of lightweight, frontal, and structural armors. ***FY 2010 Accomplishments:*** Optimized glass-ceramic laminate transparent composite materials at reduced weight; and examined interlaminar properties of multilaminate materials to optimize performance and reduce weight. ***FY 2011 Plans:*** Determine candidate materials and configurations for ceramic only transparent armor solutions; and characterize materials properties and microstructures to determine optimal configurations for ballistic protection. ***FY 2012 Plans:***			

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
APPROPRIATION/BUDGET ACTIVITY 2040: *Research, Development, Test & Evaluation, Army* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602105A: *MATERIALS TECHNOLOGY*	PROJECT H84: *MATERIALS*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will develop and validate model capability for composite materials that includes high rate effects, thermal effects and fatigue; will characterize the high rate properties of structural adhesives for inclusion in armor solutions; and will synthesize novel adhesive compositions.			
Title: Soldier-Borne Armor ***Description:*** Optimize lightweight armor materials and defeat mechanisms against emerging threats to enable affordable design of multifunctional ballistic protective systems for the future Soldier. Provide quantitative scientific basis for modeling and simulation that result in new lethal mechanisms/protection schemes for the individual warfighter. ***FY 2010 Accomplishments:*** Developed and formulated materials that allow for optimal ballistic performance from low, intermediate, and high velocity impacts and blast waves; and refined three dimensional reinforcement concepts for composite materials. ***FY 2011 Plans:*** Develop new, mass-efficient, protection materials and technologies to mitigate energy from both ballistic and blast events. ***FY 2012 Plans:*** Will provide the capability to non-destructively characterize the relationship between ceramic tile quality and ballistic performance; and will validate the synthesis of rate dependent soft material tissue surrogates for the development and characterization of personnel armor concepts.	2.779	3.150	2.759
Title: Composites ***Description:*** Design, validate, and optimize advanced materials (ceramic, composite, polymers, lightweight and high-strength metals) including processing techniques for protection against smaller but more lethal penetrators/warheads using affordable, lightweight, high performance armaments for revolutionary weapons effectiveness in urban and irregular operations. ***FY 2010 Accomplishments:*** Developed novel nano to micro-structures in metallic materials; characterized microstructures including high and low rate properties; and identified effect of parameters leading to shear in plastically deformed metals. ***FY 2011 Plans:*** Establish a complete set of parameters that will lead to adiabatic (no heat given off or absorbed) shear behavior of fully dense pure metals; and will develop a scaled processing approach for fully dense pure metals and produce samples of sufficient size to permit sub-scale ballistic evaluation. ***FY 2012 Plans:***	4.118	4.533	3.916

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will develop cold spray techniques to successfully deposit novel material compositions in confined spaces; will validate methods for the composite cladding of advanced gun barrel designs; and will validate improvements in gun barrel erosion.			
Title: Electronic Materials ***Description:*** Design and optimize electro-ceramic materials and processing techniques for integration by the Communications-Electronics Research, Development, and Engineering Command (CERDEC) into advanced antennas that will enable affordable and reliable command, control and communications (C3) for current and future force platforms. ***FY 2010 Accomplishments:*** Developed methodologies to enable low defect synthesis of ferroelectric oxide thin film materials for high quality factor/ low insertion loss devices; evaluated and developed methodologies to enable materials for Complementary Metal-Oxide Semiconductor (CMOS) compatible low cost integration; and employed theoretical formalisms to aid the design of materials for tunable device components. ***FY 2011 Plans:*** Advance optimization methodologies to enable low defect synthesis of ferroelectric oxide thin film materials; and perform optimization of low temperature synthesis of ferroelectric oxide thin film materials for CMOS compatibility and integration. ***FY 2012 Plans:*** Will develop the material designs, fabrication methods, and process science protocols required for CERDEC to achieve high quality, affordable, performance consistent, tunable beam steering antenna elements.	0.497	0.500	0.514
Title: Nanomaterials ***Description:*** Mature and scale-up nanomaterials processes, fabrication, characterization and performance measures to enable revolutionary concepts for future force lethality and survivability beyond those addressed for individual Soldier protection in project H7G. ***FY 2010 Accomplishments:*** Developed relationships between scaled-up processing of nanoscale materials and processing; and characterized reactive materials and provided feedback to model developers. ***FY 2011 Plans:*** Develop new reactive structural material compositions and optimize microstructures based on models and experiments; and characterize nanoscale structures using analytical microscopy tools. ***FY 2012 Plans:***	1.390	1.486	1.544

Exhibit R-2A, RDT&E Project Justification: PB 2012 Army		DATE: February 2011
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Will validate nanograined metallic structures fabrication process using thermodynamic techniques, and will provide an initial validation of the improvement in the ballistic capability of transparent materials reinforced with natural cellulose nanofibers.			
Title: Multifunctional Armor ***Description:*** Armor Materials. Material technologies for Soldier personnel protection will be transitioned to PE 0602786/project H98. Materials for reactive armor and electromagnetic armor concepts will be used in PE 0602618/project H80, and refined in PE 0602601/project C05. ***FY 2010 Accomplishments:*** Characterized ceramic materials for high strain rate/shock properties; examined the tradeoff of stiffness versus damage tolerance in materials systems by quantified constitutive property behaviors; and completed investigation/design of material properties for reactive armor effectors and electromagnetic armors coils. ***FY 2011 Plans:*** Perform failure mode characterization of passive and active armor materials; determine propagation fracture toughness in ceramics; measure and model residual stress in metal matrix composite armor materials; develop scale up processes for multi-modal materials microstructures; and examine novel metallic structures to reduce weight and manage ballistic impact loads. ***FY 2012 Plans:*** Will provide new multifunctional composite materials with structural and power storage capability; will develop synthesis routes for soft polymer nano-composites with controllable electrical properties; and will provide composite materials with improved damage tolerance for use in ultra-lightweight structures and armors.	7.704	9.062	9.251
Accomplishments/Planned Programs Subtotals	21.713	24.644	24.959

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.