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 0602307A: *ADVANCED WEAPONS 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	19.906	18.190	20.034	-	20.034	21.377	21.230	20.826	19.741	Continuing	Continuing
042: *HIGH ENERGY LASER TECHNOLOGY*	18.906	18.190	20.034	-	20.034	21.377	21.230	20.826	19.741	Continuing	Continuing
NA5: *Advanced Weapons Components (CA)*	1.000	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program element (PE) investigates enabling technologies for High Energy Laser (HEL) weapons. Project 042 develops component technologies such as efficient, high energy, solid state laser designs and adaptive optics, and lethality / effectiveness measurements that enable better models and simulations for future HEL weapon designs. Project NA5 funds congressional special interest items.

Work in this project is related to, and fully complements, efforts in PE 0602890F (HEL Research) and PE 0603924F (HEL Advanced Technology Program), PE 0605605A (DOD High Energy Laser Systems Test Facility (HELSTF)), PE 0602120A (Sensors and Electronic Survivability), and PE 0603004A (Weapons and Munitions Advanced Technology) Project L96, and is coordinated with PE 0603005A (Combat Vehicle and Automotive Advanced Technology) Project 441.

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 U.S. Army Space and Missile Defense Command (SMDC), in Huntsville, AL, the U.S. Army Aviation and Missile Research, Development, and Engineering Center (AMRDEC) in Huntsville, AL, and the High Energy Laser Systems Test Facility, at White Sands Missile Range, NM.

B. Program Change Summary ($ in Millions)	FY 2010	FY 2011	FY 2012 Base	FY 2012 OCO	FY 2012 Total
Previous President's Budget	21.964	18.190	20.034	-	20.034
Current President's Budget	19.906	18.190	20.034	-	20.034
Total Adjustments	-2.058	-	-	-	-
• Congressional General Reductions		-			
• Congressional Directed Reductions		-			
• Congressional Rescissions	-	-			
• Congressional Adds		-			
• Congressional Directed Transfers		-			
• Reprogrammings	-1.387	-			
• SBIR/STTR Transfer	-0.671	-			

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 0602307A: *ADVANCED WEAPONS TECHNOLOGY*	PROJECT 042: *HIGH ENERGY LASER 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
042: *HIGH ENERGY LASER TECHNOLOGY*	18.906	18.190	20.034	-	20.034	21.377	21.230	20.826	19.741	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project investigates and develops advanced technologies for High Energy Laser (HEL) weapon systems to enable more efficient lasers with greater power output. This includes technologies to support development of alternate laser sources; precision optical pointing and tracking components; adaptive optics to overcome laser degradation due to atmospheric effects; and thermal management systems to remove excess heat. In addition, this effort conducts laser lethality testing and analysis against a variety of targets and investigates the impact of low-cost laser countermeasures. Solid State Laser (SSL) efforts continue to leverage other funds provided by the HEL Joint Technology Office (JTO), the Air Force, and the Navy to develop multiple technical approaches that reduce program risk and maintain competition.

Work in this project is related to, and fully coordinated with, efforts in PE 0602890F (HEL Research) and PE 0603924F (HEL Advanced Technology Program), PE 0605605A (DOD High Energy Laser Systems Test Facility (HELSTF)), PE 0602120A (Sensors and Electronic Survivability), PE 0603004A (Weapons and Munitions Advanced Technology) Project L96, and to PE 0603005A (Combat Vehicle and Automotive Advanced Technology) Project 441.

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 U.S. Army Space and Missile Defense Command (SMDC), in Huntsville, AL, the U.S. Aviation and Missile Research, Development, and Engineering Center (AMRDEC) in Huntsville, AL, and the High Energy Laser Systems Test Facility (HELSTF), at White Sands Missile Range, NM.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: Solid State Laser (SSL) Effects	2.837	2.925	5.948
Description: This effort provides the underlying data required to support system engineering designs, lethality analysis, and modeling and simulation (M&S) tools for laser weapon systems.			
FY 2010 Accomplishments: Conducted expanded full scale static SSL lethality evaluations against rocket, artillery, and mortar (RAM) targets, unmanned aerial systems (UASs), and other high priority threats to determine the laser energy required both on target and at the laser source to defeat them under various engagement ranges.			
FY 2011 Plans:			

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
Determine SSL effectiveness against targets of interest in both static and dynamic test scenarios to assess a broad spectrum of mission applications and validate M&S tools that support analysis of alternatives, HEL power levels, and associated ranges across multiple mission sets. ***FY 2012 Plans:*** Will continue static and dynamic evaluations at various power levels up to 100kW using the SSL at the High Energy Laser Systems Test Facility (HELSTF) against RAM and UAS targets in conjunction with the other Services.			
Title: SSL Development, Phase 3 - 100 kW ***Description:*** The goal of this Joint High Power Solid State Laser (JHPSSL) Phase 3 effort is to develop and demonstrate 100 kW-class, near-diffraction-limited diode-pumped solid-state lasers that have architectures favorable for tactical weapon applications. ***FY 2010 Accomplishments:*** Completed integration of the selected laser device with the existing Beam Control System (BCS) and began evaluation of high power SSL performance against a variety of target types at tactical ranges of interest as a risk reduction activity for the High Energy Laser Technology Demonstrator (HEL TD). ***FY 2011 Plans:*** Decouple 100 kW SSL from existing BCS and integrate SSL with the mobile HEL TD BCS to demonstrate potential mission applications, including Counter-RAM (CRAM), and explore performance of the HEL TD BCS.	4.443	1.950	-
Title: Advanced Beam Control Component Development ***Description:*** This effort investigates technologies to enable lighter, more agile beam control systems that are robust enough to be used in Army ground platforms. This work is done in collaboration with the HEL JTO and other Services. ***FY 2010 Accomplishments:*** Designed advanced architectures for BCSs and developed component technologies that improved compactness, pointing accuracy, and agility of beam directors for improved compatibility with future all-electric tactical platforms. This included adaptive optics (AO) components to engage threats at longer ranges and low-absorbing HEL windows, shared aperture optics, and mirror coatings to minimize laser power and beam quality degradation. ***FY 2011 Plans:*** Fabricate and assemble advanced beam control components for integration into the HEL TD beam control system, such as AO, to increase the effective range of the system. ***FY 2012 Plans:***	4.820	2.620	0.751

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 coat optics, begin assembly, and conduct laboratory demonstrations of a lightweight beam director with the performance characteristics required for a tactical HEL weapon system.			
Title: High Efficiency Laser Development ***Description:*** This effort develops component technologies that lead to increased SSL wall-plug efficiencies that greatly improve the ability to integrate SSL systems onto mobile Army weapon platforms. This work is done in collaboration with the HEL JTO and other Services. ***FY 2010 Accomplishments:*** Continued to design and develop reliable electric laser component technologies that improve SSL efficiencies, such as improved gain media, pump power sources, optical elements, and diode arrays; and began to explore thermal management technologies. ***FY 2011 Plans:*** Begin risk reduction for assembly and integration of two 25 kW high efficiency breadboards using alternative technical approaches; begin the conceptual design of a 100 kW class high efficiency device; initiate multiple eye-safe laboratory demonstrations with greater than 30% efficiency; and continue to develop thermal management techniques specific to high efficiency lasers that minimize thermal distortions, alignment errors, and beam quality degradation. ***FY 2012 Plans:*** Will complete the design and risk reduction of the 25 kW high efficiency approaches, to include fabrication, integration, and evaluation of laser assemblies at 5 kW and 15 kW; will complete the interim design of the 25 kW laboratory devices; will complete the conceptual design of the 100 kW class device, to include thermal management techniques; and will leverage small business innovation research efforts to complete eye-safe laser component demonstrations.	6.334	9.720	12.521
Title: HEL Research and Development Laboratory ***Description:*** This effort focuses on developing in-house expertise through SSL assessments. This work is done in cooperation with the Aviation and Missile Research Development and Engineering Center (AMRDEC). ***FY 2010 Accomplishments:*** Conducted low-to-medium power studies on a 600 meter test range to investigate SSL atmospheric propagation and target interaction phenomenology. Initiated data analysis and model development to support atmospheric correction algorithm development and to provide validated inputs for wargaming modeling and simulation efforts. ***FY 2011 Plans:***	0.472	0.975	0.814

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 0602307A: *ADVANCED WEAPONS TECHNOLOGY*	PROJECT 042: *HIGH ENERGY LASER TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Investigate new deformable mirror designs to identify those with lower cost and sufficient performance; and investigate causes of poor beam quality in SSLs to determine where investments can advance the technology for Army applications. ***FY 2012 Plans:*** Will conduct modeling and simulation studies to characterize and optimize HEL system and component performance; and will enhance state-of-the-art reflectance measurement capability and continue collecting reflectance data of threat targets.			
Accomplishments/Planned Programs Subtotals	18.906	18.190	20.034

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 0602307A: *ADVANCED WEAPONS TECHNOLOGY*	PROJECT NA5: *Advanced Weapons Components (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
NA5: *Advanced Weapons Components (CA)*	1.000	-	-	-	-	-	-	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

Congressional Interest Item funding provided for Advanced Weapons Components applied research.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2010	FY 2011	FY 2012
Title: UAV Directed Energy Weapons System Payloads	1.000	-	-
Description: This is a Congressional Interest Item.			
FY 2010 Accomplishments: This effort investigated a compact RF directed energy weapons system in a package that is capable of deployment on a presently mature UAV platform.			
Accomplishments/Planned Programs Subtotals	1.000	-	-

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.