Exhibit R-2, PB 2011 Army RDT&E Budget Item Justification											DATE: February 2010
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 2009 Actual**	**FY 2010 Estimate**	**Base FY 2011 Estimate**	**OCO FY 2011 Estimate**	**Total FY 2011 Estimate**	**FY 2012 Estimate**	**FY 2013 Estimate**	**FY 2014 Estimate**	**FY 2015 Estimate**	**Cost To Complete**	**Total Cost**
Total Program Element	22.638	21.964	18.190	0.000	18.190	20.034	22.377	24.730	26.059	0	174.182
042: *HIGH ENERGY LASER TECHNOLOGY*	19.050	19.576	18.190	0.000	18.190	20.034	22.377	24.730	26.059	Continuing	Continuing
NA5: *Advanced Weapons Components (CA)*	3.588	2.388	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program element (PE) investigates enabling technologies for High Energy Laser (HEL) weapons. The major efforts under this PE develop 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 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. 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.

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B. Program Change Summary ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
Previous President's Budget	23.187	19.678	20.690	0.000	20.690
Current President's Budget	22.638	21.964	18.190	0.000	18.190
Total Adjustments	-0.549	2.286	-2.500	0.000	-2.500
• Congressional General Reductions		-0.114			
• Congressional Directed Reductions					
• Congressional Rescissions		0.000			
• Congressional Adds		2.400			
• Congressional Directed Transfers					
• Reprogrammings	0.101	0.000			
• SBIR/STTR Transfer	-0.650	0.000			
• Adjustments to Budget Years	0.000	0.000	-2.500	0.000	-2.500

Change Summary Explanation

FY10 Congressionally directed increases. FY11 funding realigned to higher priority efforts.

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COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	Base FY 2011 Estimate	OCO FY 2011 Estimate	Total FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
042: *HIGH ENERGY LASER TECHNOLOGY*	19.050	19.576	18.190	0.000	18.190	20.034	22.377	24.730	26.059	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 Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Program #1	1.453	2.456	2.925	0.000	2.925
Solid State Laser (SSL) Effects: This effort provides the underlying data required to support system engineering designs for laser weapon systems. In FY09, continued assessing the effectiveness of SSLs against Rocket, Artillery, and Mortar (RAM) warheads and fuses and began expanding the program to emphasize targets other than RAM, such as Unmanned Aerial System (UAS) components, Man Portable Air Defense Systems (MANPADS), Anti-Tank Guided Missiles, and Rocket Propelled Grenades (RPGs). Used results to improve and validate the target vulnerability models for use in Army engagement simulation codes such as Extended Air Defense Simulation (EADSIM), Interactive Distributed Early Entry Analysis Simulation (IDEEAS), and other distributed interactive simulation tools. In FY10, conduct expanded full scale static SSL lethality testing					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
against RAM targets, UASs, and other high priority threats to determine the laser energy required to defeat them under various engagement ranges. In FY11, will determine SSL effectiveness against targets of interest in both static and dynamic test scenarios to assess a broad spectrum of mission applications and validate Modeling and Simulation (M&S) tools that support analysis of alternatives, HEL power levels, and associated ranges across multiple mission sets. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #2 Solid State Laser (SSL) Development, Phase 3 - 100 kW: 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. In FY09, leveraging joint and other Service funding:1) completed integration and performance testing of two 100 kW SSL devices; 2) selected the most promising laser and component technologies for use in the High Energy Laser Technology Demonstrator (HEL TD) risk reduction activities; 3) supported systems engineering of the selected SSL Phase 3 technology for use on the mobile HEL TD platform; and 4) began integration of one of the down-selected devices with an existing beam control subsystem (BCS) at HELSTF to evaluate high power SSL performance at tactical ranges of interest. In FY10, complete integration of the selected laser device with the existing BCS and begin evaluation	11.784	4.601	1.950	0.000	1.950

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
of high power SSL performance against a variety of target types at tactical ranges of interest as a risk reduction activity for the HEL TD. In FY11, a 100kW SSL will be integrated with the mobile HEL TD BCS to demonstrate potential mission applications, including Counter-RAM (CRAM), and explore performance of the HEL TD BCS. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #3 Advanced Beam Control Component Development: 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. In FY09, researched and demonstrated beam control components suitable for integration into an existing beam control system. This includes development and field testing of adaptive optics (AO) consisting of deformable mirrors (DMs) with high stroke and bandwidth to overcome ground-level atmospheric degradation. In FY10, design advanced architectures for beam control systems and develop component technologies that improve compactness, pointing accuracy, and agility of beam directors for improved compatibility with future all-electric tactical platforms. This includes AO to engage threats at longer ranges and low-absorbing HEL windows, shared aperture optics, and mirror coatings to minimize system losses. In FY11, will begin fabrication and assembly of advanced beam control components that can be integrated into the HEL TD beam control system, such as AO, to increase the effective range of the system.	4.844	4.991	2.620	0.000	2.620

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
FY 2009 Accomplishments: FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #4 High Efficiency Laser Development: 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. In FY09, initiated design of components, such as diode arrays, high throughput optical elements, and fiber optic/ceramic slab gain media, for developing high efficiency (greater than 30% wall-plug efficiency) SSLs. In FY10, in cooperation with the HEL JTO and other Services, continue 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 begin to explore thermal management technologies. In FY11, in continued partnership with the HEL JTO and other Services,: 1) will begin assembly and integration of two 25 kW high efficiency breadboards using alternative technical approaches; 2) will begin the design of a 100 kW class high efficiency device based on the most promising approach; 3) will initiate the development of multiple eye-safe laboratory demonstrations with greater than 30% efficiency; and 4) will continue to develop thermal management technologies specific to high efficiency lasers that minimize thermal distortions, alignment errors, and beam quality degradation.	0.969	6.558	9.720	0.000	9.720

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
FY 2009 Accomplishments: FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #5 HEL Research and Development Laboratory: This effort focuses on developing in-house expertise through SSL assessments. In FY10, in cooperation with the AMRDEC, conduct low-to-medium power studies on a 600-meter test range to investigate SSL atmospheric propagation and target interaction phenomenology. Initiate data analysis and model development to support atmospheric correction algorithm development and to provide validated inputs for wargaming modeling and simulation efforts. In FY11, will investigate new deformable mirror designs to identify those with lower cost and sufficient performance; will investigate causes of poor beam quality in SSLs to determine where investments can advance the technology for Army applications. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010	0.000	0.489	0.975	0.000	0.975

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Base FY 2011 Plans: FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #6 Small Business Innovative Research/Small Business Technology Transfer Programs *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO	0.000	0.481	0.000	0.000	0.000
Accomplishments/Planned Programs Subtotals	19.050	19.576	18.190	0.000	18.190

C. Other Program Funding Summary ($ in Millions)

N/A

D. Acquisition Strategy

N/A

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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.

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COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	Base FY 2011 Estimate	OCO FY 2011 Estimate	Total FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
NA5: *Advanced Weapons Components (CA)*	3.588	2.388	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

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

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Program #1	1.595	0.000	0.000	0.000	0.000
Army Missile and Space Technology Initiative: In FY09, completed an architecture study for an Intelligence, Surveillance, and Reconnaissance (ISR) test-bed aboard an airship and development of an associated payload utilizing previously developed sensors. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #2	1.993	0.000	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Remote Video Weapon Sight, USSOCOM Phase III: In FY09, developed a weapon sight that provides video images to remote locations. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO					
Program #3 Integrated Family of Test Equipment V6 Product Improvement Program: This is a Congressional Interest Item. *FY 2009 Accomplishments:* FY 2009 *FY 2010 Plans:* FY 2010 *Base FY 2011 Plans:* FY 2011 Base *OCO FY 2011 Plans:* FY 2011 OCO	0.000	2.388	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	Base FY 2011	OCO FY 2011	Total FY 2011
Accomplishments/Planned Programs Subtotals	3.588	2.388	0.000	0.000	0.000

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.