ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

February 2006

BUDGET ACTIVITY	PE NUMBER AND TITLE
2 - Applied Research	**0602307A - ADVANCED WEAPONS TECHNOLOGY**

COST (In Thousands)		FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
Total Program Element (PE) Cost		27121	36233	19430	19492	19826	20638	20362
042	HIGH ENERGY LASER TECHNOLOGY	15141	20363	19430	19492	19826	20638	20362
NA3	MICROELECTRO MECHANICAL SYSTEMS	2637	0	0	0	0	0	0
NA5	Advanced Weapons Components (CA)	9343	15870	0	0	0	0	0

A. Mission Description and Budget Item Justification: This applied research Program Element (PE) investigates advanced technologies for Future Force High Energy Laser (HEL) weapons technology, and, where feasible, exploits opportunities to enhance Current Force capabilities. This PE also initiated the investigation of new technology concepts in space applications. The major effort under this PE is the development of a multi-hundred kilowatt (kW) Solid State Laser (SSL) laboratory demonstration that can be integrated into a HEL weapon to provide increased ground platform-based lethality. HEL systems have the potential to address the following identified Army capability gaps: 1) Defeat In-Flight Projectiles such as rockets, artillery, mortars, anti-tank guided missiles, rocket propelled grenades, and man-portable surface-to-air missiles; 2) Ultra-Precision Strike with little to no collateral damage; 3) Disruption of Electro-Optical (EO) and Infra-Red (IR) sensors; and 4) Neutralizing mines and other ordnance (especially improvised explosive devices (IEDs)) from a stand-off distance. HELs are expected to complement conventional offensive and defensive weapons at a lower cost-per-shot than current systems. At weapon system power levels of greater than 100kW, SSL technology has the potential to enhance Future Combat Systems (FCS) survivability by addressing the capability gaps identified above. This SSL technology effort addresses technical issues such as high average power output from compact and more efficient lasers; precision optical pointing and tracking; laser effects degradation due to atmospheric effects; lethality against a variety of targets; and effectiveness against low-cost laser countermeasures. The multi-hundred kilowatt laser and additional HEL technology components will be refined and upgraded to transition into an integrated SSL weapons system that will be developed in PE 0603004A/L96. Projects NA3 and NA5 funds Congressional special interest items. Work in this PE is related to, and fully coordinated with, efforts in PE 0602890F and PE 0603924F (High Energy Laser Joint Technology Office), PE 0605605A (DOD High Energy Laser Systems Test Facility) and starting in FY06 to PE 0603004/L96 (Weapons and Munitions Advanced Technology). The cited work is consistent with Strategic Planning Guidance, the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and the Defense Technology Area Plan (DTAP). Work is performed by the US Army Space and Missile Defense Command (SMDC), in Huntsville, AL and the High Energy Laser Systems Test Facility, White Sands Missile Range, NM.

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B. Program Change Summary	FY 2005	FY 2006	FY 2007
Previous President's Budget (FY 2006)	24495	21139	21989
Current BES/President's Budget (FY 2007)	27121	36233	19430
Total Adjustments	2626	15094	-2559
Congressional Program Reductions		-636	
Congressional Rescissions		-370	
Congressional Increases		16100	
Reprogrammings	2626		
SBIR/STTR Transfer			
Adjustments to Budget Years			-2559

FY 05 increase of +$2.6 million (after adjustment for Congressional Undistributed Reductions) is attributed to reprogramming of Congressional Add for Microelectromechanical Systems from PE 0602303A for proper execution.
FY 07 decrease of -2.6 million due to realignment of funding to higher priority requirements.
Three FY06 Congressional adds totaling $16100 were added to this PE.

FY06 Congressional adds with no R-2A (appropriated amount is shown):
($12600) Army Missile and Space Technology Initiative
($1000) Single Crystal Chemical Vapor Deposition (CVD)Diamond Lens Elements for High-energy Lasers
($2500) Solid-State High-Output Diode Arrays

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2a Exhibit)

February 2006

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
2 - Applied Research	**0602307A - ADVANCED WEAPONS TECHNOLOGY**	**042**

COST (In Thousands)	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate
042 HIGH ENERGY LASER TECHNOLOGY	15141	20363	19430	19492	19826	20638	20362

A. Mission Description and Budget Item Justification: This applied research project investigates advanced technologies for Future Force High Energy Laser (HEL) weapons technology, and, where feasible, exploits opportunities to enhance Current Force capabilities. This project also initiated the investigation of new technology concepts in space applications. The major effort under this project is the development of a multi-hundred kilowatt (kW) Solid State Laser (SSL) laboratory demonstration that can be integrated into a HEL weapon to provide increased ground platform-based lethality. HEL systems have the potential to address the following identified Army capability gaps: 1) Defeat In-Flight Projectiles such as rockets, artillery, mortars, anti-tank guided missiles, rocket propelled grenades, and man-portable surface-to-air missiles; 2) Ultra-Precision Strike with little to no collateral damage; 3) Disruption of Electro-Optical (EO) and Infra-Red (IR) sensors; and 4) Neutralizing mines and other ordnance (especially improvised explosive devices (IEDs)) from a stand-off distance. HELs are expected to complement conventional offensive and defensive weapons at a lower cost-per-shot than current systems. At weapon system power levels of greater than 100kW, SSL technology has the potential to enhance Future Combat Systems (FCS) survivability by addressing the capability gaps identified above. This SSL technology effort addresses technical issues such as high average power output from compact and more efficient lasers; precision optical pointing and tracking; laser effects degradation due to atmospheric effects; lethality against a variety of targets; and effectiveness against low-cost laser countermeasures. The multi-hundred kilowatt laser and additional HEL technology components will be refined and upgraded to transition into an integrated SSL weapons system that will be developed in PE 0603004A/L96. Work in this project is related to, and fully coordinated with, efforts in PE 0602890F and PE 0603924F (High Energy Laser Joint Technology Office), PE 0605605A (DOD High Energy Laser Systems Test Facility), and starting in FY06 to PE 0603004/L96 (Weapons and Munitions Advanced Technology). The cited work is consistent with Strategic Planning Guidance, the Army Science and Technology Master Plan (ASTMP), the Army Modernization Plan, and the Defense Technology Area Plan (DTAP). Work is performed by the US Army Space and Missile Defense Command (SMDC), in Huntsville, AL and the High Energy Laser Systems Test Facility, White Sands Missile Range, NM.

Accomplishments/Planned Program	FY 2005	FY 2006	FY 2007
Solid State Laser (SSL) Development, Phase 1 and 2 - 25kW: In FY05, assembled a multi-module, diode-pumped Solid State Heat Capacity Laser (SSHCL) breadboard using 10-cm on-edge laser slabs and demonstrated up to 46kW of laser power for approximately 1 sec. Integrated intra-cavity active resonator and conducted laboratory characterization of the SSHCL breadboard. Demonstrated beam quality of less than 2 times diffraction limit. Demonstrated the major aspects of power scaling and beam combining/quality/efficiency. Integrated the sliding laser disk thermal management concept into the SSHCL breadboard design to improve run-time performance. Analyzed results of competitive 25 kW Joint High Power Solid State Laser (JHPSSL) Program laboratory demonstrations and independent Government testing and down-selected best SSL design.	12241	0	0
SSL Subcomponent Development: - Laser crystal development - In FY05, conducted ceramic laser crystals assessment. Procured and tested optical and thermal properties of high quality ceramic slabs as an alternative laser crystal material. Thermal management - Developed and tested advanced resonator concepts to improve beam quality.	1100	0	0
Solid State Laser Effects: - Laser Lethality and Propagation Assessments - In FY05, expanded lethality assessment to include representative threat system components. In FY06, initiate laser propagation and lethality studies in different environments at tactical ranges both at HELSTF and other test facilities using SSLs. In FY07, will conduct lethality assessments on an expanded target set representative of identified capability gaps.- Laser Modeling and Simulation - In FY05, enhanced on-going High Energy Laser Joint	1800	1500	1500

Technology Office efforts in establishing a DoD-wide validated M&S capability for effectively modeling SSL technology. In FY06, initiate the development and validation of performance and propagation models for Solid State Lasers in a tactical environment. In FY07, will begin integration of validated models into approved Army war-gaming models.			
Solid State Laser (SSL) Development, Phase 3 - 100kW: The goal of this JHPSSL Phase 3 Project is to develop and demonstrate alternative 100-kW-class, near-diffraction-limited diode-pumped solid-state lasers that have architectures that are favorable in terms of size, weight, efficiency, affordability, reliability, maintainability, supportability, environmental acceptability (air, land, and maritime), and ruggedness for tactical weapon applications. In FY06, initiate development of 100kW Solid State Laser. Procure long lead items and begin integration of components into subsystems that form the basis of a 100kW laboratory laser device that meets the JHPSSL Program Phase 3 performance goals for power, beam quality, run time, and efficiency. In FY07, will fabricate remaining components; integrate subsystems into a laser breadboard and conduct preliminary performance tests. Begin integration of complete 100kW solid state laser.	0	17313	17930
Space Application Concepts: In FY06, complete Joint Warfighting Space/Tactical Satellite (JWS/TacSat) cooperative Hyperspectral Imagery (HSI) payload development with Air Force Research Laboratory for JWS demonstration to validate Army Space Intelligence and reconnaissance tactical needs. This activity will be transferred to PE 0602120A beginning in FY07.	0	1550	0
Total	15141	20363	19430