ARMY RDT&E BUDGET ITEM JUSTIFICATION (R2 Exhibit)

February 2004

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

COST (In Thousands)		FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
Total Program Element (PE) Cost		19785	14706	16641	19589	19962	20386	20790
042	HIGH ENERGY LASER TECHNOLOGY	11926	13737	16641	19589	19962	20386	20790
NA3	MICROELECTRO MECHANICAL SYSTEMS	4048	0	0	0	0	0	0
NA5	ADVANCED WEAPONS COMPONENTS (CA)	3811	969	0	0	0	0	0

A. Mission Description and Budget Item Justification: This program matures technologies for the Army Transformation as related to High Energy Laser (HEL) weapon systems. Specific program focus is maturing Solid State Laser (SSL) technology for platform-based lethality. Potential HEL weapon system missions in the areas of Information Dominance and Force Protection include countering airborne electro-optical sensors and defending against airborne threats, providing a new, low cost per shot, complement to conventional offensive and defensive weapons. At weapon system power levels, SSL technology has the potential to enhance Future Combat Systems (FCS) survivability by defeating Precision Guided Munitions such as Anti-Tank Guided Missiles (ATGMs). This program will address technical issues such as high average power output from compact and more efficient lasers; precision optical pointing and tracking; laser influence degradation due to atmospheric effects; lethality; and effectiveness against low-cost laser countermeasures. A key project within this program is the development of a multi-hundred kilowatt (kW) solid-state laser (SSL) laboratory demonstrator. This project will demonstrate a 15-25 kW diode-pumped solid-state laser (SSL) breadboard in FY04. By FY05, the Army will evaluate this concept against alternative SSL technology approaches being supported by the High Energy Laser (HEL) Joint Technology Office (JTO) High-Power Solid-State Laser program. The most promising technology will then be upgraded to a 100kW SSL laboratory device, scheduled for completion in FY07. The project will continue to mature the selected SSL technology into a multi-hundred kW laboratory device. The program element contains no duplication with any effort within the Military Departments. Work in this program element is related to, and fully coordinated with, efforts in PE 0602890 D8Z and PE 0603924D8Z (High Energy Laser Joint Technology Office), PE 0605605A (DOD High Energy Laser Systems Test Facility), PE 0603305A/TR3 (Army Missile Defense Systems Integration/Mobile Tactical High Energy Laser), 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 Army Test and Engineering Center, White Sands Missile Range, NM.

B. Program Change Summary	FY 2003	FY 2004	FY 2005
Previous President's Budget (FY 2004)	19976	14189	17560
Current Budget (FY 2005 PB)	19785	14706	16641
Total Adjustments	-191	517	-919
Congressional program reductions		-129	
Congressional rescissions			
Congressional increases		1000	
Reprogrammings	-191	-354	
SBIR/STTR Transfer			
Adjustments to Budget Years			-919

FY04 Congressional Add with no R-2A:

($940) Rapid Target Acquisition & Tracking System, Project NA5: The purpose of this one year Congressional add is to mature a brassboard with the elements of a rapid, passive infrared (IR) acquisition and tracking system for use in detection of fast, low signature threats such as Anti-Tank Guided Missiles (ATGM). No additional funding is required to complete this project.

ARMY RDT&E BUDGET ITEM JUSTIFICATION (R-2A Exhibit)

February 2004

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

COST (In Thousands)		FY 2003 Actual	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate
042	HIGH ENERGY LASER TECHNOLOGY	11926	13737	16641	19589	19962	20386	20790

A. Mission Description and Budget Item Justification: This project matures technologies for Army Transformation relating to solid-state High Energy Laser (HEL) weapon systems. Specific program focus is maturing Solid State Laser (SSL) technology for platform-based lethality. Potential HEL weapon system missions include defense against airborne threats and countering electro-optical sensors. At weapon system power levels, Solid-State Laser (SSL) technology has the potential to enhance Future Combat Systems (FCS) survivability by defeating Precision Guided Munitions such as ATGM's. To achieve the program goal of rapidly developing weapon level power, the Army has concentrated on developing the Solid State Heat Capacity Laser (SSHCL) technology. The Army effort will develop and demonstrate a 15-25 kilowatt (kW) diode-pumped SSHCL breadboard in FY04. By FY05, the Army will evaluate the SSHCL technology against alternative SSL technology approaches being supported by the High Energy Laser (HEL) Joint Technology Office (JTO) High-Power SSL Program. The most promising SSL technology will then be upgraded to a 100kW laboratory device, scheduled for completion in FY07. This project would continue to mature the selected SSL technology into a multi-hundred kW laboratory SSL device. The 100kW 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 0602890 D8Z and PE 0603924D8Z (High Energy Laser Joint Technology Office), PE 0605605A (DOD High Energy Laser Systems Test Facility), PE 0603305A/TR3 (Army Missile Defense Systems Integration/Mobile Tactical High Energy Laser), 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 Army Test and Engineering Center, White Sands Missile Range, NM.

Accomplishments/Planned Program	FY 2003	FY 2004	FY 2005
Solid State Laser (SSL) Development: In FY03, completed integration of the diode-pumped SSHCL breadboard and demonstrated 16.6 kW of laser power. Modified intra-cavity active resonator and initiated tests within diode-pumped test bed. In FY04, integrate thermal management system into the SSHCL concept and complete laboratory characterization of the laser device to include thermal cycling time, power management requirements, and beam quality. This breadboard device will demonstrate the major aspects of power scaling and beam combining/quality/efficiency that support the engineering analysis used in the technology selection process.	8704	8712	0
SSL Subcomponent Development: - Laser crystal development - In FY03, demonstrated ability to grow high-quality, large diameter (>10cm) laser crystals. In FY04, reliably produce laser crystals, maintaining state-of-the-art crystal dislocation density while increasing crystal diameter by 50 percent. - Thermal management - In FY03, maintained a uniform temperature (< 1degC) across a large bulk media crystal. Improve alternative mist-cooling thermal management system to enable a reduction in cool down time by a factor of five. In FY04, integrate scaled versions of thermal management system into SSHCL breadboards. Design and validate novel rotating disk approach (or Gain Media Exchange) for SSHCL thermal management. - - Laser Diode Development - Developed an industrial effort for area scaling (monolithic array) of laser diode/cooler package. This technology enables the processing of multiple diode bars per cooler and reduces manpower requirements for assembly.	1793	4616	0
High Power SSL Development - In FY05, will analyze results of competitive 25 kW SSL laboratory demonstrations; down select best design, and initiate development of 100kW SSL. Will begin procurement of several long-lead items, such as power supplies, crystal media, diode arrays and thermal management technologies. Will develop brassboard components for 100kW laser prototype and begin integration. Will conduct laboratory testing of breadboard design with the goal to achieve at least 50 kW average laser output power with a beam quality goal of 2 times the diffraction limit and will demonstrate propagation effectiveness through at least 500 m of atmosphere.	0	0	16641
- Laser Diode Production - This one year Congressional add built additonal diode arays to enhance diode-pumped SSHCL breadboard. No additional funding is required to complete this project.	1429	0	0
Small Business Innovative Research/Small Business Technology Transfer Programs	0	409	0
Totals	11926	13737	16641