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

February 2002

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

	COST (In Thousands)	FY 2001 Actual	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate
	Total Program Element (PE) Cost	6435	26883	11208	11312	17864	21045	21481
042	HIGH ENERGY LASER TECHNOLOGY	474	16391	11208	11312	17864	21045	21481
04G	MINIATURE DETECTION DEVICES & ANALYSIS METHODS	2884	992	0	0	0	0	0
04H	ZEUS LASER ORDNANCE NEUTRALIZATION	3077	0	0	0	0	0	0
NA3	MICROELECTRO MECHANICAL SYSTEMS	0	8100	0	0	0	0	0
NA5	RAPID TARGET ACQUISITION & TRACKING SYSTEM	0	1400	0	0	0	0	0

A. Mission Description and Budget Item Justification: Recent advances in solid state laser and other High Energy Laser (HEL) weapons technologies may set the stage for the development of an Army tactical laser weapons capability for the Objective Force. Potential HEL mission areas include counterair munitions defense and airborne electro-optical sensor countermeasures. Technical issues such as lethality; laser fluence degradation due to atmospheric effects; precision optical pointing and tracking; and effectiveness against low-cost laser countermeasures, must be resolved before any weapon system development can commence. To support the resolution of these technical issues, this project will leverage existing laser weapon programs such as the US/Israeli Tactical High Energy Laser Advanced Concept Technology Demonstration, the USAF Airborne Laser Program, and the Department of Energy National Ignition Facility. In addition, this project will develop preliminary system designs to highlight potential sub-system/component issues attributable to technology integration. Current funding will develop a diode-pumped 15 kilowatt (kW) solid-state laser breadboard by FY04. Successful progress in this 15kW effort would initiate the development of a 100kW demonstrator scheduled for completion in FY07. The work in this program element is consistent with the Army Directed Energy Master Plan and the Army Modernization Plan. Work in this program element is related to, and fully coordinated with, efforts in PE 605605A (DOD High Energy Laser Systems Test Facility), PE 0603308A (Army Missile Defense Systems Integration) through FY02, and starting in FY03 PE 0603305A (Army Missile Defense Systems Integration - Non-Space)in accordance with the ongoing Reliance joint planning process and contains no unwarranted duplication of effort among the Military Departments. Work for this project 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. The major contractors for this effort are Raytheon, El Segundo, CA., and Logitech, Inc., Las Cruces, NM. This PE supports the Objective Force transition path of the Transformation Campaign Plan (TCP).

B. Program Change Summary	FY 2001	FY 2002	FY 2003
Previous President's Budget (FY2002 PB)	6632	19043	11234
Appropriated Value	6693	27043	0
Adjustments to Appropriated Value	0	0	0
a. Congressional General Reductions	0	-160	0
b. SBIR / STTR	-197	0	0
c. Omnibus or Other Above Threshold Reductions	0	0	0
d. Below Threshold Reprogramming	0	0	0
e. Rescissions	-61	0	0
Adjustments to Budget Years Since FY2002 PB	0	0	-26
Current Budget Submit (FY 2003 PB)	6435	26883	11208

Change Summary Explanation:

Significant Changes:
FY02 - Congressional adds totaling $14000, as noted below, and a decrement for program growth totalling $6000 for a total change to the PE of $7840 (including other minor adjustments).

FY02 Adds:
Congressional adds were made for Microelectro Mechanical Systems, Project NA3 ($8100); Miniature Detection Devices and Analysis Methods, Project 04G ($1000); and Rapid Target Acquisition & Tracking System, Project NA5 ($1400), HELSTF Solid State Heat Capacity Laser (+3500), Project 042.

Projects with no R2A:
- ($8100) Microelectro Mechanical Systems, Project NA3: The objective of this one year Congressional add is to continue development of a chemical/physical analysis instrument suitable for harsh environments. No additional funding is required to complete this project.
- ($1000) Miniature Detection Devices and Analysis Methods, Project 04G: The objective of this one year Congressional add is to continue development of signal processing electronics for Mercuric Iodide detector (uncooled) and begin the development of electro-luminescent Xenon gamma radiation

detectors - both for nuclear weapons and potential CB detection. No additional funding is required to complete this project.
- ($1400) Rapid Target Acquisition & Tracking System, Project NA5: The objective of this one year Congressional add is to design/develop a brassboard with the critical 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 2002

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

COST (In Thousands)		FY 2001 Actual	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate
042	HIGH ENERGY LASER TECHNOLOGY	474	16391	11208	11312	17864	21045	21481

A. Mission Description and Budget Item Justification: Recent advances in solid state laser and other High Energy Laser (HEL) weapons technologies may set the stage for the development of an Army tactical laser weapons capability for the Objective Force. Potential HEL mission areas include counterair munitions defense and airborne electro-optical sensor countermeasures. Technical issues such as lethality; laser fluence degradation due to atmospheric effects; precision optical pointing and tracking; and effectiveness against low-cost laser countermeasures, must be resolved before any weapon system development can commence. To support the resolution of these technical issues, this project will leverage existing laser weapon programs such as the US/Israeli Tactical High Energy Laser Advanced Concept Technology Demonstration, the USAF Airborne Laser Program, and the Department of Energy National Ignition Facility. In addition, this project will develop preliminary system designs to highlight potential sub-system/component issues attributable to technology integration. Current funding will develop a diode-pumped 15 kilowatt (kW) solid-state laser breadboard by FY04. Successful progress in this 15kW effort would initiate the development of a 100kW demonstrator scheduled for completion in FY07. The work in this program element is consistent with the Army Directed Energy Master Plan and the Army Modernization Plan. Work in this program element is related to, and fully coordinated with, efforts in PE 605605A (DOD High Energy Laser Systems Test Facility) and PE 0603308A (Army Missile Defense Systems Integration) through FY02, and starting in FY03 PE 0603305A (Army Missile Defense Systems Integration - Non-Space) in accordance with the ongoing Reliance joint planning process and contains no unwarranted duplication of effort among the Military Departments. Work for this project 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. The major contractors for this effort are Raytheon, El Segundo, CA., and Logitech, Inc., Las Cruces, NM. This PE supports the Objective Force transition path of the Transformation Campaign Plan (TCP).

FY 2001 Accomplishments:

- 474 Completed assessment of existing precision optical pointing and tracking system along with modifications to demonstrate propagation effectiveness of high power, pulsed, solid state lasers. Designed and manufactured improved diode cooler packages which allow for 10 diode bars/cooler packages. Demonstrated a limited quantities of these diode coolers for test and evaluations. Acquired laser diode bars for integration onto diode cooler packages.

Total 474

FY 2002 Planned Program

- 16391 Begin multi-year development of diode-pumped 15kW solid-state laser breadboard. This breadboard will represent the basic building block for higher power solid state lasers and demonstrate basic technology readiness. Major efforts will include:

  - Laser Diode Development: Produce diode/cooler packages to populate a full-size three-disk laser module using rack & stack technology. Reduce the production cost of laser diode/cooler integrated packages to $5/W. Demonstrate integration of prime power at the 1kW/kg level.

  - Thermal Management: Demonstrate ability to maintain disk temperature to a delta of < 1 degree C across a single subscale disk. Also will demonstrate (off-line) a 3-minute cooldown system with mist cooling and a 5W/kg cooling capability.

  - Beam Control: Develop a testbed to assess and define atmospheric compensation requirements with closed-loop feedback. Based on detailed wave optic codes, the beam diameter to atmospheric coherence length ratio (D/ro) estimate for propagation is 5. Using this ratio as a basis, demonstrate tilt-only atmospheric correction improvement in the Strehl ratio from 0.18 (non-corrected) to 0.28, and a tilt and focus correction improvement of 0.32.

  - Design Analysis: Determine system parameters required for an effective tactically mobile HEL weapon. Assess atmospheric propagation, system lethality, size constraints and technology maturity for various HEL technology approaches.

  - Engineering Design: Perform first-order-detailed design of a tactically mobile HEL Air Defense Weapon System to include the engineering design and analysis complete with simulation-based feasibility assessments of systems performance as a function of threat. Assess atmospheric effects and compensation, where applicable; system lethality; size constraints; life cycle costs; total system cost-per-kill; logistical burden; and technology maturity. Identify barriers to building a tactically mobile HEL system for airborne and ground deployments.

Total 16391

FY 2003 Planned Program

- 11208 Complete 15kW solid-state laser breadboard development. Major efforts will include:

  - Laser Diode Development: Produce diode/cooler packages to populate a full-size three-disk laser module using a monolithic array process. Reduce the production cost of laser diode/cooler integrated packages to $2/W.

  - Thermal Management: Demonstrate ability to maintain disk temperature to a delta of < 1 degree C across a single full-scale disk. Will also demonstrate (off-line) a 20-second cooldown system with mist cooling and a 20W/kg cooling capability.

FY 2003 Planned Program (Continued)

- Beam Control: Assess and define atmospheric compensation requirements with closed-loop feedback. Demonstrate atmospheric correction improvement in the Strehl ratio from 0.32 (tilt and focus correction) to 0.45 (tilt, focus and astigmatism). Add correction for coma to improve Strehl ratio up to 0.5.

Total 11208