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

DATE: February 2003

BUDGET ACTIVITY: 02 - Applied Research

PE NUMBER AND TITLE: 0602890F High Energy Laser Research

PROJECT: 5096

COST ($ in Thousands)		FY 2002 Actual	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	Cost to Complete	Total Cost
5096	High Energy Laser Research	0	0	41,854	45,452	48,448	51,805	52,167	52,971	0	0
	Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0	0

Note: In FY 2004, this program was transferred to the Air Force by the Office of the Secretary of Defense. The Air Force plans to continue the tri-Service operation of the program under the High Energy Laser (HEL) Joint Technology Office (JTO).

(U) A. Mission Description

This program funds DOD HEL applied research aimed at translating fundamental scientific knowledge into proof-of-concept solutions relevant to HEL systems. HEL weapon systems have many potential advantages, including speed-of-light velocity, high precision, nearly unlimited magazine depth, low-cost per kill, and reduced logistics requirements since there is no need for stocks of munitions or warheads. As a result, HELs have the potential to perform a wide variety of military missions, including some that are impossible, or nearly so, for conventional weapons. These include interception of ballistic missiles in boost phase; defeat of high-speed, maneuvering anti-ship and anti-aircraft missiles; and the ultra-precision negation of targets in urban environments with no collateral damage. This program is part of an overall DOD initiative in HEL science and technology being conducted by the HEL JTO. In general, efforts funded under this program are chosen for their potential to have major impact on multiple HEL systems and on multiple Service missions. As a result of this focus and of close coordination with the Military Departments and Defense Agencies, this program complements other DOD HEL programs that are directed at more specific Service needs. A broad range of technology is addressed in key areas such as chemical lasers, solid state lasers, beam control, optics, propagation, and free electron lasers.

(U) FY 2002 ($ in Thousands)

(U) $0 This activity was performed under PE 0602890D8Z, High Energy Laser Research. Funding was $35.2 million.

(U) $0 Total

(U) FY 2003 ($ in Thousands)

(U) $0 This activity is performed under PE 0602890D8Z, High Energy Laser Research. Current funding is $45.9 million.

(U) $0 Total

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(U) A. Mission Description Continued

(U) FY 2004 ($ in Thousands)

(U)	$0	Accomplishments/Planned Program
(U)	$17,000	Explore solid state lasers that have potential in future high energy laser (HEL) weapons because they require only electrical energy in order to run, thereby greatly simplifying systems engineering and supportability. A major focus for the HEL Joint Technology Office (JTO) will be the Joint High Power Solid State Laser (HPSSL) project. The objective of the Joint HPSSL project is to accelerate the demonstration of solid state lasers at initial weapon grade power levels. The power scaling will be 25 kilowatts in two years leading to a 100 kilowatt design.
(U)	$8,107	Develop beam-control technologies that are directly applicable to surface, air, and space mission areas. Results of these activities will be transitioned to near-term HEL systems and will also serve to enhance the HEL-related technology base and industrial capability. Beam control component technology will be developed to improve HEL system performance and to help protect and enhance the fragile manufacturing base in this critical area. Tactical beam control technology development efforts will seek to provide critical technology options for use in tactical scenarios on tactical platforms such as aircraft, ground vehicles, and maritime platforms, thus enabling the advantages of HELs to be applied in a wide variety of military operations.
(U)	$2,500	Develop chemical laser technologies concentrating on developing improved predictive and design capabilities and laser concepts that provide higher performance and better supportability. Despite the fact that chemical lasers are the most mature of the HEL laser device technologies, further technology development has the potential to greatly enhance their viability as weapon systems. Results of these activities will result in chemical lasers that are lighter and more affordable. Chemical laser research will include efforts to develop and demonstrate closed-cycle chemical lasers, especially chemical oxygen iodine laser-derived devices, appropriate for space-based and tactical applications. The anticipated payoffs are tactically-suited chemical lasers of high power that are supportable on the battlefield.
(U)	$3,300	Conduct mission and system analysis studies to examine potential military missions for which HELs present unique solutions because of their inherent characteristics (i.e., speed-of-light, possibility of graduated effects, precise target selectability, nearly unlimited magazine size, reduced logistics requirements, etc.) as compared to today's conventional weapons. Use the studies to focus the investment strategy for technology development.
(U)	$2,167	Development atmospheric characterization technologies and techniques aimed at making precise absorption measurements in interesting atmospheric windows, measuring and assimilating information on turbulence at locations relevant to tactical HEL systems, and developing and testing real-time characterization tools to assist the HEL operator. Characterization for tactical scenarios will concentrate on understanding atmospheric limitations in low-altitude tactical scenarios. The payoff will be increased lethal range in these optically stressing scenarios.
(U)	$3,780	Develop lethality technologies that concentrate on developing a strong scientifically-based understanding of laser kill mechanisms so that HEL systems can be optimized to produce the maximum kill probability for the minimum system size and cost. Develop a firm, physics-based understanding of the mechanisms involved in the interaction between HEL beams and the targets they strike. The expected payoffs from these

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(U) A. Mission Description Continued

(U) FY 2004 ($ in Thousands) Continued

efforts are databases accepted by the high energy laser (HEL) community and validated models that are available to systems designers.

(U) $3,700 Develop free electron laser (FEL) technologies to make the FELs more lethal, smaller, and lighter. Focus on technologies to scale to high power and technologies to permit FELs to be fielded on military platforms. The expected payoff is the demonstration of critical FEL technology.

(U) $300 Develop advanced optics technologies that focus on large, lightweight deployable optics to reduce system weight while increasing laser intensity on target for space-based and other HEL systems. Advanced optics technology development will extend the state-of-the-art in lighter weight, nonconventional approaches to adaptive optics systems. The potential payoffs are large reductions in overall HEL system weight and significant improvement in the ability to correct for stressing atmospheric aberrations, particularly for space-related applications.

(U) $1,000 Develop a fully realistic model of end-to-end HEL system performance, from birth of photons in the laser to their death at the target, thereby improving the design of HEL systems and reducing the need for expensive field testing. Continue development of a fully realistic model of end-to-end system performance, from birth of photons in the laser to their death at the target, thereby improving the design of HEL systems and reducing the need for expensive field testing.

(U) $41,854 Total

(U) B. Budget Activity Justification

This program is in Budget Activity 2, Applied Research, since it develops and determines the technical feasibility and military utility of evolutionary and revolutionary technologies.

(U) C. Program Change Summary ($ in Thousands)

		FY 2002	FY 2003	FY 2004	Total Cost
(U)	Previous President's Budget	0	0	0	
(U)	Appropriated Value				
(U)	Adjustments to Appropriated Value				
	a. Congressional/General Reductions				
	b. Small Business Innovative Research				
	c. Omnibus or Other Above Threshold Reprogram				
	d. Below Threshold Reprogram				
	e. Rescissions				
(U)	Adjustments to Budget Years Since FY 2003 PBR			41,854	
(U)	Current Budget Submit/FY 2004 PBR			41,854	

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(U) C. Program Change Summary ($ in Thousands) Continued

(U) Significant Program Changes:
In FY 2004, this program was transferred to the Air Force by the Office of the Secretary of Defense. The Air Force plans to continue the tri-Service operation of the program under the High Energy Laser (HEL) Joint Technology Office (JTO).

(U) D. Other Program Funding Summary ($ in Thousands)

(U) PE 0602500F, Multi-Disciplinary Space Technology.
(U) PE 0601108F, High Energy Laser Research Initiatives.
(U) PE 0603444F, Maui Space Surveillance System.
(U) PE 0603500F, Multi-Disciplinary Advanced Development Space Technology.
(U) PE 0603605F, Advanced Weapons Technology.
(U) PE 0603924F, High Energy Laser Advanced Technology Program.
(U) PE 0603883C, Ballistic Missile Defense Boost Phase Segment.
(U) PE 0602605F, Directed Energy Technology.
(U) PE 0602307A, Advanced Weapons Technology.
(U) PE 0602114N, Power Projection Applied Research.
(U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) E. Acquisition Strategy

Not Applicable.

(U) F. Schedule Profile

(U) Not Applicable.