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

DATE: February 2003

BUDGET ACTIVITY: 01 - Basic Research

PE NUMBER AND TITLE: 0601108F High Energy Laser Research Initiatives

PROJECT: 5097

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
5097	High Energy Laser Research Initiatves	0	0	12,063	12,363	12,501	12,742	12,878	13,076	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 basic research aimed at developing fundamental scientific knowledge to support future DOD 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. Efforts funded under this program element are chosen for their potential to have a major impact on multiple HEL systems and on multiple Service missions. 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. Research is conducted principally by universities, but also by Government laboratories and industry. The program funds theoretical, computational, and experimental investigations.

(U) FY 2002 ($ in Thousands)

(U) $0 This activity was performed under PE 0601108D8Z, High Energy Laser Initiative. Funding was approximately $11.8 million.

(U) $0 Total

(U) FY 2003 ($ in Thousands)

(U) $0 This activity is performed under PE 0601108D8Z, High Energy Laser Initiative. Funding is approximately $12.1 million.

(U) $0 Total

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(U) A. Mission Description Continued

(U) FY 2004 ($ in Thousands)

(U)	$0	Accomplishments/Planned Program
(U)	$2,320	Conduct fundamental research in solid state lasers. Achieving the promise of simplified logistics and platform integration requires that cost, power, and efficiency barriers be breached. Research areas of interest include laser materials with large fluorescence lifetime and cross-section and the ability to operate at high temperatures, athermal laser gain media, modular and scalable architectures for laser power scaling, means of increasing efficiency in excess of 20%, operation in harsh environments, and corrections for thermally induced distortions in gain media. Pursuant to the nature of the university-led multidisciplinary research initiative program, all of the efforts to address the above research areas begun during FY 2002 will continue to receive funding.
(U)	$1,910	Conduct fundamental research in high-power, lightweight optics. This research focuses on technology development that addresses advanced technological elements and concepts relevant to the development of lightweight optics for high energy laser (HEL) systems. Areas of interest include basic materials and fabrication techniques, large optics lightweight structure and deployment concepts, HEL optical coatings, multipurpose materials (e.g., wavefront correction combined with aperture adjustment), and control mechanisms. Pursuant to the nature of the university-led multidisciplinary research initiative program, all of the efforts to address the above research areas begun during FY 2002 will continue to receive funding.
(U)	$3,313	Conduct research focused on the scientific concerns associated with atmospheric beam control including characterization efforts in aerial, battlefield, and maritime-like environments. These efforts could lead to substantial increases in the lethality of HEL systems without the need for ever-higher power levels. Areas of interest include improved theoretical and computer-based analysis of propagation effects, advanced wavefront sensing and reconstruction (especially in the presence of thermal blooming), and the effects of extended reference sources used for wavefront correction. Pursuant to the nature of the university-led multidisciplinary research initiative program, all of the efforts to address the above research areas that were begun during FY 2002 will continue to receive funding.
(U)	$1,210	Conduct fundamental research in chemical lasers. This research focuses on improving the understanding of the processes necessary for the realization of truly closed cycle, lightweight, high-power, continuously operating chemical lasers. Areas of interest include studies of chemical processes and reactions for a closed-cycle chemical laser system, new sources of the high-energy chemical species needed to produce the lasing event, and novel recovery systems for regeneration of the laser fuels. Pursuant to the nature of the university-led multidisciplinary research initiative program, all of the efforts to address the above research areas that were begun during FY 2002 will continue to receive funding.
(U)	$1,810	Conduct fundamental research in high-average-power ultra-short-pulse free electron lasers (FELs). This research will significantly advance the average power obtainable by ultra-short-pulse FELs, while decreasing relative size and cost. Areas of interest include high-current devices and control methods, higher damage threshold resonator optics, advanced optical cavity designs for high power and compact spaces, and design methods for scaling FELs to reach multi-megawatt class average power levels. Pursuant to the nature of the university-led multidisciplinary

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(U) A. Mission Description Continued

(U) FY 2004 ($ in Thousands) Continued

research initiative program, all of the efforts to address the above research areas that were begun during FY 2002 will continue to receive funding.

(U) $1,500 Conduct fundamental research in modeling and simulation for high energy lasers (HELs). The initial focus achieves a balance between ongoing high-fidelity technical analyses, engineering trade studies which allow analyses of a wide range of systems, and analyses of HEL systems' military utility in a broad range of missions. Pursuant to the nature of the university-led multidisciplinary research initiative program, all of the efforts to address the above research areas that were begun during FY 2002 will continue to receive funding.

(U) $12,063 Total

(U) B. Budget Activity Justification

This program is Budget Activity 1, Basic Research, because it funds scientific study and experimentation. Through this program, the Air Force invests in research directed toward increasing knowledge and understanding in those fields of science and engineering related to long-term national security needs.

(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			12,063	
(U) Current Budget Submit/FY 2004 PBR			12,063	

(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 HEL Joint Technology Office (JTO).

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

(U) PE 0602500F, Multi-Disciplinary Space Technology.
(U) PE 0602890F, High Energy Laser Research.
(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.