Exhibit R-2, RDT&E Budget Item Justification

DATE **February 2007**

BUDGET ACTIVITY
01 Basic Research

PE NUMBER AND TITLE
0601108F High Energy Laser Research Initiatives

Cost ($ in Millions)		FY 2006 Actual	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	Cost to Complete	Total
	Total Program Element (PE) Cost	12.072	12.356	12.636	13.735	14.079	14.299	14.581	14.883	Continuing	TBD
5097	High Energy Laser Research Initiatves	12.072	12.356	12.636	13.735	14.079	14.299	14.581	14.883	Continuing	TBD

(U) A. Mission Description and Budget Item Justification

This program funds basic research aimed at developing fundamental scientific knowledge to support future Department of Defense (DoD) High Energy Laser (HEL) systems. HEL systems have many potential advantages, including speed-of-light velocity, high precision, significant magazine depth, low-cost per kill, and reduced logistics requirements. As a result, HELs have the potential to perform a wide variety of military missions including interception of ballistic missiles in boost phase; defeat of high-speed, maneuvering anti-ship and anti-aircraft missiles; and ultra-precision negation of targets in urban environments with no collateral damage. This program is part of an overall DoD effort in HEL science and technology conducted by the HEL Joint Technology Office. In general, efforts funded under this program are chosen for their potential to have a broad impact on multiple HEL systems and Service missions, while complementing Service/Agency programs that are directed at more specific Service needs. A broad range of technologies are addressed in key areas such as chemical lasers, solid state lasers, beam control, optics, propagation, and free electron lasers. The program funds theoretical, computational, and experimental investigations. This program is in Budget Activity 1, Basic Research, because it funds scientific study and experimentation. Through this program, the DoD invests in research directed toward increasing knowledge and understanding in those fields of science and engineering related to long-term national security needs.

(U) B. Program Change Summary ($ in Millions)

		FY 2006	FY 2007	FY 2008	FY 2009
(U)	Previous President's Budget	12.414	12.403	12.524	13.583
(U)	Current PBR/President's Budget	12.072	12.356	12.636	13.735
(U)	Total Adjustments	-0.342			
(U)	Congressional Program Reductions				
	Congressional Rescissions		-0.047		
	Congressional Increases				
	Reprogrammings				
	SBIR/STTR Transfer	-0.342			
(U)	Significant Program Changes:				
	Not Applicable.				

C. Performance Metrics

Exhibit R-2, RDT&E Budget Item Justification	DATE February 2007
BUDGET ACTIVITY **01 Basic Research**	PE NUMBER AND TITLE **0601108F High Energy Laser Research Initiatives**

Under Development.

Exhibit R-2a, RDT&E Project Justification

DATE **February 2007**

BUDGET ACTIVITY
01 Basic Research

PE NUMBER AND TITLE
0601108F High Energy Laser Research Initiatives

PROJECT NUMBER AND TITLE
5097 High Energy Laser Research Initiatves

Cost ($ in Millions)		FY 2006 Actual	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	Cost to Complete	Total
5097	High Energy Laser Research Initiatves	12.072	12.356	12.636	13.735	14.079	14.299	14.581	14.883	Continuing	TBD
	Quantity of RDT&E Articles	0	0	0	0	0	0	0	0		

(U) A. Mission Description and Budget Item Justification

This program funds basic research aimed at developing fundamental scientific knowledge to support future Department of Defense (DoD) High Energy Laser (HEL) systems. HEL systems have many potential advantages, including speed-of-light velocity, high precision, significant magazine depth, low-cost per kill, and reduced logistics requirements. As a result, HELs have the potential to perform a wide variety of military missions including interception of ballistic missiles in boost phase; defeat of high-speed, maneuvering anti-ship and anti-aircraft missiles; and ultra-precision negation of targets in urban environments with no collateral damage. This program is part of an overall DoD effort in HEL science and technology conducted by the HEL Joint Technology Office. In general, efforts funded under this program are chosen for their potential to have a broad impact on multiple HEL systems and Service missions, while complementing Service/Agency programs that are directed at more specific Service needs. A broad range of technologies are addressed in key areas such as chemical lasers, solid state lasers, beam control, optics, propagation, and free electron lasers. The program funds theoretical, computational, and experimental investigations. This program is in Budget Activity 1, Basic Research, because it funds scientific study and experimentation. Through this program, the DoD invests in research directed toward increasing knowledge and understanding in those fields of science and engineering related to long-term national security needs.

(U) B. Accomplishments/Planned Program ($ in Millions)	FY 2006	FY 2007	FY 2008	FY 2009
(U) MAJOR THRUST: Improve the fundamental understanding of high-power laser sources, to include solid-state, free electron, and gas laser technologies.	7.054	7.450	7.578	8.563

(U) In FY 2006: Initiated fiber laser research focused on single aperture scaling single-mode fibers, and organization of multiple fibers. Initiated research to understand optically-pumped atomic and molecular gas lasers. Conducted research in chemical processes and chemical reactions for closed-cycle chemical lasers. Conducted free electron laser research on high-damage resonator optics, advanced optical cavity designs for high power, and scaling methodology for megawatt-class power levels. Conducted research in solid-state laser materials with large fluorescence lifetime and cross-section, and the ability to operate at high temperatures.

(U) In FY 2007: Complete research on closed-cycle chemical, free electron, and solid state laser initiatives. Conduct fiber laser research focused on single aperture scaling single-mode fibers, and organization of multiple fibers. Conduct fundamental research of optically-pumped atomic and molecular gas lasers. Conduct a multi-disciplinary research institute (MRI) call for innovative research related to gas, free electron, and solid state laser topics.

(U) In FY 2008: Conduct fiber laser research focused on single aperture scaling single-mode fibers, and

Exhibit R-2a, RDT&E Project Justification		DATE February 2007
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(U) **B. Accomplishments/Planned Program ($ in Millions)**	FY 2006	FY 2007	FY 2008	FY 2009
organization of multiple fibers. Conduct fundamental research of optically-pumped atomic and molecular gas lasers. Initiate research on awarded topics in gas, free electron, and solid state laser technologies.				
(U) In FY 2009: Conduct fiber laser research focused on single aperture scaling single-mode fibers, and organization of multiple fibers. Conduct fundamental research of optically-pumped atomic and molecular gas lasers. Conduct research on awarded topics in gas, free electron, and solid state laser technologies.				
(U)				
(U) MAJOR THRUST: Improve the fundamental understanding of beam control technologies as they relate to high power laser applications. Conduct research in atmospheric characterization and beam control component technology.	2.271	2.493	2.559	2.662
(U) In FY 2006: Improved negative thermal expansion optical coating materials to match zero expansion substrates, and measured thermal and strain responses of these coatings. Conducted research on improved theoretical and computational atmospheric propagation effects, advanced wavefront sensing, and thermal blooming effects. Discontinued lightweight optics research.				
(U) in FY 2007: Improve negative thermal expansion optical coating materials to match zero expansion substrates, and measured thermal and strain responses of these coatings. Complete research on improved theoretical and computational atmospheric propagation effects, advanced wavefront sensing, and thermal blooming effects. Conduct an MRI call for innovative research related to improved beam control technology and techniques.				
(U) In FY 2008: Complete negative thermal expansion research. Initiate research on awarded topics for improved beam control technologies and techniques.				
(U) In FY 2009: Conduct research on awarded topics for improved beam control technologies and techniques.				
(U)				
(U) MAJOR THRUST: Evaluate high-fidelity engineering models for incorporation into the HEL toolkit.	1.520	1.765	1.794	1.700
(U) In FY 2006: Began to merge the developed models into a common architecture through verification and validation techniques. Conducted mission-level HEL engagement scenarios and wargame HEL concepts.				
(U) In FY 2007: Merge the developed models into a common architecture through verification and validation techniques. Conduct mission-level HEL engagement scenarios and wargame HEL concepts.				

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	B. Accomplishments/Planned Program ($ in Millions)	FY 2006	FY 2007	FY 2008	FY 2009
(U)	In FY 2008: Merge the developed models into a common architecture through verification and validation techniques. Conduct mission-level HEL engagement scenarios and wargame HEL concepts.				
(U)	In FY 2009: Merge the developed models into a common architecture, through verification and validation techniques. Conduct mission-level HEL engagement scenarios and wargame HEL concepts.				
(U)					
(U)	MAJOR THRUST: Fund educational grants intended to simulate interest in HEL among students.	0.556	0.648	0.705	0.810
(U)	In FY 2006: Provided scholarships and internships to support to college students obtaining HEL degrees. Provided support to K-12 school programs to stimulate science and math studies, with an emphasis on lasers and optics. Funded publication of journals and continuing education for professionals in the HEL field. Initiated a Service Academy grant program to stimulate HEL studies among military cadets.				
(U)	In FY 2007: Provide scholarships and internships to support to college students obtaining HEL degrees. Provide grants to Service Academies to stimulate HEL studies among military cadets. Provide support to K-12 school programs to stimulate science and math studies, with an emphasis on lasers and optics. Fund publication of journals and continuing education for professionals in the HEL field.				
(U)	In FY 2008: Provide scholarships and internships to support to college students obtaining HEL degrees. Provide grants to Service Academies to stimulate HEL studies among military cadets. Provide support to K-12 school programs to stimulate science and math studies, with an emphasis on lasers and optics. Fund publication of journals and continuing education for professionals in the HEL field.				
(U)	In FY 2009: Provide scholarships and internships to support to college students obtaining HEL degrees. Provide grants to Service Academies to stimulate HEL studies among military cadets. Provide support to K-12 school programs to stimulate science and math studies, with an emphasis on lasers and optics. Fund publication of journals and continuing education for professionals in the HEL field.				
(U)					
(U)	CONGRESSIONAL ADD: Landscape Operational and Knowledge-based Characterization.	0.671	0.000	0.000	0.000
(U)	In FY 2006: Conducted Congressionally-directed effort for Landscape Operational and Knowledge-based Characterization.				
(U)	In FY 2007: Not Applicable.				
(U)	In FY 2008: Not Applicable.				
(U)	In FY 2009: Not Applicable.				
(U)	Total Cost	12.072	12.356	12.636	13.735

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(U) C. Other Program Funding Summary ($ in Millions)

	FY 2006 Actual	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	Cost to Complete	Total Cost
(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										

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(U) C. Other Program Funding Summary ($ in Millions)

duplication.

(U) D. Acquisition Strategy

Not Applicable.