Exhibit R-2, RDT&E Budget Item Justification: PB 2011 Air Force										DATE: February 2010	
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602605F: *DIRECTED ENERGY TECHNOLOGY*							
COST ($ in Millions)	**FY 2009 Actual**	**FY 2010 Estimate**	**FY 2011 Base Estimate**	**FY 2011 OCO Estimate**	**FY 2011 Total Estimate**	**FY 2012 Estimate**	**FY 2013 Estimate**	**FY 2014 Estimate**	**FY 2015 Estimate**	**Cost To Complete**	**Total Cost**
Total Program Element	60.233	105.231	103.596	0.000	103.596	112.629	119.405	123.200	126.394	Continuing	Continuing
624866: *Lasers & Imaging Technology*	35.680	73.826	77.821	0.000	77.821	85.420	89.125	92.029	94.793	Continuing	Continuing
624867: *Advanced Weapons & Survivability Technology*	18.682	31.405	25.775	0.000	25.775	27.209	30.280	31.171	31.601	Continuing	Continuing
6255SP: *Laser and Imaging Space Tech*	5.871	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program covers research in directed energy technologies, primarily lasers and high power microwaves. In lasers, this research includes moderate to high power laser devices (electric and chemical) and associated optical components and techniques. In imaging, this research includes long-range optical imaging for space situational awareness. In advanced weapons, this program examines technologies such as narrowband and wideband high power microwave devices and antennas. Vulnerability/lethality assessments of representative systems are done for both areas. 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.

B. Program Change Summary ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
Previous President's Budget	62.701	105.677	0.000	0.000	0.000
Current President's Budget	60.233	105.231	103.596	0.000	103.596
Total Adjustments	-2.468	-0.446	103.596	0.000	103.596
• Congressional General Reductions		0.000			
• Congressional Directed Reductions		0.000			
• Congressional Rescissions	0.000	-0.446			
• Congressional Adds		0.000			
• Congressional Directed Transfers		0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	-2.468	0.000	103.596	0.000	103.596

Exhibit R-2, RDT&E Budget Item Justification: PB 2011 Air Force	DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602605F: *DIRECTED ENERGY TECHNOLOGY*

Change Summary Explanation

The FY 2010 President's Budget submittal did not reflect FY 2011 through FY 2015 funding. A detailed explanation of changes between the two budget positions is not provided because it cannot be made in a relevant manner.

In FY 2010, funds from Project 55SP, Laser and Imaging Space Technology, are being moved to Project 4866, Lasers & Imaging Technology, to better align efforts. Also in FY 2010, significant funding for electric laser, relay mirror, and space situational awareness (SSA) efforts in PE 0603605F, Advanced Weapons Technology, have been moved into this PE to better reflect the actual technology readiness level of the efforts.

Note: In FY 2010, Congress added $0.8 million for Hybrid Nanoparticle-based Coolant Technology Development and Manufacturing that has been moved to PE 0602102F, Materials, Project 624347, for execution.

C. Performance Metrics
Under Development.

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force			DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602605F: *DIRECTED ENERGY TECHNOLOGY*	PROJECT 624866: *Lasers & Imaging Technology*	

COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	FY 2011 Base Estimate	FY 2011 OCO Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
624866: *Lasers & Imaging Technology*	35.680	73.826	77.821	0.000	77.821	85.420	89.125	92.029	94.793	Continuing	Continuing

Note

Note: In FY 2010, the efforts that had been in Project 55SP, Laser and Imaging Space Technology, have been moved to this project to allow better integration of directed energy efforts. Also in FY 2010 several electric laser, relay mirror, and space situational awareness efforts in PE 0603605F, Advanced Weapons Technology, have been moved into this project to better reflect the actual technology readiness level of the efforts.

A. Mission Description and Budget Item Justification

This project explores the technical feasibility of moderate to high power lasers, including beam control, for applications such as aircraft protection, force protection, and precision engagement. It also explores the technical feasibility of long-range optical imaging for space situational awareness. New technologies will be developed and physics based modeling will be conducted that will enable: (1) compact, reliable, and affordable laser systems with good beam quality, scalability to high power, and high potential military utility; (2) optical and beam control systems to enhance space surveillance applications, laser beam propagation, and optical pointing and tracking. System concept assessment tools will be developed and used.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
MAJOR THRUST: Develop electric laser technologies for airborne tactical applications. Technologies include fiber, bulk solid state, semiconductor, and other electrically powered lasers.	16.200	28.132	33.241	0.000	33.241
FY 2009 Accomplishments: In FY 2009: Improved design of laser sources for aircraft self-protection. Demonstrated system-level beam control solutions to aero-optical issues of tactical laser weapons applications on airborne platforms. Continued to assess the effectiveness of various laser concepts in relevant scenarios. Continued to scale electric lasers up to the weapons class power level. Developed architectures that are suitable in terms of size, weight, efficiency, affordability, reliability, maintainability, supportability, environmental acceptability, and ruggedness for the next-generation applications. Performed damage/					

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602605F: *DIRECTED ENERGY TECHNOLOGY*	PROJECT 624866: *Lasers & Imaging Technology*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
vulnerability tests against real or simulated systems. Used test results to verify models and assess laser effectiveness/system vulnerabilities. *FY 2010 Plans:* In FY 2010: Develop technologies, building on previous laser development efforts and incorporating joint service and agency technology advances, to support designing a weapon-class electric laser demonstrator for inclusion on a large aircraft. Enhance design of laser sources for aircraft self-protection and refine system packaging. Improve system architectures that are suitable in terms of size, weight, efficiency, affordability, reliability, maintainability, supportability, environmental acceptability, and ruggedness for the next-generation applications. Develop fiber laser technologies that can be used on a future airborne tactical laser system. Continue damage/vulnerability tests against real and/or simulated systems. Use test results to verify models and assess laser effectiveness/system vulnerabilities. *FY 2011 Base Plans:* In FY 2011: Continue research supporting design and fabrication of weapons-class electric laser components, including fiber lasers, for potential inclusion on a large aircraft. Begin testing of components and subsystems incorporating advances for thermal management. Ruggedize laser sources for aircraft self-protection and improve system packaging. Develop advanced electrically-powered laser concepts. Continue damage/vulnerability tests against real and/or simulated systems. Use test results to verify models and assess laser effectiveness/system vulnerabilities. Improve modeling and simulation of advanced electric laser concepts for use in various applications. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A					
MAJOR THRUST: Develop chemical laser technologies for scalable, strategic-class high energy laser devices with improved efficiency.	4.918	5.977	2.280	0.000	2.280

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602605F: *DIRECTED ENERGY TECHNOLOGY*	PROJECT 624866: *Lasers & Imaging Technology*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2009 Accomplishments: In FY 2009: Demonstrated high-performance singlet delta oxygen generator and advanced ejector nozzle concepts for airborne laser applications based on results of previous analysis. Demonstrated scaled electric discharge oxygen-iodine lasers and refined diode-pumped atomic laser concepts. Improved modeling and simulation of chemical, hybrid, and diode-pumped lasers. *FY 2010 Plans:* In FY 2010: Continue efforts to improve laser nozzle and generator designs to enhance performance of chemical oxygen-iodine lasers such as those on the Airborne Laser. Demonstrate initial diode-pumped atomic laser concept scaling capability. Continue to improve modeling and simulation of chemical, hybrid, and diode-pumped lasers. *FY 2011 Base Plans:* In FY 2011: Continue to improve and use modeling and simulation of chemical lasers. Maintain research to support future multi-megawatt-class high energy lasers. Chemical lasers are the only types of lasers that have demonstrated the megawatt power capabilities required for strategic applications. A continued research capability in this technology is required to support these long-range revolutionary applications and to maintain expertise in very high power lasers. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A					
MAJOR THRUST: Develop and demonstrate optical technologies including beam control, atmospheric compensation, pointing and tracking, and integration of optical systems with the laser device. *FY 2009 Accomplishments:* In FY 2009: Continued initial demonstration of system-level solutions to aero-optical distortions associated with airborne tactical laser weapons systems in wind-tunnel environment. Began assembly of major subsystems for the tactical relay mirror demonstrator. Reviewed improved compensation	9.825	13.643	10.315	0.000	10.315

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602605F: *DIRECTED ENERGY TECHNOLOGY*	PROJECT 624866: *Lasers & Imaging Technology*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
concepts for laboratory demonstrations of long horizontal path propagation. Continued analyzing improvements for consideration of system performance and mission suitability for solid state laser systems on large aircraft. Completed initial design of a demonstrator laser weapon system based on DARPA's High Energy Liquid Laser Area Defense System device. *FY 2010 Plans:* In FY 2010: Demonstrate in the laboratory selected atmospheric compensation concepts for laboratory long horizontal path propagation. Continue final tactical relay mirror assembly and begin laboratory testing of major subsystems for the demonstrator. Continue aero-optics wind tunnel tests. Complete component research and modeling and simulation efforts supporting the joint AF/DARPA field demonstration of a high power solid state laser with a beam control system. *FY 2011 Base Plans:* In FY 2011: Continue laboratory testing on horizontal propagation compensation concepts and begin planning for field testing. Begin tactical relay mirror demonstrations at low power. Conduct laser communications research focused on ultra-high data rate, free-space, secure communications including atmospheric signal degradation. Funding decrease in FY 2011 is due to completion in FY 2010 of the applied research support to the joint AF/DARPA field demonstration of a high power solid state laser with a beam control system. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A					
MAJOR THRUST: Develop advanced, long-range, optical technologies that support future space situational awareness (SSA) systems.	4.737	26.074	31.985	0.000	31.985

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602605F: *DIRECTED ENERGY TECHNOLOGY*	PROJECT 624866: *Lasers & Imaging Technology*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2009 Accomplishments: In FY 2009: Integrated second-generation sodium beacon adaptive optics system with 3.5 meter telescope and prepared for demonstrations of compensated imaging and detection of very dim objects at visible and near-infrared wavelengths. *FY 2010 Plans:* In FY 2010: Complete system tests of second-generation sodium beacon adaptive optics system on 3.5 meter telescope and perform demonstrations of compensated imaging and detection of very dim objects at visible and near-infrared wavelengths. Develop, integrate, and test component and system level technologies to advance space situational awareness. Investigate passive and active imaging techniques and demonstrate imaging and non-imaging space-object identification techniques. Develop assessment methodologies by incorporating new experimental data from laser illumination, tracking, and compensated imaging; from results of space materials properties and aging analysis; and from enhanced numerical techniques. Support operational SSA mission planning tools, algorithms, predictive avoidance databases and assessment capabilities with expanded software tools. Develop tools supporting analysis, modeling, and simulation. *FY 2011 Base Plans:* In FY 2011: Assess capabilities of second-generation sodium beacon adaptive optics system on 3.5 meter telescope through demonstrations of compensated imaging and detection of very dim objects at visible and near-infrared wavelengths. Continue development and demonstration of active and passive imaging techniques using the 3.5 meter telescope and second-generation adaptive optics. Assess non-conventional imaging methods. Develop, refine, integrate, and test component and system level technologies to advance SSA. Continue to refine and broaden assessment methodologies by incorporating new experimental data from laser illumination, tracking, and compensated imaging; results of space materials properties and aging analysis; and enhanced numerical techniques. Continue support of operational mission planning tools, algorithms, predictive					

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602605F: *DIRECTED ENERGY TECHNOLOGY*	PROJECT 624866: *Lasers & Imaging Technology*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
avoidance, and space situational awareness and space protection concepts and operational techniques by updating and transitioning databases and assessment and analysis capabilities. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A					
Accomplishments/Planned Programs Subtotals	35.680	73.826	77.821	0.000	77.821

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost
• PE 0601108F: *High Energy Laser Research Initiatives.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0602890F: *High Energy Laser Research.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603444F: *Maui Space Surveillance System.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603605F: *Advanced Weapons Technology.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603924F: *High Energy Laser Advanced Technology Program.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0602120A: *Sensors and Electronic Survivability.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0602307A: *Advanced Weapons Technology.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0602624A: *Weapons and Munitions Technology.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force			DATE: February 2010
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C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost
• PE 0603004A: *Weapons and Munitions Advanced Technology.*											
• PE 0602114N: *Power Projection Applied Research.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0602702E: *Tactical Technology.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603175C: *Ballistic Missile Defense Technology.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603883C: *Ballistic Missile Defense Boost Phase Segment.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0602651M: *Joint Non-Lethal Weapons Applied Research.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603651M: *Joint Non-Lethal Weapons Technology Development.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

D. Acquisition Strategy

Not Applicable.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force			DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602605F: *DIRECTED ENERGY TECHNOLOGY*	PROJECT 624867: *Advanced Weapons & Survivability Technology*	

COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	FY 2011 Base Estimate	FY 2011 OCO Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
624867: *Advanced Weapons & Survivability Technology*	18.682	31.405	25.775	0.000	25.775	27.209	30.280	31.171	31.601	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project explores high power microwave (HPM) and other unconventional weapon concepts using innovative technologies. Research is conducted that support a wide range of Air Force missions such as the disruption and degradation of an adversary's electronic infrastructure and military capability. This research will allow the effect to be applied covertly and with no collateral structural or human damage. This project also provides for vulnerability assessments of representative U.S. strategic and tactical systems to HPM weapons, HPM weapon technology assessment for specific Air Force missions, and HPM weapon lethality assessments against foreign targets. Active Denial technologies are also developed and assessed for Air Force non-lethal force protection applications.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
MAJOR THRUST: Investigate technologies for HPM components for applications such as disruption of electronic systems. Investigate other unconventional weapon concepts using innovative technologies.	11.201	15.499	10.922	0.000	10.922
FY 2009 Accomplishments: In FY 2009: Enhanced the compact repetitively pulsed gigawatt-class HPM testbed. Integrated and demonstrated a conformal antenna and command and control system for the compact HPM testbed. Designed and developed narrowband HPM components that will be integrated into a demonstration aerial platform. Demonstrated mature HPM source materials and continued assessing the applicability of solid state subsystem designs supporting ruggedized high power airborne systems. Improved the wideband antenna and high voltage switch and demonstrated improved effectiveness during field tests. Developed apparatus capable of correctly delivering gas into interaction region of HPM tubes. Investigated HPM concepts related to cyber warfare and studied the possibility of developing new HPM waveforms for a counter-electronics application. Implemented the enhanced options for high power subsystem components based on the results of the HPM system source code. Designed/ developed state-of-the-art energy storage power components.					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2010 Plans: In FY 2010: Develop and evaluate components of the narrowband HPM aerial demonstrator. Investigate electromagnetic interference/electromagnetic capability of narrowband HPM components. Continue investigations of integrating a wideband HPM system into small unmanned aerial vehicles. Conduct laboratory experiments using new types of HPM waveforms for counter-electronics applications. Advance and utilize state-of-the-art energy storage components within pulsed-power components. Design hardware to generate high energy density plasmas, based on experimental validation, for applications such as countering weapons of mass destruction. *FY 2011 Base Plans:* In FY 2011: Continue development of advanced HPM components. Apply advances in target effect prediction to a suite of HPM-related codes. Continue mitigation efforts for Air Force and other government systems. Further refine models for use in HPM system development. Continue to investigate state-of-the-art energy storage components. Conduct high energy density plasma experiments for applications such as countering weapons of mass destruction. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A					
MAJOR THRUST: Assess the effects/lethality of HPM technologies against representative threats. Develop and apply sophisticated models to enhance the development of HPM and related technology. *FY 2009 Accomplishments:* In FY 2009: Applied physics-based understanding and models to predict and refine target effects, and incorporated capabilities into an engagement model. Continued verification of engagement model software. Expanded microwave effects mitigation effort to harden additional Air Force systems against red systems. Verified linkages between components in an HPM system. Integrated, verified, and improved field and thermal emission models. Began upgrade of infrastructure to accommodate HPM effects testing at frequencies as high as 35 gigahertz.	5.530	6.206	6.240	0.000	6.240

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2010 Plans: In FY 2010: Expand modeling capabilities to include accurate prediction of effects with significantly reduced user inputs. Continue effects mitigation efforts on systems of interest and expand into new systems to include modern tactical aircraft components. Unite multiple HPM-related models for end-to-end simulation and design efforts. Complete infrastructure updates to enable representative effects testing on subsystems to cover all HPM frequencies currently of interest. *FY 2011 Base Plans:* In FY 2011: Continue effects mitigation efforts on systems of interest including modern tactical aircraft components. Apply advances in target effect prediction to a suite of HPM-related codes. Continue mitigation efforts for Air Force and other US government systems. Refine models for use in HPM system development. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A					
MAJOR THRUST: Investigate advanced technologies that support force protection tactical applications, including non-lethal counter-personnel applications from an airborne platform. *FY 2009 Accomplishments:* In FY 2009: Continued main design work for test stand for full power non-lethal radiating system demonstration. Continued development of advanced modeling codes that incorporate ability to model harmonic and fundamental mode sources. Completed next phase of harmonic source development study. *FY 2010 Plans:* In FY 2010: Complete design and continue research work for test stand for full power non-lethal radiating system demonstration for airborne application. Continue development and use of advanced modeling codes that incorporate ability to model harmonic sources. Begin development, analysis, and	1.951	9.700	8.613	0.000	8.613

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
evaluation of source and thermal subsystem options for next-generation non-lethal systems. Begin harmonic source development. *FY 2011 Base Plans:* In FY 2011: Continue working towards an FY 2013 ground demonstration of key Airborne Active Denial Technology (AADT) components. Perform full-powered, long-pulse, high duty-cycle testing of the Airborne Active Denial 2.5 megawatt gyrotron source. Continue to improve fidelity of airborne gyrotron source computer model. Continue development of AADT prime power and power conditioning approaches, as well as antenna and beam conditioning systems, including air breakdown mitigation techniques. Perform computer modeling and simulation of a next-generation Active Denial source. Perform engagement modeling and simulation of an Active Denial System. Continue to research and develop alternative use applications for Active Denial. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A					
Accomplishments/Planned Programs Subtotals	18.682	31.405	25.775	0.000	25.775

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost
• PE 0602202F: *Human Systems Technology.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603605F: *Advanced Weapons Technology.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0602120A: *Sensors and Electronic Survivability*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0602624A: *Weapons and Munitions Technology*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

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C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost
• PE 0602114N: *Power Projection*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0602651M-A: *Joint Non-Lethal Weapons Applied Research.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603851M: *Nonlethal Weapons*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

D. Acquisition Strategy

Not Applicable.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force			DATE: February 2010
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COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	FY 2011 Base Estimate	FY 2011 OCO Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
6255SP: *Laser and Imaging Space Tech*	5.871	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

Note

Note: In FY 2010, the efforts in this project are being moved to Project 4866, Lasers & Imaging Technology to better align efforts.

A. Mission Description and Budget Item Justification

Develop advanced, long-range, optical technologies such as advanced beam control; beam acquisition, tracking, and pointing; adaptive optics; dual line-of-sight pointing; large, lightweight optics; and optical coatings that support future space-object imaging systems. Assess the vulnerability of satellites to the effects of high-energy laser weapons and update catalogued satellites.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
MAJOR THRUST: Develop advanced, long-range, optical technologies that support future space-object imaging systems.	2.444	0.000	0.000	0.000	0.000
FY 2009 Accomplishments: In FY 2009: Tested electrostatic deformable mirror technologies to determine maturity and utility for Air Force applications. Developed and demonstrated a high energy fiber laser phased array transceiver system level brassboard concept that includes high resolution pupil plane imaging, coherent beam combining, shared transmit/receive sub-apertures, and initial acquisition, pointing, and tracking investigation.					
FY 2010 Plans: In FY 2010: This thrust has been moved to Project 4866, Laser and Imaging Technology, in order to better align efforts.					

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602605F: *DIRECTED ENERGY TECHNOLOGY*	PROJECT 6255SP: *Laser and Imaging Space Tech*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2011 Base Plans: In FY 2011: Not Applicable. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A					
MAJOR THRUST: Assess the vulnerability of U.S. satellites to the effects of high-energy laser weapons and update catalogued satellites. *FY 2009 Accomplishments:* In FY 2009: Expanded analysis capabilities to provide assessments of effects on aerospace systems from new and emerging directed energy concepts. Refined and broadened assessment methodologies by incorporating new experimental data from laser illumination, tracking, and compensated imaging; results of space materials properties and aging analysis; and enhanced numerical techniques. Continued support of operational mission planning tools, algorithms, predictive avoidance, and space situational awareness by updating and transitioning databases and assessment capabilities. Integrated and tested advanced optical and infrared sensor systems with 3.5 meter telescope and second generation sodium beacon adaptive optics for dim space object tracking, detection, and imaging. *FY 2010 Plans:* In FY 2010: This thrust has been moved to Project 4866, Laser and Imaging Technology, in order to better align efforts. *FY 2011 Base Plans:* In FY 2011: Not Applicable. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A	3.427	0.000	0.000	0.000	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602605F: *DIRECTED ENERGY TECHNOLOGY*	PROJECT 6255SP: *Laser and Imaging Space Tech*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
Accomplishments/Planned Programs Subtotals	5.871	0.000	0.000	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost
• PE 0603444F: *Maui Space Surveillance Systems.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603605F: *Advanced Weapons Technology.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0601108F: *High Energy Laser Research Initiatives.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0602890F: *High Energy Laser Research.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603924F: *High Energy Laser Advanced Technology Program.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603883C-A: *Ballistic Missile Defense Boost Phase Segment.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0602120A: *Sensors and Electronic Survivability.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0602307A: *Advanced Weapons Technology.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0602624A: *Weapons and Munitions Technology.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603004A: *Weapons and Munitions Advanced Technology.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0602114N: *Power Projection Applied Research.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602605F: *DIRECTED ENERGY TECHNOLOGY*	PROJECT 6255SP: *Laser and Imaging Space Tech*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost
• PE 0602702E: *Tactical Technology.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603175C: *Ballistic Missile Defense Technology.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603883C-B: *Ballistic Missile Defense Boost Phase Segment.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0602651M-B: *Joint Non-Lethal Weapons Applied Research.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0602651M-C: *Joint Non-Lethal Weapons Applied Research.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

D. Acquisition Strategy

Not Applicable.

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.