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 3: *Advanced Technology Development (ATD)*				R-1 ITEM NOMENCLATURE PE 0603203F: *Advanced Aerospace Sensors*							
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	69.902	52.786	44.677	0.000	44.677	50.650	48.614	50.969	53.337	Continuing	Continuing
63665A: *Advanced Aerospace Sensors Technology*	19.832	27.175	22.996	0.000	22.996	24.446	22.571	23.656	24.755	Continuing	Continuing
6369DF: *Target Attack and Recognition Technology*	40.422	25.611	21.681	0.000	21.681	26.204	26.043	27.313	28.582	Continuing	Continuing
6388SP: *Advanced Space Sensors*	9.648	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

Divided into three broad project areas, this program develops technologies to enable the continued superiority of sensors from aerospace platforms. The first project develops and demonstrates advanced technologies for electro-optical sensors, radar sensors and electronic counter-countermeasures, and components and algorithms. The second project develops and demonstrates radio frequency and electro-optical sensors for detecting, locating, and targeting airborne, fixed, and time-critical mobile ground targets obscured by natural or man-made means. The third project develops and demonstrates space sensor technologies including radio-frequency sensors; intelligence, surveillance, and reconnaissance sensors; electro-optical sensors; laser warning sensors; targeting and attack radar sensors; and electronic counter-countermeasures and communications. Together, the projects in this program develop the means to find, fix, target, track, and engage air and ground targets anytime, anywhere, and in any weather. This program is in Budget Activity 3, Advanced Technology Development, since it develops and demonstrates technologies for existing system upgrades and/or new sensor and electronic combat system developments that have military utility and address warfighter needs.

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 3: *Advanced Technology Development (ATD)*	**R-1 ITEM NOMENCLATURE** PE 0603203F: *Advanced Aerospace Sensors*

B. Program Change Summary ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
Previous President's Budget	65.115	51.482	0.000	0.000	0.000
Current President's Budget	69.902	52.786	44.677	0.000	44.677
Total Adjustments	4.787	1.304	44.677	0.000	44.677
• Congressional General Reductions		-0.075			
• Congressional Directed Reductions		0.000			
• Congressional Rescissions	0.000	-0.221			
• Congressional Adds		1.600			
• Congressional Directed Transfers		0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	4.787	0.000	44.677	0.000	44.677

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2009	FY 2010
Project: 63665A: *Advanced Aerospace Sensors Technology*		
Congressional Add: *Moving Target Strike.*	1.995	0.000
Congressional Add: *Precision Image Tracking and Registration.*	1.596	0.000
Congressional Add Subtotals for Project: 63665A	3.591	0.000
Project: 6369DF: *Target Attack and Recognition Technology*		
Congressional Add: *Active Unmanned Air Vehicle (UAV) Phenomenology (AUP) & ART Technology Transition.*	1.995	0.000
Congressional Add: *Automated Sensor-Communication Response Technology.*	1.596	0.000
Congressional Add: *Reconfigurable Secure Computing Technologies.*	1.197	1.593
Congressional Add Subtotals for Project: 6369DF	4.788	1.593
Congressional Add Totals for all Projects	8.379	1.593

Exhibit R-2, RDT&E Budget Item Justification: PB 2011 Air Force	DATE: February 2010
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Change Summary Explanation

Note: In FY 2010, Congress added $1.6 million for Reconfigurable Secure Computing Technologies. 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.

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 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603203F: *Advanced Aerospace Sensors*	PROJECT 63665A: *Advanced Aerospace Sensors 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
63665A: *Advanced Aerospace Sensors Technology*	19.832	27.175	22.996	0.000	22.996	24.446	22.571	23.656	24.755	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project develops and demonstrates aerospace sensor and processing technologies for intelligence, surveillance, reconnaissance, target, and attack radar applications in both manned and unmanned platforms, including electro-optical sensors and electronic counter-countermeasures for radars. It provides aerospace platforms with the capability to precisely detect, track, and target both airborne (conventional and low radar cross-section) and ground-based, high-value, time-critical targets in adverse clutter and jamming environments. Project activities include developing multi-function radio-frequency systems including radar and electronic warfare technology. Desired warfighting capabilities include the ability to detect concealed targets in difficult background conditions.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
MAJOR THRUST: Develop electro-optical sensor technology to detect, locate, and identify air and ground targets at long ranges, including those that are low-observable, or use deception or camouflage.	4.259	3.979	1.317	0.000	1.317
FY 2009 Accomplishments: In FY 2009: Conducted airborne experiments with a multi-function active/passive electro-optical/ infrared demonstration system to detect, locate, and identify difficult targets in both obscured and urban environments for intelligence, surveillance, and reconnaissance applications. Characterized end-to-end performance of high-resolution, three-dimensional laser radar for high confidence target identification coupled with passive spectral imaging for low false alarm rate detection utilizing advanced change detection and spatial-spectral discrimination techniques. Completed development of multispectral/polarimetric focal plane array device for enhanced low contrast target discrimination, and designed airborne sensor module for enhancement of multi-function demonstration system.					

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
FY 2010 Plans: In FY 2010: Complete end-to-end performance characterization, via airborne flight test, of high-resolution, three-dimensional laser radar for high confidence target identification coupled with passive spectral imaging for low false alarm rate detection utilizing change detection and spatial-spectral discrimination techniques. Continue design of airborne multispectral/polarimetric sensor module for long range target discrimination and integrated laser radar for long range identification of stationary and moving targets. *FY 2011 Base Plans:* In FY 2011: Perform concept validation and signature utility experiments for long range multispectral/polarimetric and synthetic aperture laser radar imaging. Continue signature collection experiments with multispectral/polarimetric imaging systems to assess military utility. Initiate laboratory and field experiments for mitigating primary risk areas associated with synthetic aperture laser radar imaging from airborne platforms. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A.					
MAJOR THRUST: Develop technologies to maximize positional accuracy, timing accuracy, and exploitation techniques to improve offensive and defensive combat capabilities. *FY 2009 Accomplishments:* In FY 2009: Demonstrated worldwide ultra-accurate positioning system technologies to optimize time sensitive targeting, battlespace awareness, persistent intelligence, surveillance, and reconnaissance capabilities. Developed multi-sensor phenomenology-based georegistration for imagery and performed lab tests of multi-intelligence georegistration.	1.819	0.700	1.232	0.000	1.232

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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: Demonstrate optimized reference for precise emitter geolocation, utilizing advanced two-way time transfer techniques. Explore feasibility and goals for reference optimization for bi-static and multi-static radar application. *FY 2011 Base Plans:* In FY 2011: Develop reference optimization components necessary to support bi-static and multi-static radar technologies. Evaluate progress and determine next spiral requirements. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A.					
MAJOR THRUST: Develop light, low power, compact RF sensors to use against difficult-to-detect targets, enable persistent ISR from unmanned aerial vehicles, and detect advanced air and ground targets. *FY 2009 Accomplishments:* In FY 2009: Demonstrated the radio-frequency sensors of an integrated electro-optical/radio-frequency sensor suite for unmanned aerial vehicles with severe size, weight, and power constraints to enable single platform persistent intelligence, surveillance, and reconnaissance capabilities compatible with a system of systems architecture. Performed systems analysis for improved air and ground target detection and tracking using cross-cued, dual-band radar coupled with electronic support sensors. Enhanced the modeling, simulation, and analysis test bed with the inclusion of electro-optical sensing modes, and provided input into the required design for an integrated electro-optical/ radio-frequency sensor suite, including required data processing and exploitation. Provided systems engineering support fostering the transition of developed enabling technologies and concepts to weapon systems and intelligence, surveillance, and reconnaissance assets. Conducted experiments with the modeling, simulation, and analysis test bed providing input into a design for an airborne multi-intelligence experiment.	9.259	17.757	14.899	0.000	14.899

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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: Continue demonstration of the radio-frequency sensors (Ultra-High Frequency (UHF) radar, X-band radar, electronic support sensors) of an integrated electro-optical/radio-frequency sensor suite for unmanned aerial vehicles with severe size, weight, and power constraints to enable persistent intelligence, surveillance, and reconnaissance capabilities compatible with a system of systems architecture. Utilize the modeling, simulation, and analysis test bed, including radio-frequency and electro-optical sensing modes, to provide input into the required design for an integrated electro-optical/radio-frequency sensor suite, including required data processing and exploitation. Continue sensor systems engineering support fostering the transition of developed enabling technologies and concepts to weapon systems and intelligence, surveillance, and reconnaissance assets. Enhance the systems engineering to consider the optimal use of a high-altitude, long-endurance sensor platform within a layered sensing architecture. Initiate effort using multi-intelligence sensor suite to improve detection and tracking of difficult targets such as dismounts or targets in urban areas. Initiate efforts to improve the capabilities of passive sensing to enhance the detection and tracking of airborne and ground based targets with low radar cross section (including dismounts), concealment capabilities, or employment of electronic counter-countermeasures. *FY 2011 Base Plans:* In FY 2011: Complete demonstration of the radio-frequency sensors (Ultra-High Frequency (UHF) radar, X-band radar, electronic support sensors) of an integrated electro-optical/radio-frequency sensor suite for unmanned aerial vehicles with severe size, weight, and power constraints to enable single platform persistent intelligence, surveillance, and reconnaissance capabilities compatible with a system of systems architecture. Include in the demonstration simultaneous air and ground target tracking. Design and demonstrate multiple radio frequency emitter/receiver sensor operation to include waveform diversity electronic protection techniques and advanced high range resolution target response characteristics. Continue to improve the capabilities of receivers in a passive mode to enhance the detection and tracking of airborne and ground based targets with low radar					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
cross section (including dismounts), concealment capabilities, or employment of electronic counter-countermeasures. Emphasis is on low cost sensing capability to bolster system ubiquity. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A.					
MAJOR THRUST: Develop weapons guidance-quality track radar performance in jamming environments, and advanced radar signal processing techniques to improve performance against difficult targets. *FY 2009 Accomplishments:* In FY 2009: Demonstrated the surveillance performance of homogeneous sensor networks and newly developed adaptive processing algorithms and waveforms in heterogeneous conditions, including clutter and jamming interference. *FY 2010 Plans:* In FY 2010: Not Applicable. *FY 2011 Base Plans:* In FY 2011: Not Applicable. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A.	0.904	0.000	0.000	0.000	0.000
MAJOR THRUST: Develop technologies to provide precision position and timing information to enable distributed, layered sensing on large air and space vehicles in GPS-denied environments. *FY 2009 Accomplishments:* In FY 2009: Not Applicable.	0.000	2.131	3.969	0.000	3.969

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
FY 2010 Plans: In FY 2010: Design reduced size, weight, and power precision time, position, and velocity sensor techniques for space-based, airborne, and ground-based applications. Demonstrate constructive systems engineering model to assess assured reference techniques in terms of measures of performance and warfighter utility. Enhance multi-ship virtual flight test simulation technology to assess world-wide distributed position, navigation, and timing architectures for disparate platforms enabling distributed, layered sensing. *FY 2011 Base Plans:* In FY 2011: Design reduced size, weight, and power for precision time, position, and velocity sensor consisting of a single integrated GPS and inertial sensor for stringent installation requirements characteristic of small unmanned aerial systems appropriate for distributed, layered sensing. Continue demonstration through a constructive systems engineering model to assess assured reference techniques in terms of measures of performance and warfighter utility. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A.					
MAJOR THRUST: Develop infrared surveillance technologies for continuous surveillance of dynamic targets in urban areas from high altitude UAV and manned platforms. *FY 2009 Accomplishments:* In FY 2009: Not Applicable. *FY 2010 Plans:* In FY 2010: Initiate an effort to perform design studies and concept demonstration experiments for exploiting novel temporal, spectral, and polarimetric discrimination based on infrared sensors to rapidly detect, locate, identify, and characterize battlefield targets and events over broad theater-sized areas.	0.000	0.949	1.579	0.000	1.579

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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: Initiate concept demonstration experiments, beginning with ground-based experiments, for exploiting novel temporal, spectral, and polarimetric discrimination based on infrared sensors to rapidly detect, locate, identify, and characterize battlefield targets and events in urban areas. Leverage large format, infrared focal plane array technology developed under other component development projects and assess utility for high altitude and space platforms. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A.					
MAJOR THRUST: Reduce technology risk for space sensor platform payload components and exploitation of infrastructure integration. *FY 2009 Accomplishments:* In FY 2009: Not Applicable. *FY 2010 Plans:* In FY 2010: Develop Mission Design Tool kit and experimental hardware for class III (scalable payloads) sensors. Begin to address PnP (Plug and Play) concepts for large satellite systems. *FY 2011 Base Plans:* In FY 2011: Not Applicable. Effort eliminated due to higher Air Force priorities. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A.	0.000	1.659	0.000	0.000	0.000
Accomplishments/Planned Programs Subtotals	16.241	27.175	22.996	0.000	22.996

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
Congressional Add: Moving Target Strike. *FY 2009 Accomplishments:* In FY 2009: Conducted Congressionally-directed effort for Moving Target Strike. *FY 2010 Plans:* In FY 2010: Not Applicable.	1.995	0.000
Congressional Add: Precision Image Tracking and Registration. *FY 2009 Accomplishments:* In FY 2009: Conducted Congressionally-directed effort for Precision Image Tracking and Registration. *FY 2010 Plans:* In FY 2010: Not Applicable.	1.596	0.000
Congressional Adds Subtotals	3.591	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 Not Provided (1862): *Activity Not Provided*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0602204F: *Aerospace Sensors.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603205F: *Flight Vehicle Technology.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603707F: *Weather Systems Advanced Development.*	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 0603500F: *Multi-Disciplinary Advanced Development Space Technology.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0602111N: *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 0602232N: *Space and Electronic Warfare (SEW) Technology.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0604249F: *LANTIRN Night Precision Attack.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603270F: *Electronic Combat Technology.*	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.

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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
6369DF: *Target Attack and Recognition Technology*	40.422	25.611	21.681	0.000	21.681	26.204	26.043	27.313	28.582	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project develops and demonstrates advanced technologies for attack management, fire control, and target identification and recognition. This includes developing and demonstrating integrated and cooperative fire control techniques to provide for adverse-weather precision air strikes against multiple targets per pass and at maximum weapon launch ranges. Specific fire control technologies under development include attack management, sensor fusion, automated decision aids, advanced tracking for low radar cross section threats, and targeting using both on-board and off-board sensor information. This project also evaluates targeting techniques to support theater missile defense efforts in surveillance and attack. These fire control technologies will provide force multiplication and reduce warfighter exposure to hostile fire. This project also develops and demonstrates target identification and recognition technologies for positive, high confidence cueing, recognition, and identification of airborne and ground-based, high-value, time-critical targets at longer ranges than are currently possible. The goal is to apply these technologies to tactical air-to-air and air-to-surface weapon systems so they are able to operate in all weather conditions, during day or night, and in high-threat, multiple target environments. Model-based vision algorithms and target signature development techniques are the key to target identification and recognition. This project is maturing these technologies in partnership with the Defense Advanced Research Projects Agency and evaluating the techniques to support theater missile defense efforts in surveillance and attack. Fire control and recognition technologies developed and demonstrated in this project are high leverage efforts, providing for significant advancements in operational capabilities largely through software improvements readily transitionable to new and existing weapon systems.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
MAJOR THRUST: Develop and test an automatic target recognition system for tracking and identifying moving and stationary ground targets for use in strike and reconnaissance platforms.	0.945	0.098	0.000	0.000	0.000
FY 2009 Accomplishments: In FY 2009: Provided support to the transition of the moving target algorithm technology to operational strike and reconnaissance platforms.					

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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: Complete the transition of moving target algorithm technology to operational strike and reconnaissance platforms. *FY 2011 Base Plans:* In FY 2011: Not Applicable. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A.					
MAJOR THRUST: Develop and assess multi-sensor automatic target recognition for intelligence, surveillance, reconnaissance, strike, and weapon systems. *FY 2009 Accomplishments:* In FY 2009: Conducted spiral development and assessment of multi-sensor automatic target recognition fusion algorithms. Conducted assessment of technology supporting intelligence, surveillance, reconnaissance, strike, and weapon systems using the Air Force automatic target recognition test and evaluation facility. Conducted spiral development and validation of synthetic data generation capability critically needed to augment collected research, development, and operational data sets. Developed automatic target recognition fusion sensor data exploitation capability utilizing analysis and experimentation of data independence and interdependence of features to support development of an optimum data fusion exploitation capability. Enhanced the Air Force automatic target recognition test and evaluation facility and data sets as required to support enhanced automatic target recognition fusion capabilities. Determined technology shortfalls and developed automatic target recognition fusion technologies to overcome these shortfalls. *FY 2010 Plans:* In FY 2010: Continue spiral development and assessment of multi-sensor automatic target recognition fusion algorithms. Continue assessment of technology supporting intelligence, surveillance,	2.478	1.950	3.077	0.000	3.077

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
reconnaissance, strike, and weapon systems using the Air Force automatic target recognition test and evaluation facility. Continue spiral development and validation of synthetic data generation capability critically needed to augment collected research, development, and operational data sets. Continue development of an automatic target recognition fusion sensor data exploitation capability utilizing analysis and experimentation of data independence and interdependence of features to support development of an optimum data fusion exploitation capability. Enhance the Air Force automatic target recognition test and evaluation facility and data sets as required to support enhanced automatic target recognition fusion capabilities. Determine technology shortfalls and develop automatic target recognition fusion technologies to overcome these shortfalls. Execute a laboratory demonstration of technology developed to date. *FY 2011 Base Plans:* In FY 2011: Continue spiral development and assessment of multi-sensor automatic target recognition fusion algorithms. Continue assessment of technology supporting intelligence, surveillance, reconnaissance, strike, and weapon systems using the Air Force automatic target recognition test and evaluation facility. Continue spiral development and validation of synthetic data generation capability critically needed to augment collected research, development, and operational data sets. Begin development of signature science for automatic target recognition database development. Continue development of an automatic target recognition fusion sensor data exploitation capability utilizing analysis and experimentation of data independence and interdependence of features to support development of an optimum data fusion exploitation capability. Enhance the Air Force automatic target recognition test and evaluation facility and data sets as required to support enhanced automatic target recognition fusion capabilities. Determine technology shortfalls and develop automatic target recognition fusion technologies to overcome these shortfalls. Execute a field demonstration of technology developed to date. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A.					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
MAJOR THRUST: Develop and demonstrate a moderate-confidence automatic target recognition (ATR) and advanced cueing capability for stationary and moving targets. *FY 2009 Accomplishments:* In FY 2009: Incorporated improvements in the initial design of the multi-sensor fusion algorithms for improved detection that were previously evaluated. Incorporated improvements in the initial design of the three-dimensional laser-detection-and-ranging automatic target recognition algorithms that were previously evaluated. Incorporated improvements in the initial design of the laser vibrometry algorithms that were previously evaluated. Incorporated improvements in the initial design of the sensor management suite that were previously evaluated. Incorporated improvements in the initial set of laser sensor exploitation tools that were previously evaluated. Enhanced automatic target recognition evaluation test facility and data sets as necessary to support program requirements. *FY 2010 Plans:* In FY 2010: Develop an electro-optic enhanced automatic target recognition system based on improvements provided by the multi-sensor fusion algorithms, the three-dimensional laser-detection-and-ranging automatic target recognition algorithms that were previously evaluated, the laser vibrometry algorithms and the sensor management suite that were previously evaluated. Enhance laser sensor exploitation tools as required to support spiral ATR development. Enhance automatic target recognition evaluation test facility and data sets as necessary to support program requirements. *FY 2011 Base Plans:* In FY 2011: Not Applicable. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A.	7.975	2.778	0.000	0.000	0.000
MAJOR THRUST: Develop and demonstrate an automatic target recognition capability integrated with advanced geo-registration techniques and innovative change detection algorithms.	1.618	1.035	2.193	0.000	2.193

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 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603203F: *Advanced Aerospace Sensors*	PROJECT 6369DF: *Target Attack and Recognition 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: Determined need to continue spiral assessment and development of automatic target recognition, automatic target cueing, geo-registration, and change detection technology. Conducted assessment of technology supporting time-critical targeting systems in the Air Force automatic target recognition test and evaluation facility. Conducted spiral development and validation of synthetic data generation capability critically needed to augment collected research, development, and operational data sets. Demonstrated time-critical targeting, advanced target tracking and multi-sensor track maintenance capabilities. Enhanced the Air Force automatic target recognition test and evaluation facility and data sets as required to support enhanced time-critical targeting capabilities. Determined technology shortfalls and develop emerging time-critical targeting and advanced target tracking technologies to overcome these shortfalls. *FY 2010 Plans:* In FY 2010: Assess performance of developed technology and develop enhancements to automatic target recognition, automatic target cueing, geo-registration, and change detection technology to meet warfighter needs. Continue assessment and enhancement of technology supporting time-critical targeting systems in the Air Force automatic target recognition test and evaluation facility. Continue spiral development and validation of synthetic data generation capability critically needed to augment collected research, development, and operational data sets. Enhance the Air Force automatic target recognition test and evaluation facility and data sets as required to support enhanced time-critical targeting capabilities. Continue spiral development and assessment development of time-critical targeting and advanced target tracking technologies required to meet warfighter requirements. *FY 2011 Base Plans:* In FY 2011: Determine state of the art technology capabilities and spirally develop enhancements to automatic target recognition, automatic target cueing, geo-registration, and change detection technology to meet warfighter needs. Continue assessment and enhancement of technology supporting time-critical					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
targeting systems in the Air Force automatic target recognition test and evaluation facility. Continue spiral development and validation of synthetic data generation capability critically needed to augment collected research, development, and operational data sets. Enhance the Air Force automatic target recognition test and evaluation facility and data sets as required to support enhanced time-critical targeting capabilities. Continue spiral development and assessment of time-critical targeting and advanced target tracking technologies required to meet warfighter requirements. Execute a laboratory demonstration of technology developed to date. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A.					
MAJOR THRUST: Develop an "identify friend, foe, or neutral" air-to-ground capability using cooperative and non-cooperative identification techniques. *FY 2009 Accomplishments:* In FY 2009: Integrated and demonstrated improved ground target identification capabilities through enhanced target databases, identification algorithm advancements, and radio-frequency tags in an operational environment. Assessed performance of technology to support warfighter integration with operational systems. Conducted refinement of identification algorithms and target databases as necessary to support transition of technology. *FY 2010 Plans:* In FY 2010: Integrate, demonstrate, and assess, in an operational environment, the improved ground target identification capabilities through enhanced target databases, identification algorithm advancements, and radio-frequency tags. Determine enhancements required to attain the required performance of these technologies to support warfighter needs. Continue refinement of identification algorithms, target databases, and exploitation tools as necessary to support transition of technology.	2.921	1.387	1.018	0.000	1.018

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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: Begin development of physics-based signature exploitation, modeling methods, and signal processing for feature-based recognition and fusion and apply these methods to sensor design to enable performance-based sensing. Begin development of an integrated radar sensor signature exploitation and signal processing analysis capability for recognition applications including staring radar, Combat Identification (CID), Space Situational Awareness, Measurement and Signatures Intelligence (MASINT), and ISR applications. Develop efficient methods for collecting and processing radar sensor data for recognition. Begin development of methods to analyze salient features to aid in the prediction, analysis, and processing capability as a function of sensor design parameters for performance-driven sensing. Develop a loosely coupled capability for multi-sensor measurement, processing, modeling and analysis methods to support target recognition database development efforts and MASINT applications. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A.					
MAJOR THRUST: Develop wide angle, persistent, multi-sensor/wavelength sensing and automated exploitation technology to detect, track, and identify targets over large areas at low sensor update rates. *FY 2009 Accomplishments:* In FY 2009: Designed and developed engineering models of the multi-sensor, multi-wavelength wide-angle, continuously-staring capability building upon the technologies developed during the individual component stage. Integrated and demonstrated the wide angle, continuously-staring component technologies. Assessed the maturity of the technology via a combination of exercises and scientific analyses in the Air Force automatic target recognition test and evaluation facility. Initiated spiral development of wide angle, continuous staring exploitation algorithms, phenomenological modeling, target and scenario databases necessary to support transition to the warfighter. Initiated Secretary	7.117	6.535	9.241	0.000	9.241

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
of the Air Force interest item to develop electro-optical, infrared, and synthetic aperture radar staring-sensor technologies and algorithms. *FY 2010 Plans:* In FY 2010: Develop, integrate, and test the next spiral engineering model of the multi-sensor, multi-wavelength wide-angle, continuously-staring capability building upon the technologies developed during the individual component stage. Integrate, demonstrate, and test the enhanced, spiral two, wide angle, continuously-staring component technologies via a combination of exercises and scientific analyses in the Air Force automatic target recognition test and evaluation facility. Continue spiral development of wide angle, continuous staring exploitation algorithms, phenomenological modeling, target and scenario databases necessary to support transition to the warfighter. Demonstrate in a militarily significant scenario, evaluate results and plan for transition. *FY 2011 Base Plans:* In FY 2011: Develop, integrate and test to technology readiness level (TRL) 5, the next spiral engineering model of the multi-sensor, multi-wavelength wide-angle, continuously-staring capability building upon the technologies developed during the previous demonstration. Integrate, demonstrate and test the enhanced, TRL level 5, wide angle, continuously-staring component technologies via a combination of exercises and scientific analyses in the Air Force automatic target recognition test and evaluation facility. Continue spiral development of wide angle, continuous staring exploitation algorithms, phenomenological modeling, target and scenario databases necessary to support transition to the warfighter. Increase TRL to 5 and demonstrate in a militarily significant scenario, evaluate results and begin transition. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A.					
	12.580	9.854	6.048	0.000	6.048

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
MAJOR THRUST: Develop an advanced suite of sensors with automatic target recognition, fusion, and target tracking, all working in concert to provide a high-confidence identification capability.					
FY 2009 Accomplishments: In FY 2009: Designed and tested an advanced aimpoint tracking capability. Developed and tested automatic target recognition capability using electro-optical sensor data. Built upon previous synthetic aperture radar automatic target recognition capability to develop a high confidence exploitation of synthetic aperture radar data. Developed an advanced capability to fuse information and exploitation results from multiple sensors. Conducted spiral high confidence identification development of algorithm phenomenological modeling, target and scenario databases necessary to support technology development. Assessed maturity of technology during the spiral process via the Air Force automatic target recognition test and evaluation facility and other sensor test facilities.					
FY 2010 Plans: In FY 2010: Integrate the advanced aimpoint tracking, electro-optical automatic target recognition, synthetic aperture radar automatic target recognition and the multi-sensor fusion algorithms. Test the integrated system and develop the second spiral requirements. Enhance phenomenological modeling, target and scenario databases and exploitation tools necessary to support spiral two technology development. Assess maturity of technology during the spiral process via the Air Force automatic target recognition test and evaluation facility and other sensor test facilities.					
FY 2011 Base Plans: In FY 2011: Identify candidate technologies to improve aimpoint tracking, electro-optical automatic target recognition, synthetic aperture radar automatic target recognition and the multi-sensor fusion algorithms. Predict performance of the integrated technologies and system. Enhance phenomenological modeling, target and scenario databases and exploitation tools necessary to support technology development. Assess maturity of applicable technology during the Air Force automatic target recognition test and evaluation facility and other sensor test facilities.					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2011 OCO Plans: In FY 2011 OCO: N/A.					
MAJOR THRUST: Investigate airborne techniques and algorithms for space object identification and characterization, and airborne technology for multi-sensor data fusion for better characterization. *FY 2009 Accomplishments:* In FY 2009: Not Applicable. *FY 2010 Plans:* In FY 2010: Initiate an effort to process multiple sources of ground based space situational awareness data on various space objects using upgraded space object ID algorithms for validation, along with upgrades to a space object ID database. *FY 2011 Base Plans:* In FY 2011: Begin spiral development and assessment of multi-sensor, space object focused, automatic target recognition fusion algorithms. Assess technology supporting space object recognition in the Air Force automatic target recognition test and evaluation facility. Continue spiral development and validation of synthetic data generation capability critically needed to augment collected research, development, and operational data sets. Critically examine target and scenario data to determine independence and interdependence of features to support development of an optimum data fusion exploitation capability. Incorporate enhanced Space Object Identification models into advanced space situational awareness experiments. Continue enhancement of the Air Force automatic target recognition test and evaluation facility and data sets as required to support enhanced space situational awareness automatic target recognition fusion capabilities. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A.	0.000	0.381	0.104	0.000	0.104

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
Accomplishments/Planned Programs Subtotals	35.634	24.018	21.681	0.000	21.681

	FY 2009	FY 2010
Congressional Add: Active Unmanned Air Vehicle (UAV) Phenomenology (AUP) & ART Technology Transition. *FY 2009 Accomplishments:* In FY 2009: Conducted Congressionally-directed effort for Active Unmanned Air Vehicle (UAV) Phenomenology (AUP) & ART Technology Transition. *FY 2010 Plans:* In FY 2010: Not Applicable.	1.995	0.000
Congressional Add: Automated Sensor-Communication Response Technology. *FY 2009 Accomplishments:* In FY 2009: Conducted Congressionally-directed effort for Automated Sensor-Communication Response Technology. *FY 2010 Plans:* In FY 2010: Not Applicable.	1.596	0.000
Congressional Add: Reconfigurable Secure Computing Technologies.	1.197	1.593

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
FY 2009 Accomplishments: In FY 2009: Conducted Congressionally-directed effort for Reconfigurable Secure Computing Technologies. *FY 2010 Plans:* In FY 2010: Conduct Congressionally-directed effort for Reconfigurable Secure Computing Technologies.		
Congressional Adds Subtotals	4.788	1.593

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 0602204F: *Aerospace Sensors.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603253F: *Advanced Sensor Integration.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603500F: *Multi-Disciplinary Advanced Space Technology.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603762E: *Sensor and Guidance Technology.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603270F: *Electronic Combat Technology.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE Not Provided (2391): *Theater Missile Defense System Program Office.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE Not Provided (2403): *Low Altitude Night Targeting and*	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
Infrared Navigation (LANTIRN) System Program Office.											

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 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603203F: *Advanced Aerospace Sensors*	PROJECT 6388SP: *Advanced Space Sensors*	

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
6388SP: *Advanced Space Sensors*	9.648	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

Note

Note: In FY 2010, funds from Project 88SP are being moved to Projects 665A and 69DF to better align efforts.

A. Mission Description and Budget Item Justification

This project develops and demonstrates space sensor technologies, including radio frequency sensors; intelligence, surveillance, and reconnaissance sensors; electro-optical sensors; laser warning sensors; targeting and attack radar sensors; and electronic counter-countermeasures and communications. By developing multi-function radar, laser, electronic combat, and electronic counter-countermeasures technologies for space applications, this project provides space platforms with the capability to precisely detect, track, and target air- and ground-based, high-value, time-critical targets, while remaining invulnerable to hostile and natural threats.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
MAJOR THRUST: Reduce technology risk for space sensor platform payload components and exploitation of infrastructure integration.	0.789	0.000	0.000	0.000	0.000
FY 2009 Accomplishments: In FY 2009: Developed "plug-and-play" satellite critical experiment, to including full simulation.					
FY 2010 Plans: In FY 2010: Not Applicable.					
FY 2011 Base Plans: In FY 2011: Not Applicable.					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2011 OCO Plans: In FY 2011 OCO: N/A.					
MAJOR THRUST: Develop technologies for global positioning system jam resistance, positional and timing accuracy, and exploitation techniques to improve offensive and defensive combat capabilities. *FY 2009 Accomplishments:* In FY 2009: Demonstrated space-based distributed position, navigation, and timing technologies to achieve optimal sensor fusion for distributed, layered sensing. Demonstrated multi-ship virtual flight test simulation technology to assess world-wide distributed position, navigation, and timing architectures for disparate platforms across distributed, layered sensing. *FY 2010 Plans:* In FY 2010: Not Applicable. *FY 2011 Base Plans:* In FY 2011: Not Applicable. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A.	2.065	0.000	0.000	0.000	0.000
MAJOR THRUST: Develop electro-optical sensor component technology to advance multiple space mission areas. Develop new sensor components, topologies and architectures for space. *FY 2009 Accomplishments:* In FY 2009: Completed experimental space flight of sensor components to test in space environment. Completed data collection, testing, and system evaluation. Initiated lab-based integration testing with embedded satellite components.	1.428	0.000	0.000	0.000	0.000

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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: Not Applicable. *FY 2011 Base Plans:* In FY 2011: Not Applicable. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A.					
MAJOR THRUST: Develop advanced laser communication component and sub-system technology to support a network-level topology for airborne intelligence, surveillance, and reconnaissance. *FY 2009 Accomplishments:* In FY 2009: Matured technologies for integration into airborne network communication architecture. Conducted further ground and flight tests of laser communication system. Developed advanced Free Space Optical Modem focusing on compact packaging for Airborne Terminal Rack (ATR) rack installations. Integrated Optical terminal with RF communications gear to enable testing of hybrid free space optical and radio-frequency communications terminal for Intelligence Surveillance and Reconnaissance (ISR) relay missions. Demonstrated hybrid free space optical/radio frequency failsafe/failback operations in airborne tests. This effort ended in FY 2009. *FY 2010 Plans:* In FY 2010: Not Applicable. *FY 2011 Base Plans:* In FY 2011: Not Applicable. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A.	4.724	0.000	0.000	0.000	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
MAJOR THRUST: Develop a geodesic phased array antenna to improve satellite operations over current reflector antennas. Improve operational capacity and efficiency of the satellite control network. *FY 2009 Accomplishments:* In FY 2009: Fully characterized the advanced technology demonstrator sub-sector and demonstrate with operational satellites. This effort completed in FY 2009. *FY 2010 Plans:* In FY 2010: Not Applicable. *FY 2011 Base Plans:* In FY 2011: Not Applicable. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A.	0.642	0.000	0.000	0.000	0.000
Accomplishments/Planned Programs Subtotals	9.648	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 Not Provided (2596): *Activity Not Provided*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0602204F: *Aerospace Sensors.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0602500F: *Multi-Disciplinary Space 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

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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 0603500F: *Multi-Disciplinary Advanced Development Space Technology.*											

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.