Exhibit R-2, RDT&E Budget Item Justification: PB 2015 Air Force											Date: March 2014	
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 3: *Advanced Technology Development (ATD)*					R-1 Program Element (Number/Name) PE 0603203F / *Advanced Aerospace Sensors*							
COST ($ in Millions)	**Prior Years**	**FY 2013**	**FY 2014**	**FY 2015 Base**	**FY 2015 OCO #**	**FY 2015 Total**	**FY 2016**	**FY 2017**	**FY 2018**	**FY 2019**	**Cost To Complete**	**Total Cost**
Total Program Element	-	32.818	30.546	34.420	-	34.420	39.901	40.058	40.851	39.123	Continuing	Continuing
63665A: *Advanced Aerospace Sensors Technology*	-	14.681	16.632	14.794	-	14.794	20.189	15.677	15.663	15.590	Continuing	Continuing
6369DF: *Target Attack and Recognition Technology*	-	18.137	13.914	19.626	-	19.626	19.712	24.381	25.188	23.533	Continuing	Continuing

The FY 2015 OCO Request will be submitted at a later date.

A. Mission Description and Budget Item Justification

Divided into two broad project areas, this program develops technologies to enable the continued superiority of sensors from aerospace platforms. The first project area develops and demonstrates advanced technologies for electro-optical sensors, radar sensors and electronic counter-countermeasures, and components and algorithms. The second project area develops and demonstrates radio frequency (RF) and electro-optical (EO) sensors for detecting, locating, and targeting airborne, fixed, and time-critical mobile ground targets obscured by natural or man-made means. 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 has been coordinated through the Department of Defense (DoD) Science and Technology (S&T) Executive Committee process to harmonize efforts and eliminate duplication. 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.

B. Program Change Summary ($ in Millions)	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO	FY 2015 Total
Previous President's Budget	37.657	30.579	29.808	-	29.808
Current President's Budget	32.818	30.546	34.420	-	34.420
Total Adjustments	-4.839	-0.033	4.612	-	4.612
• Congressional General Reductions	-0.050	-0.033			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.809	-			
• Other Adjustments	-3.980	-	4.612	-	4.612

Change Summary Explanation

Decrease in FY13 Other Adjustments was due to Sequestration.

Exhibit R-2, RDT&E Budget Item Justification: PB 2015 Air Force	Date: March 2014
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603203F / *Advanced Aerospace Sensors*

Increase in FY15 due to increased emphasis in long wave infra-red search truck technology.

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force			Date: March 2014
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603203F / *Advanced Aerospace Sensors*	Project (Number/Name) 63665A / *Advanced Aerospace Sensors Technology*	

COST ($ in Millions)	Prior Years	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO #	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost
63665A: *Advanced Aerospace Sensors Technology*	-	14.681	16.632	14.794	-	14.794	20.189	15.677	15.663	15.590	Continuing	Continuing

The FY 2015 OCO Request will be submitted at a later date.

A. Mission Description and Budget Item Justification

This project area develops and demonstrates aerospace sensor and processing technologies for intelligence, surveillance, reconnaissance (ISR), 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 Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Title: Integrated Navigation Technologies	1.621	4.483	4.910

Description: Develop and demonstrate technologies to provide precision position and timing information to enable distributed, layered sensing on air and space vehicles in Global Positioning System (GPS) degraded/denied environments. Develop technologies to maximize positional accuracy, timing accuracy, and exploitation techniques to improve offensive and defensive combat capabilities. Simulate, develop, and demonstrate integrated navigation warfare technologies, to establish and maintain a military advantage in satellite-based navigation.

FY 2013 Accomplishments:
Developed strategies to optimize reference technologies for distributed sensing missions. Maintained/enhanced performance while reducing size, weight, and power. Developed reference optimization components necessary to support bi-static and multi-static radar technologies.

FY 2014 Plans:
Develop technologies to preserve position, navigation, and timing (PNT) avilability, including augmentation technologies for GPS in the event of outage, and advanced technologies that do not rely on GPS. Explore integration of GPS with precise inertial measurement units (IMUs) and augmentation using geo-referenced imagery. Collaborate with the Air Force Research Laboratory's Space Vehicles Directorate to develop advanced, low-drift IMUs involving novel measurement techniques.

FY 2015 Plans:
Mature GPS augmentation technologies that take advantage of distributed platforms relaying Global Navigation Satellite Systems (GNSS) signals and geo-referenced real-time imaging to improve GPS accuracy in GPS sparse or denied environments. Develop

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force		Date: March 2014
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603203F / *Advanced Aerospace Sensors*	**Project (Number/Name)** 63665A / *Advanced Aerospace Sensors Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
technologies that expand the ability to incorporate GNSS signals into GPS user equipment as a means to improve navigation signal reliability and availability.			
Title: Persistent Sensing in Contested Environment Technologies ***Description:*** Develop active radio frequency (RF) sensor solutions to use against difficult-to-detect targets in challenging environments, and advanced RF architectures for open and reconfigurable systems. Enable persistent intelligence, surveillance, and reconnaissance (ISR) over wide areas, and detect advanced air and ground targets. ***FY 2013 Accomplishments:*** Completed development of modular RF backend (demonstration of open systems architecture) for combined radar and signals intelligence (SIGINT) processing and integrated into the outdoor range. Developed and tested a wide area staring radar. ***FY 2014 Plans:*** Complete modular RF backend demonstration for combined radar and signal intelligence (SIGINT). Continue research and development of a wide area staring radar, and begin development of staring radar RF testbed. Initiate research and development in next generation active RF sensing for contested spectrum environments, including investigation of the limits of active RF sensing with an emphasis on contested and denied environments. ***FY 2015 Plans:*** Continue research and development of high performance conformal array antenna technology, novel waveforms, Multiple-Input Multiple-Output (MIMO) signal processing techniques, and cooperative RF sensing from multiple platforms in contested environments. Characterize, measure, model, simulate, and improve system performance of active and passive RF sensing systems in terms of RF sensing geometry, environmental phenomenology, clutter, and interference.	7.104	4.000	3.000
Title: Passive Radio Frequency (RF) Sensing Technologies ***Description:*** Develop advanced techniques and prototype passive RF sensors to intercept, collect, locate and track enemy RF sensor systems for intelligence, reconnaissance and surveillance (ISR) of air and ground targets. ***FY 2013 Accomplishments:*** Completed flight test data collection of passive multistatic radar process data and developed algorithms for future multistatic radar systems. ***FY 2014 Plans:*** Initiate research for creating passive RF sensing testbed for use in indoor and outdoor range laboratories. Initiate advanced exploration and investigation of the limits of passive RF sensing with an emphasis on innovative passive techniques for operations in contested and denied environments. Develop advanced techniques for the exploitation of active RF emitters utilizing passive	3.675	4.149	3.884

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force		Date: March 2014
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603203F / *Advanced Aerospace Sensors*	**Project (Number/Name)** 63665A / *Advanced Aerospace Sensors Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
RF sensing techniques. Conduct research and development of passive RF sensors including phenomenology, modeling and simulation, algorithm development and experimentation. ***FY 2015 Plans:*** Continue research and development of passive multi-mode radar technology, including signal intelligence (SIGINT), airborne moving target indicator (AMTI), ground moving target indicator (GMTI), and synthetic aperture radar (SAR) imaging. Further develop sensor resource management capabilities for sensor time, energy, and waveform management, as well as optimal utilization of non-cooperative signals in the field of regard. Continue development of algorithms and hardware for passive RF sensing applications, with emphasis on both high endurance at long stand-off range, and survivable, covert stand-in RF sensing within contested airspace.			
Title: Long Range Sensing Technologies ***Description:*** Develop radio frequency (RF) and electro-optical (EO) 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. ***FY 2013 Accomplishments:*** Refined performance and signature models to validated requirements and concept of operations for long range synthetic aperture laser radar imaging. Conducted laboratory and field experiments for mitigating primary risk areas associated with synthetic aperture laser radar imaging from airborne platforms. ***FY 2014 Plans:*** Initiate development of advanced active and passive electro-optical (EO) sensing technologies for surveillance and reconnaissance at standoff ranges in contested environments. Continue development of long range temporal synthetic aperture radar system. Demonstrate high power, high coherence transmitter and receiver array. Initiate ground and flight test plans for aircraft integration. Develop transceiver hardware for ground based imaging of satellite in geosyncronous orbit. Initiate test and characterization of mercury-cadmium-teluride on silicone focal plane. Initiate design and prototyping of passive infrared imaging system for enhanced range infrared target recognition and full motion video. ***FY 2015 Plans:*** Extend ground moving target indicator (GMTI) and synthetic aperture radar (SAR) techniques developed for detection and tracking of dismounts and high value mobile ground targets from high angle, close-in radio frequency (RF) sensing scenarios to low angle, long stand-off RF sensing geometric scenarios with anti-access/area denial (A2/AD). Revise and extend prior radar systems engineering and develop improved algorithms and multi-static cooperative radar techniques to address the challenges of long stand-off RF sensing in A2/AD airspace.	2.281	4.000	3.000
Accomplishments/Planned Programs Subtotals	14.681	16.632	14.794

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force		Date: March 2014
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603203F / *Advanced Aerospace Sensors*	**Project (Number/Name)** 63665A / *Advanced Aerospace Sensors Technology*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

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 2015 Air Force			Date: March 2014
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603203F / *Advanced Aerospace Sensors*	Project (Number/Name) 6369DF / *Target Attack and Recognition Technology*	

COST ($ in Millions)	Prior Years	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO #	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost
6369DF: *Target Attack and Recognition Technology*	-	18.137	13.914	19.626	-	19.626	19.712	24.381	25.188	23.533	Continuing	Continuing

The FY 2015 OCO Request will be submitted at a later date.

A. Mission Description and Budget Item Justification

This project area 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 area 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 area 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 (DARPA) 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 area 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 Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Title: Automatic Target Recognition	0.516	-	-
Description: Develop and demonstrate an automatic target recognition capability integrated with advanced geo-registration techniques and innovative change detection algorithms.			
FY 2013 Accomplishments: Completed development of enhancements to automatic target recognition, automatic target cueing, geo-registration, and change detection technology to meet warfighter needs. Completed assessment and enhancement of technology supporting time-critical targeting systems in automatic target recognition. Completed development and validation of synthetic data generation capability critically needed to augment collected research, development, and operational data sets. Enhanced the Air Force automatic target recognition test and evaluation facility and data sets as required to support enhanced time-critical targeting capabilities. Completed development and assessment of time-critical targeting and advanced target tracking technologies required to meet warfighter requirements.			
FY 2014 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force		Date: March 2014
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603203F / *Advanced Aerospace Sensors*	**Project (Number/Name)** 6369DF / *Target Attack and Recognition Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Effort moved to Wide-Angle,Continuously-Staring Technologies in this Project to better align efforts. ***FY 2015 Plans:*** N/A			
Title: Integrated Sensor Targeting Technologies ***Description:*** 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 2013 Accomplishments:*** Identified candidate technologies to address deficiencies to improve electro-optical automatic target recognition, synthetic aperture radar automatic target recognition, and multi-sensor fusion algorithms. ***FY 2014 Plans:*** Continue identification of new candidate technologies to address deficiencies to improve electro-optical automatic target recognition, synthetic aperture radar automatic target recognition and the multi-sensor fusion algorithms for both Planning, Collection, Processing, Analysis, and Dissemination (PCPAD) and combat identification applications in contested and denied environments. Enhance phenomenological modeling, target and scenario databases and exploitation tools necessary to address contested and denied environments. Continue development of PCPAD capabilities for non-contested environments. ***FY 2015 Plans:*** Continue assessing integrated sensor targeting technologies for permissive environments which could serve as candidate solutions for PCPAD in contested environments. Create target signature databases from electro-optical, synthetic aperture radar, and multi-source sensor data for targets representing the highest priority threat systems.	2.881	2.700	3.570
Title: Multi-Sensor Target Recognition ***Description:*** Develop and assess multi-sensor automatic target recognition for intelligence, surveillance, reconnaissance, strike, and weapon systems. ***FY 2013 Accomplishments:*** Initiated technology assessment of intelligence, surveillance and reconnaissance (ISR) systems in anti-access/area denial (A2/AD) environments. Analyzed unique technology requirements for new automatic target recognition fusion algorithms to address anti-access/area denial environments. Initiated research in exploitation algorithms supporting Planning, Collection, Processing, Analysis and Dissemination (PCPAD). Developed fusion algorithm for automatic target recognition and exploitation in non-contested environments. ***FY 2014 Plans:***	6.517	6.484	8.206

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force		Date: March 2014
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603203F / *Advanced Aerospace Sensors*	**Project (Number/Name)** 6369DF / *Target Attack and Recognition Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Continue assessment of technology supporting intelligence, surveillance and reconnaissance systems in contested anti-access/ area denial environments. Continue development of new automatic target recognition fusion research to address technology gaps. Initiate research in development and assessment of multi-sensor automatic target recognition specifically for strike. Initiate spiral development of sensor exploitation algorithms of multi-sensor automatic target recognition systems supporting PCPAD. ***FY 2015 Plans:*** Continue development of target signature formation techniques from single and multiple cooperating sensors, and sensors and signals of opportunity. Create experiments for demonstrating the contributions of promising technologies to address deficiencies in automatic target recognition for select classes of targets in contested environments.			
Title: Wide-Angle, Continuously-Staring Technologies ***Description:*** Develop wide angle, continuous staring, multi-sensor/wavelength sensing and automated exploitation technology to detect, track, and identify targets over large areas at low sensor update rates. ***FY 2013 Accomplishments:*** Developed, integrated, and tested 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. Integrated, demonstrated, and tested the enhanced wide angle, continuously-staring component technologies via a combination of exercises and scientific analyses. Conducted spiral development of wide angle, continuous staring exploitation algorithms, phenomenological modeling, target, and scenario databases necessary to support transition to the warfighter. ***FY 2014 Plans:*** Initiate development of continuously-staring capability in contested and denied environments building upon the previous technologies developed for non-contested environments. Integrate, demonstrate and evaluate the enhanced wide angle, continuously-staring component technologies in contested and denied environments. Continue spiral development of wide angle, continuous staring exploitation algorithms, phenomenological modeling, target and scenario databases necessary to support transition to the warfighter. ***FY 2015 Plans:*** Continue development of stand-off (air and space) and episodic stand-in sensing capabilities for contested and denied environments. Continue development of exploitation algorithms, phenomenological modeling, image formation, and target and scenario databases necessary to support transition of staring sensing capabilities to the warfighter. Continue to integrate, demonstrate and evaluate enhanced wide angle and wide area sensing and exploitation technologies in conditions representative of contested and denied environments.	5.225	4.730	7.850
Title: Radio Frequency (RF) Persistent Sensing Technologies	2.998	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force		Date: March 2014
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603203F / *Advanced Aerospace Sensors*	**Project (Number/Name)** 6369DF / *Target Attack and Recognition Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Description: Develop active RF sensor solutions to use against difficult-to-detect targets in challenging environments, and advanced RF architectures for open and reconfigurable systems. Enable persistent ISR over wide areas, and detect advanced air and ground targets. ***FY 2013 Accomplishments:*** Completed development of dual-band system, and integrated on to identified platform. ***FY 2014 Plans:*** N/A. This effort completed in FY13. ***FY 2015 Plans:*** N/A			
Accomplishments/Planned Programs Subtotals	18.137	13.914	19.626

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

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.