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

DATE: February 2002

BUDGET ACTIVITY: 03 - Advanced Technology Development

PE NUMBER AND TITLE: 0603203F Advanced Aerospace Sensors

	COST ($ in Thousands)	FY 2001 Actual	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
	Total Program Element (PE) Cost	44,774	60,914	50,589	42,072	37,115	38,011	38,045	Continuing	TBD
5019	Advanced RF Technology for ISR Sensors	0	0	4,725	6,047	4,250	5,925	5,531	Continuing	TBD
665A	Advanced Aerospace Sensors Technology	17,156	17,334	11,241	10,157	10,976	9,922	11,063	Continuing	TBD
69DF	Target Attack and Recognition Technology	27,618	43,580	34,623	25,868	21,889	22,164	21,451	Continuing	TBD
	Quantity of RDT&E Articles	0	0	0	0	0	0	0	Continuing	TBD

In FY 2002, work performed under PE 0603253F, Projects 2735 and 666A, moves to this PE, Project 665A. Apparent project ramp in Project 665A is due only to realignment of the projects. In FY 2003, efforts in advanced radio frequency (RF) technologies for intelligence, surveillance, and reconnaissance (ISR) sensors previously performed in this PE, Project 665A, transfers to this project. Also in FY 2003, space unique tasks in this PE, Project 665A, will be transferred to PE 0603500F, Project 5034, in conjunction with the Space Commission recommendation to consolidate all space unique activities.

(U) A. Mission Description

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 RF sensors for aerospace ISR systems. The second project develops and demonstrates advanced technologies for electro-optical (EO) sensors, radar sensors and electronic counter-countermeasures (ECCM), and components and algorithms. The third project develops and demonstrates RF and 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. Note: In FY 2002, Congress added $1.0 million for Advanced Physical Vapor Transport and $7.4 million for the Radar Target Modeling Thrust.

(U) B. Budget Activity Justification

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.

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

DATE: February 2002

BUDGET ACTIVITY: 03 - Advanced Technology Development

PE NUMBER AND TITLE: 0603203F Advanced Aerospace Sensors

(U) C. Program Change Summary ($ in Thousands)

		FY 2001	FY 2002	FY 2003	Total Cost
(U)	Previous President's Budget	46,381	55,809	43,098	
(U)	Appropriated Value	46,811	61,509		
(U)	Adjustments to Appropriated Value				
	a. Congressional/General Reductions		-595		
	b. Small Business Innovative Research	-1,100			
	c. Omnibus or Other Above Threshold Reprogram				
	d. Below Threshold Reprogram	-507			
	e. Rescissions	-430			
(U)	Adjustments to Budget Years Since FY 2002 PBR			7,491	
(U)	Current Budget Submit/FY 2003 PBR	44,774	60,914	50,589	TBD

(U) Significant Program Changes:

In FY 2002, work performed under PE 0603253F, Projects 2735 and 666A, moves to this PE, Project 665A. Apparent project ramp in Project 665A is due only to realignment of the projects. In FY 2003, space unique tasks in this PE, Project 665A, will be transferred to PE 0603500F, Project 5034, in conjunction with the Space Commission recommendation to consolidate all space unique activities.

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

DATE: February 2002

BUDGET ACTIVITY: 03 - Advanced Technology Development

PE NUMBER AND TITLE: 0603203F Advanced Aerospace Sensors

PROJECT: 5019

COST ($ in Thousands)	FY 2001 Actual	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
5019 Advanced RF Technology for ISR Sensors	0	0	4,725	6,047	4,250	5,925	5,531	Continuing	TBD

In FY 2003, efforts in advanced radio frequency technologies for intelligence, surveillance, and reconnaissance (ISR) sensors previously performed in this PE, Project 665A, transfers to this project.

(U) A. Mission Description

This project develops and demonstrates radio frequency (RF) aerospace surveillance sensors and signal processing for ISR sensors capable of operating in adverse clutter and jamming environments. This project provides the warfighter with sensors capable of detecting and tracking both airborne (conventional and low radar cross section) and ground-based high value, time-critical targets. Work includes developing aerospace environmentally qualified (vibration, shock, temperature, and radiation hardened) sensor capabilities (including integrated electro-optical mixed signal), as well as advanced component and subsystem technologies.

(U) FY 2001 ($ in Thousands)

(U) $0 No Activity

(U) $0 Total

(U) FY 2002 ($ in Thousands)

(U) $0 No Activity

(U) $0 Total

(U) FY 2003 ($ in Thousands)

(U) $882 Configure data collection opportunities using existing assets for validation of techniques generated for advanced air moving target indication, ground moving target indication (GMTI), and foliage penetrating ground target indication. Initiate effort to design a flexible testbed using a manned test aircraft to demonstrate multi-intelligence surveillance.

(U) $1,503 Conduct in-house development of a multi-intelligence sensor design, utilizing technologies developed in aperture development, signal processing, and radar design. Develop techniques for discriminating ground from air targets under conditions of common pulse repetition frequencies, waveforms, and receiver systems.

(U) $1,457 Develop advanced radar signal processing techniques to mitigate clutter and jamming interference, and improve detection and tracking of difficult targets in hostile environments. Develop knowledge-aided radar signal processing techniques for improved detection and false alarm control performance in GMTI sensors. Implement multi-dimensional adaptive processing techniques and knowledge-aided radar signal

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2A Exhibit)		DATE: February 2002
BUDGET ACTIVITY: 03 - Advanced Technology Development	PE NUMBER AND TITLE: 0603203F Advanced Aerospace Sensors	PROJECT: 5019

(U) A. Mission Description Continued

(U) FY 2003 ($ in Thousands) Continued

processing techniques on selected advanced computing architectures, and demonstrate these techniques for multi-mission aerospace radar applications.

(U) $883 Develop and demonstrate photonic digital and analog mixed signal multi-gigahertz component architectures. Develop and integrate chip-scale photonic and hybrid mixed signal components for radio frequency signal generation, phased array antenna beam formation, and beam control. Develop and demonstrate high-resolution wide bandwidth photonic wavelength division multiplexing and signal processing technology. Provide performance modeling, verification, and analysis of photonic and hybrid mixed signal devices for military unique applications.

(U) $4,725 Total

(U) B. Project Change Summary

Not Applicable.

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

(U) Related Activities:
(U) PE 0602204F, Aerospace Sensors.
(U) PE 0603270F, Electronic Combat Technology.
(U) PE 0603500F, Multi-disciplinary Adv Space Tech.
(U) PE 0604270F, Electronic Warfare (EW) Development.
(U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) D. Acquisition Strategy

Not Applicable.

(U) E. Schedule Profile

(U) Not Applicable.

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

DATE: February 2002

BUDGET ACTIVITY: 03 - Advanced Technology Development

PE NUMBER AND TITLE: 0603203F Advanced Aerospace Sensors

PROJECT: 665A

COST ($ in Thousands)	FY 2001 Actual	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
665A Advanced Aerospace Sensors Technology	17,156	17,334	11,241	10,157	10,976	9,922	11,063	Continuing	TBD

In FY 2003, space unique tasks in this project will be transferred to PE 0603500F, Project 5034, in conjunction with the Space Commission recommedation to consolidate all space unique activities. Also in FY 2003, efforts in advanced radio frequency technologies for intelligence, surveillance, and reconnaissance (ISR) sensors previously performed in this project will transfer to this PE, Project 5019.

(U) A. Mission Description

This project develops and demonstrates aerospace sensor technologies for manned and unmanned platforms, including electro-optical (EO) sensors, targeting and attack radar sensors, and electronic counter-countermeasures (ECCM) 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. Project activities include developing multi-function radar and electronic combat technology. Desired warfighting capabilities include the ability to detect concealed targets in difficult background conditions.

(U) FY 2001 ($ in Thousands)

(U) $641 Developed integrated EO sensor technology to search, detect, locate, and identify air and ground targets at ranges longer than currently achievable, whether the targets are camouflaged, low-observable, or employing other means of deception. Optimized sensor design and performed utility assessments for an affordable integrated targeting capability.

(U) $10,500 Developed EO sensor technologies to detect and locate camouflaged and concealed targets for aerospace ISR applications. Completed critical signature data collection experiments to determine performance parameters for day/night hyperspectral sensors. Fabricated a hyperspectral imaging sensor for high altitude reconnaissance aircraft.

(U) $868 Developed advanced radar signal processing techniques to mitigate clutter and jamming interference and improve detection and tracking of difficult targets. Demonstrated ability to detect slow moving airborne and ground targets from an airborne platform.

(U) $3,148 Developed and demonstrated the radio frequency (RF) sensor and algorithm technology required to detect, identify, and target high-value, time-critical targets obscured by foliage or concealed through deceptive techniques. Performed flight test demonstrations of foliage penetration RF sensor and real-time image formation algorithms.

(U) $20 Developed technology to lower life cycle costs of radar systems. Developed low-cost, lightweight antennas using micro-electro-mechanical phase shifters for aerospace surveillance and strike radar applications.

(U) $765 Developed advanced EO sensor technology for non-cooperative target identification. Flight tested eye-safe sensor. Performed necessary modifications prior to sensor transition.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2A Exhibit)	DATE: February 2002
BUDGET ACTIVITY: 03 - Advanced Technology Development	PE NUMBER AND TITLE: 0603203F Advanced Aerospace Sensors / PROJECT: 665A

(U) A. Mission Description Continued

(U) FY 2001 ($ in Thousands) Continued

(U)	$133	Developed advanced multi-function sensor component technologies for radar, electronic warfare, navigation, and communications applications. Demonstrated and evaluated affordable, high performance radio frequency (RF) circuits and packaging technologies for use in phased array transmit/receive modules on manned and unmanned platforms. (In FY 2000, this work was performed in this PE, Project 69CK.)
(U)	$743	Developed advanced RF photonic signal control and distribution technologies for phased array apertures. Demonstrated and evaluated photonic beamforming. Designed and fabricated true-time-delay photonic technology for phased array antennas used in intelligence, surveillance, and reconnaissance (ISR) applications. (In FY 2000, this effort was conducted under PE 0603726F, Project 2863.)
(U)	$338	Developed and demonstrated advanced modular, shareable digital RF sensor technologies for aerospace sensor suites used in intelligence, surveillance, and reconnaissance (ISR) applications. Fabricated and tested dual-use, modular digital RF receiver components for multi-mode radar operations.
(U)	$17,156	Total

(U) FY 2002 ($ in Thousands)

(U)	$2,710	Develop integrated electro-optical (EO) sensor technology to search, detect, locate, and identify air and ground targets at ranges significantly longer than currently achievable, including targets that are camouflaged, low-observable, or employ other means of deception. Design and begin demonstrating active and passive sensor components of an affordable, integrated targeting capability.
(U)	$3,718	Develop EO sensor technologies to detect and locate camouflaged and concealed targets for aerospace ISR applications. Continue fabricating a demonstration sensor for high altitude reconnaissance aircraft, perform initial system utility demonstrations, and develop signature-based data processing techniques.
(U)	$1,032	Develop advanced radar signal processing techniques to mitigate clutter and jamming interference and improve detection and tracking of difficult targets. Design processing architecture for evaluating multi-dimensional adaptive processing techniques. Demonstrate these techniques for multi-mission aerospace radar applications.
(U)	$3,231	Develop, test, evaluate, and demonstrate the RF sensor techniques required to detect, track, and target high-value, time-critical targets that are concealed through staelth or deceptive techniques. Demonstrate technologies to increase detection range for low-observable targets. Initiate concept design study for a 'mini' unmanned aerospace vehicle RF sensor to detect, track, and target high-value, time-critical targets that are difficult to detect through either stealth or concealment.
(U)	$908	Develop advanced EO sensor technology for non-cooperative target identification. Complete design and begin development of a multi-function laser for air and ground target identification.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2A Exhibit)	DATE February 2002
BUDGET ACTIVITY 03 - Advanced Technology Development	PE NUMBER AND TITLE 0603203F Advanced Aerospace Sensors
	PROJECT 665A

(U) A. Mission Description Continued

(U) FY 2002 ($ in Thousands) Continued

(U)	$1,099	Develop advanced multi-function sensor component technologies for radar, electronic warfare, navigation, and communications applications. Initiate evaluation of very high density two-dimensional and three-dimensional interconnects for phased array transmit/receive modules on manned and unmanned platforms. Complete testing a multi-chip module version of a monobit receiver for electronic warfare applications. Develop advanced radio frequency (RF) photonic signal control and distribution technologies for phased array apertures.
(U)	$1,985	Develop and demonstrate advanced modular, sharable, digital RF sensor technologies for aerospace sensor suites performing intelligence, surveillance, and reconnaissance (ISR) applications. Demonstrate a multi-channel radar digital receiver with channel match greater than 60dB and jammer cancellation. (In FY 2001, this work was performed in PE 0603253F, Project 2735.)
(U)	$1,660	Develop technologies to maximize Global Positioning System (GPS) jam resistance, positional accuracy, and exploitation techniques to improve offensive and defensive combat capabilities. Design advanced GPS M-Code technology. Develop geo-registration and precise target location technology supporting multi-sensor and distributed sensor integration. (In FY 2001, this work was performed in PE 0603253F, Project 666A.)
(U)	$991	Develop deposition techniques for high growth rate, high quality silicon carbide semiconductor substrates to enable advanced physical vapor transport techniques.
(U)	$17,334	Total

(U) FY 2003 ($ in Thousands)

(U)	$3,239	Develop integrated electro-optical (EO) sensor technology to search, detect, locate, and identify air and ground targets at ranges significantly longer than currently achievable, including targets that are camouflaged, low-observable, or employ other means of deception. Complete fabricating and testing a ground demonstration sensor and aircraft integration design. Assess real-time data processing performance.
(U)	$3,333	Develop EO sensor technologies to detect and locate camouflaged and concealed targets for aerospace ISR applications. Complete fabricating and testing a demonstration sensor for high altitude reconnaissance aircraft. Perform flight characterization. Assess signature-based data processing performance.
(U)	$1,398	Develop advanced EO sensor technology for non-cooperative target identification. Complete design and begin development of a multi-function laser for air and ground target identification.
(U)	$1,210	Develop technologies to maximize GPS jam resistance, positional accuracy, timing accuracy, and exploitation techniques to improve offensive and defensive combat capabilities. Develop advanced GPS M-Code technologies. Develop reference technologies to adaptively operate GPS in buildings, underground, and in air and space to provide precise time, position, and velocity for multiple platforms. Develop virtual flight test

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2A Exhibit)		DATE: February 2002
BUDGET ACTIVITY: 03 - Advanced Technology Development	PE NUMBER AND TITLE: 0603203F Advanced Aerospace Sensors	PROJECT: 665A

(U) A. Mission Description Continued

(U) FY 2003 ($ in Thousands) Continued

		technology for improved assessment of GPS anti-jam technologies.
(U)	$1,828	Develop, test, evaluate, and demonstrate the RF sensor techniques required to detect, track, and target high-value, time-critical targets that are difficult to detect through either stealth or concealment. Evaluate 'mini' unmanned aerospace vehicle concept of operation and RF sensor performance improvements in the detection, tracking, and targeting of high-value, time-critical targets.
(U)	$233	Provide concept definition and system analysis of a fire control radar system for airborne applications.
(U)	$11,241	Total

(U) B. Project Change Summary

Not Applicable.

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

(U) Related Activities:
(U) PE 0602204F, Aerospace Sensors.
(U) PE 0603205F, Flight Vehicle Technology.
(U) PE 0603707F, Weather Systems Advanced Development.
(U) PE 0603500F, Multi-disciplinary Adv Space Tech.
(U) PE 0602111N, Weapons Technology.
(U) PE 0602232N, Space and Electronic Warfare (SEW) Technology.
(U) PE 0604249F, LANTIRN Night Precision Attack.
(U) PE 0603270F, Electronic Combat Technology.
(U) An MOA has been established between AFRL and DARPA to jointly develop the technology required to detect high-value, time-critical targets in a variety of environments including deception, camouflage, concealment, and deep hide.
(U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) D. Acquisition Strategy

Not Applicable.

(U) E. Schedule Profile

(U) Not Applicable.

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

DATE: February 2002

BUDGET ACTIVITY: 03 - Advanced Technology Development

PE NUMBER AND TITLE: 0603203F Advanced Aerospace Sensors

PROJECT: 69DF

COST ($ in Thousands)	FY 2001 Actual	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
69DF Target Attack and Recognition Technology	27,618	43,580	34,623	25,868	21,889	22,164	21,451	Continuing	TBD

In FY 2003, efforts in advanced radio frequency technologies for intelligence, surveillance, and reconnaissance previously performed in this project will transfer to this PE, Project 5019.

(U) A. Mission Description

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 (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 are high leverage efforts, providing for significant advancements in operational capabilities largely through software improvements readily transitionable to new and existing weapon systems.

(U) FY 2001 ($ in Thousands)

(U) $2,347 Developed advanced situational awareness technologies for rapid detection, location, and prosecution of time-critical targets. Demonstrated algorithms for multisensor fusion of on- and off-board data and images.

(U) $1,346 Developed and demonstrated technologies for real-time information in- and out-of-the-cockpit for improved situational awareness. Completed route replanning simulations. Continued developing real-time retargeting algorithms for special operation forces applications.

(U) $1,823 Developed and evaluated radar automatic target recognition (ATR) algorithms for tracking and identifying moving and stationary ground targets. Conducted risk reduction activities to improve affordability and the smooth transition of technology via planned sensor upgrades to strike and reconnaissance platforms.

(U) $835 Developed target recognition concepts using hyperspectral imaging data and other candidate sensor inputs to determine requirements for ATR

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2A Exhibit)	DATE February 2002
BUDGET ACTIVITY: 03 - Advanced Technology Development	PE NUMBER AND TITLE: 0603203F Advanced Aerospace Sensors	PROJECT: 69DF

(U) A. Mission Description Continued

(U) FY 2001 ($ in Thousands) Continued

and target/background phenomenology efforts. Evaluated algorithms using hyperspectral imaging data.

(U) $3,108 Continued testing and integrating Defense Advanced Research Projects Agency (DARPA) multi-sensor Automatic Target Recognition (ATR) fusion algorithms into the Air Force ATR evaluation test facility for application to Air Force intelligence, surveillance, and reconnaissance missions.

(U) $4,159 Developed advanced tactical targeting technology in conjunction with DARPA for suppression of enemy air defenses. Optimized targeting algorithms and techniques. Modified brassboard units that triangulate threat emitter position and provide targeting for precision guided munitions. (In FY 2002, this effort transfers to PE 0603270F, Project 2432.)

(U) $3,500 Developed Integrated Demonstrations and Applications Laboratory technology. Performed integration of infrared (IR) and radio frequency (RF) sensors to simulate battlefield-condition sensor operation at dramatically reduced cost.

(U) $10,500 Developed a National Radar Signature Production and Research Capability (RCAS). Developed computer modeling and simulation of aircraft radar signature libraries necessary to discriminate friend, foe, and neutral targets.

(U) $27,618 Total

(U) FY 2002 ($ in Thousands)

(U) $1,193 Develop advanced global awareness and precision engagement automated targeting technologies for rapid detection, location, and prosecution of time-critical targets. Integrate modeling, simulation, and analysis testbed to determine ATR and information fusion algorithms for time-critical targeting, emphasizing the difficult targeting missions where weather, terrain, foliage, camoflauge, or deception techniques obscure or conceal the targets of interest during most of their deployment cycles.

(U) $3,230 Develop common, open system technologies for integrating real-time information in- and out-of-the-cockpit to improve aircrew situational awareness, target nomination, and target engagement capabilities. Demonstrate a capability to fuse all-source threat, target, and survivor location data for use on special operations forces aircraft.

(U) $2,718 Develop and evaluate radar ATR algorithms for tracking and identifying moving and stationary ground targets. Continue demonstration of affordable risk reduction for transition via planned sensor upgrades to strike and reconnaissance platforms. These algorithms will significantly impact the capability to find, fix, track, target, engage, and assess time-critical targets in all phases of deployments, including active and passive communication and emission states; during hide in foliage; and either moving or stationary.

(U) $873 Develop ATR solutions using hyperspectral imaging data and other candidate sensor inputs. Develop target and background phenomenology technology to recognize and identify targets using hyperspectral imaging data. Conduct performance analyses on candidate algorithms using

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2A Exhibit)	DATE February 2002
BUDGET ACTIVITY 03 - Advanced Technology Development	PE NUMBER AND TITLE 0603203F Advanced Aerospace Sensors
	PROJECT 69DF

(U) A. Mission Description Continued

(U) FY 2002 ($ in Thousands) Continued

hyperspectral imaging data.

(U) $2,796 Continue testing and integrating DARPA multi-sensor ATR fusion algorithms into the Air Force ATR evaluation test facility for application to Air Force intelligence, surveillance, and reconnaissance, strike, and weapon systems. Demonstrate impact to image analysts and Air Operation Center decision makers of automated multi-sensor Automatic Target Recognition (ATR) and fusion capability on sensor-to-shooter timeline reductions for time-critical targeting.

(U) $25,441 Develop technology to detect and identify targets under trees. Design and fabricate a very-high frequency (VHF) foliage penetration radar. Develop and implement VHF radar change detection algorithms for robust target detection with a low false alarm rate. Perform VHF radar data collections for algorithm development and foliage penetration characterization. Develop imagery exploitation algorithms for target identification sensor fusing techniques. Perform high fidelity modeling of the VHF radar, change detection capability, data fusion process, and weapon effectiveness. Develop integration plans for a warfighter-selected operational platform. Develop and demonstrate air-to-ground radar imaging technology and reliable combat identification technology to enable capability to detect and target difficult, concealed, and non-cooperative targets.

(U) $7,329 Continue developing a National Radar Signature Production and Research Capability. Develop, validate, and begin integrating data libraries discriminating friend, foe, and neutral targets into aircraft radar signature computer modeling and simulation tools.

(U) $43,580 Total

(U) FY 2003 ($ in Thousands)

(U) $2,006 Develop modeling and simulation to show enhanced global awareness and precision engagement capability for warfighters, as enabled by automated targeting technologies for rapid detection, location, and prosecution of time-critical targets. Employ the modeling, simulation, and analysis testbed to analyze and demonstrate ATR and information fusion algorithms for time-critical targeting, emphasizing the difficult targeting missions where weather, terrain, foliage, camouflage, and deception techniques obscure or conceal the targets of interest. Develop and employ air and ground target signature generation models to support automated target signature exploitation in automatic target recognizer and multi-sensor fusion algorithms. Generate synthetic target signatures for automated signature exploitation of radio frequency and electro-optical sensor data.

(U) $1,818 Continue common open system technology integration for real-time information in- and out-of-the-cockpit to improve aircrew combat and joint battlespace situational awareness, target nomination, and target engagement capabilities. Demonstrate initial capability to fuse all-source threat, imagery, target, and survivor location data using an airborne platform digitally linked to airborne combat search and rescue assets.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2A Exhibit)	DATE: February 2002
BUDGET ACTIVITY: 03 - Advanced Technology Development	PE NUMBER AND TITLE: 0603203F Advanced Aerospace Sensors
	PROJECT: 69DF

(U) A. Mission Description Continued

(U) FY 2003 ($ in Thousands) Continued

(U)	$5,160	Continue developing and testing an ATR system for tracking and identifying moving and stationary ground targets for use in strike and reconnaissance platforms. Integrate advanced stationary target identification techniques and algorithms with synthetic aperture radar processing. Advance the state-of-the-art for moving target identification techniques and algorithms by providing technology maturation and risk reduction. Continue analysis of requirements and affordable risk reduction for transition via planned sensor upgrades to strike and reconnaissance platforms.
(U)	$3,766	Test and integrate Air Force and Defense Advanced Research Projects Agency (DARPA) multi-sensor automatic target recognition (ATR) fusion algorithms into the Air Force ATR evaluation test facility for application to Air Force intelligence, surveillance, reconnaissance, strike, and weapon systems. Characterize single and multisensor contributions from radar and electro-optic (including hyperspectral imaging) sensors with automated exploitation. Continue demonstrating to image analysts and Air Operation Centers decision makers of automated multi-sensor ATR and fusion capability on timeline reductions for time-critical targeting.
(U)	$12,973	Develop technology to detect, identify, and engage targets under trees (TUT). Characterize performance of foliage penetration radar sensors and algorithms for robust target detection and tracking with low probability of false alarms. Develop TUT-specific tools Intelligence Preparation of the Battlefield for improved tracking, detection, sensor management, and target identification and location. Develop tools for multi-intelligence georegistration. Perform end-to-end modeling for the TUT family of systems, providing measures of effectiveness that encompass the entire kill chain cycle. Perform virtual simulations to identify system integration issues, human decision functions, and system processes. Develop integration plans with warfighter-selected operational systems. Test system functionality, including fusion and georegistration; and concepts of employment.
(U)	$8,900	Continue developing and demonstrating a moderate confidence automatic target recognition and advanced cueing (ATR/C) capability for stationary and moving targets under the Air-to-Ground Radar Imaging effort. Continue developing a follow-on, high confidence combat identification capability under the Reliable Combat Identification for Surface Targeting effort. Characterize advanced stationary and moving target radar data to determine its utility for ATR/C and combat identification. Develop tools to support sensor system, sensor management, and system performance analyses. Characterize the performance of identification techniques for multiple moving targets. Perform advanced multi-sensor data collection on stationary and moving targets. Determine which combination of sensors, modes, and fusion processing techniques would provide combat identification of the highest confidence.
(U)	$34,623	Total

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2A Exhibit)	DATE: February 2002

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT
03 - Advanced Technology Development	0603203F Advanced Aerospace Sensors	69DF

(U) B. Project Change Summary

Not Applicable.

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

(U) Related Activities:
(U) PE 0602204F, Aerospace Sensors.
(U) PE 0603253F, Advanced Sensor Integration.
(U) PE 0603500F, Multi-disciplinary Adv Space Tech.
(U) PE 0603762E, Sensor and Guidance Technology.
(U) PE 0603270F, Electronic Combat Technology.
(U) Theater Missile Defense System Program Office.
(U) Low Altitude Night Targeting and Infrared Navigation (LANTIRN) System Program Office.
(U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) D. Acquisition Strategy

Not Applicable.

(U) E. Schedule Profile

(U) Not Applicable.