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

DATE: February 2002

BUDGET ACTIVITY: 02 - Applied Research

PE NUMBER AND TITLE: 0602500F MULTI-DISCIPLINARY SPACE TECH

	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	0	0	53,592	70,020	73,748	68,442	73,070	Continuing	TBD
5023	Laser & Imaging Space Tech	0	0	1,273	1,083	1,012	420	398	Continuing	TBD
5024	Human Centered Applied Space Tech	0	0	496	693	869	0	0	Continuing	TBD
5025	Space Materials Development	0	0	18,608	20,449	23,888	24,144	24,676	Continuing	TBD
5026	Rocket Propulsion Component Tech	0	0	19,612	31,048	32,543	33,206	33,708	Continuing	TBD
5027	High Speed Airbreathing Prop Tech	0	0	4,238	4,668	4,904	5,094	5,210	Continuing	TBD
5028	Space Sensors, Photonics & RF Proc	0	0	1,025	1,602	2,064	1,871	4,491	Continuing	TBD
5029	Space Sensor & CM Tech	0	0	7,038	8,737	5,650	1,687	1,186	Continuing	TBD
5030	Applied Space Access Vehicle Tech	0	0	1,302	1,740	2,818	2,020	3,401	Continuing	TBD
	Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0

Note: This is a new PE, but not a New Start, resulting from the Space Commission recommendation to consolidate all space unique activities. In FY 2003, space unique efforts in the following PEs/Projects transferred to this PE in conjunction with the Space Commission recommendation: PE 0602102F, Projects 4347, 4348, 4349, and 5015, to Project 5025; PE 0602201F, Project 2403, to Project 5030; PE 0602202F, Project 7184, to Project 5024; PE 0602203F, Project 4847, to Project 5026; PE 0602203F, Project 3012, to Project 5027; PE 0602204F, Project 2002, to Project 5028; Projects 2002, 6095, and 7622, to Project 5029; PE 0602605F, Project 4866, to Project 5023.

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In FY 2003, this program anticipates receiving $43.0 million from the Cost of War Transfer Account. These funds are not included in the FY 2003 Air Force baseline. Funding will be used to advance technologies in support of space-based radar efforts.

(U) A. Mission Description

This program advances the technology base in multiple disciplines for future space applications in eight projects, each focusing on a separate technology area. 1) Laser and imaging space technologies develop concepts for advanced, very long-range optical systems and assess the vulnerability of satellites to the effects of high energy laser weapon systems. 2) Human centered applied space technologies focus on the human interface concepts that improve satellite operations during routine and on-demand space missions. 3) Space materials concentrate on the materials technology base for spacecraft and launch systems to improve affordability, maintainability, and performance. 4) Rocket propulsion component technologies advance technology in liquid propulsion rocket engines, solid rocket motors, and application of advanced materials for rockets and ballistic missiles to achieve revolutionary launch capabilities. 5) High-speed airbreathing propulsion technologies develop advanced and combined cycle engine technologies for revolutionary low-cost access to space. 6) Space sensors, photonics, and radio frequency processes, develop technologies to generate, control, process, receive, and transmit opto-electronic signals for space sensor applications. 7) Space sensors and countermeasures technologies focus on generation, control, reception and processing of electronic and electromagnetic signals for space sensor applications in intelligence, surveillance, reconnaissance, warning, electronic combat, and countermeasures. 8) Applied space access vehicle technologies develop advanced concepts for affordable on-demand access to space.

(U) B. Budget Activity Justification

This program in Budget Activity 2, Applied Research, since it develops and determines the technical feasibility and military utility of evolutionary and revolutionary technologies.

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

		FY 2001	FY 2002	FY 2003	Total Cost
(U)	Previous President's Budget	0	0	0	
(U)	Appropriated Value	0	0		
(U)	Adjustments to Appropriated Value				
	a. Congressional/General Reductions				
	b. Small Business Innovative Research				
	c. Omnibus or Other Above Threshold Reprogram				
	d. Below Threshold Reprogram				
	e. Rescissions				
(U)	Adjustments to Budget Years Since FY 2002 PBR			53,592	

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

		FY 2001	FY 2002	FY 2003	Total Cost
(U)	Current Budget Submit/FY 2003 PBR	0	0	53,592	TBD

(U) Significant Program Changes:

This is a new PE, but not a New Start, resulting from the Space Commission recommendation to consolidate all space unique activities.

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

DATE: February 2002

BUDGET ACTIVITY: 02 - Applied Research

PE NUMBER AND TITLE: 0602500F MULTI-DISCIPLINARY SPACE TECH

PROJECT: 5023

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
5023 Laser & Imaging Space Tech	0	0	1,273	1,083	1,012	420	398	Continuing	TBD

Note: In FY 2003, space unique efforts transferred from PE 0602605F, Project 4866, into this project in conjunction with the Space Commission recommendation to consolidate all space unique activities.

(U) A. Mission Description

This project examines the technical feasibility of laser and imaging technologies that are uniquely space-oriented technology including advanced, very long-range optical system concepts for both imaging and beam projection applications. It also supports the modeling and analysis of satellite objects to assess vulnerability to laser radiation and to support the space situational awareness mission. Near-term focus is on the continued assessment of satellite vulnerabilities and their investigation of optical approaches to meet optical quality requirements for ultra-light, large aperture, space-based optical systems.

(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) $636 Develop and field test advanced optics technologies to support beam projection and imaging applications associated with large aperture lightweight optics. Investigate, test, and characterize larger size advanced optics/liquid crystal optical devices scalable to high power beam projection applications. By decreasing the number of system components and extending the wavelength coverage, this technology has the potential to enable the use of ultra-light, large aperture mirrors in space-based optical systems.

(U) $637 Assess the vulnerability of five new United States, North Atlantic Treaty Organization, or foreign satellites to the effects of high-energy laser weapons. Update previously completed assessments on catalogued satellites. Incorporate improved algorithms and hardware for rapidly characterizing new launches into current data fusion workstations for the space situational awareness mission.

(U) $1,273 Total

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BUDGET ACTIVITY: 02 - Applied Research	PE NUMBER AND TITLE: 0602500F MULTI-DISCIPLINARY SPACE TECH	PROJECT: 5023

(U) B. Project Change Summary

Not Applicable.

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

(U) Related Activities:
(U) PE 0602605F, Directed Energy Technology.
(U) PE 0603444F, Maui Space Surveillance Systems.
(U) PE 0603500F, Multi-Disciplinary Adv Dev Space Technology.
(U) PE 0603605F, Advanced Weapons Technology.
(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: 02 - Applied Research

PE NUMBER AND TITLE: 0602500F MULTI-DISCIPLINARY SPACE TECH

PROJECT: 5024

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
5024 Human Centered Applied Space Tech	0	0	496	693	869	0	0	Continuing	TBD

Note: In FY 2003, space unique efforts transferred from PE 0602202F, Project 7184, into this project in conjunction with the Space Commission recommendation to consolidate all space unique activities. Outyear funding profiles will be addressed in future budget activities.

(U) A. Mission Description

This project identifies and develops human and crew interface concepts and technologies that improve satellite operations, satellite attack reporting, and crew situational awareness during routine and on-demand space missions. Payoffs include faster satellite reconfiguration for time-critical targeting, improved situational awareness of the space battlespace, and lower cost for operations, training, and modernization due to reduced manning and control station standardization.

(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) $496 Develop and evaluate new crew interface concepts for satellite attack reporting, having the optimal mix of human interface technologies that maximize crew situational awareness. Identify new human roles for on-orbit servicing, prepare a satellite control station simulator as an evaluation testbed, and begin to develop a multi-sensory control station interface usable across systems.
(U) $496 Total

(U) B. Project Change Summary

Not Applicable.

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BUDGET ACTIVITY: 02 - Applied Research	PE NUMBER AND TITLE: 0602500F MULTI-DISCIPLINARY SPACE TECH	PROJECT: 5024

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

(U) Related Activities:

(U) PE 0602202F, Human Effectiveness Applied Research.

(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.

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DATE: February 2002

BUDGET ACTIVITY: 02 - Applied Research

PE NUMBER AND TITLE: 0602500F MULTI-DISCIPLINARY SPACE TECH

PROJECT: 5025

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
5025 Space Materials Development	0	0	18,608	20,449	23,888	24,144	24,676	Continuing	TBD

Note: In FY 2003, space unique efforts were transferred from PE 0602102F, Projects 4347, 4348, 4349, and 5015, into this project in conjunction with the Space Commission recommendation to consolidate all space unique activities.

(U) A. Mission Description

This project develops the materials and processing technology base for spacecraft and launch systems to improve affordability, maintainability, and performance of current and future Air Force space systems. Families of affordable lightweight materials are being developed, including metals, polymers, ceramics, metallic composites, and nonmetallic composites, to provide new capabilities for spacecraft, ballistic missile, and propulsion systems to meet the future space requirements. Advanced thermal protection materials are being developed that are affordable, lightweight, dimensionally stable, thermally conductive, and/or ablation and erosion resistant to meet space and ballistic missile requirements. Develops materials technologies for surveillance and terrestrial situational awareness systems and subsystems for space and ballistic missile applications.

(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) $11,484 Develop materials and processes to dramatically improve performance, durability, and cost of rocket propulsion systems. Evaluate new candidate materials for rocket engines such as metal matrix composites, ceramics, and advanced organic composites for use in liquid oxygen, liquid hydrogen, high-temperature, and high-pressure environments. Identify and evaluate the applications of these materials to turbopump housings, ducts, valves, solid rocket casings, insulation, nozzle throats, and spacecraft propulsion. Develop material property databases and initiate demonstration of suitability for application using representative geometry and processing conditions for the intended rocket engine components.
(U) $5,685 Develop affordable, advanced structural and non-structural materials and technologies for Air Force space applications. Demonstrate optically

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(U) A. Mission Description Continued

(U) FY 2003 ($ in Thousands) Continued

tailorable thermal control coatings with controlled heat dissipation for spacecraft thermal control. Establish baseline effects of the space environment on polymer and thermal control coatings. Optimize processing methods for the metallic materials which are expected to be used for lightweight, high-strength components in future space vehicles. Test non-autoclave materials and processes for composite cryogenic tank structures for future Air Force space platforms.

(U) $1,439 Develop and demonstrate materials and materials processing technologies to enable improved performance, affordability, and performance of surveillance, tracking, targeting, and situational awareness systems. Refine improved thin film processing techniques to optimize efficiency in solar cells. Validate and transition materials processing techniques and materials that will enable high performance optical control of phased array radar and satellite-to-satellite data links. Demonstrate alternative infrared detector materials for space applications capable of detecting very long wavelengths.

(U) $18,608 Total

(U) B. Project Change Summary

Not Applicable.

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

(U) Related Activities:

(U) PE 0602102F, Materials.

(U) PE 0603112F, Advanced Materials for Weapon Systems.

(U) PE 0603500F, Multi-Disciplinary Adv Dev Space Technology.

(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.

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DATE: February 2002

BUDGET ACTIVITY: 02 - Applied Research

PE NUMBER AND TITLE: 0602500F MULTI-DISCIPLINARY SPACE TECH

PROJECT: 5026

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
5026 Rocket Propulsion Component Tech	0	0	19,612	31,048	32,543	33,206	33,708	Continuing	TBD

Note: In FY 2003, space unique efforts transferred from PE 0602203F, Project 4847, into this project in conjunction with the Space Commission recommendation to consolidate all space unique activities.

(U) A. Mission Description

This project develops advances in rocket technologies for space access, maneuver, and ballistic missiles. Analytical and experimental areas of emphasis are propellants, combustion, rocket materials, sustainment of strategic systems, and novel space propulsion concepts. Technologies of interest will improve reliability, performance, survivability, affordability, and environmental compatibility of future space and missile launch subsystems. Technologies are developed to reduce the weight and cost of components using new materials and improved designs and manufacturing techniques. All efforts in this project are part of the Integrated High Payoff Rocket Propulsion Technology program, a joint Department of Defense, National Aeronautics and Space Administration, and industry effort to focus rocket propulsion technology on national needs.

(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) $2,082 Develop, characterize, and test advanced hydrocarbons and energetic, reduced-toxicity monopropellants to increase space launch payload capability. Refine synthesis methods of new propellants to facilitate the transition from producing lab-scale quantities to producing sufficient material to meet operational requirements. Continue scale-up of selected propellants for laboratory and demonstrator engine evaluations. Develop high-energy-density oxidizers and polymeric binders and optimize paths for incorporating these materials into propellants with significantly enhanced performance. Continue evaluating the potential of monopropellants comprised of reduced-toxicity ionic salts to reduce the cost of space access and space operations. The goal is monopropellants with performance equivalent to bipropellants. Continue to evaluate selected propellants in advanced combustion devices to determine materials compatibility and performance. Continue to model and analyze

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(U) A. Mission Description Continued

(U) FY 2003 ($ in Thousands) Continued

advanced propulsion concepts with enhanced performance and reliability such as laser-propelled lightcraft.

(U) $1,017 Develop advanced liquid engine combustion technology for improved performance while preserving chamber lifetime and reliability needs for engine uses in heavy lift space vehicles. Continue to characterize, study, and evaluate injector performance to ensure chamber/injector compatibility and prevent damage to test and operational combustion devices. Continue to develop, analyze, and model advanced combustion devices and injectors compatible with new energetic propellants. Continue to model and analyze advanced propulsion concepts with enhanced performance and reliability such as rocket-based combined cycle engines and pulsed detonation engines.

(U) $2,797 Continue to develop advanced material applications for lightweight components and material property enhancements for use in launch and space systems. Develop advanced ablative components using hybrid polymers for use in current and future launch systems. Continue to characterize and develop new high temperature polymer components and carbon-carbon components for use in advanced combustion devices and propulsion systems to meet lower weight, increased strength, and lower cost requirements. Continue to develop advanced motor casings and propellant system components for high-energy propellants.

(U) $5,250 Continue to develop propulsion component technology for reliable, safe, and low-cost boost systems. Complete development and begin testing single stage hydrogen turbopump for advanced cryogenic engines. Continue development of components for hybrid propulsion technologies for space boosters and air-launched missiles. Initiate testing of injector for hydrocarbon or cryogenic fuel applications.

(U) $3,208 Continue development of lightweight combustion chamber and nozzle technology. Continue development of advanced lightweight rocket engine nozzle for upper stage and space booster applications. Initiate design study for high pressure turbopumps for use in advanced upper stage engines.

(U) $2,586 Continue demonstration of missile propulsion technology and Post Boost Control Systems (PBCS) and integrate results of aging models and test database for aging and surveillance technology for sustainment of current Intercontinental Ballistic Missile fleet. Continue demonstration of an advanced lightweight solid rocket motor. Continue demonstration of tools to increase the capability to determine the service life of strategic systems and other solid rocket motors. Continue demonstration of advanced full-scale, flight-like PBCS.

(U) $2,672 Develop solar electric and solar thermal propulsion technologies for stationkeeping, repositioning, and orbit transfer for large communication satellites and satellite constellations. Complete Hall thruster development efforts to achieve Air Force orbit transfers using electric propulsion. Continue development of microsatellites (<25 kg) propulsion systems (e.g., plasma thrusters) for advanced imaging missions. Continue developing solar thrusters and concentrators for future orbital transfer vehicles. Continue testing of an electrically controlled solid propellant. Continue development of high power solar thermal components.

(U) $19,612 Total

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02 - Applied Research	0602500F MULTI-DISCIPLINARY SPACE TECH	5026

(U) B. Project Change Summary

Not Applicable.

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

(U) Related Activities:
(U) PE 0601102F, Defense Research Sciences.
(U) PE 0602114N, Power Projection Applied Research.
(U) PE 0602203F, Aerospace Propulsion.
(U) PE 0602303A, Missile Technology.
(U) PE 0602805F, Dual Use Science and Technology.
(U) PE 0603216F, Aerospace Propulsion and Power Technology.
(U) PE 0603500F, Multi-Disciplinary Adv Dev Space Technology.
(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.

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DATE: February 2002

BUDGET ACTIVITY: 02 - Applied Research

PE NUMBER AND TITLE: 0602500F MULTI-DISCIPLINARY SPACE TECH

PROJECT: 5027

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
5027 High Speed Airbreathing Prop Tech	0	0	4,238	4,668	4,904	5,094	5,210	Continuing	TBD

Note: In FY 2003, space unique efforts transferred from PE 0602203F, Project 3012, into this project in conjunction with the Space Commission recommendation to consolidate all space unique activities.

(U) A. Mission Description

This project develops hypersonic propulsion technologies to enable revolutionary propulsion options providing lower cost access to space for the Air Force. These new engine technologies will enable future space launch concepts. The short-term focus is on hydrocarbon fueled engines capable of operating over a broad range of flight Mach numbers and longer term focus will be on hydrogen fueled scramjet powered engines that can enable the higher Mach numbers of achieving access to space. Technologies developed under this program enable capabilities of interest to both Department of Defense and National Aeronautical and Space Administration. Efforts include modeling and simulation, proof of concept demonstrations of critical components, advanced component development, and ground-based demonstrations.

(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) $233 Initiate development of flight demonstrator vehicle concepts. Conduct vehicle design trades for integration of hydrocarbon fueled scramjet engine.
(U) $987 Increase scramjet operating range (Mach 3 to >Mach 8) to provide robust options for combined cycle engines. Conduct initial feasibility assessment of variable geometry devices. Investigate variable geometry through collaborative effort with France and Russia.
(U) $301 Conduct assessment of advanced airbreathing engines/Combined Cycle Engines (CCEs) to establish and extend operability limits. Enables development of low internal drag scramjet flowpath for reusable applications. This supports the development of affordable, on-demand access to space vehicles.

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02 - Applied Research	0602500F MULTI-DISCIPLINARY SPACE TECH	5027

(U) A. Mission Description Continued

(U) FY 2003 ($ in Thousands) Continued

(U)	$2,717	Initiate development of critical components for advanced airbreathing engines and CCEs for robust performance over extended Mach range. Initiate development of high performance/low internal drag devices. This provides robust scramjet components applicable to affordable, on-demand access to space vehicles.
(U)	$4,238	Total

(U) B. Project Change Summary

Not Applicable.

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

(U) Related Activities:
(U) PE 0601102F, Defense Research Sciences.
(U) PE 0602201F, Aerospace Flight Dynamics.
(U) PE 0602203F, Aerospace Propulsion.
(U) PE 0602602F, Conventional Munitions.
(U) PE 0602702E, Tactical Technology.
(U) PE 0603111F, Aerospace Structures.
(U) PE 0603216F, Aerospace Propulsion and Power Technology.
(U) PE 0603601F, Conventional Weapons Technology.
(U) Program is reported to/coordinated by the Joint Army/Navy/NASA/Air Force (JANNAF) Executive Committee.
(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.

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PE NUMBER AND TITLE: 0602500F MULTI-DISCIPLINARY SPACE TECH

PROJECT: 5028

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
5028 Space Sensors, Photonics & RF Proc	0	0	1,025	1,602	2,064	1,871	4,491	Continuing	TBD

Note: In FY 2003, space unique efforts transferred from PE 0602204F, Project 2002, into this project in conjunction with the Space Commission recommendation to consolidate all space unique activities.

(U) A. Mission Description

This project focuses on developing methods of generating, controlling, receiving, transmitting, and processing photonic, optical, and opto-electronic (mixed) signals for radio frequency (RF) space sensor applications. The enabling technologies will be used for intelligence, surveillance, reconnaissance, electronic warfare, and precision engagement sensors based in space. The project aims to demonstrate significantly improved military space sensors of smaller size, lower weight, lower cost, lower power dissipation, higher reliability, and improved performance. This project also develops and assesses multi-dimensional adaptive processing techniques in radar technology for affordable and reliable space surveillance and reconnaissance systems.

(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)	$368	Develop high performance integrated photonic technology link, interconnect, and switching components and subsystems for wideband RF phased array antenna beamforming, and for high data rate space sensors and communications systems.
(U)	$191	Develop efficient, high coefficient chip-scale optical waveguide technology for mixed signal component subsystems.
(U)	$370	Perform independent modeling, test, and evaluation for space-qualified photonic components and integrated devices.
(U)	$96	Initiate the study of adaptive processing techniques for multi-mission conformal arrays for space sensor data.
(U)	$1,025	Total

(U) B. Project Change Summary

Not Applicable.

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

(U) Related Funding:

(U) PE 0602204F, Aerospace Sensors.

(U) PE 0603203F, Advanced Aerospace Sensors.

(U) PE 0603500F, Multi-Disciplinary Adv Dev Space Technology.

(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.

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BUDGET ACTIVITY: 02 - Applied Research

PE NUMBER AND TITLE: 0602500F MULTI-DISCIPLINARY SPACE TECH

PROJECT: 5029

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
5029 Space Sensor & CM Tech	0	0	7,038	8,737	5,650	1,687	1,186	Continuing	TBD

Note: In FY 2003, space unique efforts transferred from PE 0602204F, Projects 2002, 6095, and 7622, into this project in conjunction with the Space Commission recommendation to consolidate all space unique activities.

(U) A. Mission Description

This project focuses on developing processes and techniques for electronic and electromagnetic signal processing for intelligence, surveillance, and reconnaissance (ISR) space sensor applications. This project develops the baseline technologies required to manage and perform on-board space sensor information fusion for timely and comprehensive communications and situational awareness. Through modeling and simulation, this project develops and evaluates innovative electromagnetic and electronic sensing concepts for space applications.

(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) $1,663 Develop compact, affordable, multi-function receiver/exciter and phased array components for communications, Global Positioning System, radar, electronic warfare, and other ISR space sensors. Fabricate critical components consisting of gallium arsenide, indium phosphide, silicon, and/or wide bandgap devices for use in multi-mode/multi-function digital receiver prototype modules, and demonstrate a feasible architecture for performing wideband direct digital synthesis from space platforms.
(U) $87 Develop microwave technologies for advanced radio frequency apertures and phased array antennas used in military ISR space sensors. Develop and demonstrate robust components for L-band and X-band transmitter and receiver (T/R) channels that operate with limited environmental controls and under severe electromagnetic stress.
(U) $514 Demonstrate X-band sub-assemblies based on flexible RF membranes that enable low-cost and low-mass T/R channels integrated at the subarray level for space applications.

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(U) A. Mission Description Continued

(U) FY 2003 ($ in Thousands) Continued

(U)	$101	Characterize and mature space-qualified micro-electro-mechanical systems phase shifters for extended switch lifetimes and able to operate over a ten-to-one bandwidth.
(U)	$514	Refine materials and processes for two-dimensional and three-dimensional interconnects for space applications.
(U)	$639	Continue to refine the accuracy of predictions of the scattering phenomenology associated with electromagnetic radiation returned from objects or backgrounds when viewed from space.
(U)	$1,730	Develop space-qualified precision time, position, and velocity sensors capable of operating in jamming environments enabling multiple platform sensor-to-shooter operations. Continue development of Global Positioning System specific jamming mitigation techniques for operation in hostile radio frequency environments with emphasis on synergistic integration of anti-jam technologies. Develop virtual flight test technology for improved assessment of reference sensors for space applications.
(U)	$1,790	Develop technology to enable affordable upgrades to space-qualified radio frequency signal receivers. Model threat identification algorithms for next generation threat warning receivers. Evaluate state-of-the-art radar and electronic warfare digital receiver subsystems with Gallium Arsenide and Indium Phosphide radio frequency components (Analog-to-Digital Convertors, filters, mixers, etc.) for laboratory environment scenario testing.
(U)	$7,038	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 0603203F, Advanced Aerospace Sensors.

(U) PE 0603500F, Multi-Disciplinary Adv Dev Space Technology.

(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

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2A Exhibit)		DATE: February 2002
BUDGET ACTIVITY: 02 - Applied Research	PE NUMBER AND TITLE: 0602500F MULTI-DISCIPLINARY SPACE TECH	PROJECT: 5029

(U) E. Schedule Profile Continued

(U) Not Applicable.

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

DATE: February 2002

BUDGET ACTIVITY: 02 - Applied Research

PE NUMBER AND TITLE: 0602500F MULTI-DISCIPLINARY SPACE TECH

PROJECT: 5030

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
5030 Applied Space Access Vehicle Tech	0	0	1,302	1,740	2,818	2,020	3,401	Continuing	TBD

Note: In FY 2003, space unique efforts transferred from PE 0602201F, Project 2403, into this project in conjunction with the Space Commission recommendation to consolidate all space unique activities.

(U) A. Mission Description

This project develops technologies in areas of advanced structures, flight controls, and aerodynamics to enable affordable on-demand military access to space. Resulting technologies contribute significantly towards the development of reliable, responsive space access systems with aircraft-like operations. Payoffs to the warfighter include enhanced mission effectiveness, improved flight safety, improved maintenance, and decreased size, weight, and cost. Leverages a network of virtual environments for evaluation of advanced concepts.

(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) $1,302 Develop advanced structure, flight control, and aerodynamic technologies to enable aircraft-like operations for affordable on-demand military access to space. Define and develop integrated guidance and control laws to expand launch vehicle performance envelope. Develop capability to simulate space access operability in a virtual environment.
(U) $1,302 Total

(U) B. Project Change Summary

Not Applicable.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2A Exhibit)	DATE: February 2002	
BUDGET ACTIVITY: 02 - Applied Research	PE NUMBER AND TITLE: 0602500F MULTI-DISCIPLINARY SPACE TECH	PROJECT: 5030

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

(U) Related Funding:

(U) PE 0602201F, Aerospace Flight Dynamics.

(U) PE 0602202F, Human Effectiveness Applied Research.

(U) PE 0602204F, Aerospace Sensors.

(U) PE 0603211F, Aerospace Technology Dev/Demo.

(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.