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

DATE: February 2003

BUDGET ACTIVITY: 02 - Applied Research

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

	COST ($ in Thousands)	FY 2002 Actual	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	Cost to Complete	Total Cost
	Total Program Element (PE) Cost	0	98,929	90,526	91,185	87,613	105,733	126,760	124,746	Continuing	TBD
5023	Laser & Imaging Space Tech	0	1,246	5,110	5,133	5,381	5,395	5,423	4,718	Continuing	TBD
5024	Human Centered Applied Space Tech	0	484	0	0	0	0	0	0	Continuing	TBD
5025	Space Materials Development	0	18,204	19,614	23,389	21,612	27,376	37,236	36,737	Continuing	TBD
5026	Rocket Propulsion Component Tech	0	23,143	40,653	43,664	45,551	47,949	48,969	50,017	Continuing	TBD
5027	High Speed Airbreathing Prop Tech	0	4,146	4,588	4,861	5,018	5,121	5,200	5,278	Continuing	TBD
5028	Space Sensors, Photonics & RF Proc	0	43,549	1,690	2,162	1,957	4,217	4,267	4,317	Continuing	TBD
5029	Space Sensor & CM Tech	0	6,884	12,690	5,631	1,675	5,248	7,306	6,282	Continuing	TBD
5030	Applied Space Access Vehicle Tech	0	1,273	0	0	0	3,913	8,249	7,312	Continuing	TBD
5081	Space Antennas Tech	0	0	1,065	1,177	1,273	1,371	4,976	4,960	Continuing	TBD
5082	Optical Networking Tech	0	0	5,116	5,168	5,146	5,143	5,134	5,125	Continuing	TBD
	Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0	0

Note: In FY 2003, 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,

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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. In FY 2004, efforts in Projects 5024 were terminated and efforts in Project 5030 were delayed until FY 2007 due to higher Air Force priorities. Also in FY 2004, space antenna efforts in PE 0602204F, Project 4916, were transferred to this PE, Project 5081 and the Air Force increased emphasis on developing optical networks for space-based applications in Project 5082.

(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, spacecraft and upperstage propulsion, ballistic missiles, and application of advanced materials for rockets 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) 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. 9) Lightweight satellite antenna technology and affordable antenna terminal technology for communications and surveillance. 10) Optical networking technology focuses on the technology base for space-based laser communications to provide the warfighter with unlimited communications to any place at any time. Note: In FY 2003, Congress added $47.0 million ($43.0 million for Ground Moving Target Indication/Air Moving Target Indication, $2.0 million for Engineering Tool Improvement Program, and $2.0 million for Integrated High Payoff Rocket Propulsion Technology).

(U) B. Budget Activity Justification

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

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

		FY 2002	FY 2003	FY 2004	Total Cost
(U)	Previous President's Budget	0	53,592	70,020	
(U)	Appropriated Value	0	100,592		
(U)	Adjustments to Appropriated Value				
	a. Congressional/General Reductions		-1,063		
	b. Small Business Innovative Research				

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

		FY 2002	FY 2003	FY 2004	Total Cost
	c. Omnibus or Other Above Threshold Reprogram		-600		
	d. Below Threshold Reprogram				
	e. Rescissions				
(U)	Adjustments to Budget Years Since FY 2003 PBR		0	20,506	
(U)	Current Budget Submit/FY 2004 PBR	0	98,929	90,526	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. In FY 2004, the increase is primarily due to the transfer of civilian salaries related to space unique activities into this PE.

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DATE: February 2003

BUDGET ACTIVITY: 02 - Applied Research

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

PROJECT: 5023

COST ($ in Thousands)		FY 2002 Actual	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	Cost to Complete	Total Cost
5023	Laser & Imaging Space Tech	0	1,246	5,110	5,133	5,381	5,395	5,423	4,718	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. In FY 2004, increase is primarily due to the transfer of civilian salaries related to space unique activities into this project.

(U) A. Mission Description

This project examines the technical feasibility of space-oriented laser and imaging technologies/concepts 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.

(U) FY 2002 ($ in Thousands)

(U) $0 Accomplishments/Planned Program

(U) $0 No Activity

(U) $0 Total

(U) FY 2003 ($ in Thousands)

(U) $0 Accomplishments/Planned Program

(U) $622 Develop advanced long-range optical technologies such as space-based relay mirrors to support beam projection and imaging applications. Develop technologies such as beam control; beam acquisition, tracking, and pointing; dual line of sight pointing; and beam stabilization. Develop a roadmap for relay mirror technology development. Develop lightweight, low power optics for space-based relay mirrors. Produce and test one-meter class membrane mirror with near final curvature and demonstrate holographic correction of the mirror surface.

(U) $624 Assess the vulnerability of 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) $1,246 Total

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(U) A. Mission Description Continued

(U) FY 2004 ($ in Thousands)

(U)	$0	Accomplishments/Planned Program
(U)	$2,970	Develop advanced long-range optical technologies such as advanced beam control; beam acquisition, tracking, and pointing; adaptive optics; dual line of sight pointing; large, lightweight optics; and optical coatings (low energy and high energy) that support relay mirrors. Relay mirrors can greatly extend the range of high power laser weapons as well as low power imaging systems. Develop technologies for lightweight primary mirrors applicable to bifocal relay mirrors. Investigate different solutions for spacecraft and optical control dynamics.
(U)	$2,140	Assess the vulnerability of satellites to the effects of high energy laser weapons. Update previously completed assessments on catalogued satellites. Develop finite state models for space systems that will enable rapid characterization of new launches and provide a better estimate of on orbit space systems capabilities for improved space situational awareness.
(U)	$5,110	Total

(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.

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DATE: February 2003

BUDGET ACTIVITY: 02 - Applied Research

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

PROJECT: 5024

COST ($ in Thousands)	FY 2002 Actual	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	Cost to Complete	Total Cost
5024 Human Centered Applied Space Tech	0	484	0	0	0	0	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. In FY 2004, efforts in this project were terminated due to higher Air Force priorities within the Science and Technology Program..

(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 2002 ($ in Thousands)

(U) $0 Accomplishments/Planned Program

(U) $0 No Activity

(U) $0 Total

(U) FY 2003 ($ in Thousands)

(U) $0 Accomplishments/Planned Program

(U) $484 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) $484 Total

(U) FY 2004 ($ in Thousands)

(U) $0 Accomplishments/Planned Program

(U) $0 No Activity

(U) $0 Total

(U) B. Project Change Summary

Not Applicable.

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(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 2003

BUDGET ACTIVITY: 02 - Applied Research

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

PROJECT: 5025

COST ($ in Thousands)	FY 2002 Actual	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	Cost to Complete	Total Cost
5025 Space Materials Development	0	18,204	19,614	23,389	21,612	27,376	37,236	36,737	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. In FY 2004, the increase is primarily due to the transfer of civilian salaries related to space unique activities into this project. In FY 2008, increases are due to higher priorities within the Science and Technology Program.

(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. Rocket propulsion materials development in this project support the Integrated High Payoff Rocket Propulsion Technology (IHPRPT) Program. 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 2002 ($ in Thousands)

(U)	$0	Accomplishments/Planned Program
(U)	$0	No Activity
(U)	$0	Total

(U) FY 2003 ($ in Thousands)

(U)	$0	Accomplishments/Planned Program
(U)	$11,234	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)	$5,560	Develop affordable, advanced structural and non-structural materials and technologies for Air Force space applications. Demonstrate optically tailorable thermal control coatings with controlled heat dissipation for spacecraft thermal control. Establish baseline effects of the space

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(U) A. Mission Description Continued

(U) FY 2003 ($ in Thousands) Continued

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) $1,410 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) $18,204 Total

(U) FY 2004 ($ in Thousands)

(U) $0 Accomplishments/Planned Program

(U) $10,389 Develop materials and processes to dramatically improve performance, durability, and cost of rocket propulsion systems. Develop candidate materials and improve processing capabilities to ensure consistent material characteristics to meet Integrated High Payoff Rocket Propulsion Technology (IHPRPT) Phase II program goals for high-speed turbopump housings, ducts, valves, solid rocket casings, insulation, nozzle throats, and spacecraft propulsion. Evaluate identified high temperature metals, ceramics, and composite materials by fabricating test articles with representative geometry to provide validation of material characteristics and processing capabilities to meet IHPRPT Phase II program goals for solid rocket nozzles, throats, and spacecraft propulsion. Establish materials database and provide predictive modeling capability to anticipate materials performance and model life cycle behavior of materials in a rocket propulsion environment. Identify new candidate materials for spacecraft and rocket propulsion environment, such as thrust chambers, nozzles, and propellant catalysts to meet IHPRPT Phase III goals.

(U) $2,311 Develop nanostructured materials technology for application to aerospace structures, propulsion, and subsystems to enable lighter weights, higher performance, and lower costs. Evaluate and assess nanoparticle and nanostructured fabrication, characterization, processing techniques, and models for the efficient, low-cost assembly of nanomaterials for system integration and nanomaterials insertion into space subsystems technologies such as rocket engine components and cryogenic structures/components.

(U) $4,364 Develop affordable, advanced structural and non-structural materials and technologies for Air Force space applications. Fabricate laboratory-level demonstrations of optically tailorable active thermal control coatings with controlled heat dissipation for spacecraft thermal control and three-fold increase in service life. Establish baseline effects of the space environment on thermal control coatings, space lubricants, and other organic/inorganic space materials. Transition processing methods for the metallic materials that are expected to be used for

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(U) A. Mission Description Continued

(U) FY 2004 ($ in Thousands) Continued

lightweight, high-strength components in future space vehicles. Develop and fabricate high temperature metallic gamma-titanium-aluminide technologies for reusable access to space vehicles. Develop advanced and reproducible joining processes for large metallic cryotanks. Publish results of non-autoclave materials and processes testing for composite cryotank structures. Evaluate composite materials, process, and materials evaluation techniques for cryogenic tank structures utilized on future Air Force space platforms. Develop hybrid thermal protection materials for reusable systems and demonstrate thermal protection concepts for single use applications. Develop lightweight, highly conductive, all-composite heat-pipe radiators for spacecraft thermal management. Identify next-generation high-temperature organic matrix composites for space launch vehicle and satellite structures.

(U) $2,550 Develop and demonstrate materials and materials processing technologies to enable improved performance, affordability, and performance of surveillance, tracking, targeting, and situational awareness systems. Identify higher performance, including optical nanocomposites, photonic band gap materials and exotic ferroelectronics, for advanced optical architecture in phased array radar and satellite-to-satellite data links. Scale-up very long wavelength, alternative infrared detector materials to areas suitable for the fabrication of staring focal plane arrays.

(U) $19,614 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 Advanced Development 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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PE NUMBER AND TITLE: 0602500F MULTI-DISCIPLINARY SPACE TECH

PROJECT: 5026

COST ($ in Thousands)	FY 2002 Actual	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	Cost to Complete	Total Cost
5026 Rocket Propulsion Component Tech	0	23,143	40,653	43,664	45,551	47,949	48,969	50,017	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. In FY 2004, civilian salaries transferred from PE 0602203F, Project 4847, into this project in conjunction with the Space Commission recommendation to consolidate all space unique activities. In FY 2005, ballistic missile Technology for Sustainment of Strategic Systems (TSSS), Phase 1 will end.

(U) A. Mission Description

This project develops advances in rocket propulsion technologies for space access, space maneuver, and ballistic missiles. Analytical and experimental areas of emphasis are propellants, propellant management, combustion, rocket material applications, TSSS Phase 1, 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 2002 ($ in Thousands)

(U) $0 Accomplishments/Planned Program

(U) $0 No Activity

(U) $0 Total

(U) FY 2003 ($ in Thousands)

(U) $0 Accomplishments/Planned Program

(U) $1,995 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, nano-materials, 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 advanced propulsion concepts with enhanced performance and reliability such as laser-propelled lightcraft.

(U) $975 Develop advanced liquid engine combustion technology for improved performance while preserving chamber lifetime and reliability needs for

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(U) A. Mission Description Continued

(U) FY 2003 ($ in Thousands) Continued

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) $2,681 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) $5,281 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) $3,214 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) $2,478 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) $2,561 Develop solar electric and solar thermal propulsion technologies for stationkeeping, repositioning, and orbit transfer for large communication satellites and satellite constellations. Complete small-scale 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) $1,979 Assess and verify tool performance for additional data requirements for the modeling and simulation tool against available data. Make recommendations for future modeling and data acquisition. These efforts will contribute to the ongoing development of modeling and simulation tools as part of the Engineering Tool Improvement Program to analyze and predict the performance of aerospace engines and their components. Improve analytical tools associated with aerospace engines with the main focus on high performance, long life, advanced cooling

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(U) A. Mission Description Continued

(U) FY 2003 ($ in Thousands) Continued

techniques, and combustion stability.

(U) $1,979 Develop components and propellants that will meet the Integrated High Payoff Rocket Propulsion Technology (IHPRPT) Phase II goals. Design, fabricate, and evaluate an advanced throttleable propulsion system for energy management of tactical missile systems. Design and evaluate a new attitude control system to increase maneuverability of tactical missile systems. Develop an improve reduced/minimum smoke propellant system to reduce/change the plume signature of tactical systems.

(U) $23,143 Total

(U) FY 2004 ($ in Thousands)

(U) $0 Accomplishments/Planned Program

(U) $6,060 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, nano-materials, and polymeric binders and optimize paths for incorporating these materials into propellants with significantly enhanced performance. Continue evaluating advanced monopropellants to reduce the cost of space access, space operations, and other Air Force applications. Begin development of advanced catalysts for new monopropellant formulations. Begin scale-up of promising high energy-density materials candidates. Continue to evaluate selected propellants in advanced combustion devices to determine materials compatibility and performance. Continue to model and explore advanced propulsion concepts with enhanced performance and reliability such as laser-propelled lightcraft and rocket-based combined cycle engines. Complete formulation of propellant ingredients for IHPRPT Phase III solid propellant developments and transition to propellant formulation.

(U) $5,680 Develop advanced liquid engine combustion technology to improve performance while preserving chamber lifetime and reliability in heavy lift space vehicle engines. 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. Conduct analysis and testing to characterize causes and issues that lead to combustion instability in hydrocarbon fueled liquid rocket engines reducing the need for conducting large numbers of costly full-scale component and engine tests. Complete advanced hydrocarbon fuels development and transition to scale-up and testing.

(U) $4,954 Develop advanced technologies and material property enhancements for lightweight components for use in rocket propulsion systems. Develop advanced ablative components using hybrid polymers for use in current and future launch systems. Continue to characterize and develop new processes for high temperature polymers and carbon-carbon materials for use in advanced combustion devices and propulsion systems to meet

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(U) A. Mission Description Continued

(U) FY 2004 ($ in Thousands) Continued

lower weight and increased strength requirements. Continue to develop advanced material components for use with high-energy propellants. Complete and transition advanced high temperature material components to Air Force systems to reduce system weight and cost and increase performance. Initiate exploration of the use of nanocomposites for liquid rocket engine tanks.

(U) $1,950 Continue to develop propulsion component technology for reliable, safe, and low-cost boost systems. Complete development of components for hybrid propulsion technologies for space boosters and air launched missiles. Complete testing of single stage hydrogen turbopump for advanced cryogenic engines. Continue hydrocarbon fuel characterization test rig development and evaluation of potential hydrocarbon fuels.

(U) $11,673 Continue development of lightweight nozzle technologies for liquid rocket engines. Begin development of an advanced lightweight altitude compensating nozzle, advanced liquid oxygen and liquid hydrogen (LOX/H2) turbopumps for the next phase of advanced reusable LOX/H2 engines.

(U) $5,151 Develop missile propulsion, aging, and surveillance technology for solid rocket systems. Complete initial tool developments to enhance the capability to determine the service life of strategic systems and other solid rocket motors. Continue risk reduction efforts supporting missile propulsion demonstration. Complete efforts for prediction of solid motor life and transition into damage assessment models.

(U) $5,185 Develop solar electric, solar thermal, chemical, and advanced propulsion technologies for stationkeeping, repositioning, and orbit transfer for large communication satellites and satellite constellations. Develop monopropellant thruster component technologies for chemical-based space propulsion. Continue Hall thruster development efforts evaluating 100-200 kilowatt and clustered thrusters 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. Begin electro dynamic tether developments.

(U) $40,653 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 0602114N, Power Projection Applied Research.

(U) PE 0602203F, Aerospace Propulsion.

(U) PE 0602303A, Missile Technology.

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

(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 2003

BUDGET ACTIVITY: 02 - Applied Research

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

PROJECT: 5027

COST ($ in Thousands)	FY 2002 Actual	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	Cost to Complete	Total Cost
5027 High Speed Airbreathing Prop Tech	0	4,146	4,588	4,861	5,018	5,121	5,200	5,278	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 revolutionary, airbreathing, hypersonic propulsion technology options to enable affordable, on demand access to space for the Air Force. 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 2002 ($ in Thousands)

(U)	$0	Accomplishments/Planned Program
(U)	$0	No Activity
(U)	$0	Total

(U) FY 2003 ($ in Thousands)

(U)	$0	Accomplishments/Planned Program
(U)	$223	Initiate development of flight demonstrator vehicle concepts. Conduct vehicle design trades for integration of hydrocarbon fueled scramjet engine.
(U)	$946	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)	$288	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.
(U)	$2,689	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)	$4,146	Total

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(U) A. Mission Description Continued

(U) FY 2004 ($ in Thousands)

(U)	$0	Accomplishments/Planned Program
(U)	$4,020	Develop robust hydrocarbon fueled scramjet engine components and technologies and integrate into advanced combined cycle engine designs. Develop and demonstrate low internal drag flame stabilization devices. Demonstrate advanced ignition systems for scramjets. Conduct feasibility assessments of variable geometry devices to increase scramjet operating range from Mach 3 to Mach 8 to provide robust options for combined cycle engines. Develop advanced engine components to improve structural durability for reusable applications. Conduct assessment of current structural concepts and identify life limiting factors and initiate development of multi-use components. Support development of flight test engine components.
(U)	$568	Conduct assessment of advanced air breathing engines/Combined Cycle Engines to establish and extend engine operability limits. Conduct system trade studies to determine military payoff and establish component technology goals. Define component and engine performance objectives to enable development of affordable hypersonic combined cycles engines to meet future war fighter needs.
(U)	$4,588	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.

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(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: 5028

COST ($ in Thousands)	FY 2002 Actual	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	Cost to Complete	Total Cost
5028 Space Sensors, Photonics & RF Proc	0	43,549	1,690	2,162	1,957	4,217	4,267	4,317	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 techniques in radar technology for affordable and reliable space surveillance and reconnaissance systems.

(U) FY 2002 ($ in Thousands)

(U) $0 Accomplishments/Planned Program

(U) $0 No Activity

(U) $0 Total

(U) FY 2003 ($ in Thousands)

(U) $0 Accomplishments/Planned Program

(U) $367 Design and develop high performance integrated photonic technology link, interconnect, and switching components and subsystems for wideband RF phased array antenna beamforming/control, and for high data rate space sensors and communication systems.

(U) $191 Design and develop efficient, high coefficient chip-scale optical waveguide technology for mixed signal component subsystems.

(U) $349 Perform independent modeling, test, and evaluation for space-qualified photonic components and integrated electro-optical devices for space-based sensors.

(U) $96 Initiate the study of adaptive processing techniques for large, multi-mission, space-based conformal arrays.

(U) $42,546 Develop a system brassboard of the Active Electronic Scanned Antenna and On-Board Processor (AESA/OBP) to demonstrate the technology readiness of the most critical element of an affordable Space-Based Radar. Develop the processing architecture, adaptive signal processing algorithms, and fault tolerant, radiation resistant processing for OBP in a space environment. Develop Battle-Management Command, Control and Communications techniques for multiple satellite tasking, target tracking, and moving target exploitation. Refine and validate Space-Based Radar and Moving Target Exploitation simulation capabilities to serve as a development tool for both short term acquisition and longer term

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(U) A. Mission Description Continued

(U) FY 2003 ($ in Thousands) Continued

capability enhancement. Develop and validate both Ground Moving Target Indication and Airborne Moving Target Indication processing algorithms for environments with clutter and interference.

(U) $43,549 Total

(U) FY 2004 ($ in Thousands)

(U) $0 Accomplishments/Planned Program

(U) $586 Fabricate and evaluate high performance integrated photonic technology link, interconnect, and switching components and subsystems for wideband radio frequency phased array antenna beamforming and control, and for high data rate space sensors and communication systems.

(U) $242 Test and evaluate efficient, high coefficient chip-scale optical waveguide technology for mixed signal component subsystems.

(U) $244 Apply the results of modeling, test, and evaluation for space-qualified photonic components and integrated electro-optical devices for space-based sensors.

(U) $618 Study and analyze adaptive processing techniques for large, multi-mission, space-based, adaptive conformal arrays.

(U) $1,690 Total

(U) B. Project Change Summary

Not Applicable.

(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 2002 Actual	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	Cost to Complete	Total Cost
5029 Space Sensor & CM Tech	0	6,884	12,690	5,631	1,675	5,248	7,306	6,282	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. In FY 2004, increases are due to the transfer of civilian salaries related to space unique activities into this project and increased emphasis on National Aerospace Initiative technologies.

(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 countermeasures for space applications.

(U) FY 2002 ($ in Thousands)

(U)	$0	Accomplishments/Planned Program
(U)	$0	No Activity
(U)	$0	Total

(U) FY 2003 ($ in Thousands)

(U)	$0	Accomplishments/Planned Program
(U)	$1,709	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 (RF) 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 signals.
(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.
(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.

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(U) A. Mission Description Continued

(U) FY 2003 ($ in Thousands) Continued

(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)	$1,630	Develop space-qualified precision time, position, and velocity sensors capable of operating in jamming environments enabling multiple platform sensor-to-shooter operations. Continue developing Global Positioning System (GPS) specific jamming mitigation techniques for operation in hostile radio frequency (RF) 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)	$1,690	Develop technology to enable affordable upgrades to space-qualified RF signal receivers. Model threat identification algorithms for next generation threat warning receivers. Evaluate state-of-the-art radar and electronic warfare (EW) digital receiver subsystems with Gallium Arsenide and Indium Phosphide RF components (Analog-to-Digital Convertors, filters, mixers, etc.) for laboratory environment scenario testing.
(U)	$6,884	Total

(U) FY 2004 ($ in Thousands)

(U)	$0	Accomplishments/Planned Program
(U)	$6,316	Fabricate and test compact, affordable, multi-function receiver/exciter and phased array components for communications, GPS, radar, EW, and other Intelligence, Surveillance, and Reconnaissance (ISR) space sensors. Evaluate integrating these components into operational radar and EW digital receiver/exciter modules. Demonstrate a feasible architecture for performing wideband direct digital synthesis from aerospace platforms. Perform a component evaluation of an electronic/photonic digital receiver for Moving Target Indication and Synthetic Aperture Radar applications.
(U)	$1,206	Develop and integrate microwave technologies for advanced RF apertures and phased array antennas used in military ISR space sensors. Develop and demonstrate the proof of concept of transmitter and receiver channels that are able to withstand radiation, limited or no active cooling, and strong undesired electromagnetic signals.
(U)	$540	Demonstrate a large area (>0.5 m2) active aperture based on flexible RF membranes that lowers the assembly costs and mass over conventional phased arrays by an order of magnitude.
(U)	$433	Demonstrate mixed signal receiver/processor multi-functionality on flexible RF membranes using advanced two-dimensional and three-dimensional interconnects.
(U)	$559	Continue to refine the accuracy of exploitation of the scattering phenomenology associated with electromagnetic radiation returned from objects or backgrounds when viewed from space.

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(U) A. Mission Description Continued

(U) FY 2004 ($ in Thousands) Continued

(U)	$3,294	Design robust precision time, position, and velocity sensor technologies for multi-platform sensor-to-shooter network-centric engagement. Develop synergistic global positioning system jamming mitigation techniques for operation in hostile radio frequency (RF) environments.
(U)	$342	Continue developing technology to enable affordable upgrades to space-qualified RF signal receivers. Continue modeling threat identification algorithms for next generation threat warning receivers. Continue evaluating state-of-the-art digital and software receiver techniques for radar, electronic warfare, and narrowband space applications.
(U)	$12,690	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

(U) Not Applicable.

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BUDGET ACTIVITY: 02 - Applied Research

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

PROJECT: 5030

COST ($ in Thousands)		FY 2002 Actual	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	Cost to Complete	Total Cost
5030	Applied Space Access Vehicle Tech	0	1,273	0	0	0	3,913	8,249	7,312	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. In FY 2004, efforts in this project were delayed until FY 2007 due to higher Air Force priorities.

(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 2002 ($ in Thousands)
(U) $0 Accomplishments/Planned Program
(U) $0 No Activity
(U) $0 Total

(U) FY 2003 ($ in Thousands)
(U) $0 Accomplishments/Planned Program
(U) $1,273 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) $1,273 Total

(U) FY 2004 ($ in Thousands)
(U) $0 Accomplishments/Planned Program
(U) $0 No Activity
(U) $0 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 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.

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BUDGET ACTIVITY: 02 - Applied Research

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

PROJECT: 5081

COST ($ in Thousands)	FY 2002 Actual	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	Cost to Complete	Total Cost
5081 Space Antennas Tech	0	0	1,065	1,177	1,273	1,371	4,976	4,960	Continuing	TBD

Note: In FY 2004, space antenna efforts in PE 0602204F, Project 4916 transfer to this project.

(U) A. Mission Description

This project develops the technology base for lightweight satellite antenna technology and affordable antenna terminal technology for communications and surveillance. Enabling antenna technologies developed under this project for satellite terminals and satellite tracking will focus on significantly lowering the life cycle cost of sensors and communications system ownership, while increasing performance. Novel antenna architectures based on emerging technologies such as Micro-Electro-Mechanical Systems, nanostructures, metamaterials, rigidizable systems, and adaptive polymers will be developed. The project will include new approaches to multi-layer microstrip and stripline feed networks for limited scan, and planar and conformal architectures using overlapped subarrays. Digital Beamforming (DBF) on transmit and receive will be implemented in order to achieve simultaneous multiple-beams, conformal array beamforming, array pattern synthesis, and neural beamforming.

(U) FY 2002 ($ in Thousands)

(U)	$0	Accomplishments/Planned Program
(U)	$0	No Activity
(U)	$0	Total

(U) FY 2003 ($ in Thousands)

(U)	$0	Accomplishments/Planned Program
(U)	$0	No Activity
(U)	$0	Total

(U) FY 2004 ($ in Thousands)

(U)	$0	Accomplishments/Planned Program
(U)	$336	Develop lightweight antenna technologies concepts that enable affordable deployment of space sensors for low life cycle cost communications, detection of air and ground moving targets, and remote sensing.
(U)	$316	Develop new lightweight radiators, transmission mechanisms, and control components and concepts for advanced wideband phased array antenna architectures.
(U)	$413	Develop concepts for Digital Beamforming on both transmit and receive cycles in order to implement simultaneous multiple-beams, conformal array beamforming, array pattern synthesis, and neural beamforming.

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(U) A. Mission Description Continued

(U) FY 2004 ($ in Thousands) Continued
(U) $1,065 Total

(U) B. Project Change Summary

Not Applicable.

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

(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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DATE: February 2003

BUDGET ACTIVITY: 02 - Applied Research

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

PROJECT: 5082

COST ($ in Thousands)	FY 2002 Actual	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	Cost to Complete	Total Cost
5082 Optical Networking Tech	0	0	5,116	5,168	5,146	5,143	5,134	5,125	Continuing	TBD

Note: In FY 2004, in Project 5082, the Air Force increased emphasis on developing optical networks for space-based applications.

(U) A. Mission Description

This project develops the technology base for the next generation of ultra-wide- bandwidth, multi-channeled, space-based communications networks on and between platforms. As the application of laser-based, point-to-point communications between satellites emerges, space-based optical networks, whose communications capacities are thousands of times greater than current communications satellites, become a realistic possibility. A major thrust of this project is to assess and adapt the emerging communication and information technologies, being developed for next-generation Internet, for applications in space. This project will explore technologies for implementing photonic chip scale optical Code Division Multiple Access (CDMA) and Wavelength Division Multiplexed (WDM) transceivers and prototype networks, built to demonstrate the benefits associated with the advanced fiber optic, wireless, and satellite networks that can be built from them. This technology has potential applications in specific military systems including reliable, high bandwidth, jam-resistant communications at the theater level, and multiplexing of multiple DoD users onto a common networking infrastructure for reduced manning and logistics.

(U) FY 2002 ($ in Thousands)
(U) $0 Accomplishments/Planned Program
(U) $0 No Activity
(U) $0 Total

(U) FY 2003 ($ in Thousands)
(U) $0 Accomplishments/Planned Program
(U) $0 No Activity
(U) $0 Total

(U) FY 2004 ($ in Thousands)
(U) $0 Accomplishments/Planned Program
(U) $2,009 Develop, demonstrate, and assess optical network technologies for application in the space environment. Assess, explore, and adapt the emerging communication and information technologies being developed for next-generation Internet, for applications in space.
(U) $2,082 Develop, demonstrate, and assess existing and emerging Optical CDMA and WDM schemes and protocols for use in space-based optical networks. In conjunction with industry and academia, develop or adapt appropriate standards to ensure the evolution of an open systems

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(U) A. Mission Description Continued

(U) FY 2004 ($ in Thousands) Continued

architecture for space based-optical networks.

(U) $1,025 Further develop photonic chip scale optically implemented Code Division Multiple Access and Wavelength Division Multiplexed transceivers and prototype network into a capability to characterize, evaluate, and optimize optical network components and technologies for space applications.

(U) $5,116 Total

(U) B. Project Change Summary

Not Applicable.

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

(U) PE 0602702F, Command, Control, and Communications.

(U) PE 0603789F, C3I Advanced 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.