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

DATE: February 2003

BUDGET ACTIVITY: 03 - Advanced Technology Development (ATD)

PE NUMBER AND TITLE: 0603500F MULTI-DISCIPLINARY ADV DEV SPACE TEC

	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	54,161	62,610	55,814	63,389	82,565	88,867	80,936	Continuing	TBD
5031	Advanced Optics & Laser Space Tech	0	14,477	19,604	23,774	26,479	31,426	33,888	35,766	Continuing	TBD
5032	Advanced Space Materials	0	6,720	11,715	0	0	5,825	5,318	3,903	Continuing	TBD
5033	Rocket Propulsion Demonstration	0	25,670	22,221	22,496	28,232	30,773	32,729	33,187	Continuing	TBD
5034	Advanced Space Sensors	0	4,751	6,070	9,544	8,678	11,629	16,062	7,621	Continuing	TBD
5062	Advanced Structures for Space Vehicles	0	2,543	3,000	0	0	2,912	870	459	Continuing	TBD
	Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0	0

Note: In FY 2003 this was a new PE, but not a New Start, resulting from the Space Commission recommendation to consolidate all space unique activities. In FY 2003, only the space unique tasks in the following PEs/Projects transferred to this PE in conjunction with the Space Commission recommendation: PE 0603605F, Projects 3150 and 3647, to Project 5031; PE 0603112F, Projects 2100 and 3946, to Project 5032; PE 0603216F, Project 4922, to Project 5033; and PE 0603203F, Project 665A/PE 0603270F, Projects 431G and 691X, to Project 5034. In FY 2003, efforts in Project 5062, will be complete until FY 2007 when efforts will commence to define spacelift vehicles using the results of the hypersonic engine work in PE 0602500F, Multi-Disciplinary Space Technology, Project 5027. In FY 2005, in Project 5032, advanced space material efforts were delayed until FY 2007 due to higher Air Force priorities.

(U) A. Mission Description

This program develops and demonstrates multi-disciplinary space technologies in four projects, each focusing on a separate technology area. 1) Advanced optics and laser space technology demonstrates and assesses space unique advanced optics and high energy laser weapon systems capabilities. 2) Advanced space materials develops and demonstrates materials and processing technologies for future space vehicle components and protection of space sensors from a variety of laser threats. 3) Rocket propulsion develops and demonstrates innovative rocket propulsion technologies, propellants, and manufacturing techniques for launch and spacecraft applications. 4) Advanced space sensors develops and demonstrates sensor technologies for intelligence, surveillance, and reconnaissance, communications, targeting,

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(U) A. Mission Description Continued

and electronic counter-countermeasures for spacecraft applications. In FY 2003, Congress added $4.9 million for Aerospace Relay Mirror System.

(U) B. Budget Activity Justification

This program is in Budget Activity 3, Advanced Technology Development, since it develops and demonstrates technologies for existing system upgrades and/or new system developments that have a military utility and address warfighter needs.

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

		FY 2002	FY 2003	FY 2004	Total Cost
(U)	Previous President's Budget	0	50,538	45,417	
(U)	Appropriated Value	0	55,438		
(U)	Adjustments to Appropriated Value				
	a. Congressional/General Reductions		-711		
	b. Small Business Innovative Research				
	c. Omnibus or Other Above Threshold Reprogram		-566		
	d. Below Threshold Reprogram				
	e. Rescissions				
(U)	Adjustments to Budget Years Since FY 2003 PBR		0	17,193	
(U)	Current Budget Submit/FY 2004 PBR	0	54,161	62,610	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. Increases to this PE since the previous President's Budget are due to increased emphasis on Transformational Communications System technologies.

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

DATE: February 2003

BUDGET ACTIVITY: 03 - Advanced Technology Development (ATD)

PE NUMBER AND TITLE: 0603500F MULTI-DISCIPLINARY ADV DEV SPACE TEC

PROJECT: 5031

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
5031	Advanced Optics & Laser Space Tech	0	14,477	19,604	23,774	26,479	31,426	33,888	35,766	Continuing	TBD

Note: In FY 2003, space unique tasks in PE 0603605F, Projects 3150 and 3647, will be transferred into this project in conjunction with the Space Commission recommendation to consolidate all space unique activities. In FY 2004, increase is due to greater emphasis on Transformation Communications Systems technologies.

(U) A. Mission Description

This project provides for the demonstration and detailed assessment of space unique technologies needed for advanced optical systems and high energy laser weapons.

(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) $126 Perform directed energy and space environment assessments on satellites in support of national space control and space situational awareness requirements. Provide data to U.S. Space Command for the performance of Laser Clearinghouse functions. Fuse finite state models with other satellite data and observables to produce a more complete space situational awareness picture.

(U) $1,306 Develop and demonstrate advanced long-range optical technologies such as space-based relay mirrors to support beam projection and imaging applications. Develop system concepts and design technology demonstrations of relay mirrors and membrane mirrors to advance global strike, global presence, and ballistic missile defense capabilities for the warfighter. Quantify the performance of a membrane mirror coated with a high energy laser dielectric coating and design a space membrane mirror experiment. Begin development of modeling and simulation tools for space-based relay mirrors.

(U) $8,196 Perform atmospheric compensation/beam control experiments for applications including antisatellite weapons, relay mirror systems, satellite tests and diagnostics, and high-resolution satellite imaging. Perform beam pointing and guidestar radiometry (for atmospheric compensation) tests using a sodium-wavelength laser beacon. Design and begin integration of full aperture point-ahead atmospheric compensation system for low-power laser projection to satellites on weapons-class beam director (3.5 meter telescope). Demonstrate high-accuracy active satellite tracking on 3.5 meter telescope with simultaneous compensated satellite imaging and compensate laser projection to a low-earth-orbit satellite

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	PROJECT 5031

(U) A. Mission Description Continued

(U) FY 2003 ($ in Thousands) Continued

(integrated beam control demonstration).

(U) $4,849 Develop technologies for an aerospace (airborne) relay mirror testbed. Develop and enhance techniques for dual line of sight control via a coude path and two separate telescopes. Develop, mature, and integrate beam control, optical, and platform hardware to provide risk reduction for a full-scale relay mirror system. Develop a point design for the optical system and control system, and integrate with all subsystems. Tailor and integrate point-ahead beacon technology into the tesbed.

(U) $14,477 Total

(U) FY 2004 ($ in Thousands)

(U) $0 Accomplishments/Planned Program

(U) $4,149 Develop and demonstrate advanced long-range, relay mirror optical technologies such as advanced adaptive optics, beam control, large lightweight optics, optical coatings, throughput, dual line of sight control, spacecraft and optical control integration, beam stabilization, and jitter control. Develop relay mirror concepts and design technology demonstrations to advance global strike, global presence, and ballistic missile defense capabilities for the warfighter. Continue the development of modeling and simulation tools for relay mirrors.

(U) $5,295 Perform atmospheric compensation/beam control experiments for applications including antisatellite weapons, relay mirror systems, satellite tests and diagnostics, and high-resolution satellite imaging. Complete integration and begin testing of full aperture point-ahead atmospheric compensation system for low-power laser projection to satellites on weapons-class beam director (3.5-meter telescope).

(U) $10,160 Develop and demonstrate optical technologies for high bandwidth ground-to-air communications. Begin development of advanced modular deformable mirrors and adaptive optical control systems. Begin development of advanced optical filters, infrared sensors, and signal processing systems. Conduct optical communications experiments between the Starfire Optical Range and an aircraft-based test bed.

(U) $19,604 Total

(U) B. Project Change Summary

Not Applicable.

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

(U) PE 0602500F, Multi-Disciplinary Space Technology.
(U) PE 0602605F, Directed Energy Technology.
(U) PE 0603444F, Maui Space Surveillance System.
(U) PE 0603605F, Advanced Weapons Technology.
(U) PE 0603883C, Ballistic Missile Defense Boost Phase Segment.
(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 2003

BUDGET ACTIVITY: 03 - Advanced Technology Development (ATD)

PE NUMBER AND TITLE: 0603500F MULTI-DISCIPLINARY ADV DEV SPACE TEC

PROJECT: 5032

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
5032 Advanced Space Materials	0	6,720	11,715	0	0	5,825	5,318	3,903	Continuing	TBD

Note: In FY 2003, space unique tasks in PE 0603112F, Projects 2100 and 3946, were transferred into this project in conjunction with the Space Commission recommendation to consolidate all space unique activities. In FY 2004, increase is due to greater emphasis on National Aerospace Initiative technologies. In FY 2005, efforts in this project have been delayed until FY 2007 due to higher Air Force priorities.

(U) A. Mission Description

This project develops, demonstrates, and validates materials and processing technologies for transition into Air Force space systems. Materials and processes development is scaled up to the appropriate level to demonstrate materials capability in the relative environment. Subscale components and nonstructural material components are developed and demonstrated to validate expected materials characteristics. Critical data on both structural and nonstructural materials is developed and provided for engineering and system design decisions. Laser hardened materials technologies are developed, demonstrated, and transitioned for the broadband protection of space sensors from a variety of laser threats. Reducing risk in materials technology improves the affordability, reliability, survivability, and operational performance of current and future space 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)	$1,494	Develop and demonstrate advanced materials and processing technologies for space vehicles and subsystems to provide enhanced surveillance capabilities, improved access to space, and improved overall affordability of space vehicles. Complete the demonstration of improved material processes with increased yields for robust, high performance, and producible infrared detector materials. Continue efforts to validate and demonstrate materials and materials processing technologies to improve affordability of spacecraft components. Validate measured effects of space exposure on advanced material systems.
(U)	$1,389	Develop and demonstrate advanced materials technologies that enhance laser hardening of Air Force spacecraft sensors to ensure safety, survivability, and operability in a laser threat environment. Demonstrate hybrid optical limiters for the protection of mid-wave infrared focal

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	PROJECT 5032

(U) A. Mission Description Continued

(U) FY 2003 ($ in Thousands) Continued

plane arrays. Demonstrate hardened coating process for Rugate fixed-wavelength filters and optical switches for mid-wave infrared space systems. Conduct tests of hardening solutions for critical space sensor designs and environments based on successful approaches employed in tactical sensors. Identify and evaluate optical limiter materials for the protection of near-infrared to short-wave infrared staring focal plane arrays. Identify coating materials and processes for filters and optical switches for long-wave infrared space systems.

(U) $3,837 Develop and demonstrate advanced materials and processing technologies to enable revolutionary improvements in the performance of airbreathing and rocket-based aerospace vehicles and weapons. Identify and evaluate cryogenic fluid compatible material and affordable processing technologies for large, lightweight, potentially load bearing tank structures for airbreathing and rocket-based vehicles. Evaluate and characterize ceramic and organic-based composite materials for durable, very high temperature aerospace vehicle and weapon leading edges.

(U) $6,720 Total

(U) FY 2004 ($ in Thousands)

(U) $0 Accomplishments/Planned Program

(U) $1,876 Fabricate hybrid optical limiters for the protection of mid-wave infrared staring focal plane arrays. Validate repeatability in hardened coating process for rugate fixed-wavelength filters and optical switches for mid-wave infrared space systems. Integrate hardening solutions previously demonstrated in tactical systems into space unique sensor designs and environments. Develop optical limiter materials for the protection of near-infrared to short-wave infrared staring focal plane arrays. Develop coating materials and processes for filters and optical switches for long-wave infrared space systems.

(U) $9,839 Further evaluate and develop material and affordable processing technologies for large, lightweight, potentially load bearing tank structures for airbreathing and rocket-based vehicles. Develop analytical modeling tools to predict material behavior in cryogenic and hydrocarbon environments. Initiate materials and design concept study on durable reusable thermal protection systems for launch vehicles. Demonstrate innovative material concepts for single use thermal protection systems for reentry vehicles. Develop and assess metallic, carbon, and ceramic-based composite materials for space access structures and hypersonic ramjet, scramjet, and combined cycle propulsion structural components. Specific materials and process applications will emphasize increased operating temperature, environmental compatibility, and durability.

(U) $11,715 Total

(U) B. Project Change Summary

Not Applicable.

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

(U) PE 0602102F, Materials.

(U) PE 0602500F, Multi-Disciplinary Space Technology.

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

(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 2003

BUDGET ACTIVITY: 03 - Advanced Technology Development (ATD)

PE NUMBER AND TITLE: 0603500F MULTI-DISCIPLINARY ADV DEV SPACE TEC

PROJECT: 5033

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
5033	Rocket Propulsion Demonstration	0	25,670	22,221	22,496	28,232	30,773	32,729	33,187	Continuing	TBD

Note: In FY 2003, space unique tasks in PE 0603216F, Project 4922, will be transferred into this project in conjunction with the Space Commission recommendation to consolidate all space unique activities.

(U) A. Mission Description

This project develops advanced and innovative low-cost rocket turbomachinery and components, low-cost space launch propulsion system technologies, and demonstrates advanced propellants for launch and orbit transfer propulsion. Additionally, this project develops technologies for the Technology for Sustainment of Strategic Systems Phase 1. Characteristics such as environmental acceptability, affordability, reliability, responsiveness, reduced weight, and reduced operation and launch costs are emphasized. Increased life and performance of propulsion systems are key goals. This project also develops chemical, electrical, and solar rocket propulsion system technologies for stationkeeping and on-orbit maneuvering applications. Technology areas investigated include ground demonstrations of compact, lightweight, advanced propulsion systems, higher efficiency energy conversion systems (derived from an improved understanding of combustion fundamentals), and high-energy propellants. Technological advances developed in this program will improve the performance of expendable systems' payload capabilities by ~20 percent, reduce the launch, operations, and support costs by ~30 percent. Responsiveness and operability of propulsion systems will be enhanced for reusable launch systems. Technology advances will also lead to seven-year increase in satellite on-orbit time, a 50 percent increase in satellite maneuvering capability, a 25 percent reduction in orbit transfer operational costs, and a 15 percent increase in satellite payload. The 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 space launch needs.

(U) FY 2002 ($ in Thousands)

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

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	PROJECT 5033

(U) A. Mission Description Continued

(U) FY 2003 ($ in Thousands)

(U)	$0	Accomplishments/Planned Program
(U)	$11,773	Develop liquid rocket propulsion technology for current and future space launch vehicles. Initiate fabrication of turbopumps for integration into an advanced hydrocarbon booster engine. Commence testing in an advanced hydrocarbon test-bed engine.
(U)	$3,543	Develop solar thermal and solar electric propulsion technologies for existing and future upper stage and orbit transfer vehicles. Continue to demonstrate solar thermal propulsion technologies, such as strut development and pointing and tracking, for orbit transfer and maneuvering propulsion technology. Continue program to develop electric propulsion systems for orbit-transfer by developing high-power Hall thrusters capable of low-earth-orbit - geosynchronous-earth-orbit transfer. Initiate testing of the advanced small satellite propulsion demonstration to develop microsatellite formation flying capability for Air Force imaging requirements.
(U)	$3,539	Develop propellant technologies for the sustainment of strategic systems Phase 1. Continue testing of the Post Boost Control System program to demonstrate component technologies with available materials to reduce hardware costs and maintain system performance. Continue testing Strategic Sustainment Demonstration program technologies that integrates advanced propellant, case, and nozzle technologies and demonstrates cost and performance goals.
(U)	$393	Develop electric propulsion technologies for satellite formation flying, stationkeeping, and repositioning. Complete brass board level testing of a pulsed plasma thruster system. Initiate hot fire testing of the thruster integrated with the power processing unit. Continue development of propulsion system for Air Force small satellites (<100kg) required for key Air Force Space Command concepts. Initiate acceptance and verification testing of flight hardware for formation flying demonstration spacecraft.
(U)	$6,422	Begin component level evaluation of reusable hydrocarbon scramjet technology to support rocket-based combined cycle engines. Components to be evaluated are consistent with Integrated High Payoff Rocket Propulsion Technology Phase II hydrocarbon boost demonstration in FYs 2005-2006. Determines component technologies to be integrated into combined cycle engine development, as well as hydrocarbon engine components for highly reusable launch.
(U)	$25,670	Total

(U) FY 2004 ($ in Thousands)

(U)	$0	Accomplishments/Planned Program
(U)	$10,890	Develop liquid rocket propulsion technology for current and future space launch vehicles. Complete Integrated Powerhead Demonstration of advanced, long life, hydrogen-based engine components. Initiate component designs and analyses for hydrocarbon demonstration for reusable launch vehicle concepts.

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(U) A. Mission Description Continued

(U) FY 2004 ($ in Thousands) Continued

(U)	$6,479	Develop solar thermal and solar electric propulsion technologies for existing and future upper stage, orbit transfer vehicles, and satellite formation flying, station keeping, and repositioning. Continue program to develop electric propulsion systems for orbit-transfer by developing high-power Hall thrusters capable of low-earth orbit - geosynchronous-earth-orbit transfer. Prepare for delivery of the advanced small satellite propulsion demonstration unit for a microsatellite formation flying demonstration supporting improved capability for Air Force imaging requirements. Begin next phase solar thermal demonstration.
(U)	$2,840	Develop technologies for the sustainment of strategic systems. Continue evaluating the Strategic Sustainment Demonstration program hardware.
(U)	$2,012	Develop advanced monopropellant propulsion technologies for future chemical based propulsion systems for satellites. Continue component fabrication and preparation for demonstration tests.
(U)	$22,221	Total

(U) B. Project Change Summary

Not Applicable.

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

(U) PE 0602102F, Materials.
(U) PE 0602203F, Aerospace Propulsion.
(U) PE 0602500F, Multi-Disciplinary Space Technology.
(U) PE 0602601F, Spacecraft Technology.
(U) PE 0603114N, Power Projection Advanced Technology.
(U) PE 0603216F, Aerospace Propulsion Power Technology.
(U) PE 0603401F, Advanced Spacecraft Technology.
(U) PE 0603853F, Evolved Expendable Launch Vehicle Program.
(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: 03 - Advanced Technology Development (ATD)

PE NUMBER AND TITLE: 0603500F MULTI-DISCIPLINARY ADV DEV SPACE TEC

PROJECT: 5034

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
5034 Advanced Space Sensors	0	4,751	6,070	9,544	8,678	11,629	16,062	7,621	Continuing	TBD

Note: In FY 2003, space unique tasks in PE 0603203F, Project 665A, and PE 0603270F, Projects 431G and 691X, transferred into this project in conjunction with the Space Commission recommendation to consolidate all space unique activities. In FY 2004, increased emphasis is placed on laser warning sensor and laser communication technologies.

(U) A. Mission Description

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

(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) $283 Develop a signature analysis capability to evaluate the physical/chemical origins of paint/camouflage thermal reflectance features, and develop a forward predictive capability validated with empirical measurements. Perform chemical analyses and develop an enhanced surface scattering model. Develop and validate a baseline predictive signature prediction model for space-qualified hyperspectral electro-optical sensors.

(U) $991 Develop and demonstrate technologies to maximize Global Positioning System (GPS) jam resistance, positional accuracy, timing accuracy, and exploitation techniques to improve offensive and defensive combat capabilities. Design advanced M-Code technologies. Develop reference technologies to operate in space to provide precise time, position, and velocity for multiple platforms. Demonstrate virtual flight test technology for improved assessment of GPS anti-jam technologies.

(U) $430 Develop and demonstrate advanced wide-band electronic combat (EC) radio frequency (RF) receiver encoding/pre-processing/sorting concepts and techniques to handle increasing digitization of the modern complex RF signal environment for applications in existing and future space EC

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	PROJECT 5034

(U) A. Mission Description Continued

(U) FY 2003 ($ in Thousands) Continued

systems. These concepts and techniques will stress reconfigurability, modularity, interconnectivity, and affordability by using advanced digital technologies, such as Field Programmable Gate Arrays. Initiate requirements analysis, and hardware and software designs of future space electronic combat systems.

(U) $1,530 Complete study of and continue developing space-based support jamming technologies and techniques that will counter advanced radio frequency threats. Continue developing and assessing physical requirements for applying these technologies in space unique environments.

(U) $1,517 Complete design of space-hardened processor, geo-location, and spectrometer modules. Develop space laser warning sensor technologies for timely alert to advanced laser acquisition/tracking sensors, including detecting and locating both high power (dazzle/damage) and low power (laser-guided ordnance) signals. Complete false alarm package hardware and begin integration onto flight platform. Complete false alarm test planning. Continue risk reduction analysis for space-hardened geo-location, spectrometer, and processor modules. Initiate fabrication of space laser warning sensor modules.

(U) $4,751 Total

(U) FY 2004 ($ in Thousands)

(U) $0 Accomplishments/Planned Program

(U) $323 Continue developing a material signature analysis capability to evaluate the physical/chemical origins of paint/camouflage thermal reflectance features, and continue developing a forward predictive capability validated with empirical measurements. Perform chemical analyses of an expanded target set and continue developing an enhanced surface scattering model. Assess environmental influences on spectral signatures.

(U) $1,020 Design direction finding technologies to maximize Navigation Warfare exploitation techniques for enhanced offensive and defensive combat capabilities. Develop assured reference technologies to provide precise time, position, and velocity for on-board and off-board platform applications. Develop antenna wavefront simulation technology to assess anti-jam Global Positioning System III techniques.

(U) $559 Develop space-qualified laser warning sensor technologies for timely alerts of advanced laser acquisition/tracking sensors, including detecting and locating both high power (dazzle/damage) and low power (laser-guided ordnance) signals. Integrate false alarm package for space flight. Breadboard geo-location, spectrometer, and algorithm processor modules. Complete fabrication of space-qualified false alarm sensor modules. Continue planning for on-orbit testing.

(U) $4,168 Develop advanced laser communication component and sub-system technology to support a network-level topology for Airborne Intelligence Surveillance and Reconnaissance. Integrate and test electro-optical communication component technology into an airborne communication testbed, and evaluate performance with ground terminals under simulated space-to-ground, low elevation angle path lengths. Define

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(U) A. Mission Description Continued

(U) FY 2004 ($ in Thousands) Continued

requirements for laser communication channelization to develop multiple user access capability. Begin aircraft optical network development to switch and route high bandwidth laser communication signals to lower level radio frequency systems through a distributed fiber bus providing lower bandwidth link connectivity and redundancy.

(U) $6,070 Total

(U) B. Project Change Summary

Not Applicable.

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

(U) PE 0602204F, Aerospace Sensors.
(U) PE 0602500F, Multi-Disciplinary Space Technology.
(U) PE 0603203F, Advanced Aerospace Sensors.
(U) PE 0603270F, Electronic Combat 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 2003

BUDGET ACTIVITY: 03 - Advanced Technology Development (ATD)

PE NUMBER AND TITLE: 0603500F MULTI-DISCIPLINARY ADV DEV SPACE TEC

PROJECT: 5062

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
5062	Advanced Structures for Space Vehicles	0	2,543	3,000	0	0	2,912	870	459	Continuing	TBD

This is a new project but not a New Start resulting from the Space Commission recommedation to consolidate all space unique activities. In FY 2005, efforts in this project will be delayed until FY 2007 due to higher Air Force priorities.

(U) A. Mission Description

This project identifies, develops, and demonstrates the technologies to enable advanced access-to-space aerospace vehicles that deliver revolutionary capability, operability, responsiveness, and cost-effectiveness. Enabling technologies include thermal protection, structures, vehicle systems, configurations, aerodynamics, and controls. Technology demonstration includes multi-disciplinary system level integration of the enabling technologies.

(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) $2,543 Develop the airframe and payload technologies required to enable next generation reusable access to space systems including the thermal protection, structural, configuration, and vehicle and payload system technologies that enable aerospace vehicles to exhibit revolutionary capability, operability, responsiveness, and cost-effectiveness. Investigate integration of the multidisciplinary technologies required to design and demonstrate these aerospace vehicle configurations such as materials, munitions, human effectiveness, and both rocket- and airbreathing-based hypersonic propulsion.

(U) $2,543 Total

(U) FY 2004 ($ in Thousands)

(U) $0 Accomplishments/Planned Program

(U) $3,000 Continue to develop the airframe and payload technologies required to enable next generation reusable access to space systems including the thermal protection, structural, configuration and vehicle and payload system technologies that enable aerospace vehicles to exhibit revolutionary capability, operability, responsiveness, and cost-effectiveness.

RDT&E BUDGET ITEM JUSTIFICATION SHEET (R-2A Exhibit)	DATE: February 2003
BUDGET ACTIVITY: 03 - Advanced Technology Development (ATD)	PE NUMBER AND TITLE: 0603500F MULTI-DISCIPLINARY ADV DEV SPACE TEC / PROJECT: 5062

(U) A. Mission Description Continued

(U) FY 2004 ($ in Thousands) Continued

(U)	$0	No Activity
(U)	$3,000	Total

(U) B. Project Change Summary

Not Applicable.

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

(U) PE 0602500F, Multi-Disciplinary 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.