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

DATE: June 2001

BUDGET ACTIVITY: 03 - Advanced Technology Development

PE NUMBER AND TITLE: 0603410F Space Systems Environmental Interactions Technology

PROJECT: 2822

	COST ($ in Thousands)	FY 2000 Actual	FY 2001 Estimate	FY 2002 Estimate	FY 2003 Estimate	FY 2004 Estimate	FY 2005 Estimate	FY 2006 Estimate	FY 2007 Estimate	Cost to Complete	Total Cost
2822	Space Environmmental Impact Tests	3,312	3,381	0	0	0	0	0	0	Continuing	TBD
	Quantity of RDT&E Articles	0	0	0	0	0	0	0	0	0	0

Note: In FY 2002, in order to align projects within the Air Force Research Laboratory organization, all efforts in this Program Element were transferred to PE 0603401F, Project 4400.

(U) A. Mission Description

This program develops and demonstrates technologies to improve the survivability and reliability of current and future DoD space systems. It develops and demonstrates cost-effective solutions to mitigate hazardous space environmental interactions including electrical charge buildup and electronics failures due to both single radiation events and long-term radiation doses.

(U) FY 2000 ($ in Thousands)

(U) $1,001 Developed environmental sensors to specify and forecast scintillation and other hazardous space environmental conditions that degrade satellite systems and communications. Communications/navigation outage forecasting allows preemptive use of alternate links in times of outages to maintain communication for the warfighter. Specifying and predicting hazardous space conditions will allow improved system design, lifetime, and operational capabilities. Conducted space flight test to demonstrate capability of advanced space plasma sensor to detect environment irregularities that impact Command, Control, Communications, and Intelligence (C3I). Completed fabrication of space-based, all-sky camera for detecting solar disturbances; began integration for space flight test. Completed fabrication of relativistic electron and proton detector with capabilities to determine spectral resolution of the most damaging high-energy particle populations.

(U) $1,105 Supported initiatives to improve capability to specify and predict space environmental impacts on operational space systems such as spacecraft charging and meteor effects. Spacecraft design and space environment specification and analysis tools are required to improve space system performance, reduce cost, and provide for situational awareness and anomaly resolution for more miniaturized spacecraft, electromagnetic propulsion, and high-power systems. Completed dynamic Air Force geosynchronous space codes for space environment specification and effects determination. Completed spacecraft charging analysis tool for geosynchronous environments affecting many DoD communications and surveillance spacecraft. Developed web-based spacecraft charging design tool.

(U) $818 Developed technology to warn of spacecraft charging and other deleterious conditions for DoD and commercial spacecraft and investigated technologies for alteration of space particle environment. The ability to specify and warn of spacecraft charging and related hazards, which can

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(U) A. Mission Description Continued

(U) FY 2000 ($ in Thousands) Continued

cause component and system level failures, will prevent loss of space assets and capabilities and will provide a capability for a global situational awareness of hazards. Space particle control technology will permit the reduction of hazardous particle environments for naturally or artificially triggered events and the enhancement of particle environments to degrade hostile assets. Demonstrated capability of compact environment anomaly sensors to specify hazardous conditions local to the spacecraft on a low Earth orbit space test flight and validated performance against existing radiation belt methods.

(U) $388 Developed miniaturized chemical contamination and kinetic impact sensors for DoD operational spacecraft. Developed tools for space environmental effects specification and analysis compatible with DoD operational software systems. Advanced space optical systems, such as the planned space-based laser, are extremely sensitive to chemical contamination and require on-board, autonomous systems to monitor and warn of performance degradation. Developed space environment specification and analysis tools that are user-friendly, low-cost, and run on commonly available operational platforms. Designed space environment distributed anomaly sensor for space particle, chemical contamination, and kinetic impact hazards. Transitioned the leading Air Force space environment specification and analysis software to common Air Force operating system.

(U) $3,312 Total

(U) FY 2001 ($ in Thousands)

(U) $1,383 Complete ground testing of space environmental sensor for flight with the Communications/Navigation Outage Forecast System (C/NOFS). Support integration, launch, and on-orbit operations of instrumentation to provide improved space radiation hazard specification and forecasting. Complete space test of plasma sensor prototype for C/NOFS spacecraft. Complete integration of space-based, all-sky camera to detect solar disturbances. Begin integration of relativistic electron and proton detector for mission to map the dynamic radiation belts and quantify the hazards to space systems.

(U) $1,061 Advance spacecraft survivability through collaborative experiments and development of design tools needed for advanced power, communications, and surveillance systems. Complete web-based spacecraft charging design tool. Begin analysis of miniaturized charge control system and space power tether system performance.

(U) $937 Develop technology to warn of spacecraft charging, chemical contamination, and kinetic impact hazards to DoD and commercial spacecraft. Develop technologies to mitigate the effect of the space environment on DoD space systems. Technologies to control the level of spacecraft charging and high-energy radiation effects will significantly improve space system reliability and availability, reduce operational costs, and provide techniques to degrade hostile space assets. Continue compact environment anomaly sensor validation. Demonstrate new compact

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(U) A. Mission Description Continued

(U) FY 2001 ($ in Thousands) Continued

environment anomaly sensor capabilities for geosynchronous orbit environments on Air Force operational satellites. Begin ground tests of global particle enhancement and depletion technologies.

(U) $3,381 Total

(U) FY 2002 ($ in Thousands)

(U) $0 No Activity

(U) $0 Total

(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 military utility and address warfighter needs.

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

		FY 2000	FY 2001	FY 2002	Total Cost
(U)	Previous President's Budget (FY 2001 PBR)	4,027	3,412	3,746	
(U)	Appropriated Value	4,077	3,412		
(U)	Adjustments to Appropriated Value				
	a. Congressional/General Reductions	-1			
	b. Small Business Innovative Research	-96			
	c. Omnibus or Other Above Threshold Reprogram	-105			
	d. Below Threshold Reprogram	-520			
	e. Rescissions	-43	-31		
(U)	Adjustments to Budget Years Since FY 2001 PBR			-3,746	
(U)	Current Budget Submit/FY 2002 PBR	3,312	3,381	0	TBD

(U) Significant Program Changes:

In FY 2002, in order to align projects within the Air Force Research Laboratory organization, all efforts in this Program Element were transferred to PE 0603401F, Project 4400.

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

(U) Related Activities:

(U) PE 0602601F, Spacecraft Technology.

(U) This project has been coordinated through the Reliance process to harmonize efforts and eliminate duplication.

(U) E. Acquisition Strategy

Not Applicable.

(U) F. Schedule Profile

(U) Not Applicable.