PE NUMBER: 0603791F
PE TITLE: International Space Cooperative R&D

Exhibit R-2, RDT&E Budget Item Justification	DATE February 2006
BUDGET ACTIVITY 04 Advanced Component Development and Prototypes (ACD&P)	PE NUMBER AND TITLE 0603791F International Space Cooperative R&D

Cost ($ in Millions)	FY 2005 Actual	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	Cost to Complete	Total
Total Program Element (PE) Cost	0.532	0.566	0.593	0.612	0.625	0.639	0.649	Continuing	TBD
5035 Intl Space Coop R&D	0.532	0.566	0.593	0.612	0.625	0.639	0.649	Continuing	TBD

In FY 2003, from PE 0603790F, 64NATO, NATO Coop R&D, space-related efforts transferred to PE 0603791F, 645035, Intl Space Coop R&D, in order to clearly identify space-related projects and funding.

(U) A. Mission Description and Budget Item Justification

These funds will be used to help implement space-related international cooperative research, development, and acquisition (ICRD&A) agreements with North Atlantic Treaty Organization (NATO) member states and major non-NATO allies (Argentina, Australia, Egypt, Bahrain, Israel, Japan, Jordan, and Rep. of Korea (South Korea), Kuwait, Morocco, New Zealand, Pakistan, Taiwan, Thailand, and Phillipines) and friendly foreign countries (Austria, Brazil, Bulgaria, Finland, India, Singapore, South Africa, Sweden, Switzerland, and Ukraine). The program implements the provisions of Title 10 U.S. Code, Section 2350a on NATO Cooperative Research and Development (R&D). The program was established to improve cooperation among NATO nations, and later major non-NATO allies, in research, development, and acquisition. The legislation authorized funds to significantly improve United States (US) and allied conventional defense capabilities by leveraging the best defense technologies, eliminating costly duplication of R&D efforts, accelerating the availability of defense systems, and promoting US and allied interoperability or commonality. The program will be reported as required by Title 10 U.S. Code, Section 2350a(f). This program element funds the implementation of space-related Air Force ICRD&A agreements in (1) Basic Research (2) Applied Research (3) Advanced Technology Development (4) Advanced Component Development and Prototypes (5) System Development and Demonstration and (6) RDT&E Management Support. This PE is designated in Budget Activity 4 because most of the ICRD&A projects support specific systems, include all efforts necessary to evaluate integrated technologies in as realistic an operating environment as possible to assess the performance or cost reduction potential of advanced technology, and help expedite technology transition from the laboratory to operational use.

(U) B. Program Change Summary ($ in Millions)

		FY 2005	FY 2006	FY 2007
(U)	Previous President's Budget	0.547	0.566	0.575
(U)	Current PBR/President's Budget	0.532	0.566	0.593
(U)	Total Adjustments	-0.015	0.000	
(U)	Congressional Program Reductions			
	Congressional Rescissions			
	Congressional Increases			
	Reprogrammings			
	SBIR/STTR Transfer	-0.015		
(U)	Significant Program Changes:			

Exhibit R-2a, RDT&E Project Justification		DATE: February 2006
BUDGET ACTIVITY: 04 Advanced Component Development and Prototypes (ACD&P)	PE NUMBER AND TITLE: 0603791F International Space Cooperative R&D	PROJECT NUMBER AND TITLE: 5035 Intl Space Coop R&D

Cost ($ in Millions)	FY 2005 Actual	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	Cost to Complete	Total
5035 Intl Space Coop R&D	0.532	0.566	0.593	0.612	0.625	0.639	0.649	Continuing	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0		

(U) A. Mission Description and Budget Item Justification

These funds will be used to help implement space-related international cooperative research, development, and acquisition (ICRD&A) agreements with North Atlantic Treaty Organization (NATO) member states and major non-NATO allies (Argentina, Australia, Egypt, Bahrain, Israel, Japan, Jordan, and Rep. of Korea (South Korea), Kuwait, Morocco, New Zealand, Pakistan, Taiwan, Thailand, and Phillipines) and friendly foreign countries (Austria, Brazil, Bulgaria, Finland, India, Singapore, South Africa, Sweden, Switzerland, and Ukraine). The program implements the provisions of Title 10 U.S. Code, Section 2350a on NATO Cooperative Research and Development (R&D). The program was established to improve cooperation among NATO nations, and later major non-NATO allies, in research, development, and acquisition. The legislation authorized funds to significantly improve United States (US) and allied conventional defense capabilities by leveraging the best defense technologies, eliminating costly duplication of R&D efforts, accelerating the availability of defense systems, and promoting US and allied interoperability or commonality. The program will be reported as required by Title 10 U.S. Code, Section 2350a(f). This program element funds the implementation of space-related Air Force ICRD&A agreements in (1) Basic Research (2) Applied Research (3) Advanced Technology Development (4) Advanced Component Development and Prototypes (5) System Development and Demonstration and (6) RDT&E Management Support. This PE is designated in Budget Activity 4 because most of the ICRD&A projects support specific systems, include all efforts necessary to evaluate integrated technologies in as realistic an operating environment as possible to assess the performance or cost reduction potential of advanced technology, and help expedite technology transition from the laboratory to operational use.

(U) B. Accomplishments/Planned Program ($ in Millions)	FY 2005	FY 2006	FY 2007
(U) Impacts of the Space Environment on Communications, Navigation, and Surveillance Systems (AFRL/ The United Kingdom (UK)) - Planned cooperative project to develop space weather specification, forecasting techniques, and data displays to provide reliable, timely warning of ionospheric disturbances that will seriously disrupt the performance of space-based communication, navigation and surveillance systems, as well as ground-based surveillance systems such as those employed for early missile warning and missile defense. In FY04, data collection will begin.	0.205	0.000	0.000
(U) Hypersonic Airbreathing Propulsion Test Techniques (AEDC / Germany) - Planned project addresses US deficiencies in hypersonic test capabilities and diagnostic techniques, and will leverage German, tri-service, and Arnold AFB investments. The key component of this project will involve complementary testing of a hypersonic engine at Arnold AFB's Aerodynamic and Propulsion Test Unit (APTU) facility and the German Aerospace Center (DLR) High Enthalpy Göttingen (HEG) facility. Ancillary activities will include diagnostics and computer model development, application, and analysis. These activities are needed by the US to enhance conventional defense capabilities into hypersonic flight systems of the future. The Air Force Scientific Advisory Board (SAB) conducted report SAB-TR-00-03 on "Why and Whither Hypersonics research in the US Air Force", which recognized serious	0.097	0.195	0.107

Exhibit R-2a, RDT&E Project Justification		DATE February 2006
BUDGET ACTIVITY 04 Advanced Component Development and Prototypes (ACD&P)	PE NUMBER AND TITLE 0603791F International Space Cooperative R&D	PROJECT NUMBER AND TITLE 5035 Intl Space Coop R&D

(U)	B. Accomplishments/Planned Program ($ in Millions)	FY 2005	FY 2006	FY 2007
	shortfalls in ground test facility hypersonic capabilities. The AF published Vision 2020: Global Vigilance, Reach and Power, stated a desire to control and exploit the full aerospace continuum.			
(U)	Measurement of High-Latitude Ionospheric Structures and System Effects from Northeast Greenland (AFRL/Denmark) - Planned cooperative project to accurately model, simulate, recognize, and forecast polar ionospheric conditions impacting DoD systems. The project will collect multi-instrument measurements of ionospheric conditions at Station Nord in Greenland for the purpose of furthering basic research into mechanisms creating ionospheric disturbances, improving high-latitude ionosphere models, simulations, and providing space weather situational awareness and forecast tools.	0.135	0.100	0.018
(U)	Cooperation In Navigation Warfare Technology Demonstrator and System Prototype Projects (PA) SMC/GP (GPS Joint Program Office) and ASD/NII/UK - Cooperative project to conduct collaborative studies and cooperatively develop advance counterSATNAV capabilities that can be employed from current and projected EA platforms. Developed technologies will be jointly tested to assure desired effects are achieved and that there is minimal fraticide impact on friendly forces. Additionaly, an initial concept of employment or operations will be collectively developed and tested by the participants in order to assess optimal capabilities in varying threat situations.	0.095	0.121	0.152
(U)	Forecasting Communication and Navigation Disruptions due to Inonspheric Disturbance During Solar Minumum (AFRL/VSBX) and Australia - Planned cooperative project to collaborate with Australia to study ionospheric phenomena which impact communication, navigation and radio frequency (RF) surveillance systems. The key research focus will be on forecasting ionospheric disturbances and their impact on systems such as Ultra High Frequency (UHF) Satellite Communication (SATCOM) and GLOBAL Positioning System (GPS) navigation. Ionospheric phenomena had an adverse impact on DoD satellite communication and navigation systems in recent operations in Afghanistan and during Operation Iraqi Freedom (OIF); future military operations will almost certainly be conducted in regions where ionospheric disturbances occur and C31 systems may be vulnerable. The Communication/Navigation Outage Forecast System System (C/NOFS) Advance Concept Technical Demonstration (ACTD) is dedicated to providing space-based forecasts of the disturbances that cause impacts on radio frequency (RF) systems.	0.000	0.150	0.216
(U)	Multidemsional Diffusion of High Energy Radiation Belt Electrons (AFRL / UK) - High energy electrons constituting the radiation belts are a primary hazard for USAF and other satellites. They are often enhanced during geomagnetic storms, but not in a reliably predictable way. Thus understanding and forecasting their behavior is a major research goal. The physics of the radiation belts is believed to be largely controlled by electromagnetic waves, which cause diffusion in the otherwise constant particle energy (E), equatorial pitch angle (a0), and radial distance (L shell parameter). The wave amplitudes can become greatly enhanced during magnetic storms and substorms, leading to a rapid increase in particle energy and a rapid decrease in particle distance from the earth (through decrease in L,	0.000	0.000	0.100

Exhibit R-2a, RDT&E Project Justification		DATE February 2006
BUDGET ACTIVITY 04 Advanced Component Development and Prototypes (ACD&P)	PE NUMBER AND TITLE 0603791F International Space Cooperative R&D	PROJECT NUMBER AND TITLE 5035 Intl Space Coop R&D

(U) B. Accomplishments/Planned Program ($ in Millions)	FY 2005	FY 2006	FY 2007
a0, or both), which increases the risk to satellites in medium or low earth orbit. Wave-particle interactions are also a dominant loss mechanism for energetic electrons, so the detailed evolution of the particle distribution depends on a complex balance of several diffusion rates.			
(U) Management and administrative support and travel.	0.000	0.000	0.000
(U) Total Cost	0.532	0.566	0.593

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

	FY 2005 Actual	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	Cost to Complete	Total Cost
(U) N/A									

(U) D. Acquisition Strategy

A principal goal of the International Space Cooperative R&D program is to effectively utilize the aggregate resources invested by the US and our allies in space-related R&D. This program element provides the critical funding incentive needed to pursue space-related ICRD&A agreements and helps to (a) leverage USAF and allied resources through cost sharing and economies of scale; (b) exploit the best US and allied technologies for equipping coalition forces; (c) demonstrate areas of commonality or interoperability with our allies; and (d) accelerate the availability of defense technology and systems. Candidate projects are reviewed and approved by the USD(AT&L). An international agreement defining project objectives, responsibilities and costs is required prior to release of funds. To obtain these funds and ensure service commitment, projects are selected from existing or new space-related RDT&E programs funded in the Future Years Defense Plan (FYDP). Project offices must show matching funds and contributions from associated program elements and equitable allied funding. As appropriate, funding responsibility for out-year requirements and follow-on efforts are transferred to the project office and associated program elements. Most contracts are awarded after full and open competition.

Exhibit R-3, RDT&E Project Cost Analysis

DATE: **February 2006**

BUDGET ACTIVITY: **04 Advanced Component Development and Prototypes (ACD&P)**

PE NUMBER AND TITLE: **0603791F International Space Cooperative R&D**

PROJECT NUMBER AND TITLE: **5035 Intl Space Coop R&D**

(U) Cost Categories (Tailor to WBS, or System/Item Requirements) ($ in Millions)	Contract Method & Type	Performing Activity & Location	Total Prior to FY 2005 Cost	FY 2005 Cost	FY 2005 Award Date	FY 2006 Cost	FY 2006 Award Date	FY 2007 Cost	FY 2007 Award Date	Cost to Complete	Total Cost	Target Value of Contract
(U) Product Development												
AFRL Hanscom AFB, MA	TBD									Continuing	TBD	TBD
AFRL, WPAFB				0.335	Nov-05	0.423	Oct-06	0.236	Oct-07	Continuing	TBD	TBD
AEDC/DO				0.097	Nov-05					Continuing	TBD	TBD
SMC, LAAFB, CA				0.100	Nov-05	0.143	Oct-06	0.357	Oct-07	Continuing	TBD	TBD
Subtotal Product Development			0.000	0.532		0.566		0.593		Continuing	TBD	TBD
Remarks:												
(U) Support												
AFRL, WPAFB	TBD									Continuing	TBD	TBD
None											0.000	
Subtotal Support			0.000	0.000		0.000		0.000		Continuing	TBD	TBD
Remarks:												
(U) Test & Evaluation												
TBD	TBD									Continuing	TBD	TBD
None											0.000	
Subtotal Test & Evaluation			0.000	0.000		0.000		0.000		Continuing	TBD	TBD
Remarks:												
(U) Management												
											0.000	
Subtotal Management			0.000	0.000		0.000		0.000		0.000	0.000	0.000
Remarks:												
(U) Total Cost			0.000	0.532		0.566		0.593		Continuing	TBD	TBD

Exhibit R-4, RDT&E Schedule Profile		DATE February 2006
BUDGET ACTIVITY 04 Advanced Component Development and Prototypes (ACD&P)	PE NUMBER AND TITLE 0603791F International Space Cooperative R&D	PROJECT NUMBER AND TITLE 5035 Intl Space Coop R&D

Name of ICR&D Project & Int'l Agreement Schedule	Start Date	END IA	PE
Impacts of Space Environment...	FY 03	FY 05	63791
Hypersonic Airbreathing Propulsion Test	FY 05	FY 08	63791
Measurement of High-Latitude Ionospheric	FY 05	FY 08	63791
Cooperation in Navigation Warfare Technology	FY 05	FY 08	63791
Forecasting Communication and Navigation Disruptions due to Ionospheric Disturbance During Solar Minimum	FY 06	FY 09	63791
Multidim. Diffusion of High Energy Ratdiation Belt Electrons	FY 07	FY 10	63791

Exhibit R-4a, RDT&E Schedule Detail

DATE: February 2006

BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NUMBER AND TITLE
04 Advanced Component Development and Prototypes (ACD&P)	0603791F International Space Cooperative R&D	5035 Intl Space Coop R&D

(U)	Schedule Profile	FY 2005	FY 2006	FY 2007
(U)	Impacts of the Space Environment on Communications, Navigation and Surveillance Systems	4Q		
(U)	- Data collection	2Q		
(U)	Forecasting Comm. and Navigation Disruption due to Ionospheric Disturbances During Solar Minimum		1Q	
(U)	- Project Agreement signed		1Q	
(U)	Cooperation in Navigation Warfare Technology	1Q		
(U)	- Data collection begins		3Q	
(U)	Measurement of High-Latitude Ionospheric Structures and System Effects		4Q	
(U)	- Project agreement signed		1Q	
(U)	- Data collection begins			1Q
(U)	Multidimensional Diffusion of High Energy Radiation Belt Electrons		1-3Q	
(U)	- Project Agreement Signed		4Q	
(U)	- Data collection begins		3Q	