Exhibit R-2, RDT&E Budget Item Justification: PB 2013 Air Force										DATE: February 2012	
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 3: *Advanced Technology Development (ATD)*				R-1 ITEM NOMENCLATURE PE 0603401F: *Advanced Spacecraft Technology*							
COST ($ in Millions)	**FY 2011**	**FY 2012**	**FY 2013 Base**	**FY 2013 OCO**	**FY 2013 Total**	**FY 2014**	**FY 2015**	**FY 2016**	**FY 2017**	**Cost To Complete**	**Total Cost**
Total Program Element	75.103	74.009	64.557	-	64.557	61.690	67.075	54.973	56.870	Continuing	Continuing
632181: *Spacecraft Payloads*	18.573	18.799	15.710	-	15.710	13.299	12.303	9.659	9.989	Continuing	Continuing
633834: *Integrated Space Technology Demonstrations*	36.556	35.143	13.828	-	13.828	13.933	22.653	24.206	25.297	Continuing	Continuing
634400: *Space Systems Protection*	4.464	4.475	5.047	-	5.047	6.469	7.217	7.416	7.587	Continuing	Continuing
634950: *Space Demonstration*	-	-	16.000	-	16.000	15.000	11.500	-	-	Continuing	Continuing
635021: *Space Systems Survivability*	3.610	3.249	2.907	-	2.907	3.097	3.526	3.552	3.634	Continuing	Continuing
635083: *Ballistic Missiles Technology*	5.053	5.216	5.081	-	5.081	5.377	6.214	6.260	6.404	Continuing	Continuing
63682J: *Spacecraft Vehicles*	6.847	7.127	5.984	-	5.984	4.515	3.662	3.880	3.959	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program develops, integrates, and demonstrates space technologies in the areas of spacecraft payloads, spacecraft protection, spacecraft vehicles, ballistic missiles, and space systems survivability. The integrated space technologies are demonstrated by component or system level tests on the ground or in flight. Efforts in this program have been coordinated through the Reliance 21 process to harmonize efforts and eliminate duplication. This program is in Budget Activity 3, Advanced Technology Development, since it develops and demonstrates technologies for existing space system upgrades and/or new space system developments that have military utility and address warfighter needs.

Exhibit R-2, RDT&E Budget Item Justification: PB 2013 Air Force		DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603401F: *Advanced Spacecraft Technology*	

B. Program Change Summary ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
Previous President's Budget	83.705	74.636	75.715	-	75.715
Current President's Budget	75.103	74.009	64.557	-	64.557
Total Adjustments	-8.602	-0.627	-11.158	-	-11.158
• Congressional General Reductions	-	-0.627			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-2.511	-			
• SBIR/STTR Transfer	-1.568	-			
• Other Adjustments	-4.523	-	-11.158	-	-11.158

Change Summary Explanation

FY11: Other Adjustments include -0.933 Congressional General Reductions and -3.590 Congressional Directed Transfers

Decrease in FY13 is due to higher Department of Defense priorities.

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force			DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603401F: *Advanced Spacecraft Technology*	PROJECT 632181: *Spacecraft Payloads*	

COST ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
632181: *Spacecraft Payloads*	18.573	18.799	15.710	-	15.710	13.299	12.303	9.659	9.989	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project funds the development, demonstration, and evaluation of radiation-hardened space electronic hardware, satellite control hardware, and software for advanced satellite surveillance operations. Future improved space-qualifiable electronics and software for data and signal processing will be more interchangeable, interoperable, and standardized. In the near-term, this project's work concentrates on converting (i.e., radiation-hardening) commercial data and signal processor technologies for use in Air Force space systems. For mid-term applications, this project merges advanced, radiation-hardened space processor, memory, and interconnect technologies with commercially-derived, open system architectures to develop and demonstrate robust, on-board processing capabilities for 21st century Department of Defense satellites. In the long-term, this project area focuses on developing low-cost, easily modifiable software and hardware architectures for fully autonomous constellations of intelligent satellites capable of performing all mission related functions without operator intervention.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
Title: Major Thrust 1.	6.037	7.274	7.047	-	7.047
Description: Develop microelectronic devices, including radiation-hardened data processors and high-density hardened memories, advanced packaging technologies, and micro-electro-mechanical system components and applications.					
FY 2011 Accomplishments: Demonstrated engineering model of high-density volatile memory. Continued multiprocessor architecture development. Initiated multiprocessor component development.					
FY 2012 Plans: Complete development of Single Event Immune Reconfigurable Field Programmable Gate Array for flexible, cost-effective on-board processing in space. Develop multiprocessor components to increase on-orbit processing capability. Develop high-density volatile and non-volatile memory for increased on-orbit storage capability.					
FY 2013 Base Plans: Continue to develop multiprocessor components to increase on-orbit processing capability. Continue to develop high-density volatile and non-volatile memory for increased on-orbit storage capability. Develop structured application specific integrated circuits for affordable space electronics.					
FY 2013 OCO Plans:					

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force		DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603401F: *Advanced Spacecraft Technology*	PROJECT 632181: *Spacecraft Payloads*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
N/A					
Title: Major Thrust 2. ***Description:*** Develop satellite system technologies for spacecraft operations and for satellite control, precision navigation, formation flying, and proximity operations technologies. ***FY 2011 Accomplishments:*** Completed model of command, control, and communications systems, conducted engineering trades, and performed military utility analysis for space superiority. Continued rapid spacecraft development processes to include automated spacecraft design, rapid assembly, automated flight and ground software configuration, and expedited integration and test. ***FY 2012 Plans:*** Complete rapid spacecraft development processes for automated spacecraft design, rapid assembly, automated flight and ground software configuration, and expedited integration and test. Initiate second-generation plug-and-play ground testbed to fully test and demonstrate end-to-end flight ready spacecraft plug-and-play software and hardware. ***FY 2013 Base Plans:*** Continue second-generation plug-and-play ground testbed to fully test and demonstrate end-to-end flight ready spacecraft plug-and-play software and hardware. ***FY 2013 OCO Plans:*** N/A	3.487	2.594	1.991	-	1.991
Title: Major Thrust 3. ***Description:*** Develop modeling, simulation, and analysis tools for space-based surveillance systems, space capability protection technologies, access/mobility technologies, and flight experiments. ***FY 2011 Accomplishments:*** Developed graphic interfaces for simulation and analysis tools. Transitioned validated tools for use in customer flight programs. Applied lessons learned from analytical support, flight program participation, and external space organizations into refined modeling, simulation, and analysis tools that reduce cost and risk of flight programs and better model schedule limitations. ***FY 2012 Plans:***	4.911	4.572	2.781	-	2.781

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force		DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603401F: *Advanced Spacecraft Technology*	PROJECT 632181: *Spacecraft Payloads*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
Complete integration of autonomous flight software technologies with command, control, guidance, and navigation technologies. Apply additional physics-to-engineering-to-engagement level models for systems engineering, technology trades, mission planning and operations, and utility analysis to satellite experiments in space superiority mission areas. ***FY 2013 Base Plans:*** Validate the guidance, navigation, and control aspects of the autonomous flight software using the Mission Simulator flight software. Continue to provide engineering to engagement level models for systems engineering and trades, mission planning, and utility analysis to flight experiments and research areas. ***FY 2013 OCO Plans:*** N/A					
Title: Major Thrust 4. ***Description:*** Develop space infrared technology and hardened focal plane detector arrays to enable acquisition, tracking, and discrimination of hot targets, as well as "cold body" targets. ***FY 2011 Accomplishments:*** Refined full focal plane array for exquisite imaging for space applications. Refined higher operating temperature sensor development and large format infrared sensor development. ***FY 2012 Plans:*** Develop full focal plane array for exquisite imaging for adaptive, comprehensive space situational awareness (SSA). Initiate higher operating temperature, large format medium wavelength infrared sensor development for wide area, global access detection and tracking. ***FY 2013 Base Plans:*** Continue large focal plane array development for exquisite imaging for adaptive, comprehensive SSA. Continue development of higher operating temperature, large format medium wavelength infrared sensors for wide area, global access detection and tracking. ***FY 2013 OCO Plans:*** N/A	4.138	4.359	3.891	-	3.891
Accomplishments/Planned Programs Subtotals	18.573	18.799	15.710	-	15.710

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force		DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603401F: *Advanced Spacecraft Technology*	PROJECT 632181: *Spacecraft Payloads*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
• N/A: *N/A*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

D. Acquisition Strategy

N/A

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force			DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603401F: *Advanced Spacecraft Technology*	PROJECT 633834: *Integrated Space Technology Demonstrations*	

COST ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
633834: *Integrated Space Technology Demonstrations*	36.556	35.143	13.828	-	13.828	13.933	22.653	24.206	25.297	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project is a series of advanced technology demonstrations designed to address mission needs by applying emerging technologies from the Air Force Research Laboratory, other U.S. Government laboratories, and industry. These technologies are integrated into system-level demonstrations that are used to test, evaluate, and validate the technologies in a relevant environment.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
Title: Major Thrust 1. ***Description:*** Develop satellite technologies for integrated, robust, flexible, satellite demonstrations building on previous work and leveraging investments by other organizations. ***FY 2011 Accomplishments:*** Completed integration of experimental satellite for geosynchronous orbit. ***FY 2012 Plans:*** Complete integration/test and space environmental testing in preparation for launch of experimental satellite for geosynchronous orbit. Complete ground system software for use in space operations. Begin design of next geosynchronous space flight demonstration. ***FY 2013 Base Plans:*** Complete satellite integration to the launch vehicle. Complete satellite flight software and orbit analyst tools for commanding satellite. Continue design of next geosynchronous space flight demonstration. ***FY 2013 OCO Plans:*** N/A	36.556	35.143	13.828	-	13.828
Accomplishments/Planned Programs Subtotals	36.556	35.143	13.828	-	13.828

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
• N/A: *N/A*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force		DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603401F: *Advanced Spacecraft Technology*	PROJECT 633834: *Integrated Space Technology Demonstrations*

D. Acquisition Strategy

N/A

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force			DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603401F: *Advanced Spacecraft Technology*	PROJECT 634400: *Space Systems Protection*	

COST ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
634400: *Space Systems Protection*	4.464	4.475	5.047	-	5.047	6.469	7.217	7.416	7.587	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project develops and demonstrates tools, instruments, and mitigation techniques required to assure operation of U.S. space assets in potentially hostile warfighting environments. The project performs assessments of critical components and subsystems, and evaluates susceptibility and vulnerability to radio frequency (RF) and laser threats. This project also develops technologies that mitigate identified vulnerabilities. Technologies are developed and demonstrated to support balanced satellite protection strategies for detecting, avoiding, and operating in a hostile space environment.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
Title: Major Thrust 1. ***Description:*** Multi-threat assessment tools to assess space-based electro-optical, communication, and other responses to various candidate RF and laser countermeasures. ***FY 2011 Accomplishments:*** Conducted extensive engineering analysis and down selected final systems. Performed subsystem testing of RF and laser countermeasures. ***FY 2012 Plans:*** Conduct algorithm development and performance simulation to synthesize sensor input from multiple sources, on-board and off-board, to provide situational awareness. ***FY 2013 Base Plans:*** Continue algorithm development and performance simulation to synthesize sensor input from multiple sources, on-board and off-board, to provide situational awareness. ***FY 2013 OCO Plans:*** N/A	2.183	2.406	2.898	-	2.898
Title: Major Thrust 2. ***Description:*** Develop passive satellite countermeasures and mitigation techniques for current and future threats to satellites. ***FY 2011 Accomplishments:***	0.954	0.830	1.715	-	1.715

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force		DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603401F: *Advanced Spacecraft Technology*	PROJECT 634400: *Space Systems Protection*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
Developed performance goals using engineering models. Began design of future flight demonstration unit for passive satellite countermeasures. ***FY 2012 Plans:*** Identify local area sensors for indication and warnings concepts for engineering unit development. Begin process to identify future flight opportunity. ***FY 2013 Base Plans:*** Initiate local area sensor for indication and warnings engineering unit development. Continue to work process to identify future flight opportunity. ***FY 2013 OCO Plans:*** N/A					
Title: Major Thrust 3. ***Description:*** Develop active satellite local space awareness technologies and exploitation tools for satellite systems. ***FY 2011 Accomplishments:*** Developed performance goals using engineering models. Began design of flight demonstration unit for potential SSA applications. ***FY 2012 Plans:*** Design on-orbit threat detection, assessment, and response software systems. Focus technology development effort on on-orbit intelligent control of surveillance payloads. Explore technology for miniaturization of sensor concepts and improved dynamic sensitivity of sensor components. ***FY 2013 Base Plans:*** Demonstrate a hardware-in-the-loop responsive action to a selected postulated directed energy threat to a hypothetical friendly satellite. This includes the capability to detect threats on-board and provide autonomous potential courses of action to mitigate the postulated threat. ***FY 2013 OCO Plans:*** N/A	0.880	0.942	0.145	-	0.145
Title: Major Thrust 4.	0.447	0.297	0.289	-	0.289

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force		DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603401F: *Advanced Spacecraft Technology*	PROJECT 634400: *Space Systems Protection*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
Description: Develop RF characterization methods and performance analysis technology. ***FY 2011 Accomplishments:*** Identified technology options that provide passive or active detection of satellites in the RF spectrum. Developed and completed engineering designs for systems used to support active space superiority technologies. Demonstrated subsystems through laboratory testing. ***FY 2012 Plans:*** Evaluate sensing techniques for potential active and/or passive threat detection and tracking capabilities. Develop requirements and concepts to reduce vulnerabilities to next generation U.S. satellites. ***FY 2013 Base Plans:*** Develop engineering model sensor sub-systems for active and/or passive threat detection and tracking capabilities. Initiate technology risk reduction for U.S. satellite vulnerability mitigation. ***FY 2013 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	4.464	4.475	5.047	-	5.047

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
• N/A: *N/A*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

D. Acquisition Strategy

N/A

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force			DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603401F: *Advanced Spacecraft Technology*	PROJECT 634950: *Space Demonstration*	

COST ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
634950: *Space Demonstration*	-	-	16.000	-	16.000	15.000	11.500	-	-	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project will provide mission design and development, payload integration, launch support, operations planning, and one-year of on-orbit operations for a Science and Technology space-launch mission. The project will provide a launch opportunity in support of the multi-agency "new entrant" certification strategy and the USAF Launch Services New Entrant Certification Guide.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
Title: Major Thrust 1 ***Description:*** Provide mission design and development, payload integration, launch support, operations planning, and one-year of on-orbit operations for a Science and Technology space-launch mission while supporting the multi-agency "new entrant" certification strategy. ***FY 2011 Accomplishments:*** N/A ***FY 2012 Plans:*** N/A ***FY 2013 Base Plans:*** Provide mission definition, design, development, and operations planning. Select and/or refine satellite and payload manifest. Initiate planning and integration of satellites and payloads onto launch vehicle.	-	-	16.000	-	16.000
Accomplishments/Planned Programs Subtotals	-	-	16.000	-	16.000

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
• 0: *N/A*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force		DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603401F: *Advanced Spacecraft Technology*	PROJECT 634950: *Space Demonstration*

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force			DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603401F: *Advanced Spacecraft Technology*	PROJECT 635021: *Space Systems Survivability*	

COST ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
635021: *Space Systems Survivability*	3.610	3.249	2.907	-	2.907	3.097	3.526	3.552	3.634	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project develops and demonstrates technologies to improve space system survivability and reliability of current and future Department of Defense space systems that must continue operation despite natural space hazards. 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.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
Title: Major Thrust 1.	3.610	3.249	2.907	-	2.907
Description: Develop technologies to provide improved space radiation and ionospheric hazard specification and forecasting. ***FY 2011 Accomplishments:*** Completed initial version of new standard model of radiation belts. Began space test of miniaturized space weather sensors. Completed design and began construction of second-generation heliospheric imager as joint agency initiative. ***FY 2012 Plans:*** Develop advanced standard model of radiation belts, using data from recently launched space environment instruments. Complete trade studies to narrow alternatives for a second-generation heliospheric imager for detecting and tracking solar coronal mass ejections (CMEs) which threaten space systems and degrade communications. Complete development of a more precise CME propagation model to enhance space weather forecasting tools. ***FY 2013 Base Plans:*** Improve software tools to model surface and deep charging, radiation dose rate to spacecraft in real-time for evaluation of spacecraft anomalies. Continue development of an engineering model of an improved instrument to measure high-energy electrons and protons that contribute to radiation dose and spacecraft charging. Continue advanced development of concepts and technology for an operational capability in heliospheric imaging. ***FY 2013 OCO Plans:***					

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force		DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603401F: *Advanced Spacecraft Technology*	PROJECT 635021: *Space Systems Survivability*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
N/A					
Accomplishments/Planned Programs Subtotals	3.610	3.249	2.907	-	2.907

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
• N/A: *N/A*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

D. Acquisition Strategy

N/A

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force			DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603401F: *Advanced Spacecraft Technology*	PROJECT 635083: *Ballistic Missiles Technology*	

COST ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
635083: *Ballistic Missiles Technology*	5.053	5.216	5.081	-	5.081	5.377	6.214	6.260	6.404	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project develops, integrates, and demonstrates advanced technologies for sustainment and modernization of strategic ballistic missiles. The project focuses on developing robust, low maintenance inertial navigation instruments to sustain current ballistic missile systems, as well as provide new, small, low-powered, high-precision instrumentation for next generation missile systems.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
Title: Major Thrust 1. ***Description:*** Develop, integrate, and demonstrate advanced navigation instrumentation applied to emerging vehicle designs and other technologies that sustain current strategic missile systems. ***FY 2011 Accomplishments:*** Developed, built, and tested advanced navigation instrument engineering model. Reduced advanced guidance risk through ground testing, sled testing, and flight test planning. Initiated build and test of flight capable advanced guidance system demonstration units integrated with strategic vehicle designs and interfaces. ***FY 2012 Plans:*** Start follow-on effort to address next generation guidance and navigation technologies for future systems. Develop technologies that facilitate planned Analysis of Alternatives on next generation strategic weapons. Complete build and test Advanced Inertial Measurement Unit (AIMU) engineering model for enhanced ground testing and preparation for flight test. Focus integration studies of advanced technologies into strategic systems to reduce robustness, accuracy, and flexibility. ***FY 2013 Base Plans:*** Improve AIMU design based on engineering model testing. Begin engineering model build of AIMU for possible flight testing. Begin additional hardening of AIMU design. Begin development of technologies for next generation strategic weapons requirements. ***FY 2013 OCO Plans:*** N/A	2.528	5.216	5.081	-	5.081
Title: Major Thrust 2.	2.525	-	-	-	-

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force		DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603401F: *Advanced Spacecraft Technology*	PROJECT 635083: *Ballistic Missiles Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
Description: Develop, integrate, and demonstrate navigation technologies with new vehicle designs to provide robust, flexible, lower cost solutions for sustaining current strategic missile systems. ***FY 2011 Accomplishments:*** Completed qualification testing of designs against validated system level interfaces. Completed build and continued test and evaluation of advanced navigation instrumentation and range safety devices with new vehicle design interfaces. Integrated advanced guidance technologies with common vehicle designs and interfaces focused on lower cost solutions with increased accuracy, flexibility, and robustness. ***FY 2012 Plans:*** This thrust has merged with the previous thrust. ***FY 2013 Base Plans:*** N/A ***FY 2013 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	5.053	5.216	5.081	-	5.081

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
• N/A: *N/A*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

D. Acquisition Strategy

N/A

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

Exhibit R-2A, RDT&E Project Justification: PB 2013 Air Force			DATE: February 2012
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 3: *Advanced Technology Development (ATD)*	R-1 ITEM NOMENCLATURE PE 0603401F: *Advanced Spacecraft Technology*	PROJECT 63682J: *Spacecraft Vehicles*	

COST ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
63682J: *Spacecraft Vehicles*	6.847	7.127	5.984	-	5.984	4.515	3.662	3.880	3.959	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project develops and demonstrates compact, low-cost, spacecraft power generation, storage, distribution, and thermal management technologies, including cryogenic cooling technologies. This project also develops composites for spacecraft structures and technologies for spacecraft control and mechanisms.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
Title: Major Thrust 1. ***Description:*** Develop power generation space technologies such as multi-junction solar cells, thin-film solar cells, lightweight solar cell arrays, and radiation resistant solar cell modules. ***FY 2011 Accomplishments:*** Demonstrated module technology traceable to greater than 300 watts/kilograms arrays. ***FY 2012 Plans:*** Extend inverted metamorphic (IMM)-based solar cell development toward 35-37% efficiency. Conduct maturity development of quantum dot-enhanced IMM solar cells. ***FY 2013 Base Plans:*** Complete development of efficient 34% IMM solar cell. Continue development of 35-37% IMM and quantum-dot enhanced IMM solar cells. Continue maturation of IMM solar cell interconnection and module technologies. ***FY 2013 OCO Plans:*** N/A	1.857	1.456	2.188	-	2.188
Title: Major Thrust 2. ***Description:*** Develop technologies for long-life, efficient, low-vibration, lightweight mechanical cryocoolers and integration components for space applications. ***FY 2011 Accomplishments:*** Supported missile launch detection thermal and cryogenic SSA missions. Developed a non-moving parts compressor using proton biased membrane technology. Designed a low vibration conductance, cross gimbal	0.663	1.637	0.891	-	0.891

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
35K cooling loop interface to support space tracking missions. Furthered the technology development of satellite cryogenic interface requirements and improved technologies to support space tracking applications. ***FY 2012 Plans:*** Work to reduce size, weight, and power requirements, ease integration, and increase reliability of cryocoolers and supporting payload thermal management systems for very large format focal plane arrays for missile warning capability and for other modular systems. Evaluate passive versus active cooling, based on heat loads, power requirements, size, and payload thermal modeling. Provide correlated computer modeling results to industry to improve overall cryocooler design. ***FY 2013 Base Plans:*** Continue to reduce size, weight, and power requirements, ease integration, and increase reliability of cryocoolers and supporting payload thermal management systems for very large format focal plane arrays for missile warning capability and for industry to significantly improve overall cryocooler design. Continue to provide correlated computer modeling results. ***FY 2013 OCO Plans:*** N/A					
Title: Major Thrust 3. ***Description:*** Develop composites for spacecraft structures and space applications, such as launch vehicle shrouds, thermal protection structures, and space antennas. ***FY 2011 Accomplishments:*** Demonstrated novel deployable structural architectures. Demonstrated novel optical structures in relevant sub-system environment. Developed rapid fabrication processes to build tailored spacecraft panels in days, rather than weeks, and demonstrated and tested rapidly fabricated engineering model panels. ***FY 2012 Plans:*** Complete development of thermal management testbed for space structures. Initiate development of system-level deployable architectures for advanced optical systems and low-cost RF reflectors. ***FY 2013 Base Plans:*** Develop capability for providing structural dynamics data on large, deployable apertures for space systems. Develop technologies and processes for rapid calibration of payloads for space applications. ***FY 2013 OCO Plans:***	2.085	1.405	1.338	-	1.338

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total
N/A					
Title: Major Thrust 4. ***Description:*** Develop technologies for spacecraft controls and mechanisms for on-orbit applications. ***FY 2011 Accomplishments:*** Developed advanced guidance, navigation, and control hardware such as control moment gyroscopes and reaction wheels for rapid integration and test. Increased performance of hardware systems while maintaining rapid integration capability. Began development of hardware testbed for verifying performance of guidance, navigation, and control hardware systems. ***FY 2012 Plans:*** Transition high accuracy star tracker flight unit for use in customer flight program. Refine SSA camera tracking software in preparation for flight test. Design an autonomous mission manager for flight autonomy and on on-orbit planning systems. Implement flight-like processors with hardware-in-the-loop to increase technical maturity. ***FY 2013 Base Plans:*** Demonstrate and transition SSA camera tracking software. ***FY 2013 OCO Plans:*** N/A	2.242	2.629	1.567	-	1.567
Accomplishments/Planned Programs Subtotals	6.847	7.127	5.984	-	5.984

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2011	FY 2012	FY 2013 Base	FY 2013 OCO	FY 2013 Total	FY 2014	FY 2015	FY 2016	FY 2017	Cost To Complete	Total Cost
• N/A: *N/A*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

D. Acquisition Strategy

N/A

E. Performance Metrics

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