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Exhibit R-2, RDT&E Budget Item Justification: PB 2011 Air Force **DATE:** February 2010

APPROPRIATION/BUDGET ACTIVITY 3600: <i>Research, Development, Test & Evaluation, Air Force</i> BA 3: <i>Advanced Technology Development (ATD)</i>	R-1 ITEM NOMENCLATURE PE 0603401F: <i>Advanced Spacecraft Technology</i>
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COST (\$ in Millions)	FY 2009 Actual	FY 2010 Estimate	FY 2011 Base Estimate	FY 2011 OCO Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
Total Program Element	97.834	98.708	83.705	0.000	83.705	75.985	77.194	78.925	78.744	Continuing	Continuing
632181: <i>Spacecraft Payloads</i>	33.821	33.691	20.548	0.000	20.548	17.853	17.019	18.987	17.712	Continuing	Continuing
633834: <i>Integrated Space Technology Demonstrations</i>	37.531	28.996	41.188	0.000	41.188	36.082	33.481	32.396	33.148	Continuing	Continuing
634400: <i>Space Systems Protection</i>	5.892	8.070	5.316	0.000	5.316	6.042	9.711	10.308	10.764	Continuing	Continuing
635021: <i>Space Systems Survivability</i>	4.123	4.842	3.845	0.000	3.845	3.336	3.367	3.540	3.689	Continuing	Continuing
635083: <i>Ballistic Missiles Technology</i>	5.195	11.921	5.256	0.000	5.256	5.036	5.039	5.259	6.141	Continuing	Continuing
63682J: <i>Spacecraft Vehicles</i>	11.272	11.188	7.552	0.000	7.552	7.636	8.577	8.435	7.290	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 and launch vehicles, ballistic missiles, space systems survivability, and development of advanced laser communications technologies to support next generation satellite communication systems. The integrated space technologies are demonstrated by component or system level tests on the ground or in flight. 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.

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B. Program Change Summary (\$ in Millions)

	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011 Base</u>	<u>FY 2011 OCO</u>	<u>FY 2011 Total</u>
Previous President's Budget	97.469	83.909	0.000	0.000	0.000
Current President's Budget	97.834	98.708	83.705	0.000	83.705
Total Adjustments	0.365	14.799	83.705	0.000	83.705
• Congressional General Reductions		-0.148			
• Congressional Directed Reductions		0.000			
• Congressional Rescissions	0.000	-0.413			
• Congressional Adds		15.360			
• Congressional Directed Transfers		0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.365	0.000	83.705	0.000	83.705

Congressional Add Details (\$ in Millions, and Includes General Reductions)

Project: 632181: *Spacecraft Payloads*

Congressional Add: *Satellite Coherent Optical Receiver (SCORE).*

Congressional Add: *Integrated Spacecraft Engineering Tool (ISET).*

Congressional Add: *Operational Responsive Space Architecture for Dual Use Applications.*

Congressional Add: *Semiconductor Optical Amplifier for Responsive Space MPOI.*

Congressional Add: *Ultra Low Power Electronics.*

Congressional Add: *Micromachined Switches for Next-Generation Modular Satellites.*

Congressional Add: *Domestic Manufacturing of 45nm Electronics.*

Congressional Add: *Integrated Passive Electronic Components.*

Congressional Add Subtotals for Project: 632181

	<u>FY 2009</u>	<u>FY 2010</u>
	1.745	0.000
	1.596	0.000
	1.269	0.000
	2.194	0.000
	3.191	0.000
	2.394	2.390
	0.000	3.187
	0.000	1.354
	12.389	6.931

Project: 635083: *Ballistic Missiles Technology*

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<u>Congressional Add Details (\$ in Millions, and Includes General Reductions)</u>	FY 2009	FY 2010
Congressional Add: <i>Ballistic Missile Technology.</i>	0.000	1.593
Congressional Add: <i>Florida National Guard Total Force Integration.</i>	0.000	2.390
Congressional Add: <i>P-Net Ballistic Missile Technology.</i>	0.000	1.992
Congressional Add Subtotals for Project: 635083	0.000	5.975
Project: 63682J: <i>Spacecraft Vehicles</i>		
Congressional Add: <i>Small Low-Cost Reconnaissance Spacecraft Components/Small Responsive Spacecraft at Low-Cost.</i>	1.596	2.390
Congressional Add: <i>Thin Film Amorphous Solar Arrays.</i>	1.596	0.000
Congressional Add: <i>Space Situational Awareness.</i>	1.197	0.000
Congressional Add Subtotals for Project: 63682J	4.389	2.390
Congressional Add Totals for all Projects	16.778	15.296

Change Summary Explanation

The FY 2010 President's Budget submittal did not reflect FY 2011 through FY 2015 funding. A detailed explanation of changes between the two budget positions is not provided because it cannot be made in a relevant manner.

Note: In FY 2010, Congress added \$1.6 million for Ballistic Missile Technology, \$3.2million for Domestic Manufacturing of 45nm Electronics, \$2.4 million for Florida National Guard Total Force Integration, \$1.36 million for Integrated Passive Electronic Components, \$2.4 million for Micromachined Switches for Next Generation Modular Satellites, \$2.4 million for Small Responsive Spacecraft at Low-Cost, and \$2.0 million for P-Net Ballistic Missile Technology.

C. Performance Metrics
(U) Under Development.

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Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force								DATE: February 2010			
APPROPRIATION/BUDGET ACTIVITY 3600: <i>Research, Development, Test & Evaluation, Air Force</i> BA 3: <i>Advanced Technology Development (ATD)</i>				R-1 ITEM NOMENCLATURE PE 0603401F: <i>Advanced Spacecraft Technology</i>				PROJECT 632181: <i>Spacecraft Payloads</i>			
COST (\$ in Millions)	FY 2009 Actual	FY 2010 Estimate	FY 2011 Base Estimate	FY 2011 OCO Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
632181: <i>Spacecraft Payloads</i>	33.821	33.691	20.548	0.000	20.548	17.853	17.019	18.987	17.712	Continuing	Continuing

Note

Note: In FY 2011, some of the technology efforts are being moved from this PE to PE 0602601F, Space Technology, to better reflect the actual technology readiness levels of those efforts.

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 and development of advanced laser communications technologies to support next-generation satellite communications systems. 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, merge 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 Program (\$ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
MAJOR THRUST: Develop microelectronic devices, including radiation-hardened data processors and high-density hardened memories, advanced packaging technology, and MEMS components and applications. <i>FY 2009 Accomplishments:</i> In FY 2009: Incorporated new Satellite Design Automation software capabilities and demonstrated a logical sequence "push-button toolflow" satellite builder. Integrated high-fidelity radiation-hardened space sensor interface modules using standardized sensor data protocols and demonstrated enhanced device control of sensors and actuators in relevant satellite sub-systems.	7.467	8.479	6.431	0.000	6.431

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Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force				DATE: February 2010				
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B. Accomplishments/Planned Program (\$ in Millions)								
				FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
<i>FY 2011 OCO Plans:</i> In FY 2011 OCO: N/A								
Accomplishments/Planned Programs Subtotals				21.432	26.760	20.548	0.000	20.548
				FY 2009	FY 2010			
Congressional Add: Satellite Coherent Optical Receiver (SCORE). <i>FY 2009 Accomplishments:</i> In FY 2009: Conducted Congressionally-directed effort for Satellite Coherent Optical Receiver (SCORE). <i>FY 2010 Plans:</i> In FY 2010: Not Applicable.				1.745	0.000			
Congressional Add: Integrated Spacecraft Engineering Tool (ISET). <i>FY 2009 Accomplishments:</i> In FY 2009: Conducted Congressionally-directed effort for Integrated Spacecraft Engineering Tool (ISET). <i>FY 2010 Plans:</i> In FY 2010: Not Applicable.				1.596	0.000			
Congressional Add: Operational Responsive Space Architecture for Dual Use Applications.				1.269	0.000			

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B. Accomplishments/Planned Program (\$ in Millions)		
	FY 2009	FY 2010
<p><i>FY 2009 Accomplishments:</i> In FY 2009: Conducted Congressionally-directed effort for Operational Responsive Space Architecture for Dual Use Applications.</p> <p><i>FY 2010 Plans:</i> In FY 2010: Not Applicable.</p>		
<p>Congressional Add: Semiconductor Optical Amplifier for Responsive Space MPOI.</p> <p><i>FY 2009 Accomplishments:</i> In FY 2009: Conducted Congressionally-directed effort for Semiconductor Optical Amplifier for Responsive Space MPOI.</p> <p><i>FY 2010 Plans:</i> In FY 2010: Not Applicable.</p>	2.194	0.000
<p>Congressional Add: Ultra Low Power Electronics.</p> <p><i>FY 2009 Accomplishments:</i> In FY 2009: Conducted Congressionally-directed effort for Ultra Low Power Electronics.</p> <p><i>FY 2010 Plans:</i> In FY 2010: Not Applicable.</p>	3.191	0.000
<p>Congressional Add: Micromachined Switches for Next-Generation Modular Satellites.</p>	2.394	2.390

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B. Accomplishments/Planned Program (\$ in Millions)

	FY 2009	FY 2010
<p><i>FY 2009 Accomplishments:</i> In FY 2009: Conducted Congressionally-directed effort for Micromachined Switches for Next-Generation Modular Satellites.</p> <p><i>FY 2010 Plans:</i> In FY 2010: Conduct Congressionally-directed effort for Micromachined Switches for Next-Generation Modular Satellites.</p>		
<p>Congressional Add: Domestic Manufacturing of 45nm Electronics.</p> <p><i>FY 2009 Accomplishments:</i> In FY 2009: Not Applicable.</p> <p><i>FY 2010 Plans:</i> In FY 2010: Conduct Congressionally-directed effort for Domestic Manufacturing of 45nm Electronics.</p>	0.000	3.187
<p>Congressional Add: Integrated Passive Electronic Components.</p> <p><i>FY 2009 Accomplishments:</i> In FY 2009: Not Applicable.</p> <p><i>FY 2010 Plans:</i> In FY 2010: Conduct Congressionally-directed effort for Integrated Passive Electronic Components.</p>	0.000	1.354
Congressional Adds Subtotals	12.389	6.931

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

<u>Line Item</u>	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011</u> <u>Base</u>	<u>FY 2011</u> <u>OCO</u>	<u>FY 2011</u> <u>Total</u>	<u>FY 2012</u>	<u>FY 2013</u>	<u>FY 2014</u>	<u>FY 2015</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• PE 0303601F: <i>MILSTAR Satellite Communications System.</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0305160F: <i>Defense Meteorological Satellite Program (DMSP).</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0602601F: <i>Space Technology.</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603215C: <i>Limited Defense System.</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603218C: <i>Research and Support.</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603226E: <i>Experimental Evaluation of Major Innovative Technologies.</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0604609F: <i>Reliability and Maintainability Technology Insertion Program (RAMTIP).</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

D. Acquisition Strategy

Not Applicable.

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.

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APPROPRIATION/BUDGET ACTIVITY			R-1 ITEM NOMENCLATURE				PROJECT				
3600: <i>Research, Development, Test & Evaluation, Air Force</i> BA 3: <i>Advanced Technology Development (ATD)</i>			PE 0603401F: <i>Advanced Spacecraft Technology</i>				633834: <i>Integrated Space Technology Demonstrations</i>				
COST (\$ in Millions)	FY 2009 Actual	FY 2010 Estimate	FY 2011 Base Estimate	FY 2011 OCO Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
633834: <i>Integrated Space Technology Demonstrations</i>	37.531	28.996	41.188	0.000	41.188	36.082	33.481	32.396	33.148	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 Program (\$ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
<p>MAJOR THRUST: Develop microsatellite technologies for integrated, robust, flexible, microsatellite demonstrations building on previous work and leveraging investments by other organizations.</p> <p><i>FY 2009 Accomplishments:</i> In FY 2009: Launched and completed autonomous flight demonstration for Tactical Satellite-3. Developed next in the series of satellite design(s). Initiated procurement of bus and payload hardware.</p> <p><i>FY 2010 Plans:</i> In FY 2010: Complete lightweight visible and infrared sensors development. Complete bus designs and begin integration.</p> <p><i>FY 2011 Base Plans:</i> In FY 2011: Complete integration of experimental microsatellite for geosynchronous orbit. Complete design for next generation plug-n-play bus.</p>	37.531	28.996	41.188	0.000	41.188

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B. Accomplishments/Planned Program (\$ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
<i>FY 2011 OCO Plans:</i> In FY 2011 OCO: N/A					
Accomplishments/Planned Programs Subtotals	37.531	28.996	41.188	0.000	41.188

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

<u>Line Item</u>	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011 Base</u>	<u>FY 2011 OCO</u>	<u>FY 2011 Total</u>	<u>FY 2012</u>	<u>FY 2013</u>	<u>FY 2014</u>	<u>FY 2015</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
• PE 0602601F: <i>Space Technology.</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603605F: <i>Advanced Weapons Technology.</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

D. Acquisition Strategy

Not Applicable.

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.

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COST (\$ in Millions)	FY 2009 Actual	FY 2010 Estimate	FY 2011 Base Estimate	FY 2011 OCO Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
634400: <i>Space Systems Protection</i>	5.892	8.070	5.316	0.000	5.316	6.042	9.711	10.308	10.764	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 Program (\$ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
<p>MAJOR THRUST: Multi-threat assessment tools to assess space-based electro-optical, communication, and other responses to various candidate RF and laser countermeasures and directed energy threats.</p> <p><i>FY 2009 Accomplishments:</i> In FY 2009: Conducted demonstrations illustrating effects and meditation analysis. Identified technology transition opportunities and reported findings to major commands.</p> <p><i>FY 2010 Plans:</i> In FY 2010: Demonstrate additional subsystem performance in laboratory. Identify additional transition opportunities and prepare engineering models to assess performance.</p> <p><i>FY 2011 Base Plans:</i> In FY 2011: Conduct extensive engineering analysis and down select final systems. Perform subsystem testing of RF and laser countermeasures.</p>	1.415	2.186	2.325	0.000	2.325

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B. Accomplishments/Planned Program (\$ in Millions)						
		FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
<p><i>FY 2011 OCO Plans:</i> In FY 2011 OCO: N/A</p>						
<p>MAJOR THRUST: Develop passive satellite countermeasures and mitigation techniques for current and future threats to satellites.</p> <p><i>FY 2009 Accomplishments:</i> In FY 2009: Conducted mitigation technology space demonstration and post flight analysis.</p> <p><i>FY 2010 Plans:</i> In FY 2010: Demonstrate enhanced subsystems performance through laboratory testing. Identify transition opportunities and prepare engineering models to assess of performance.</p> <p><i>FY 2011 Base Plans:</i> In FY 2011: Develop performance goals using engineering models. Begin design of flight demonstration unit for passive satellite countermeasures.</p> <p><i>FY 2011 OCO Plans:</i> In FY 2011 OCO: N/A</p>		3.122	2.074	1.297	0.000	1.297
<p>MAJOR THRUST: Develop visible and near-infrared laser protection technologies. In FY 2011: This thrust is moving to PE 0602601F in order to better align the technology readiness of these efforts.</p> <p><i>FY 2009 Accomplishments:</i> In FY 2009: Developed selected "space qualified" technology and provided test unit to experimental satellite for integration.</p> <p><i>FY 2010 Plans:</i> In FY 2010: Build candidate systems and conduct space qualification testing. Identify transition opportunities and prepare engineering models of performance.</p>		1.355	2.026	0.000	0.000	0.000

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B. Accomplishments/Planned Program (\$ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
<i>FY 2010 Plans:</i> In FY 2010: Not Applicable.					
<i>FY 2011 Base Plans:</i> In FY 2011: Identify technology options that provide passive or active detection of satellites in the RF spectrum. Develop and complete engineering designs for systems used to support active space superiority technologies. Demonstrate subsystems through laboratory testing.					
<i>FY 2011 OCO Plans:</i> In FY 2011 OCO: N/A					
Accomplishments/Planned Programs Subtotals	5.892	8.070	5.316	0.000	5.316

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

<u>Line Item</u>	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011 Base</u>	<u>FY 2011 OCO</u>	<u>FY 2011 Total</u>	<u>FY 2012</u>	<u>FY 2013</u>	<u>FY 2014</u>	<u>FY 2015</u>	<u>Cost To Complete</u>	<u>Total Cost</u>
• PE 0602102F: <i>Materials.</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0602601F: <i>Space Technology.</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603605F: <i>Advanced Weapons Technology.</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

D. Acquisition Strategy

Not Applicable.

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.

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APPROPRIATION/BUDGET ACTIVITY			R-1 ITEM NOMENCLATURE				PROJECT				
3600: <i>Research, Development, Test & Evaluation, Air Force</i> BA 3: <i>Advanced Technology Development (ATD)</i>			PE 0603401F: <i>Advanced Spacecraft Technology</i>				635021: <i>Space Systems Survivability</i>				
COST (\$ in Millions)	FY 2009 Actual	FY 2010 Estimate	FY 2011 Base Estimate	FY 2011 OCO Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
635021: <i>Space Systems Survivability</i>	4.123	4.842	3.845	0.000	3.845	3.336	3.367	3.540	3.689	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 Program (\$ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
<p>MAJOR THRUST: Develop technologies to provide improved space radiation and ionospheric hazard specification and forecasting.</p> <p><i>FY 2009 Accomplishments:</i> In FY 2009: Completed development of miniaturized space weather sensor engineering models. Identified space test opportunity for miniaturized solar hazard sensors. Initiated development of a new standard model of the radiation belts. Co-operatively operated existing first generation heliospheric imagers in coordinated joint-agency campaign exploiting unique three vantage point configuration. Developed and evaluated concepts for second-generation joint-agency heliospheric imager(s).</p> <p><i>FY 2010 Plans:</i> In FY 2010: Continue development of new standard model of radiation belts to specify space hazards for spacecraft design. Design second-generation heliospheric imager as joint agency initiative.</p>	3.149	3.916	3.845	0.000	3.845

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APPROPRIATION/BUDGET ACTIVITY 3600: <i>Research, Development, Test & Evaluation, Air Force</i> BA 3: <i>Advanced Technology Development (ATD)</i>	R-1 ITEM NOMENCLATURE PE 0603401F: <i>Advanced Spacecraft Technology</i>	PROJECT 635021: <i>Space Systems Survivability</i>
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C. Other Program Funding Summary (\$ in Millions)

<u>Line Item</u>	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011</u> <u>Base</u>	<u>FY 2011</u> <u>OCO</u>	<u>FY 2011</u> <u>Total</u>	<u>FY 2012</u>	<u>FY 2013</u>	<u>FY 2014</u>	<u>FY 2015</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• PE 0602601F: <i>Space Technology.</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

D. Acquisition Strategy

Not Applicable.

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.

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Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force **DATE:** February 2010

APPROPRIATION/BUDGET ACTIVITY 3600: <i>Research, Development, Test & Evaluation, Air Force</i> BA 3: <i>Advanced Technology Development (ATD)</i>	R-1 ITEM NOMENCLATURE PE 0603401F: <i>Advanced Spacecraft Technology</i>	PROJECT 635083: <i>Ballistic Missiles Technology</i>
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COST (\$ in Millions)	FY 2009 Actual	FY 2010 Estimate	FY 2011 Base Estimate	FY 2011 OCO Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
635083: <i>Ballistic Missiles Technology</i>	5.195	11.921	5.256	0.000	5.256	5.036	5.039	5.259	6.141	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 Program (\$ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
<p>MAJOR THRUST: Develop, integrate, and demonstrate advanced navigation instrumentation applied to emerging vehicle designs and other technologies that sustain current strategic missile systems.</p> <p><i>FY 2009 Accomplishments:</i> In FY 2009: Continued engineering system development design verification and testing to incorporate performance improvements. Conducted flight qualification testing and evaluation of candidate demonstration flight units. Initiated system integration of flight demonstration units with emerging vehicle designs.</p> <p><i>FY 2010 Plans:</i> In FY 2010: Continue performance verification and integration of demonstration units. Begin advanced navigation instrument engineering model designs with common mission requirements for better accuracy, lower cost, increased robustness, and smaller size. Initiate planning for advanced guidance risk reduction ground and flight demonstrations.</p>	2.598	2.973	2.628	0.000	2.628

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Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force				DATE: February 2010				
APPROPRIATION/BUDGET ACTIVITY 3600: <i>Research, Development, Test & Evaluation, Air Force</i> BA 3: <i>Advanced Technology Development (ATD)</i>		R-1 ITEM NOMENCLATURE PE 0603401F: <i>Advanced Spacecraft Technology</i>		PROJECT 635083: <i>Ballistic Missiles Technology</i>				
B. Accomplishments/Planned Program (\$ in Millions)								
				FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
<p>safety devices with new vehicle design interfaces. Continue dynamic and hostile environments analysis and testing of common guidance designs. Initiate integration of advanced guidance technologies with common vehicle designs and interfaces focused on lower cost solutions with increased accuracy, flexibility, and robustness.</p> <p><i>FY 2011 OCO Plans:</i> In FY 2011 OCO: N/A</p>								
Accomplishments/Planned Programs Subtotals				5.195	5.946	5.256	0.000	5.256
				FY 2009	FY 2010			
<p>Congressional Add: Ballistic Missile Technology.</p> <p><i>FY 2009 Accomplishments:</i> In FY 2009: Not Applicable.</p> <p><i>FY 2010 Plans:</i> In FY 2010: Conduct Congressionally-directed effort for Ballistic Missile Technology.</p>				0.000	1.593			
<p>Congressional Add: Florida National Guard Total Force Integration.</p> <p><i>FY 2009 Accomplishments:</i> In FY 2009: Not Applicable.</p> <p><i>FY 2010 Plans:</i> In FY 2010: Conduct Congressionally-directed effort for Florida National Guard Total Force Integration.</p>				0.000	2.390			

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Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force										DATE: February 2010	
APPROPRIATION/BUDGET ACTIVITY 3600: <i>Research, Development, Test & Evaluation, Air Force</i> BA 3: <i>Advanced Technology Development (ATD)</i>				R-1 ITEM NOMENCLATURE PE 0603401F: <i>Advanced Spacecraft Technology</i>				PROJECT 635083: <i>Ballistic Missiles Technology</i>			
B. Accomplishments/Planned Program (\$ in Millions)											
						FY 2009	FY 2010				
Congressional Add: P-Net Ballistic Missile Technology. <i>FY 2009 Accomplishments:</i> In FY 2009: Not Applicable. <i>FY 2010 Plans:</i> In FY 2010: Conduct Congressionally-directed effort for P-Net Ballistic Missile Technology.						0.000	1.992				
Congressional Adds Subtotals						0.000	5.975				
C. Other Program Funding Summary (\$ in Millions)											
Line Item	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost
• PE 0601102F: <i>Defense Research Sciences.</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0602601F: <i>Space Technology.</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603601F: <i>Conventional Weapons Technology.</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603851F: <i>Intercontinental Ballistic Missile-Dem/Val.</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0604851F: <i>Intercontinental Ballistic Missile-EMD.</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0605860F: <i>Rocket System Launch Program-Space.</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
D. Acquisition Strategy Not Applicable.											

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Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
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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.

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Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force								DATE: February 2010			
APPROPRIATION/BUDGET ACTIVITY 3600: <i>Research, Development, Test & Evaluation, Air Force</i> BA 3: <i>Advanced Technology Development (ATD)</i>				R-1 ITEM NOMENCLATURE PE 0603401F: <i>Advanced Spacecraft Technology</i>				PROJECT 63682J: <i>Spacecraft Vehicles</i>			
COST (\$ in Millions)	FY 2009 Actual	FY 2010 Estimate	FY 2011 Base Estimate	FY 2011 OCO Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
63682J: <i>Spacecraft Vehicles</i>	11.272	11.188	7.552	0.000	7.552	7.636	8.577	8.435	7.290	Continuing	Continuing

Note

Note: In FY 2011: Changes in funding are due to some technology development efforts being moved to PE 0602601F, Space Technology, in order to better align the technology readiness levels of these efforts.

A. Mission Description and Budget Item Justification

This project develops and demonstrates compact, low-cost, spacecraft and launch vehicle power generation, storage, distribution, and thermal management technologies, including cryogenic cooling technologies. Power generation activities focus on lightweight, low-cost, low-volume, and survivable solar cell arrays. Energy storage work focuses on lightweight nickel hydrogen and sodium sulfur spacecraft batteries and flywheel energy storage systems for extended (five to ten year) satellite missions. The project's power distribution efforts focus on producing lightweight, high-efficiency, standardized power busses for use on future space systems.

B. Accomplishments/Planned Program (\$ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
<p>MAJOR THRUST: 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.</p> <p><i>FY 2009 Accomplishments:</i> In FY 2009: Demonstrated greater than 14% efficient thin-film solar cells. Explored performance optimization of greater than 40% efficient solar cell concepts.</p> <p><i>FY 2010 Plans:</i> In FY 2010: Demonstrate large area solar cells based on the inverted metamorphic structure. Develop integration schemes and module technology for inverted metamorphic solar cells. Begin environmental testing of inverted metamorphic solar cells.</p>	1.905	2.621	1.978	0.000	1.978

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Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force				DATE: February 2010				
APPROPRIATION/BUDGET ACTIVITY 3600: <i>Research, Development, Test & Evaluation, Air Force</i> BA 3: <i>Advanced Technology Development (ATD)</i>		R-1 ITEM NOMENCLATURE PE 0603401F: <i>Advanced Spacecraft Technology</i>		PROJECT 63682J: <i>Spacecraft Vehicles</i>				
B. Accomplishments/Planned Program (\$ in Millions)								
				FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
Accomplishments/Planned Programs Subtotals				6.883	8.798	7.552	0.000	7.552
				FY 2009	FY 2010			
Congressional Add: Small Low-Cost Reconnaissance Spacecraft Components/Small Responsive Spacecraft at Low-Cost. <i>FY 2009 Accomplishments:</i> In FY 2009: Conducted Congressionally-directed effort for Small Low-Cost Reconnaissance Spacecraft Components. <i>FY 2010 Plans:</i> In FY 2010: Conduct Congressionally-directed effort for Small Responsive Spacecraft at Low-Cost.				1.596	2.390			
Congressional Add: Thin Film Amorphous Solar Arrays. <i>FY 2009 Accomplishments:</i> In FY 2009: Conducted Congressionally-directed effort for Thin Film Amorphous Solar Arrays. <i>FY 2010 Plans:</i> In FY 2010: Not Applicable.				1.596	0.000			
Congressional Add: Space Situational Awareness. <i>FY 2009 Accomplishments:</i> In FY 2009: Conducted Congressionally-directed effort for Space Situational Awareness.				1.197	0.000			

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B. Accomplishments/Planned Program (\$ in Millions)

	FY 2009	FY 2010
<i>FY 2010 Plans:</i> In FY 2010: Not Applicable.		
Congressional Adds Subtotals	4.389	2.390

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

<u>Line Item</u>	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011</u> <u>Base</u>	<u>FY 2011</u> <u>OCO</u>	<u>FY 2011</u> <u>Total</u>	<u>FY 2012</u>	<u>FY 2013</u>	<u>FY 2014</u>	<u>FY 2015</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>
• PE 0602203F: <i>Aerospace Propulsion.</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0602601F: <i>Space Technology.</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603218C: <i>Research and Support.</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603226E: <i>Experimental Evaluation of Major Innovative Technologies.</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

D. Acquisition Strategy

Not Applicable.

E. Performance Metrics

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