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Exhibit R-2, PB 2010 Air Force RDT&E Budget Item Justification **DATE:** May 2009

APPROPRIATION/BUDGET ACTIVITY					R-1 ITEM NOMENCLATURE					
3600 - Research, Development, Test & Evaluation, Air Force/BA 3 - Advanced Technology Development (ATD)					PE 0603270F Electronic Combat Technology					
COST (\$ in Millions)	FY 2008 Actual	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
Total Program Element	26.947	30.241	31.021						Continuing	Continuing
632432: Defensive System Fusion Technology	7.596	11.922	4.567						Continuing	Continuing
63431G: RF Warning & Countermeasures Tech	7.795	9.957	20.159						Continuing	Continuing
63691X: EO/IR Warning & Countermeasures Tech	11.556	8.362	6.295						Continuing	Continuing

Note
 Note: Funds for the FY 2008 Congressionally-directed Innovative Polymeric Materials for Three-Dimensional (3-D) Microdevice Construction in the amount of \$1.0 million are in the process of being moved from PE 0603270F, Electronic Combat Technology, to PE 0602102F, Materials, for execution.

A. Mission Description and Budget Item Justification
 This program develops and demonstrates technologies to support Air Force electronic combat warfighting capabilities. The program focuses on developing components, subsystems, and technologies with potential aerospace combat, special operations, and airlift electronic combat applications in three project areas. The first project develops and demonstrates technologies for integrating electronic combat sensors and systems into a fused and seamless whole. The second project develops and demonstrates advanced technologies for radio-frequency (RF) electronic combat suites. The third project develops and demonstrates advanced warning and countermeasure technologies to defeat electro-optical (EO), infrared (IR), and laser threats to aerospace platforms. This program is in Budget Activity 3, Advanced Technology Development, since it develops and demonstrates technologies for existing system upgrades and/or new sensor and electronic combat system developments that have military utility and address warfighter needs.

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APPROPRIATION/BUDGET ACTIVITY 3600 - Research, Development, Test & Evaluation, Air Force/BA 3 - Advanced Technology Development (ATD)	R-1 ITEM NOMENCLATURE PE 0603270F Electronic Combat Technology
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B. Program Change Summary (\$ in Millions)

	<u>FY 2008</u>	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011</u>
Previous President's Budget	26.762	21.056	16.740	
Current BES/President's Budget	26.947	30.241	31.021	
Total Adjustments	0.185	9.185	0.000	
Congressional Program Reductions	0.000	-0.013		
Congressional Rescissions	0.000	-0.082		
Total Congressional Increases	0.000	10.880		
Total Reprogrammings	0.689	-1.600		
SBIR/STTR Transfer	-0.504	0.000		

Change Summary Explanation

Note: In FY 2009 Congress added +\$1.6M for Advanced Electromagnetic Location of IEDs Defeat System, +\$1.2M for COTS Analysis Tools for Navigational Warfare, +\$1.6M for Innovative Polymeric Materials for Three-Dimensional (3-D) Microdevice Construction, +\$1.6M for New Electronic Warfare Specialists Through Advanced Research by Students, and +\$4.9M for Advanced Threat Alert/Advance Technology Development.

C. Performance Metrics
Under Development.

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Exhibit R-2a, PB 2010 Air Force RDT&E Project Justification								DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY 3600 - Research, Development, Test & Evaluation, Air Force/BA 3 - Advanced Technology Development (ATD)				R-1 ITEM NOMENCLATURE PE 0603270F Electronic Combat Technology					PROJECT NUMBER 632432	
COST (\$ in Millions)	FY 2008 Actual	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
632432: Defensive System Fusion Technology	7.596	11.922	4.567						Continuing	Continuing

A. Mission Description and Budget Item Justification

This project develops and demonstrates technologies for integrating electronic combat sensors and electronic combat system fusion. It develops advanced algorithms and assessment techniques needed to evaluate and enable combat aircraft operations in multi-spectral threat and countermeasure environments. It also matures technologies required for command-and-control warfare, standoff jamming, and electronic support measures for the denial, disruption, and suppression of adversary air defense operations. Technologies included are: advanced components and techniques needed to jam enemy radars; advanced standoff jammer technologies; and electronic collection methods to inform field commanders of changes in the electronic environment.

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

	FY 2008	FY 2009	FY 2010	FY 2011
<p>MAJOR THRUST: Develop affordable radio-frequency and electro-optical emitter warning and electronic warfare battle management concepts and techniques. Develop techniques for coordination and management of multiple, distributed, jamming nodes against integrated air defense systems. Conduct integrated electronic warfare/information operations simulations and demonstrations for the deception and defeat of integrated air defense system threats.</p> <p>In FY 2008: Completed maturation demonstration of advanced threat alert and jamming subsystem for combat aircraft to increase survivability against advanced, integrated radio-frequency, electro-optical, and infrared air defense systems. Investigated electronic warfare battle management strategies and technical protocols for control of multiple jamming nodes working in coordination against an integrated air defense system in the overall context of non-traditional intelligence, surveillance, reconnaissance and strike operations. Developed and demonstrated technical protocols for the integration of electronic warfare, command-and-control warfare, and information operations against an integrated air defense system.</p> <p>In FY 2009: Conduct analyses and initial demonstrations of electronic warfare battle management strategies in the Air Force Integrated Demonstrations and Applications Laboratory and Virtual Combat Laboratory simulation facilities. Continue to develop and demonstrate technical protocols for the integration of electronic warfare,</p>	5.939	5.858	4.567	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>command-and-control warfare and information operations against an integrated air defense system. Develop and mature key technologies essential for Airborne Electronic Attack risk reduction.</p> <p>In FY 2010: Continue research into electronic warfare battle management techniques and protocols in the Virtual Combat Environment for Electronic Conflict. Investigate and demonstrate electronic attack techniques from multiple nodes. Initiate a project to demonstrate a distributed (multi-node) electronic support/electronic attack architecture. Continue research into integration of electronic attack and information operations to defeat an adversary integrated air defense system.</p>				
<p>CONGRESSIONAL ADD: Advanced Threat Alert Advanced Technology Demonstration.</p> <p>In FY 2008: Conducted Congressionally-directed effort for Advanced Threat Alert Advanced Technology Demonstration.</p> <p>In FY 2009: Conduct Congressionally-directed effort for Advanced Threat Alert Advanced Technology Demonstration.</p> <p>In FY 2010: Not Applicable.</p>	1.657	4.867	0.000	
<p>CONGRESSIONAL ADD: Commercial-Off-the-Shelf (COTS) Analysis Tools for Navigational Warfare.</p> <p>In FY 2008: Not Applicable.</p> <p>In FY 2009: Conduct Congressionally-directed effort for COTS Analysis Tools for Navigational Warfare.</p> <p>In FY 2010: Not Applicable.</p>	0.000	1.197	0.000	

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

	<u>FY 2008</u>	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011</u>	<u>FY 2012</u>	<u>FY 2013</u>	<u>FY 2014</u>	<u>FY 2015</u>	Cost To Complete	Total Cost
Activity Not Provided/ Related Activities:	0.000	0.000							Continuing	Continuing
PE 0602204F/ Aerospace Sensors.	0.000	0.000							Continuing	Continuing
PE 0603203F/ Advanced Aerospace Sensors.	0.000	0.000							Continuing	Continuing
PE 0603500F/ Multi-disciplinary Advanced Space Technology.	0.000	0.000							Continuing	Continuing
PE 0604270F/ Electronic Warfare (EW) Development.	0.000	0.000							Continuing	Continuing
Activity Not Provided/ This project has been coordinated through the Reliance 21 process to harmonize efforts and eliminate	0.000	0.000							Continuing	Continuing

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, PB 2010 Air Force RDT&E Project Justification								DATE: May 2009		
APPROPRIATION/BUDGET ACTIVITY 3600 - Research, Development, Test & Evaluation, Air Force/BA 3 - Advanced Technology Development (ATD)				R-1 ITEM NOMENCLATURE PE 0603270F Electronic Combat Technology					PROJECT NUMBER 63431G	
COST (\$ in Millions)	FY 2008 Actual	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
63431G: RF Warning & Countermeasures Tech	7.795	9.957	20.159						Continuing	Continuing

A. Mission Description and Budget Item Justification

This project develops and demonstrates advanced technologies for radio-frequency electronic combat suites to enhance the survivability of aerospace vehicles and to provide crew situational awareness. One major area addresses technologies for missile/threat warning, radio-frequency receivers, electronic combat pre-processors, advanced sorting/pre-processing algorithms, and expert software for applications on existing and future electronic combat systems. Another major technology area focuses on the development and demonstration of subsystems and components for generating on-board/off-board radio-frequency countermeasure techniques. This includes the development of electronic countermeasures techniques as well as advanced electronic countermeasures technologies such as antennas, power amplifiers, and preamplifiers.

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

	FY 2008	FY 2009	FY 2010	FY 2011
<p>MAJOR THRUST: Develop wideband, multi-mode, multi-function apertures for electronic warfare applications (i.e., threat detection, threat avoidance, suppression of enemy air defenses, surveillance, and reconnaissance). Note: This effort completed in FY 2008.</p> <p>In FY 2008: Completed integration and test of array compatible with unmanned aerial vehicles.</p> <p>In FY 2009: Not Applicable.</p> <p>In FY 2010: Not Applicable.</p>	1.161	0.000	0.000	
<p>MAJOR THRUST: Develop aerospace platform self-protection and mutual support jamming technologies and techniques to counter advanced radio-frequency threats associated with current and future aerospace weapon systems. Develop distributed, coordinated, multi-nodal radar jamming techniques for degradation, deception and neutralization of early warning and surveillance networks to enable all-platform operations in defended adversary airspace. Develop new adaptive electronic attack techniques fusing advanced digital signal processing receivers with digital technique generators.</p>	6.634	6.765	20.159	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>In FY 2008: Provided hardware simulation and analysis support to multi-intelligence sensor needs for accurate and timely electronic surveillance information. Conducted threat research, simulation, and analysis of early warning radar characteristics. Developed multiple technical strategies and techniques for deceiving them in a network enabled operational environment. Developed advanced simulation capabilities to support network enabled jamming of adversary early warning and surveillance networks. Developed and evaluated integrated digital receiver/jammer architectures.</p> <p>In FY 2009: Continue to provide hardware simulation and analysis support to multi-intelligence sensor needs for accurate and timely electronic surveillance information. Develop advanced radar jamming engineering models including technique generators, wide band amplifier modules and apertures, needed to conduct network enabled research and evaluation of countermeasure techniques. Continue to develop advanced simulation capabilities to support network enabled jamming of adversary early warning and surveillance networks. Continue to develop and evaluate integrated digital receiver/jammer brassboard architectures that leverage real-time electronic surveillance signal processing to enhance electronic attack effectiveness.</p> <p>In FY 2010: Initiate advanced electronic attack jamming algorithms development for network operations to defeat future advanced threats. Continue to research the synergy between electronic protection and electronic attack technologies to realize more effective jamming. Demonstrate a distributed, multi-node electronic support/electronic attack concept. Continue research to tailor electronic attack techniques in combination with simultaneous information operations to counter the increasing adversary air defense systems moves to increased digital integration of defense sensors. Develop and assess advanced technology, concepts, and algorithms to mitigate the effects of advanced signals on radio frequency receiver-processors.</p>				
<p>CONGRESSIONAL ADD: Advanced Electromagnetic Location of IEDs Defeat System.</p> <p>In FY 2008: Not Applicable.</p>	0.000	1.596	0.000	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
In FY 2009: Conduct Congressionally-directed effort for Advanced Electromagnetic Location of IEDs Defeat System. In FY 2010: Not Applicable.				
CONGRESSIONAL ADD: New Electronic Warfare Specialists Through Advanced Research by Students. In FY 2008: Not Applicable. In FY 2009: Conduct Congressionally-directed effort for New Electronic Warfare Specialists Through Advanced Research by Students. In FY 2010: Not Applicable.	0.000	1.596	0.000	

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

	<u>FY 2008</u>	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011</u>	<u>FY 2012</u>	<u>FY 2013</u>	<u>FY 2014</u>	<u>FY 2015</u>	Cost To Complete	Total Cost
Activity Not Provided/ Related Activities:	0.000	0.000							Continuing	Continuing
PE 0602204F/ Aerospace Sensors.	0.000	0.000							Continuing	Continuing
PE 0604270F/ Electronic Warfare (EW) Development.	0.000	0.000							Continuing	Continuing
PE 0603500F/ Multi- disciplinary Advanced Space Technology.	0.000	0.000							Continuing	Continuing
PE 0604270N/ EW Development.	0.000	0.000							Continuing	Continuing
Activity Not Provided/ This project has been coordinated through the Reliance 21 process to harmonize efforts and eliminate	0.000	0.000							Continuing	Continuing

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 2008 Actual	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
63691X: EO/IR Warning & Countermeasures Tech	11.556	8.362	6.295						Continuing	Continuing

A. Mission Description and Budget Item Justification

This project develops and demonstrates the advanced warning and countermeasure technologies required to negate electro-optical, infrared, and laser threats to aerospace platforms. Off-board (decoys and expendables) and on-board countermeasure technologies developed for aircraft self-protection will provide robust, affordable solutions for protection against infrared missiles with autonomous seekers, multi-spectral threats, laser-guided weapons, and electro-optical and infrared tracking systems used to direct electro-optical, infrared, and radar-guided missiles.

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

	FY 2008	FY 2009	FY 2010	FY 2011
<p>MAJOR THRUST: Analyze the vulnerabilities of current infrared missile systems and future imaging infrared sensors.</p> <p>In FY 2008: Concluded in-house analyses on infrared-guided missile and future imaging infrared sensor susceptibilities. Further evaluated countermeasure techniques for countering multiple types of missiles and imaging infrared sensors. Identified optimal countermeasure techniques to defeat single color imaging infrared sensors.</p> <p>In FY 2009: Perform laboratory analyses on future infrared guided missile capabilities. Assess effectiveness of current and planned techniques against new threat trends and direction of future countermeasure technique requirements. Conduct digital simulations to assess effectiveness of expendable and laser countermeasure techniques.</p> <p>In FY 2010: Continue to perform laboratory analyses and assessments on infrared guided missiles and future imaging systems. Investigate countermeasures techniques that include laser jamming and jamming, expendables combinations. Conduct digital, injection, hardware-in-loop simulation to develop and assess countermeasures (CM) effectiveness. Obtain imaging threat to enable evaluation of postulated CM concepts. Support major Advanced Technology Demonstrations through Developmental Test and Evaluation.</p>	3.529	4.549	1.664	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
<p>MAJOR THRUST: Develop aerospace laser warning sensor technologies for timely alert to advanced laser acquisition/tracking sensors, including detecting and locating both high power (dazzle/damage) and low power (laser-guided ordnance) signals.</p> <p>In FY 2008: Developed laser warning sensors to address emerging laser threats. Initiated development of miniaturized laser warning sensors. Fabricated compact device for personnel protection. Demonstrated capability to geolocate laser threats for enhanced situational awareness.</p> <p>In FY 2009: Continue developing laser warning sensors to address emerging laser threats. Continue development of miniaturized laser warning sensors. Fabricate sensor for sensor and eye protection cueing. Demonstrate capability to cue agile filters for optimized protection against advanced laser threats.</p> <p>In FY 2010 Further develop laser warning sensors to address emerging laser threats. Demonstrate integration of miniaturized laser warning sensors in sensor protection, personnel protection and countermeasures cueing. Develop laser detection/warning/geolocation concepts for air based defense against medium and high energy lasers. Investigate advanced concepts for laser beam rider (laser augmented manpad) detection and geolocation. Demonstrate hardware-in-the-loop laser threat/sensor engagement testing for mission survivability testing.</p>	0.829	0.939	0.593	
<p>MAJOR THRUST: Develop a countermeasure technology to defeat passive electro-optical and infrared aircraft tracking sensors and ordnance guidance. Note: Funding decrease in FY 2009 is due to completion of tests and demonstrations in FY 2008.</p> <p>In FY 2008: Completed field tests to locate and counter passive threats before threats can develop fire control solution. Completed tower demonstration system development and conduct experiments over 2 km range. Evaluated effectiveness of countermeasure techniques against night vision devices and other passive surveillance sensors.</p>	4.882	2.724	1.672	

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B. Accomplishments/Planned Program (\$ in Millions)			FY 2008	FY 2009	FY 2010	FY 2011
<p>In FY 2009: Initiate development of affordable, lightweight infrared countermeasures capability combining passive surveillance and missile defeat techniques for tactical aircraft. Initiate design of a compact system to geolocate and identify threats.</p> <p>In FY 2010: Continue development of affordable, lightweight infrared, laser countermeasures capability combining passive surveillance and missile defeat techniques for tactical aircraft. Continue design of capability to geolocation and identify passive infrared threats for targeting.</p>						
<p>MAJOR THRUST: Develop electro-optical/infrared missile warning technologies to alert aircrews and aircraft self-protection systems to the approach of advanced, low-signature threats.</p> <p>In FY 2008: Characterized sensor performance in varied background clutter. Identified maximum detection ranges for high priority threat missiles.</p> <p>In FY 2009: Conduct missile warning sub-system integration of sensor, real-time processor and algorithms for a complete real-time visible missile warning system and for testing of the system in real-time environments.</p> <p>In FY 2010: Integrate visible missile warning system (VMWS) into the Affordable Laser Infrared Survivability System (ALISS).</p>			0.853	0.150	0.148	
<p>MAJOR THRUST: Develop electro-optical sensor component technology to advance multiple space mission areas. Develop new sensor components, topologies, and architectures for space. Note: Prior to FY 2010, this effort was performed in PE 0603203F, Project 88SP.</p> <p>In FY 2008: Not Applicable.</p> <p>In FY 2009: Not Applicable.</p>			0.000	0.000	2.218	

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B. Accomplishments/Planned Program (\$ in Millions)	FY 2008	FY 2009	FY 2010	FY 2011
In FY 2010: Conduct space situation awareness (SSA) sensor prototype experiments.				
CONGRESSIONAL ADD: Battlefield Laser Detection System (BLADES). In FY 2008: Conducted Congressionally-directed effort for BLADES. In FY 2009: Not Applicable. In FY 2010: Not Applicable.	1.463	0.000	0.000	

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

	<u>FY 2008</u>	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011</u>	<u>FY 2012</u>	<u>FY 2013</u>	<u>FY 2014</u>	<u>FY 2015</u>	Cost To Complete	Total Cost
Activity Not Provided/ Related Activities:	0.000	0.000							Continuing	Continuing
PE 0602204F/ Aerospace Sensors.	0.000	0.000							Continuing	Continuing
PE 0604270F/ Electronic Warfare (EW) Development.	0.000	0.000							Continuing	Continuing
PE 0603500F/ Multi- disciplinary Advanced Development Space Technology.	0.000	0.000							Continuing	Continuing
PE 0604270N/ EW Development.	0.000	0.000							Continuing	Continuing
PE 0603203F/ Advanced Aerospace Sensors.	0.000	0.000							Continuing	Continuing
Activity Not Provided/ This project has been coordinated through the Reliance 21 process to harmonize efforts and eliminate	0.000	0.000							Continuing	Continuing

D. Acquisition Strategy

Not Applicable.

E. Performance Metrics

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