PE NUMBER: 0603270F
PE TITLE: Electronic Combat Technology

Exhibit R-2, RDT&E Budget Item Justification

DATE: February 2006

BUDGET ACTIVITY: 03 Advanced Technology Development (ATD)

PE NUMBER AND TITLE: 0603270F Electronic Combat Technology

	Cost ($ in Millions)	FY 2005 Actual	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	Cost to Complete	Total
	Total Program Element (PE) Cost	37.883	33.342	24.436	24.857	26.978	27.578	28.094	Continuing	TBD
2432	Defensive System Fusion Technology	7.386	7.432	5.183	5.270	5.720	5.839	5.950	Continuing	TBD
431G	RF Warning & Countermeasures Tech	14.567	9.888	8.387	8.531	9.259	9.495	9.674	Continuing	TBD
691X	EO/IR Warning & Countermeasures Tech	15.930	16.022	10.866	11.056	11.999	12.244	12.470	Continuing	TBD

(U) A. Mission Description and Budget Item Justification

This program develops and demonstrates technologies to support Air Force electronic combat (EC) warfighting capabilities. The program focuses on developing components, subsystems, and technologies with potential aerospace combat, special operations, and airlift EC applications in three project areas. The first project develops and demonstrates technologies for integrating EC sensors and systems into a fused and seamless whole. The second project develops and demonstrates advanced technologies for radio frequency EC suites. The third project develops and demonstrates advanced warning and countermeasure technologies to defeat electro-optical, infrared, and laser threats to aerospace platforms. Note: In FY 2006, Congress added $1.0 million for RAPCEval, $1.4 million for Detect and Avoid for UAVs, $2.1 million for Affordable Visible Missile Warning System, $1.0 for Electronic Combat Battle Management, $1.4 million for BLADES, $2.0 million for Advanced Threat Alert ATD - Technology Insertion, and $1.0 million for the Infrared Countermeasures Electronics Improvement Program. 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 EC system developments that have military utility and address warfighter needs.

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

		FY 2005	FY 2006	FY 2007
(U)	Previous President's Budget	39.234	23.923	24.159
(U)	Current PBR/President's Budget	37.883	33.342	24.436
(U)	Total Adjustments	-1.351	9.419	
(U)	Congressional Program Reductions			
	Congressional Rescissions	-0.030	-0.481	
	Congressional Increases		9.900	
	Reprogrammings	-0.495		
	SBIR/STTR Transfer	-0.826		
(U)	Significant Program Changes:			

Not Applicable.

C. Performance Metrics

Under Development.

Exhibit R-2a, RDT&E Project Justification

DATE: February 2006

BUDGET ACTIVITY: 03 Advanced Technology Development (ATD)

PE NUMBER AND TITLE: 0603270F Electronic Combat Technology

PROJECT NUMBER AND TITLE: 2432 Defensive System Fusion Technology

Cost ($ in Millions)		FY 2005 Actual	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	Cost to Complete	Total
2432	Defensive System Fusion Technology	7.386	7.432	5.183	5.270	5.720	5.839	5.950	Continuing	TBD
	Quantity of RDT&E Articles	0	0	0	0	0	0	0		

(U) A. Mission Description and Budget Item Justification

This project develops and demonstrates technologies for integrating electronic combat (EC) sensors and EC 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 (C2W), stand off 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 stand off jammer technologies; and electronic collection methods to inform field commanders of changes in the electronic environment.

(U) B. Accomplishments/Planned Program ($ in Millions)	FY 2005	FY 2006	FY 2007
(U) MAJOR THRUST: Develop and investigate offensive counter information warfare technologies to disrupt and deny hostile command and control nodes and networks. Note: This effort completes in FY06.	2.870	0.853	0.000
(U) In FY 2005: Integrated flyable hardware and software for the Electronic Attack/Electronic Support (EA/ES) support system to counter high-speed, wideband data and communication links utilized by multiple ground-based and airborne platforms.			
(U) In FY 2006: Complete the EA/ES support system integration. Conduct laboratory and field tests of the countermeasure system to verify the capability to counter high-speed, wideband data communication links utilized by multiple ground-based and airborne platforms. Develop an integrated, networked approach to disrupt and deny current and future Integrated Air Defense Systems.			
(U) In FY 2007: Not applicable.			
(U)			
(U) MAJOR THRUST: Develop and integrate advanced sensor receiver and processing technologies.	1.972	0.576	0.596
(U) In FY 2005: Conducted evaluations and risk reduction demonstrations of defensive sensors and fusion of multiple information sources for situational awareness in the Integrated Demonstrations and Applications Laboratory (IDAL). Conducted IDAL laboratory risk reduction evaluations and demonstrations that evolve and optimize sensor fusion algorithms for utilization on tactical platforms that provide real-time threat situational awareness. Conducted IDAL laboratory risk reduction evaluations and demonstrations for advanced digital receiver and processor technologies that provide the warfighter with multispectral warning, identification, and threat response for current and next generation aerospace platforms.			
(U) In FY 2006: Perform risk reduction for defensive sensors using multiple information sources for situational awareness in the IDAL. Conduct IDAL laboratory risk reduction evaluations and demonstrations that evolve and			

Exhibit R-2a, RDT&E Project Justification		DATE February 2006
BUDGET ACTIVITY 03 Advanced Technology Development (ATD)	PE NUMBER AND TITLE 0603270F Electronic Combat Technology	PROJECT NUMBER AND TITLE 2432 Defensive System Fusion Technology

	B. Accomplishments/Planned Program ($ in Millions)	FY 2005	FY 2006	FY 2007
	optimize network EA techniques on disparate platforms. Conduct IDAL laboratory demonstrations of advanced digital receiver and processor technologies that provide the warfighter with multispectral warning, identification, and threat response for current and next generation aerospace platforms.			
(U)	In FY 2007: Continue risk reduction for defensive sensors using multiple information sources for situational awareness in the IDAL. Continue IDAL laboratory risk reduction evaluations and demonstrations that evolve and optimize network EA techniques on disparate platforms. Perform demonstrations of advanced multiplatform digital receiver and processor technologies that provide the warfighter with multispectral warning, identification, and threat response for current and next generation aerospace platforms.			
(U)				
(U)	MAJOR THRUST: Develop affordable radio frequency (RF) and electro-optical (EO) emitter warning concepts and techniques.	2.544	4.032	4.587
(U)	In FY 2005: Demonstrated affordable threat alert and jamming techniques generator technologies for combat aircraft to increase survivability against advanced, integrated RF, EO, and infrared (IR) air defense systems, including implementation of techniques to defeat future threat radar guided missile systems. Incorporated advanced jamming techniques into plans for flight demonstrations of a significantly improved digital threat warning and response capability. Developed advanced processing and encoding methods for complex emitter signals.			
(U)	In FY 2006: Design and initiate demonstration of advanced threat alert and jamming subsystem for combat aircraft to increase survivability against advanced, integrated RF, EO, and IR air defense systems. Perform initial flight tests to select advanced jamming techniques for a significantly improved digital threat warning and response capability.			
(U)	In FY 2007: Complete engineering model demonstration of advanced threat alert and jamming subsystem for combat aircraft to increase survivability against advanced, integrated RF, EO, and IR air defense systems. Perform final flight tests to validate advanced jamming techniques for a significantly improved digital threat warning and response capability.			
(U)				
(U)	CONGRESSIONAL ADD: Advanced Threat Alert ATD (Advanced Technology Demonstration) - Technology Insertion.	0.000	1.971	0.000
(U)	In FY 2005: Not Applicable.			
(U)	In FY 2006: Conduct Congressionally-directed effort for Advanced Threat Alert ATD - Technology Insertion.			
(U)	In FY 2007: Not Applicable.			
(U)	Total Cost	7.386	7.432	5.183

Exhibit R-2a, RDT&E Project Justification		DATE February 2006
BUDGET ACTIVITY 03 Advanced Technology Development (ATD)	PE NUMBER AND TITLE 0603270F Electronic Combat Technology	PROJECT NUMBER AND TITLE 2432 Defensive System Fusion Technology

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

	FY 2005 Actual	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	Cost to Complete	Total Cost

(U) Related Activities:

(U) PE 0602204F, Aerospace Sensors.

(U) PE 0603203F, Advanced Aerospace Sensors.

(U) PE 0603500F, Multi-disciplinary Advanced Space Technology.

(U) PE 0604270F, Electronic Warfare (EW) Development.

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

(U) D. Acquisition Strategy

Not Applicable.

Exhibit R-2a, RDT&E Project Justification

DATE: February 2006

BUDGET ACTIVITY: 03 Advanced Technology Development (ATD)

PE NUMBER AND TITLE: 0603270F Electronic Combat Technology

PROJECT NUMBER AND TITLE: 431G RF Warning & Countermeasures Tech

Cost ($ in Millions)		FY 2005 Actual	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	Cost to Complete	Total
431G	RF Warning & Countermeasures Tech	14.567	9.888	8.387	8.531	9.259	9.495	9.674	Continuing	TBD
	Quantity of RDT&E Articles	0	0	0	0	0	0	0		

(U) A. Mission Description and Budget Item Justification

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

(U) B. Accomplishments/Planned Program ($ in Millions)	FY 2005	FY 2006	FY 2007
(U) 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).	3.195	1.688	1.371
(U) In FY 2005: Developed low-cost wideband and conformal, multiple polarization arrays through the use of RF-on-Flex techniques.			
(U) In FY 2006: Design and fabricate critical aperture and receiver subsystems for an efficient, low frequency, wide band aperture compatible with unmanned aerial vehicle (UAV) platforms.			
(U) In FY 2007: Test critical subsystems of an efficient, low frequency, wide band aperture, and fabricate array compatible with UAV platforms.			
(U)			
(U) MAJOR THRUST: Develop aerospace platform self-protection and support jamming technologies and techniques to counter advanced RF threats associated with current and future aerospace weapon systems.	4.772	6.228	7.016
(U) In FY 2005: Developed self-protection countermeasures effective against fourth generation surface-to-air missile systems. Conducted laboratory evaluations of countermeasures to defeat an advanced integrated air defense system (IADS). Laboratory and field-tested innovative, networked RF countermeasure techniques against advanced target engagement radars. Developed anti-jam technologies for advanced RF sensor systems.			
(U) In FY 2006: Further develop self-protection countermeasures effective against fourth generation surface-to-air missile systems. Begin development and conduct laboratory evaluations of advanced countermeasures techniques and technology to defeat an advanced IADS. Continue laboratory and field-testing of innovative, networked RF countermeasure techniques against advanced target engagement radars. Further develop anti-jam techniques and technologies for advanced RF sensor systems. Demonstrate a lightweight, low-profile, multi-function, active electronically scanned array on an airborne test bed. Analyze data from flight test and predict system performance			

Exhibit R-2a, RDT&E Project Justification		DATE February 2006
BUDGET ACTIVITY 03 Advanced Technology Development (ATD)	PE NUMBER AND TITLE 0603270F Electronic Combat Technology	PROJECT NUMBER AND TITLE 431G RF Warning & Countermeasures Tech

	B. Accomplishments/Planned Program ($ in Millions)	FY 2005	FY 2006	FY 2007
	using advanced computational techniques.			
(U)	In FY 2007: Continue developing self-protection countermeasures effective against advanced future surface-to-air missile systems. Conduct further laboratory and field-testing of innovative, networked RF countermeasure techniques against advanced target engagement radars. Continue development of advanced countermeasures techniques and technology to defeat an advanced IADS. Continue developing anti-jam techniques and technologies for advanced RF sensor systems. Demonstrate electronic support cross-cueing capabilities of a multi-intelligence sensor suite including the effects of electromagnetic interference and platform compatibility to provide precision location and identification with increased probability of intercept.			
(U)				
(U)	CONGRESSIONAL ADD: Lightweight Modular Support Jammer.	5.600	0.000	0.000
(U)	In FY 2005: Developed and demonstrated a special capability high band antenna array aperture with wide bandwidth solid state power amplifiers. Developed and demonstrated a wide bandwidth jamming techniques generator. Implemented needed hardware modifications and upgrades to the system to provide high band exciter coverage. Implemented software modifications to the software system needed for demonstration of the high band electronic attack (EA) jamming subsystem. Performed an EC battle management study for distributed and networked EA.			
(U)	In FY 2006: Not Applicable.			
(U)	In FY 2007: Not Applicable.			
(U)				
(U)	CONGRESSIONAL ADD: Receiver and Processing Concepts Evaluation (RAPCEval).	1.000	0.986	0.000
(U)	In FY 2005: Expanded research in advanced RF receiver and processing algorithms using state-of-the art concepts and modern technologies.			
(U)	In FY 2006: Conduct Congressionally-directed effort for RAPCEval.			
(U)	In FY 2007: Not Applicable.			
(U)				
(U)	CONGRESSIONAL ADD: Electronic Combat Battle Management.	0.000	0.986	0.000
(U)	In FY 2005: Not Applicable.			
(U)	In FY 2006: Conduct Congressionally-directed effort for Electronic Combat Battle Management.			
(U)	In FY 2007: Not Applicable.			
(U)	Total Cost	14.567	9.888	8.387

Exhibit R-2a, RDT&E Project Justification		DATE February 2006
BUDGET ACTIVITY 03 Advanced Technology Development (ATD)	PE NUMBER AND TITLE 0603270F Electronic Combat Technology	PROJECT NUMBER AND TITLE 431G RF Warning & Countermeasures Tech

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

	FY 2005 Actual	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	Cost to Complete	Total Cost

(U) Related Activities:

(U) PE 0602204F, Aerospace Sensors.

(U) PE 0604270F, Electronic Warfare (EW) Development.

(U) PE 0603500F, Multi-disciplinary Advanced Space Technology.

(U) PE 0604270N, EW Development.

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

(U) D. Acquisition Strategy

Not Applicable.

Exhibit R-2a, RDT&E Project Justification			DATE: February 2006
BUDGET ACTIVITY: 03 Advanced Technology Development (ATD)	PE NUMBER AND TITLE: 0603270F Electronic Combat Technology	PROJECT NUMBER AND TITLE: 691X EO/IR Warning & Countermeasures Tech	

Cost ($ in Millions)		FY 2005 Actual	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	Cost to Complete	Total
691X	EO/IR Warning & Countermeasures Tech	15.930	16.022	10.866	11.056	11.999	12.244	12.470	Continuing	TBD
	Quantity of RDT&E Articles	0	0	0	0	0	0	0		

(U) A. Mission Description and Budget Item Justification

This project develops and demonstrates the advanced warning and countermeasure technologies required to negate electro-optical (EO), infrared (IR), 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 IR missiles with autonomous seekers, multispectral threats, laser-guided weapons, and EO and IR tracking systems used to direct EO, IR, and radar-guided missiles.

(U) B. Accomplishments/Planned Program ($ in Millions)	FY 2005	FY 2006	FY 2007
(U) MAJOR THRUST: Analyze the vulnerabilities of current IR missile systems and future imaging IR sensors. Note: Increased funding in FY 2006 supports field demonstration of cooperative techniques and expendable decoys with modified spatial and kinematic properties for countering IR missiles.	2.168	4.341	1.109
(U) In FY 2005: Conducted in-house analyses on current IR-guided missile susceptibilities and future imaging IR sensors. Evaluated countermeasure techniques for countering multiple types of imaging IR sensors used for target acquisition. Developed low-cost, cooperative techniques to counter imaging IR sensors. Designed and developed expendable decoy technology with modified spatial and kinematic properties that can be used to deceive imaging IR missiles.			
(U) In FY 2006: Further conduct in-house analyses on IR-guided missile and future imaging IR sensor susceptibilities. Continue evaluating countermeasure techniques for countering multiple types of missiles and imaging IR sensors.			
(U) In FY 2007: Continue conducting in-house analyses on IR guided missiles and future imaging IR sensor susceptibilities. Further evaluate countermeasure techniques for countering multiple types of missiles and imaging IR sensors. Conduct digital simulations to assess the effectiveness of spatial decoy techniques against imaging IR missiles under flyout conditions. Assess proposed advanced countermeasure techniques to defeat imaging IR sensors.			
(U)			
(U) 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.	3.667	2.020	1.850
(U) In FY 2005: Conducted risk reduction research and development for continuous wave and femto-second lasers from remote vehicles and sensors. Developed advanced eye and sensor protection cueing concepts tailored for specific			

Exhibit R-2a, RDT&E Project Justification		DATE February 2006
BUDGET ACTIVITY 03 Advanced Technology Development (ATD)	PE NUMBER AND TITLE 0603270F Electronic Combat Technology	PROJECT NUMBER AND TITLE 691X EO/IR Warning & Countermeasures Tech

	B. Accomplishments/Planned Program ($ in Millions)	FY 2005	FY 2006	FY 2007
	operational deficiencies. Planned development of a laser warning sensor package for integration into unmanned aerial vehicles (UAVs) and night vision goggles (NVGs).			
(U)	In FY 2006: Initiate development of advanced laser warning receivers for aircraft. Continue developing laser warning sensor technologies to address emerging laser threats. Continue laser warning sensor packages for integration into UAVs and NVGs.			
(U)	In FY 2007: Initiate development of an advanced laser warning receiver for integration into tactical aircraft. Continue developing laser warning sensor technologies to address emerging laser threats. Initiate miniature laser warning for personnel protection.			
(U)				
(U)	MAJOR THRUST: Develop a countermeasure technology to defeat passive EO and IR aircraft tracking sensors and ordnance guidance.	4.279	2.996	7.061
(U)	In FY 2005: Demonstrated laboratory capability to locate and counter passive threats before threats can develop a fire control solution. Fabricated a testbed for field demonstrations over extended ranges.			
(U)	In FY 2006: Complete development of testbed to locate and counter passive threats before threats can develop a fire control solution. Conduct field demonstration over extended ranges to demonstrate capability. Initiate testbed integration on aircraft for flight demonstrations over full required range.			
(U)	In FY 2007: Complete integration of testbed on aircraft. Conduct flight test demonstration of the capability to locate and counter passive threats over required range before threats can develop a fire control solution.			
(U)				
(U)	MAJOR THRUST: Develop EO/IR missile warning technologies to alert aircrews and aircraft self-protection systems to the approach of advanced, low-signature threats.	1.116	0.849	0.846
(U)	In FY 2005: Performed a concept evaluation of a visible band passive warning sensor that can provide timely countermeasure initiation with high declaration probability and low false alarm rate.			
(U)	In FY 2006: Perform integration of subsystem components into affordable visible missile warning system (AVMWS). Perform test and evaluation of AVMWS. Coordinate AVMWS development with the Affordable Laser Infrared Survivability System countermeasure system.			
(U)	In FY 2007: Complete test and evaluation of AVMWS.			
(U)				
(U)	CONGRESSIONAL ADD: Detect and Avoid for UAVs.	1.400	1.380	0.000
(U)	In FY 2005: Integrated and demonstrated see and avoid wide field of regard sensor subsystem, high performance field programmable gate array processors, and detection algorithms.			
(U)	In FY 2006: Conduct Congressionally-directed effort for Detect and Avoid for UAVs.			

Exhibit R-2a, RDT&E Project Justification		DATE February 2006
BUDGET ACTIVITY 03 Advanced Technology Development (ATD)	PE NUMBER AND TITLE 0603270F Electronic Combat Technology	PROJECT NUMBER AND TITLE 691X EO/IR Warning & Countermeasures Tech

	B. Accomplishments/Planned Program ($ in Millions)	FY 2005	FY 2006	FY 2007
(U)	In FY 2007: Not Applicable.			
(U)				
(U)	CONGRESSIONAL ADD: Affordable Visible Missile Warning System.	3.300	2.070	0.000
(U)	In FY 2005: Fabricated passive, visible band missile warning subsystems for a system to provide timely countermeasure initiation with high declaration probability and low false alarm rate. Subsystems fabricated include the sensor, data processor, and detection algorithms.			
(U)	In FY 2006: Conduct Congressionally-directed effort for the Affordable Visible Missile Warning System.			
(U)	In FY 2007: Not Applicable.			
(U)				
(U)	CONGRESSIONAL ADD: Battlefield Laser Detection System (BLADES).	0.000	1.380	0.000
(U)	In FY 2005: Not Applicable.			
(U)	In FY 2006: Conduct Congressionally-directed effort for BLADES.			
(U)	In FY 2007: Not Applicable.			
(U)				
(U)	CONGRESSIONAL ADD: Infrared Countermeasures Electronics Improvement Program.	0.000	0.986	0.000
(U)	In FY 2005: Not Applicable.			
(U)	In FY 2006: Conduct Congressionally-directed effort for the Infrared Countermeasures Electronics Improvement Program.			
(U)	In FY 2007: Not Applicable.			
(U)	Total Cost	15.930	16.022	10.866

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

	FY 2005 Actual	FY 2006 Estimate	FY 2007 Estimate	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	Cost to Complete	Total Cost
(U) Related Activities:									
(U) PE 0602204F, Aerospace Sensors.									
(U) PE 0604270F, Electronic Warfare (EW) Development.									
(U) PE 0603500F, Multi-disciplinary Advanced Development Space Technology.									

Exhibit R-2a, RDT&E Project Justification		DATE February 2006
BUDGET ACTIVITY **03 Advanced Technology Development (ATD)**	PE NUMBER AND TITLE **0603270F Electronic Combat Technology**	PROJECT NUMBER AND TITLE **691X EO/IR Warning & Countermeasures Tech**

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

(U) PE 0604270N, EW Development.

(U) PE 0603203F, Advanced Aerospace Sensors.

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

(U) D. Acquisition Strategy

Not Applicable.