

UNCLASSIFIED

PE NUMBER: 0603270F
 PE TITLE: Electronic Combat Technology

Exhibit R-2, RDT&E Budget Item Justification	DATE February 2008
---	-------------------------------------

BUDGET ACTIVITY 03 Advanced Technology Development (ATD)	PE NUMBER AND TITLE 0603270F Electronic Combat Technology
---	--

Cost (\$ in Millions)	FY 2007 Actual	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	Cost to Complete	Total
Total Program Element (PE) Cost	27.599	26.762	21.056	16.740	18.312	25.609	24.124	Continuing	TBD
2432 Defensive System Fusion Technology	6.186	7.050	5.878	4.907	5.623	8.627	6.532	Continuing	TBD
431G RF Warning & Countermeasures Tech	8.643	7.691	6.788	5.946	5.269	6.860	8.065	Continuing	TBD
691X EO/IR Warning & Countermeasures Tech	12.770	12.021	8.390	5.887	7.420	10.122	9.527	Continuing	TBD

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. FY 2008 funding totals do not include \$5.325 million in FY 2008 GWOT requirements still pending Congressional consideration.

(U) 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. Note: In FY 2008 Congress added \$1.7 million for Advanced Threat Alert Advanced Technology Development and \$1.5 million for BLADES. 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.

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

	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
(U) Previous President's Budget	28.528	23.743	21.287
(U) Current PBR/President's Budget	27.599	26.762	21.056
(U) Total Adjustments	-0.929	3.019	
(U) Congressional Program Reductions		-0.004	
Congressional Rescissions		-0.177	
Congressional Increases		4.200	
Reprogrammings	-0.288	-1.000	
SBIR/STTR Transfer	-0.641		
(U) <u>Significant Program Changes:</u> Not Applicable.			

Exhibit R-2, RDT&E Budget Item Justification

DATE

February 2008

BUDGET ACTIVITY

03 Advanced Technology Development (ATD)

PE NUMBER AND TITLE

0603270F Electronic Combat Technology

C. Performance Metrics
Under Development.

Exhibit R-2a, RDT&E Project Justification

DATE
February 2008

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 2007 Actual	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	Cost to Complete	Total	
2432 Defensive System Fusion Technology	6.186	7.050	5.878	4.907	5.623	8.627	6.532	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 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.
- (U) **B. Accomplishments/Planned Program (\$ in Millions)**
- | | | | |
|---|----------------|----------------|----------------|
| | <u>FY 2007</u> | <u>FY 2008</u> | <u>FY 2009</u> |
| (U) MAJOR THRUST: Develop and integrate advanced sensor receiver and processing technologies. Note: This effort completes in FY 2007. | 0.836 | 0.000 | 0.000 |
| (U) In FY 2007: Completed risk reduction for defensive sensors using multiple information sources for situational awareness in the Air Force Integrated Demonstrations and Applications Laboratory. Completed Integrated Demonstrations and Applications Laboratory risk reduction evaluations and demonstrations that evolve and optimize network electronic attack techniques on disparate platforms. Performed 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) In FY 2008: Not Applicable. | | | |
| (U) In FY 2009: Not Applicable. | | | |
| (U) MAJOR THRUST: Develop affordable radio-frequency and electro-optical emitter warning concepts and techniques. Develop techniques for coordination and management of multiple jamming nodes against integrated air defense systems. Conduct integrated electronic warfare and information operations simulations and demonstrations for the deception and defeat of integrated air defense system threats. | 5.350 | 5.361 | 5.878 |
| (U) In FY 2007: Completed brassboard 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. Performed final flight tests to validate advanced jamming techniques for a significantly improved digital threat warning and response capability. | | | |
| (U) In FY 2008: Complete 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 | | | |

Exhibit R-2a, RDT&E Project Justification	DATE February 2008
--	------------------------------

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) <u>B. Accomplishments/Planned Program (\$ in Millions)</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
defense systems. Investigate 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. Develop and demonstrate technical protocols for the integration of electronic warfare, command-and-control warfare, and information operations against an integrated air defense system.			
(U) 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, 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.			
(U) CONGRESSIONAL ADD: Advanced Threat Alert Advanced Technology Development.	0.000	1.689	0.000
(U) In FY 2007: Not Applicable.			
(U) In FY 2008: Conduct Congressionally-directed effort for Advanced Threat Alert Advanced Technology Development.			
(U) In FY 2009: Not Applicable.			
(U) Total Cost	6.186	7.050	5.878

(U) <u>C. Other Program Funding Summary (\$ in Millions)</u>	<u>FY 2007</u>	<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>Cost to Complete</u>	<u>Total Cost</u>
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>		
(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									

Exhibit R-2a, RDT&E Project Justification

DATE

February 2008

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)**

coordinated through the
Reliance 21 process to
harmonize efforts and eliminate
duplication.

(U) D. Acquisition Strategy

Not Applicable.

Exhibit R-2a, RDT&E Project Justification

DATE
February 2008

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 2007 Actual	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	Cost to Complete	Total	
431G RF Warning & Countermeasures Tech	8.643	7.691	6.788	5.946	5.269	6.860	8.065	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 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.

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

	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
(U) MAJOR THRUST: Develop wide-band, 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 completes in FY 2008.	1.425	1.148	0.000
(U) In FY 2007: Tested critical subsystems of an efficient, low-frequency, wide-band aperture, and fabricate array compatible with unmanned aerial vehicles.			
(U) In FY 2008: Complete integration and test of array compatible with unmanned aerial vehicles.			
(U) In FY 2009: Not Applicable.			
(U) MAJOR THRUST: Develop aerospace platform self-protection and support jamming technologies and techniques to counter advanced radio-frequency threats associated with current and future aerospace weapon systems. Develop coordinated, multi-player radar jamming techniques for deception and neutralization of early warning and surveillance networks to enable all-platform operations in defended adversary airspace. Develop new electronic attack techniques fusing advanced digital signal processing receivers with digital technique generators.	6.222	6.543	6.788
(U) In FY 2007: Continued developing self-protection countermeasures effective against advanced future surface to air missile systems. Completed laboratory and field-testing of innovative, networked radio-frequency countermeasure techniques against advanced target engagement radars. Completed development of advanced countermeasures techniques and technology to defeat an advanced integrated air defense system. Continued developing anti-jam techniques and technologies for advanced radio-frequency sensor systems. Completed demonstration of 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			

UNCLASSIFIED

Exhibit R-2a, RDT&E Project Justification	DATE February 2008
--	------------------------------

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>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
(U) <u>B. Accomplishments/Planned Program (\$ in Millions)</u>			
intercept.			
(U) In FY 2008: Provide hardware simulation and analysis support to multi-intelligence sensor needs for accurate and timely electronic surveillance information. Conduct threat research, simulation, and analysis of early warning radar characteristics. Develop multiple technical strategies and techniques for deceiving them in a network enabled operational environment. Develop advanced simulation capabilities to support network enabled jamming of adversary early warning and surveillance networks. Develop and evaluate integrated digital receiver/jammer architectures.			
(U) 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.			
(U) CONGRESSIONAL ADD: Receiver and Processing Concepts Evaluation (RAPCEval).	0.996	0.000	0.000
(U) In FY 2007: Conducted Congressionally-directed effort for RAPCEval.			
(U) In FY 2008: Not Applicable.			
(U) In FY 2009: Not Applicable.			
(U) Total Cost	8.643	7.691	6.788

	<u>FY 2007</u>	<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>Cost to</u>	<u>Total Cost</u>
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	
(U) <u>C. Other Program Funding Summary (\$ in Millions)</u>									
(U) Related Activities:									
(U) PE 0602204F, Aerospace Sensors.									
(U) PE 0604270F, Electronic Warfare (EW) Development.									
(U) PE 0603500F, Multi-disciplinary Advanced Space Technology.									

Exhibit R-2a, RDT&E Project Justification

DATE

February 2008

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)****(U)** PE 0604270N, EW
Development.**(U)** This project has been
coordinated through the
Reliance 21 process to
harmonize efforts and eliminate
duplication.**(U) D. Acquisition Strategy**

Not Applicable.

Exhibit R-2a, RDT&E Project Justification

DATE
February 2008

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 2007 Actual	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	Cost to Complete	Total
691X EO/IR Warning & Countermeasures Tech	12.770	12.021	8.390	5.887	7.420	10.122	9.527	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, 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.
- (U) **B. Accomplishments/Planned Program (\$ in Millions)**
- | | | | |
|---|----------------|----------------|----------------|
| | <u>FY 2007</u> | <u>FY 2008</u> | <u>FY 2009</u> |
| (U) MAJOR THRUST: Analyze the vulnerabilities of current infrared missile systems and future imaging infrared sensors. | 1.862 | 3.687 | 4.565 |
| (U) In FY 2007: Continued conducting 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. Conducted digital simulations to assess the effectiveness of spatial decoy techniques against imaging infrared missiles under fly-out conditions. Assessed proposed advanced countermeasure techniques to defeat imaging infrared sensors. | | | |
| (U) In FY 2008: Conclude in-house analyses on infrared-guided missile and future imaging infrared sensor susceptibilities. Further evaluation of countermeasure techniques for countering multiple types of missiles and imaging infrared sensors. Identify optimal countermeasure techniques to defeat single color imaging infrared sensors. | | | |
| (U) 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. | | | |
| (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. | 1.629 | 0.862 | 0.942 |
| (U) In FY 2007: Initiated development of advanced laser warning receiver for integration into tactical aircraft. Continued developing laser warning sensor technologies to address emerging laser threats. Initiated miniature laser | | | |

UNCLASSIFIED

Exhibit R-2a, RDT&E Project Justification		DATE February 2008		
BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NUMBER AND TITLE		
03 Advanced Technology Development (ATD)	0603270F Electronic Combat Technology	691X EO/IR Warning & Countermeasures Tech		
(U) B. Accomplishments/Planned Program (\$ in Millions)		<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
warning for personnel protection.				
(U) In FY 2008: Continue developing laser warning sensors to address emerging laser threats. Initiate development of miniaturized laser warning sensors. Fabricate compact device for personnel protection. Demonstrate capability to geolocate laser threats for enhanced situational awareness.				
(U) 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.				
(U) MAJOR THRUST: Develop a countermeasure technology to defeat passive electro-optical and infrared aircraft tracking sensors and ordnance guidance.		5.271	5.101	2.883
(U) In FY 2007: Continued field tests to locate and counter passive threats before threats can develop a fire control solution. Initiated development of a tower demonstration system. Demonstrated capability to scan wide field of regard and locate passive surveillance sensors in real time.				
(U) In FY 2008: Complete field tests to locate and counter passive threats before threats can develop fire control solution. Complete tower demonstration system development and conduct experiments over 2 km range. Evaluate effectiveness of countermeasure techniques against night vision devices and other passive surveillance sensors.				
(U) 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.				
(U) 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. Note: This effort ends in FY 2008.		0.820	0.880	0.000
(U) In FY 2007: Completed tests and evaluation of the affordable visible missile warning system.				
(U) In FY 2008: Characterize sensor performance in varied background clutter. Identify maximum detection ranges for high priority threat missiles.				
(U) In FY 2009: Not Applicable.				
(U) CONGRESSIONAL ADD: Affordable Visible Missile Warning System.		1.893	0.000	0.000
(U) In FY 2007: Conducted Congressionally-directed effort for the Affordable Visible Missile Warning System.				
(U) In FY 2008: Not Applicable.				
(U) In FY 2009: Not Applicable.				

Exhibit R-2a, RDT&E Project Justification

DATE

February 2008

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) <u>B. Accomplishments/Planned Program (\$ in Millions)</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
(U)			
(U) CONGRESSIONAL ADD: Battlefield Laser Detection System (BLADES).	1.295	1.491	0.000
(U) In FY 2007: Conducted Congressionally-directed effort for BLADES.			
(U) In FY 2008: Conduct Congressionally-directed effort for BLADES.			
(U) In FY 2009: Not Applicable.			
(U)			
(U) Total Cost	12.770	12.021	8.390

(U) <u>C. Other Program Funding Summary (\$ in Millions)</u>	<u>FY 2007</u>	<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>Cost to</u>	<u>Total Cost</u>
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	
(U) Related Activities:									
(U) PE 0602204F, Aerospace									
Sensors.									
(U) PE 0604270F, Electronic									
Warfare (EW) Development.									
(U) PE 0603500F, Multi-disciplinary									
Advanced Development Space									
Technology.									
(U) PE 0604270N, EW									
Development.									
(U) PE 0603203F, Advanced									
Aerospace Sensors.									
(U) This project has been									
coordinated through the									
Reliance 21 process to									
harmonize efforts and eliminate									
duplication.									
(U) <u>D. Acquisition Strategy</u>									
Not Applicable.									