Exhibit R-2, RDT&E Budget Item Justification: PB 2015 Air Force											Date: March 2014	
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 3: *Advanced Technology Development (ATD)*					R-1 Program Element (Number/Name) PE 0603270F / *Electronic Combat Technology*							
COST ($ in Millions)	**Prior Years**	**FY 2013**	**FY 2014**	**FY 2015 Base**	**FY 2015 OCO #**	**FY 2015 Total**	**FY 2016**	**FY 2017**	**FY 2018**	**FY 2019**	**Cost To Complete**	**Total Cost**
Total Program Element	-	24.181	43.381	47.602	-	47.602	49.502	54.679	56.314	57.059	Continuing	Continuing
632432: *Defensive System Fusion Technology*	-	1.425	-	-	-	-	-	-	-	-	Continuing	Continuing
633720: *EW Quick Reaction Capabilities*	-	6.828	25.083	28.725	-	28.725	29.510	33.813	35.936	36.795	Continuing	Continuing
63431G: *RF Warning & Countermeasures Tech*	-	11.464	14.410	14.516	-	14.516	15.905	15.795	15.411	15.366	Continuing	Continuing
63691X: *EO/IR Warning & Countermeasures Tech*	-	4.464	3.888	4.361	-	4.361	4.087	5.071	4.967	4.898	Continuing	Continuing

The FY 2015 OCO Request will be submitted at a later date.

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 four 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 integrates and focuses research efforts in electronic warfare (EW), directed energy weapons (DEW), and cyber warfare to rapidly demonstrate a capability for rapid fielding. The third project develops and demonstrates advanced technologies for radio-frequency electronic combat suites. The fourth project develops and demonstrates advanced warning and countermeasure technologies to defeat electro-optical, infrared, and laser threats to aerospace platforms. This program has been coordinated through the Department of Defense (DoD) Science and Technology (S&T) Executive Committee process to harmonize efforts and eliminate duplication. This program is in Budget Activity 3, Advanced Technology Development, since it develops and demonstrates technologies for existing system upgrades and/or new sensor and electronic combat system developments that have military utility and address warfighter needs.

Exhibit R-2, RDT&E Budget Item Justification: PB 2015 Air Force					Date: March 2014
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 3: *Advanced Technology Development (ATD)*			R-1 Program Element (Number/Name) PE 0603270F / *Electronic Combat Technology*		
B. Program Change Summary ($ in Millions)	**FY 2013**	**FY 2014**	**FY 2015 Base**	**FY 2015 OCO**	**FY 2015 Total**
Previous President's Budget	32.941	49.128	37.016	-	37.016
Current President's Budget	24.181	43.381	47.602	-	47.602
Total Adjustments	-8.760	-5.747	10.586	-	10.586
• Congressional General Reductions	-0.036	-0.047			
• Congressional Directed Reductions	-6.000	-5.700			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-0.509	-			
• Other Adjustments	-2.215	-	10.586	-	10.586

Change Summary Explanation

Decrease in FY13 Other Adjustments was due to Sequestration.

Decrease in FY13 Congressional Directed Reductions related to "Protection concepts for 6th generation aircraft" and "Rapidly fieldable operational demonstrations."

Decrease in FY14 Congressional Directed Reductions related to "Delayed program start."

Increase in FY15 is due to increased emphasis on technology to detect and defeat emerging air threats.

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force											Date: March 2014	
Appropriation/Budget Activity 3600 / 3					R-1 Program Element (Number/Name) PE 0603270F / *Electronic Combat Technology*				Project (Number/Name) 632432 / *Defensive System Fusion Technology*			
COST ($ in Millions)	**Prior Years**	**FY 2013**	**FY 2014**	**FY 2015 Base**	**FY 2015 OCO #**	**FY 2015 Total**	**FY 2016**	**FY 2017**	**FY 2018**	**FY 2019**	**Cost To Complete**	**Total Cost**
632432: *Defensive System Fusion Technology*	-	1.425	-	-	-	-	-	-	-	-	Continuing	Continuing

The FY 2015 OCO Request will be submitted at a later date.

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, stand off jamming, and electronic support measures for the denial, disruption, and suppression of adversary air defense operations. Technologies include 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.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Title: Integrated Electronic Warfare Technologies	1.425	-	-
Description: Develop affordable radio-frequency and electro-optical emitter warning and electronic warfare (EW) battle management technologies, integrating EW and information operations. ***FY 2013 Accomplishments:*** Developed Distributed Electronic Attack concepts for specific threats and radar classes. ***FY 2014 Plans:*** This effort moves to project 63431G in this program to better align efforts. ***FY 2015 Plans:*** N/A.			
Accomplishments/Planned Programs Subtotals	1.425	-	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force		Date: March 2014
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603270F / *Electronic Combat Technology*	**Project (Number/Name)** 632432 / *Defensive System Fusion Technology*

E. Performance Metrics

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

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force			Date: March 2014
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603270F / *Electronic Combat Technology*	Project (Number/Name) 633720 / *EW Quick Reaction Capabilities*	

COST ($ in Millions)	Prior Years	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO #	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost
633720: *EW Quick Reaction Capabilities*	-	6.828	25.083	28.725	-	28.725	29.510	33.813	35.936	36.795	Continuing	Continuing

The FY 2015 OCO Request will be submitted at a later date.

A. Mission Description and Budget Item Justification

This project establishes a capability to rapidly assess, develop and demonstrate new electronic warfare concepts, techniques, and capabilities in the context of systemic electronic warfare (EW) effects (EW-threat interactions) in a congested/contested electromagnetic spectrum (EMS), system-of-systems (SoS) environment of the future. It develops disruptive EW and countermeasures concepts specifically selected for high-impact, game-changing effects; evaluates them in high fidelity virtual and hardware evaluation settings; and demonstrates them in an operationally relevant environment. It establishes and maintains an all-source, physics-based, threat-to-countermeasures EW systems engineering methodology. It develops a core analytic function, supported by simulation-based wargaming and interactive engineering modeling capabilities to evaluate advanced countermeasures concepts.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Title: Disruptive Electronic Warfare (EW) and Countermeasure Technologies	5.334	11.683	13.550
Description: Develop disruptive EW and countermeasure concepts specifically selected for rapidly fieldable, high-impact effects and demonstrate them in an operational environment. ***FY 2013 Accomplishments:*** Initiated development of disruptive EW and countermeasure concepts and technologies initially identified for high-impact, game-changing effects in a contested electromagnetic spectrum (EMS) environment, and began initial evaluations thereof. ***FY 2014 Plans:*** Continue development of disruptive EW and countermeasures concepts and technologies specifically selected for high impact effects and demonstrate them in simulated or operational environments. Expand these systemic SoS developments to include GPS-denied techniques and technology solutions, networked-systems electronic protection (EP), and effects experimentation between/across EMS, cyber and directed energy (DE) domains. ***FY 2015 Plans:*** Focus research on investigating the use of directed energy and cyber effects for EW use against Radio Frequency (RF) threats. Determine trade space and conduct experiments of these disruptive technologies against integrated air defense systems and other RF threats. Explore multi-spectral approaches to defense against these threat systems.			
Title: Threat-to-Countermeasure System of Systems (SoS) Methods	1.000	5.800	7.020

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force		Date: March 2014
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603270F / *Electronic Combat Technology*	**Project (Number/Name)** 633720 / *EW Quick Reaction Capabilities*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Description: Establish and maintain an all-source, physics-based, design-level, red-blue, comparative, threat-to-countermeasure SoS techniques methodology. This systems engineering-based electronic warfare (EW) approach will inform programmatic planning, quantify desirable research areas with realistic SoS metrics, and foster improved understanding of future concept contributions to EW warfighting capabilities. ***FY 2013 Accomplishments:*** Initiated development of an all-source, physics-based, design-level, red-blue, comparative, threat-to-countermeasure SoS techniques methodology. ***FY 2014 Plans:*** Continue development of an all source, physics based, design level, red-blue, comparative, threat-to countermeasure SoS techniques methodology for use in concept development and simulation based testing. Initiate integration of SoS engineering methods across virtual/modeling, hardware-in-the-loop (HWIL) and systems integration lab (SIL) options to optimize end-to-end (threat-to-countermeasure) systemic effects. ***FY 2015 Plans:*** Improve in-house system of systems analysis capabilities in order to develop new techniques to address multi-spectral EW threats. Conduct initial systems engineering research on new technology initiatives in order to provide physics based, metric-driven projects that will address threats to countermeasure systems.			
Title: Evaluation of Advanced Countermeasure Concepts ***Description:*** Develop a core analytic function, supported by simulation-based wargaming and engineering modeling capabilities for evaluation, development, and demonstration of advanced electronic warfare (EW), cyber, directed energy (DE) and integrated/ systemic, non-kinetic concepts to include special capability programs. ***FY 2013 Accomplishments:*** Initiated development of a core analytic function, supported by simulation-based wargaming and engineering modeling capabilities for evaluation, development, and demonstration of advanced EW, cyber, DE and integrated systemic, non-kinetic concepts to include special capability programs. ***FY 2014 Plans:*** Continue development of a core analytical function, supported by simulation based war gaming and engineering modeling capabilities for evaluation, development, and demonstration of advanced countermeasure concepts to include special capability	0.494	7.600	8.155

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force		Date: March 2014
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603270F / *Electronic Combat Technology*	**Project (Number/Name)** 633720 / *EW Quick Reaction Capabilities*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
programs. Expand evaluation capabilities to incorporate full systemic electromagnetic spectrum (EMS) effects and netted/ distributed EW capabilities in anti-access/area denial (A2/AD) scenarios. ***FY 2015 Plans:*** Enhance in-house analysis and assessment capability to include current threat arrays and allow the analysis of distributed EW techniques against these systems. These include hardware in the loop (HWIL) and software in the loop (SWIL) enhancements for EW, electro-optical (EO) / infrared (IR) countermeasures, avionics vulnerability, and positioning, navigation, and timing (PNT).			
Accomplishments/Planned Programs Subtotals	6.828	25.083	28.725

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

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

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force			Date: March 2014
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603270F / *Electronic Combat Technology*	Project (Number/Name) 63431G / *RF Warning & Countermeasures Tech*	

COST ($ in Millions)	Prior Years	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO #	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost
63431G: *RF Warning & Countermeasures Tech*	-	11.464	14.410	14.516	-	14.516	15.905	15.795	15.411	15.366	Continuing	Continuing

The FY 2015 OCO Request will be submitted at a later date.

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 Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Title: Electronic Attack	11.464	14.410	14.516
Description: Develop aerospace platform jamming technologies and techniques to counter advanced radio-frequency (RF) threats associated with current and future aerospace weapon systems. ***FY 2013 Accomplishments:*** Demonstrated adaptable electronic attack (EA) technique concepts against a modeled threat environment. Developed and demonstrated a cognitive jammer system concept in a laboratory environment. Assessed and analyzed proactive electronic protection (EP) concepts. Conducted effort to focus on next generation RF threats and potential electronic warfare (EW) concepts. ***FY 2014 Plans:*** Continue to develop and demonstrate adaptable electronic attack (EA) technique concepts, cognitive jammer system concepts, and advanced EP concepts to defeat next generation RF threats with a major emphasis on penetrating contested, anti-access/ area denial environments. ***FY 2015 Plans:*** Develop and conduct laboratory simulation experiments of adaptable electronic attack (EA) technique concepts. Develop software prototype algorithms for cognitive jammer system concepts as well as protection of avionics systems to cyber-attacks. Continue to develop and demonstrate in laboratory environment advanced EP concepts to defeat next generation RF threats with a major emphasis on penetrating contested, anti-access/area denial scenarios.			
Accomplishments/Planned Programs Subtotals	11.464	14.410	14.516

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force		Date: March 2014
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603270F / *Electronic Combat Technology*	**Project (Number/Name)** 63431G / *RF Warning & Countermeasures Tech*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

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

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force			Date: March 2014
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603270F / *Electronic Combat Technology*	Project (Number/Name) 63691X / *EO/IR Warning & Countermeasures Tech*	

COST ($ in Millions)	Prior Years	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO #	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost
63691X: *EO/IR Warning & Countermeasures Tech*	-	4.464	3.888	4.361	-	4.361	4.087	5.071	4.967	4.898	Continuing	Continuing

The FY 2015 OCO Request will be submitted at a later date.

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 infrared missiles with autonomous seekers, multi-spectral threats, laser-guided weapons, and EO/IR tracking systems used to direct EO/IR and radar-guided missiles.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
Title: Advanced Electro-Optical (EO)/Infrared (IR) Warning and Countermeasure Technologies	4.464	3.888	4.361

Description: Analyze the vulnerabilities of current infrared (IR) missile systems and future imaging IR sensors. Develop advanced countermeasure system technologies to exploit vulnerabilities for use against IR and electro-optical (EO) guided missile threats. Develop advanced optical and infrared sensor systems for airborne and space situational awareness and threat warning.

FY 2013 Accomplishments:

Developed, tested, and refined infrared countermeasures concepts and techniques against current infrared missile systems and future advanced threat sensors. Developed surrogate imaging sensors, processors, and track algorithms to test and evaluate countermeasure concepts against advanced threat systems. Performed advanced proactive infrared countermeasures (PIRCM) search, detect, and countermeasure research. Developed concepts for protection of postulated future threats to 6th generation aircraft including definition of component and subsystem requirements.

FY 2014 Plans:

Continue to develop, test, and refine infrared countermeasures concepts with emphasis on penetrating contested, anti-access/ area denial environments. Continue development of surrogate imaging sensors, processors, and track algorithms and perform advance proactive infrared countermeasure (PIRCM) search, detect, and countermeasure research. Develop concepts for protection of postulated future threats to 6th generation aircraft including definition of component and subsystem requirements.

FY 2015 Plans:

Develop advanced EO/IR concepts for protection from postulated future threats, including definition of component and subsystem requirements. Concepts will address contested, anti-access/area denial threats. Conduct laboratory experiments

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force		Date: March 2014
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603270F / *Electronic Combat Technology*	**Project (Number/Name)** 63691X / *EO/IR Warning & Countermeasures Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
of surrogate multi-mode EO/IR sensors, processors, and track algorithms and continue to perform advanced proactive infrared countermeasure (PIRCM) search, detect, and countermeasure research.			
Accomplishments/Planned Programs Subtotals	4.464	3.888	4.361

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

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