Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force											Date: February 2019	
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 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	-	56.238	55.054	48.408	0.000	48.408	47.116	49.893	50.135	51.229	Continuing	Continuing
633720: *EW Quick Reaction Capabilities*	-	30.205	30.556	29.454	0.000	29.454	29.313	29.424	29.519	30.217	Continuing	Continuing
63431G: *RF Warning & Countermeasures Tech*	-	13.645	14.441	11.691	0.000	11.691	10.312	11.448	11.530	11.785	Continuing	Continuing
634335: *Cyber Concepts*	-	6.095	5.832	2.903	0.000	2.903	3.040	4.434	4.472	4.521	Continuing	Continuing
63691X: *EO/IR Warning & Countermeasures Tech*	-	6.293	4.225	4.360	0.000	4.360	4.451	4.587	4.614	4.706	Continuing	Continuing

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. It develops and demonstrates technologies for integrating electronic combat sensors and systems into a fused and seamless whole. It integrates and focuses research efforts in electronic warfare and cyber warfare to rapidly demonstrate a capability for rapid fielding. It develops and demonstrates technologies for navigation and timing in radio frequency (RF) contested and denied environments. It develops and demonstrates advanced technologies for radio frequency electronic combat suites and advanced warning and countermeasure technologies to defeat electro-optical, infrared, and laser threats to aerospace platforms. It also develops and demonstrates technologies that identify and mitigate avionics system cyber vulnerabilities as well as protects avionics and other critical technologies. 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 element may include necessary civilian pay expenses required to manage, execute, and deliver science & technology capabilities. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 0601102F, 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602602F, 0602605F, 0602788F, 1206601F, and 0602298F.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is $14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

This program is in Budget Activity 3, Advanced Technology Development because this budget activity includes development of subsystems and components and efforts to integrate subsystems and components into system prototypes for field experiments and/or tests in a simulated environment.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force					Date: February 2019
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 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**
Previous President's Budget	60.551	55.319	57.501	0.000	57.501
Current President's Budget	56.238	55.054	48.408	0.000	48.408
Total Adjustments	-4.313	-0.265	-9.093	0.000	-9.093
• Congressional General Reductions	-0.166	-0.265			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-1.330	0.000			
• Other Adjustments	-2.817	0.000	-9.093	0.000	-9.093

Change Summary Explanation

Decrease in FY 2018 in Other Adjustments is due to realignment of funds to PE 0602212F to support Research and Development Projects, 10 U.S.C. Section 2358.

Decrease in FY 2020 due to realignment of electronic warfare science and technology funding from PE 0603270F, Electronic Combat Technology, to PE 0602204F, Aerospace Sensors.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force			Date: February 2019
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
633720: *EW Quick Reaction Capabilities*	-	30.205	30.556	29.454	0.000	29.454	29.313	29.424	29.519	30.217	Continuing	Continuing

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 as well as the required position navigation and timing (PNT) technologies and capabilities in the context of systemic electronic warfare (EW) effects (electronic warfare threat interactions) in a congested/contested electromagnetic spectrum, system-of-systems (SoS) environment of the future. It develops disruptive electronic warfare 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 electronic warfare 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 2018	FY 2019	FY 2020
Title: Radio Frequency Electronic Warfare	13.594	9.513	10.503
Description: Develop Electronic Warfare focused knowledge databases, engineering models, mission simulations, analysis tools and assessment environments which enable the development of multi-domain electronic warfare technologies. The primary focus is on emulating complex battlespace radio frequency environments, electronic attack effects against emerging, networked weapon systems, and assessing flexible, software-defined electronic warfare systems with non-deterministic performance (for example, utilizing cognitive algorithms). ***FY 2019 Plans:*** Expand simulations to accommodate advanced electronic warfare systems, and to emulate the radio frequency threats and signal environments for which they're designed. Develop higher fidelity threat system and signal propagation models. Continue developing the tools, methods and demonstrations to assess both the performance of future electronic warfare systems as well as their effectiveness. Continue the development and demonstration efforts to prove the concepts for "full spectrum" countermeasures capabilities. In select situations, develop threat seeker surrogates with which to test emerging electronic warfare technologies. Expand software-in-the-loop and hardware-in-the-loop environments to achieve closed-loop system performance. ***FY 2020 Plans:*** Continue expansion of simulations to accommodate advanced electronic warfare systems, and to emulate the complex radio frequency threats and signal environments for which they're designed. Continue development of higher fidelity threat system and signal propagation models. Continue developing the tools, methods and demonstrations to assess both the performance of			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force		Date: February 2019
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 2018	FY 2019	FY 2020
future electronic warfare systems as well as their effectiveness including cognitive and autonomous technologies. Continue the development and demonstration efforts to prove the concepts for "full spectrum" countermeasures capabilities. Continue the select development of threat seeker surrogates with which to test emerging electronic warfare technologies. Continue expansion of software-in-the-loop and hardware-in-the-loop environments to achieve closed-loop system performance. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2020 increased compared to FY 2019 by $0.990 million. Justification for this increase is described in plans above.			
Title: Position, Navigation and Timing for Contested/Denied Environments ***Description:*** Develop and transition robust Global Navigation Satellite System capabilities; resilient complementary position, navigation and timing techniques; precise position, navigation and timing technologies for distributed sensing; position, navigation and timing technology to provide position, navigation and timing electronic warfare situational awareness and training; and position, navigation and timing architectures to enable resiliency against the rapidly evolving threat. Efforts will include prototypes and relevant Open Architecture standards where applicable to enable timely technology transition. ***FY 2019 Plans:*** Research techniques to securely certify Global Navigation Satellite System software defined radio technology and methods to trust Global Navigation Satellite System. Develop complementary position, navigation and timing techniques which increase the availability of the position, navigation and timing solution as well as increase the precision for radio frequency coherent sensing and electronic warfare. Evolve open architecture standards to allow for integration of Global Navigation Satellite System and complementary position, navigation and timing into future systems. Demonstrate integration of Global Navigation Satellite System position, navigation and timing and datalink-based complementary position, navigation and timing into an resilient embedded Global Positioning System inertial government reference architecture. Previous to FY 2019, some of this work was performed in Radio Frequency Electronic Warfare and Electro-Optical and Infrared (EO/IR) Threat Warning and Countermeasures efforts under Project 633720, EW Quick Reaction Capabilities. ***FY 2020 Plans:*** Continue to further research techniques to securely certify Global Navigation Satellite System software defined radio technology and methods to trust Global Navigation Satellite System and integrate into the Navigation Technology Satellite-3 flight experiment. Develop advanced reconfigurable software defined radio navigation receivers to enable spectrum agile systems and integrate into the Navigation Technology Satellite-3 flight experiment. Develop alternative position, navigation and timing techniques which increase the availability of the position, navigation and timing solution as well as increase the precision for radio frequency coherent sensing and electronic warfare. Evolve open architecture standards to allow for integration of Global Navigation Satellite System and alternative position, navigation and timing into future systems. Demonstrate integration of Global Navigation	7.739	16.335	16.336

Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force		Date: February 2019
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 2018	FY 2019	FY 2020
Satellite System position, navigation and timing and datalink-based complementary position, navigation and timing into a resilient embedded Global Positioning System inertial (R-EGI) government reference architecture. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2020 increased compared to FY 2019 by $0.001 million. Justification for this increase is described in plans above.			
Title: Electro-Optical/Infrared Threat Warning and Countermeasures ***Description:*** Develop next generation countermeasure techniques to address the complete range of multispectral (for example, dual band infrared) threats including advanced techniques versus advanced man portable air defense system and air-to-air threats with multimode capabilities. Develop capabilities for situational awareness and countermeasure to integrated air defense systems and associated multispectral threats. ***FY 2019 Plans:*** Continue test planning and field and flight tests of a proactive infrared countermeasure capability to detect ground based electro-optical/infrared threats. Continue the integration of joint radio frequency and electro-optical/infrared engagement modeling and simulation capabilities to support countering multispectrum (for example, radio frequency and electro-optical/infrared combined) threats. Continue designs and begin field test demonstration of capabilities against multispectral threats. Refine the countermeasure techniques and sources for countermeasures against advanced imaging multispectral sensors to include tower testing against surrogates and representative threats hardware. ***FY 2020 Plans:*** Continue at range evaluation of next generation high sensitivity focal plane array for proactive detection. Start requirements definition and evaluate acquisition alternatives for a proactive advanced technology demonstration. Start laboratory tests and continue modeling and simulation efforts to support the multispectrum electro-optical/radio frequency countermeasures. Continue advance technique countermeasure at range tests to support requirements definition. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2020 decreased compared to FY 2019 by $2.093 million. Funding decreased due to realignment to PE 0602204F, Aerospace Sensors, Project 624920, Electronic Warfare Technology, Electro-Optical/Infrared Threat Warning and Countermeasure Technologies effort.	8.872	4.708	2.615
Accomplishments/Planned Programs Subtotals	30.205	30.556	29.454

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force		Date: February 2019
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603270F / *Electronic Combat Technology*	**Project (Number/Name)** 633720 / *EW Quick Reaction Capabilities*

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 2020 Air Force			Date: February 2019
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
63431G: *RF Warning & Countermeasures Tech*	-	13.645	14.441	11.691	0.000	11.691	10.312	11.448	11.530	11.785	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project develops and demonstrates advanced technologies for radio frequency electronic combat suites, including the required navigation technologies and capabilities, to enhance the survivability of aerospace vehicles and to provide crew situational awareness. The research 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. The research also 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 2018	FY 2019	FY 2020
Title: Electronic Attack	13.645	14.441	11.691
Description: Develop aerospace platform jamming concepts, technologies and techniques to counter advanced radio frequency threats associated with current and future aerospace weapon systems. Provide position, navigation and system resilience via open architecture solutions.			
FY 2019 Plans: Continue research into radio frequency receiver technologies that will better detect threats, measure more radio frequency features with greater accuracy, identify or classify signals more reliably, track and predict signals, and use reasoning algorithms to reduce ambiguities and errors, and deduce greater knowledge from the radio frequency spectrum. Continue development of countermeasures toward explicit, underserviced threat weapon systems, with an emphasis on chamber and field testing for validation. Continue research and development of novel multi-domain electronic attack methods and tactics to include distributed operations. Initiate the study, research and/or development of merged autonomy and electronic warfare technologies. Continue expansion of modeling, simulation and laboratory assessment environments commensurate with technologies being researched, developed and tested.			
FY 2020 Plans: Continue research into radio frequency receiver technologies that will better detect threats, measure more radio frequency features with greater accuracy, identify or classify signals more reliably, track and predict signals, and use reasoning algorithms to reduce ambiguities and errors, and deduce greater knowledge from the radio frequency spectrum. Continue development of countermeasures toward explicit, underserviced threat weapon systems, with an emphasis on chamber and field testing for validation. Continue research and development of novel multi-domain electronic attack methods and tactics to include			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force		Date: February 2019
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603270F / *Electronic Combat Technology*	**Project (Number/Name)** 63431G / *RF Warning & Countermeasures Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
distributed operations. Continue expansion of modeling, simulation and laboratory assessment environments commensurate with technologies being researched, developed and tested including cognitive and autonomous electronic warfare technologies. Continue the study, research and/or development of merged autonomy and electronic warfare technologies. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2020 decreased compared to FY 2019 by $2.750 million. Funding decreased due to realignment to PE 0602204F, Aerospace Sensors, Project 624920, Electronic Warfare Technology, Radio Frequency Countermeasures Technologies effort.			
Accomplishments/Planned Programs Subtotals	13.645	14.441	11.691

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 2020 Air Force			Date: February 2019
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603270F / *Electronic Combat Technology*	Project (Number/Name) 634335 / *Cyber Concepts*	

COST ($ in Millions)	Prior Years	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
634335: *Cyber Concepts*	-	6.095	5.832	2.903	0.000	2.903	3.040	4.434	4.472	4.521	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project develops and demonstrates methods to discover cyber susceptibilities, assess avionics systems, formulate mitigation strategies, and investigate use of tools and technologies to automate this process. It is designed to apply developed vulnerability discovery, vulnerability mitigation, and cyber protection technology to avionics systems and components and embedded systems. This involves technologies for trusted sensors and trusted systems that deter exploitation of our critical hardware and software. This project aims to develop cyber resilience and protect systems through adaptation of the system to the threat. It demonstrates these technologies in open and adaptable architectures for system integration in field demonstrations and proves out the technologies through rapid integration of sensors and architectures for technology transition. It integrates research efforts in electronic and cyber warfare to rapidly demonstrate a capability for rapid fielding.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Avionics Cyber Vulnerabilities	3.386	3.241	1.613
Description: Develop and demonstrate methods, techniques, and technical tools to enable, assist, and improve the vulnerability discovery processes. Use developed tools and techniques to assess avionics boxes, systems, busses, and components. Investigate techniques to mitigate discovered vulnerabilities. Develop and demonstrate mitigation and protection technologies on future concept platforms for adaptability and resilience. ***FY 2019 Plans:*** Complete transition of assessment tools and continue to develop and transition mitigation technologies. Investigate and advance architectural concepts that enable cost-effective and rapid integration of revolutionary sensor capabilities. This allows system flexibility required for future operations. Architecture includes features to make it cyber secure. ***FY 2020 Plans:*** Continue to transition vulnerability mitigation technologies to address enduring issues with legacy weapon systems. Increase efforts to demonstrate next-generation architecture capabilities, providing integration support for emerging technologies such as autonomy, alternative-navigation technologies, open system architecture standards and approaches, and multispectral and distributed intelligence surveillance and reconnaissance and electronic warfare. Transition next-generation architectures to adopting programs/platforms, and open architecture approaches to rapidly integrate advanced mission system capability for next-generation architectures. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2020 decreased compared to FY 2019 by $1.628 million. Funding decreased due to realignment to PE 0602204F, Aerospace Sensors, Project 622005, Cyber Technology, Vulnerability Mitigation effort.			
Title: Avionics Cyber Protections	2.709	2.591	1.290

Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force		Date: February 2019
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603270F / *Electronic Combat Technology*	**Project (Number/Name)** 634335 / *Cyber Concepts*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Description: Develop and demonstrate advanced automated analysis tools and protection techniques to prevent exploitation of cyber susceptibilities in avionics systems. This strategy would include discovery and mitigation of likely attack vectors, remediation of susceptibilities, and safeguards to assure the integrity of embedded software. ***FY 2019 Plans:*** Continue to extend research on a suite of protection tools with focus on their application to unmanned aircraft system platforms. Continue to investigate automation and optimization of malware detection and classification work using machine learning techniques. Develop a patterns database that detects and classifies benign and malicious behaviors, and validate proof-of-concept for x86 computer architectures. Investigate and create architecture specific translators to provide input to behaviors database to further validate the concept. ***FY 2020 Plans:*** Enhance and extend cyber protection tools, techniques and test beds for manned and unmanned air vehicles, mission and support equipment. Demonstrate a cyber defense-in-depth by integrating software, firmware and hardware-assisted protection technologies. Develop system integration laboratory capabilities to develop, integrate, and test real-time cyber protections for avionics; intelligence, surveillance, and reconnaissance; positioning, navigation, and timing; and other systems. Develop test samples to demonstrate the effectiveness of cyber protections. Flight test and demonstrate advanced cyber protection capabilities to reduce the risk to programs of record. Collaborate with program offices and end-users to transition cyber protection technologies. Leverage open system architecture standards and approaches to demonstrate cyber protections for current and next-generation architectures. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2020 decreased compared to FY 2019 by $1.301 million. Funding decreased due to realignment to PE 0602204F, Aerospace Sensors, Project 622005, Cyber Technology, Adaptive Cyber Protections effort.			
Accomplishments/Planned Programs Subtotals	6.095	5.832	2.903

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force		Date: February 2019
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603270F / *Electronic Combat Technology*	**Project (Number/Name)** 634335 / *Cyber Concepts*

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 2020 Air Force			Date: February 2019
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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
63691X: *EO/IR Warning & Countermeasures Tech*	-	6.293	4.225	4.360	0.000	4.360	4.451	4.587	4.614	4.706	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. Develops off-board (decoys and expendables) and on-board countermeasure technologies for aircraft self-protection to provide robust, affordable solutions for protection against infrared missiles with autonomous seekers, multi-spectral threats, laser-guided weapons, and electro-optical/infrared tracking systems used to direct electro-optical/infrared and radar-guided missiles.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Advanced Electro-Optical/Infrared Warning and Countermeasure Technologies	6.293	4.225	4.360
Description: Analyze the vulnerabilities of current infrared missile systems and future imaging infrared sensors. Develop advanced countermeasure system techniques to exploit vulnerabilities for use against infrared and electro-optical guided missile threats. Develop advanced optical and infrared sensor systems for airborne and space situational awareness and threat warning. ***FY 2019 Plans:*** Continue countermeasure development and field testing of new threats to include new jam codes and countermeasure techniques. Continue to incorporate proactive infrared countermeasures capabilities into Modeling System for Advanced Investigation of Countermeasures (MOSAIC). Laboratory testing of the low cost missile warning capabilities as designed and built into current missile warning system form factor. Flight test the low cost missile warning capabilities and refine design alternative and conduct critical experiments for long range missile warning. Stand up the High altitude threat warning capabilities and begin characterization testing for advanced laser warning options. Start design and tradeoff phase for the proactive critical experiment. ***FY 2020 Plans:*** Continue threat characterization and countermeasures development and field testing of new threats to include new jam codes and countermeasure techniques. Continue to work with customers to determine impacts on current systems. Continue flight test of the low cost missile warning capabilities. Conduct critical experiments of long range missile warning technologies. Start incorporation of Modeling System for Advanced Investigation of Countermeasures and Radio Frequency engagement model development to meet the multispectral and multispectrum threats. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2020 increased compared to FY 2019 by $0.135 million. Justification for this increase is described in plans above.			
Accomplishments/Planned Programs Subtotals	6.293	4.225	4.360

Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force		Date: February 2019
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*

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.