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**Exhibit R-2, RDT&E Budget Item Justification:** PB 2023 Air Force **Date:** April 2022

<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603270F / <i>Electronic Combat Technology</i>
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COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	-	33.804	44.938	33.380	0.000	33.380	39.964	45.206	57.038	58.305	Continuing	Continuing
633720: <i>EW Quick Reaction Capabilities</i>	-	0.000	27.967	17.877	0.000	17.877	20.443	23.351	34.654	35.424	Continuing	Continuing
63431G: <i>RF Warning &amp; Countermeasures Tech</i>	-	29.142	9.119	8.926	0.000	8.926	12.034	12.268	12.543	12.821	Continuing	Continuing
634335: <i>Cyber Concepts</i>	-	0.000	4.147	3.725	0.000	3.725	4.098	4.689	4.835	4.942	Continuing	Continuing
63691X: <i>EO/IR Warning &amp; Countermeasures Tech</i>	-	4.662	3.705	2.852	0.000	2.852	3.389	4.898	5.006	5.118	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, 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 will enable mission systems to be more resilient, agile, autonomous, and be able to operate in multiple domains. 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.

The Department of the Air Force technologies in this program are both enabling and enduring as we invest in maturing emerging technologies that address established mission gaps, and transformational technologies that address integrated enterprise capabilities intended to reshape the future force across air, space, and cyber warfighting domains. Development of transformational operational capabilities through advanced technology solutions focuses on five strategic capabilities: Global Persistent Awareness; Resilient Information Sharing; Rapid, Effective Decision-Making; Complexity, Unpredictability, and Mass; and Speed and Reach of Disruption and Lethality.

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, and 0602298F.

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.

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<b>Exhibit R-2, RDT&amp;E Budget Item Justification:</b> PB 2023 Air Force	<b>Date:</b> April 2022
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<b>Appropriation/Budget Activity</b> 3600: <i>Research, Development, Test &amp; Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	<b>R-1 Program Element (Number/Name)</b> PE 0603270F / <i>Electronic Combat Technology</i>
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<b>B. Program Change Summary (\$ in Millions)</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023 Base</b>	<b>FY 2023 OCO</b>	<b>FY 2023 Total</b>
Previous President's Budget	35.841	46.591	0.000	0.000	0.000
Current President's Budget	33.804	44.938	33.380	0.000	33.380
Total Adjustments	-2.037	-1.653	33.380	0.000	33.380
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	-1.653			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	-0.023	0.000			
• SBIR/STTR Transfer	-0.578	0.000			
• Other Adjustments	-1.436	0.000	33.380	0.000	33.380

**Change Summary Explanation**

Decrease in FY 2021 reflects adjustments and reprogramming to support Research and Development Projects, 10 U.S.C. Section 2363, an amendment to PL 110-417, 10 U.S.C. Section 2358 and 10 U.S.C. 2805(d)(1)(B).

The FY 2022 President's Budget submittal did not reflect FY 2023 through FY 2026 funding. Therefore, an explanation of the change between the two budget positions for FY2023 cannot be made in a relevant manner.

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Air Force										<b>Date:</b> April 2022		
<b>Appropriation/Budget Activity</b> 3600 / 3					<b>R-1 Program Element (Number/Name)</b> PE 0603270F / <i>Electronic Combat Technology</i>				<b>Project (Number/Name)</b> 633720 / <i>EW Quick Reaction Capabilities</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023 Base</b>	<b>FY 2023 OCO</b>	<b>FY 2023 Total</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
633720: <i>EW Quick Reaction Capabilities</i>	-	0.000	27.967	17.877	0.000	17.877	20.443	23.351	34.654	35.424	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**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.

This project includes the initiation and development of programs addressing DAF capability gaps and provides technologies for transformational future force capabilities. Transformational efforts will be identified through a competitive process and be responsive to DAF design priorities. Selected efforts will be designated as transformational, indicating enterprise-level priority.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<b>Title:</b> Radio Frequency Electronic Warfare	0.000	3.476	3.432
<b>Description:</b> 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).			
<b>FY 2022 Plans:</b> Mature fidelity of simulations of advanced electronic warfare systems to emulate the complex radio frequency threats and signals environment. Continue implementation of advanced digital signal synthesis to better represent complex emitters operating in complex environments containing sophisticated background emitters. Continue the development and demonstration efforts to prove the concepts for full spectrum countermeasures capabilities. Continue expansion of software-in-the-loop and hardware-in-the-loop environments to assess closed-loop system performance.			
<b>FY 2023 Plans:</b>			

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<p>Continue the implementation of emerging electromagnetic attack and support capabilities into open architectures to support electromagnetic spectrum operations. Continue to conduct technology demonstrations to support transition into Air Force platforms and electromagnetic spectrum operations units. Use agile software defined process to demonstrate the capability to rapidly respond to new and unexpected complex emitters in realistic radio frequency environments. Continue expansion and maturation of modeling, simulation and laboratory assessment environments commensurate with technologies being researched, developed and tested including cognitive and autonomous electronic warfare technologies for multi-spectral treats in a complex electromagnetic environment.</p> <p><b>FY 2022 to FY 2023 Increase/Decrease Statement:</b> FY 2023 decreased compared to FY 2022 by \$0.044 million. Justification for this decrease is described in plans above.</p>				
<p><b>Title:</b> Resilient Positioning, Navigation and Timing</p> <p><b>Description:</b> 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/effects; 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.</p> <p><b>FY 2022 Plans:</b> Develop and demonstrate multi-ship geolocation of sources interfering with navigational satellite signals. Develop and demonstrate a transcoder that converts modernized Global Positioning System military signals into military signals useable by legacy Department of Defense Global Positioning System receivers. Continue software defined radio technology efforts to authenticate signals from foreign satellite navigation systems. Continue to define and refine navigational open architecture standards to permit integration of alternative/complementary position, navigation and timing approaches into future DoD systems including the resilient embedded Global Positioning System-inertial government reference architecture.</p> <p>In FY 2022 this effort renamed from Position, Navigation and Timing for Contested/Denied Environments to Resilient Positioning, Navigation and Timing.</p> <p><b>FY 2023 Plans:</b> Continue to prototype and transition technologies for geolocation of sources interfering with navigational satellite signals. Continue to develop and demonstrate a transcoder that converts modernized Global Positioning System military signals into military signals useable by legacy Department of Defense GPS receivers. Continue software defined radio technology efforts to authenticate signals from foreign satellite navigation systems. Further develop, demonstrate, and promulgate navigational open</p>		0.000	14.947	10.098

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<p>architecture standards to permit integration of alternative/complementary position, navigation and timing approaches into future Department of Defense systems, such as the resilient embedded Global Positioning System-inertial program of record.</p> <p><b>FY 2022 to FY 2023 Increase/Decrease Statement:</b> FY 2023 decreased compared to FY 2022 by \$4.849 million. Funding decrease is a result of Department of the Air Force reprogramming.</p>				
<p><b>Title:</b> Electro-Optical/Infrared Warfare Demonstrator</p> <p><b>Description:</b> 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.</p> <p><b>FY 2022 Plans:</b> Develop a low cost, integrated missile and laser warning capability to identify, geo-locate, and counter, using both laser and expendable countermeasure response techniques, advanced laser and EO/IR guided missile threats to aircrews. Continue to apply analysis from field test to develop requirements for proactive detection and situation awareness for multiple Air Force platforms. Continue to iterate and refresh techniques for in-house at range data collection capabilities. Continue efforts to develop multispectrum electro-optical/radio frequency countermeasures and insert capabilities into existing and developing engagement modeling and simulation tools.</p> <p>In FY 2022 this effort renamed from Electro-Optical/Infrared Threat Warning and Countermeasures to Electro-Optical/Infrared Warfare Demonstrator.</p> <p><b>FY 2023 Plans:</b> Continue assessment of developed low cost, integrated missile and laser warning capability to identify, geo-locate, and counter, using both laser and expendable countermeasure response techniques, advanced laser and electro-optical/infrared guided missile threats to aircrews. Continue to iterate and refresh techniques for in-house at range data collection capabilities. Apply analysis from field test to develop requirements for proactive detection and situation awareness for multiple Department of the Air Force platforms. Continue efforts to develop multi-spectral electro-optical/radio frequency countermeasures and insert capabilities into existing and developing engagement modeling and simulation tools.</p> <p><b>FY 2022 to FY 2023 Increase/Decrease Statement:</b> FY 2023 increased compared to FY 2022 by \$0.871 million. Justification for this increase is described in plans above.</p>		0.000	3.476	4.347
<p><b>Title:</b> Transformational Technology Development</p>		0.000	6.068	0.000

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<p><b>Description:</b> Continually funded effort. This funding allocation will initiate new and continue existing Transformational Technology Development efforts. The Transformational Technology Development program will select new projects, in alignment with mission focused areas which include, but are not limited to: Intelligent Planning and Wargaming, Battlespace Awareness, Integrated Base Defense, and Hypersonic Multi-Mission Aircraft. Investments focus on technology development efforts including, but are not limited to technologies to enhance survivability, operability and performance of personnel, sensors, and structures in a threat environment through new electronic warfare concepts, techniques and capabilities as well as new positioning, navigation and timing technologies and capabilities. This investment is overseen by senior representatives from Air and Space Forces who participate in the submission, initial review, and down-selection of Transformational Technology Development proposed efforts. Final selections will be reviewed by the Air Force Deputy Assistant Secretary for Science, Technology, and Engineering before a final recommendation for Congressional approval is made.</p> <p><b>FY 2022 Plans:</b> Select Transformational Technology Development efforts in FY 2022 that support the National Defense Strategy and Department of Air Force priorities.</p> <p><b>FY 2023 Plans:</b> Not applicable</p> <p><b>FY 2022 to FY 2023 Increase/Decrease Statement:</b> FY 2023 decreased compared to FY 2022 by \$6.068 million. Funding decrease is a result of Department of the Air Force reprogramming.</p>			
<b>Accomplishments/Planned Programs Subtotals</b>	0.000	27.967	17.877

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

N/A

**Remarks**

**D. Acquisition Strategy**

Not applicable

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Air Force										<b>Date:</b> April 2022		
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<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023 Base</b>	<b>FY 2023 OCO</b>	<b>FY 2023 Total</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
63431G: <i>RF Warning &amp; Countermeasures Tech</i>	-	29.142	9.119	8.926	0.000	8.926	12.034	12.268	12.543	12.821	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**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.

This project includes the initiation and development of programs addressing DAF capability gaps and provides technologies for transformational future force capabilities. Transformational efforts will be identified through a competitive process and be responsive to DAF design priorities. Selected efforts will be designated as transformational, indicating enterprise-level priority.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<b>Title:</b> Radio Frequency Electronic Warfare Demonstrator	5.710	8.575	7.896
<b>Description:</b> 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.			
<b>FY 2022 Plans:</b> Continue the implementation of emerging electronic attack and electronic support capabilities into open architectures. Continue to conduct technology demonstrations to support transition into Air Force platforms. Use agile software defined process to demonstrate the capability to rapidly respond to new and unexpected complex emitters in realistic radio frequency environments. Continue expansion and maturation of modeling, simulation and laboratory assessment environments commensurate with technologies being researched, developed and tested including cognitive and autonomous electronic warfare technologies.			
In FY 2022 this effort was renamed from Electronic Attack to Radio Frequency Electronic Warfare Demonstrator.			
<b>FY 2023 Plans:</b>			

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
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Continue the implementation of emerging electromagnetic attack and support capabilities into open architectures to support electromagnetic spectrum operations. Continue to conduct technology demonstrations to support transition into Air Force platforms and electromagnetic spectrum operations units. Use agile software defined process to demonstrate the capability to rapidly respond to new and unexpected complex emitters in realistic radio frequency environments. Continue expansion and maturation of modeling, simulation and laboratory assessment environments commensurate with technologies being researched, developed and tested including cognitive and autonomous electronic warfare technologies for multi-spectral treats in a complex electromagnetic environment.

**FY 2022 to FY 2023 Increase/Decrease Statement:**  
FY 2023 decreased compared to FY 2022 by \$0.679 million. Justification for this decrease is described in plans above.

<p><b>Title:</b> Transformational Technology Development</p> <p><b>Description:</b> Continually funded effort. This funding allocation will initiate new and continue existing Transformational Technology Development efforts. The Transformational Technology Development program will select new projects, in alignment with mission focused areas which include, but are not limited to: Intelligent Planning and Wargaming, Battlespace Awareness, Integrated Base Defense, and Hypersonic Multi-Mission Aircraft. Investments focus on technology development efforts including, but are not limited to technologies to enhance survivability, operability and performance of personnel, sensors, and structures in a threat environment through development and demonstration of advanced technologies for radio frequency electronic combat suites. This investment is overseen by senior representatives from Air and Space Forces who participate in the submission, initial review, and down-selection of Transformational Technology Development proposed efforts. Final selections will be reviewed by the Air Force Deputy Assistant Secretary for Science, Technology, and Engineering before a final recommendation for Congressional approval is made.</p> <p><b>FY 2022 Plans:</b> Select Transformational Technology Development efforts in FY 2022 that support the National Defense Strategy and Department of Air Force priorities.</p> <p><b>FY 2023 Plans:</b> Continue to develop and enable multi-domain sense-making at the tactical edge. Continue to develop and demonstrate advanced technologies for radio frequency electronic combat capabilities. Initiate projects selected from the annual WARTECH process that investigate Department of the Air Force prioritized topics. Continue to perform modeling, simulation, and analyses to establish the future force effect of candidate Transformational Component investments and continue the next cycle of WARTECH process.</p> <p><b>FY 2022 to FY 2023 Increase/Decrease Statement:</b></p>	0.000	0.544	1.030
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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
FY 2023 increased compared to FY 2022 by \$0.486 million. Justification for this increase is described in plans above.				
<p><b>Title:</b> Radio Frequency Electronic Warfare</p> <p><b>Description:</b> 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).</p> <p><b>FY 2022 Plans:</b> Starting in FY 2022, this work is performed under Project 633720, EW Quick Reaction Capabilities, Radio Frequency Electronic Warfare effort and Transformational Technology Development effort.</p> <p><b>FY 2023 Plans:</b> Not applicable</p> <p><b>FY 2022 to FY 2023 Increase/Decrease Statement:</b> Not applicable</p>		4.800	0.000	0.000
<p><b>Title:</b> Position, Navigation and Timing for Contested/Denied Environments</p> <p><b>Description:</b> 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/effects; 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.</p> <p><b>FY 2022 Plans:</b> Starting in FY 2022, this work is performed under Project 633720, EW Quick Reaction Capabilities, Resilient Positioning, Navigation and Timing effort.</p> <p><b>FY 2023 Plans:</b> Not applicable</p> <p><b>FY 2022 to FY 2023 Increase/Decrease Statement:</b> Not applicable</p>		8.899	0.000	0.000
<p><b>Title:</b> Electro-Optical/Infrared Threat Warning and Countermeasures</p>		5.034	0.000	0.000

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<p><b>Description:</b> 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.</p> <p><b>FY 2022 Plans:</b> Starting in FY 2022, this work is performed under Project 633720, EW Quick Reaction Capabilities, Electro-Optical/Infrared Warfare Demonstrator effort and Transformational Technology Development effort.</p> <p><b>FY 2023 Plans:</b> Not applicable</p> <p><b>FY 2022 to FY 2023 Increase/Decrease Statement:</b> Not applicable</p>				
<p><b>Title:</b> Avionics Cyber Vulnerabilities</p> <p><b>Description:</b> 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.</p> <p><b>FY 2022 Plans:</b> Starting in FY 2022, this work is performed under Project 634335, Cyber Concepts, Resilient and Agile Mission Systems Architecture effort and Transformational Technology Development effort.</p> <p><b>FY 2023 Plans:</b> Not applicable</p> <p><b>FY 2022 to FY 2023 Increase/Decrease Statement:</b> Not applicable</p>		1.500	0.000	0.000
<p><b>Title:</b> Avionics Cyber Protections</p> <p><b>Description:</b> 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.</p> <p><b>FY 2022 Plans:</b></p>		3.199	0.000	0.000

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<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
Starting in FY 2022, this work is performed under Project 634335, Cyber Concepts, Resilient and Agile Mission Systems Architecture effort and Transformational Technology Development effort.				
<b>FY 2023 Plans:</b> Not applicable				
<b>FY 2022 to FY 2023 Increase/Decrease Statement:</b> Not applicable				
<b>Accomplishments/Planned Programs Subtotals</b>		29.142	9.119	8.926
<b>C. Other Program Funding Summary (\$ in Millions)</b> N/A				
<b>Remarks</b>				
<b>D. Acquisition Strategy</b> Not applicable				

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**Exhibit R-2A, RDT&E Project Justification:** PB 2023 Air Force **Date:** April 2022

<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603270F / <i>Electronic Combat Technology</i>	<b>Project (Number/Name)</b> 634335 / <i>Cyber Concepts</i>
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COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
634335: <i>Cyber Concepts</i>	-	0.000	4.147	3.725	0.000	3.725	4.098	4.689	4.835	4.942	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**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.

This project includes the initiation and development of programs addressing DAF capability gaps and provides technologies for transformational future force capabilities. Transformational efforts will be identified through a competitive process and be responsive to DAF design priorities. Selected efforts will be designated as transformational, indicating enterprise-level priority.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	FY 2021	FY 2022	FY 2023
<b>Title:</b> Resilient and Agile Mission Systems Architecture	0.000	3.260	3.021
<p><b>Description:</b> This effort performs advanced development and demonstration of methods, technologies, and tools to enable resilience and protect mission systems against threats. This involves open and adaptable architectures for rapid integration and agile systems, cyber protections and resilience technologies to protect against threats. It integrates research efforts in electronic and cyber warfare to demonstrate novel operational capabilities through laboratory, field, and flight tests and experimentation. The goal is to reduce risk for rapid transition of novel operational capabilities into Department of the Air Force mission systems.</p> <p><b>FY 2022 Plans:</b> Continue ongoing investigations to evolve and mature open architecture standards. Initiate development of advanced networking, processing, advanced computing paradigms, and cybersecurity technologies for next-generation avionics mission system capabilities. Apply agile software technologies and digital engineering techniques for rapid and affordable development, integration, and prototype capability demonstrations.</p> <p><b>FY 2023 Plans:</b> Continue investigations to evolve and mature open architecture standards. Continue development of advanced networking, processing, advanced computing paradigms, and cybersecurity technologies for next-generation avionics mission system capabilities. Apply agile software technologies and digital engineering techniques for rapid and affordable development,</p>			

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Air Force		<b>Date:</b> April 2022		
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603270F / <i>Electronic Combat Technology</i>	<b>Project (Number/Name)</b> 634335 / <i>Cyber Concepts</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
integration, and prototype capability demonstrations. Initiate development of Reference Architecture Implementation for resilient mission systems.				
<b>FY 2022 to FY 2023 Increase/Decrease Statement:</b> FY 2023 decreased compared to FY 2022 by \$0.239 million. Justification for this decrease is described in plans above.				
<b>Title:</b> Transformational Technology Development		0.000	0.887	0.704
<b>Description:</b> Continually funded effort. This funding allocation will initiate new and continue existing Transformational Technology Development efforts. The Transformational Technology Development program will select new projects, in alignment with mission focused areas which include, but are not limited to: Intelligent Planning and Wargaming, Battlespace Awareness, Integrated Base Defense, and Hypersonic Multi-Mission Aircraft. Investments focus on technology development efforts including, but are not limited to technologies to enhance survivability, operability and performance of personnel, sensors, and structures in a threat environment through vulnerability discovery, vulnerability mitigation, and cyber protection technology to avionics systems and components and embedded systems. This investment is overseen by senior representatives from Air and Space Forces who participate in the submission, initial review, and down-selection of Transformational Technology Development proposed efforts. Final selections will be reviewed by the Air Force Deputy Assistant Secretary for Science, Technology, and Engineering before a final recommendation for Congressional approval is made.				
<b>FY 2022 Plans:</b> Select Transformational Technology Development efforts in FY 2022 that support the National Defense Strategy and Department of Air Force priorities.				
<b>FY 2023 Plans:</b> Continue to develop and enable multi-domain sense-making at the tactical edge. Continue to develop technologies to automate cyber vulnerabilities detection. Initiate projects selected from the annual WARTECH process that investigate Department of the Air Force prioritized topics. Continue to perform modeling, simulation, and analyses to establish the future force effect of candidate Transformational Component investments and continue the next cycle of WARTECH process.				
<b>FY 2022 to FY 2023 Increase/Decrease Statement:</b> FY 2023 decreased compared to FY 2022 by \$0.183 million. Justification for this decrease is described in plans above.				
<b>Accomplishments/Planned Programs Subtotals</b>		0.000	4.147	3.725
<b>C. Other Program Funding Summary (\$ in Millions)</b>				
N/A				
<b>Remarks</b>				

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Air Force		<b>Date:</b> April 2022
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603270F / <i>Electronic Combat Technology</i>	<b>Project (Number/Name)</b> 634335 / <i>Cyber Concepts</i>

**D. Acquisition Strategy**  
Not applicable

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Air Force										<b>Date:</b> April 2022		
<b>Appropriation/Budget Activity</b> 3600 / 3					<b>R-1 Program Element (Number/Name)</b> PE 0603270F / <i>Electronic Combat Technology</i>				<b>Project (Number/Name)</b> 63691X / <i>EO/IR Warning &amp; Countermeasures Tech</i>			
<b>COST (\$ in Millions)</b>	<b>Prior Years</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023 Base</b>	<b>FY 2023 OCO</b>	<b>FY 2023 Total</b>	<b>FY 2024</b>	<b>FY 2025</b>	<b>FY 2026</b>	<b>FY 2027</b>	<b>Cost To Complete</b>	<b>Total Cost</b>
63691X: <i>EO/IR Warning &amp; Countermeasures Tech</i>	-	4.662	3.705	2.852	0.000	2.852	3.389	4.898	5.006	5.118	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

**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.

This project includes the initiation and development of programs addressing DAF capability gaps and provides technologies for transformational future force capabilities. Transformational efforts will be identified through a competitive process and be responsive to DAF design priorities. Selected efforts will be designated as transformational, indicating enterprise-level priority.

**B. Accomplishments/Planned Programs (\$ in Millions)**

	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<b>Title:</b> Advanced Electro-Optical/Infrared Warning and Countermeasure Technologies	4.662	2.791	2.243
<b>Description:</b> 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.			
<b>FY 2022 Plans:</b> Continue to mature the process for threat characterization and countermeasures development and field testing of new advanced threats to include laser jam codes and techniques. Mature the incorporation of air to air threat radio frequency data links into validated engagement models and examine the combination of the infrared models with equivalent radio frequency models into the overarching Advanced Framework for Simulation, Integration and Modeling software environment to address multispectrum threats. Continue effectiveness assessment of laser and missile warning technologies and techniques for a variety of Air Force platforms.			
<b>FY 2023 Plans:</b> Continue to mature the process for threat characterization and countermeasures development and field testing of new advanced threats to include laser jam codes and techniques. Continue effectiveness assessment of laser and missile warning technologies and techniques for a variety of Air Force platforms. Continue to provide electro-optical/infrared models to be combine with radio			

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Air Force		<b>Date:</b> April 2022		
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603270F / <i>Electronic Combat Technology</i>	<b>Project (Number/Name)</b> 63691X / <i>EO/IR Warning &amp; Countermeasures Tech</i>		
<b>B. Accomplishments/Planned Programs (\$ in Millions)</b>		<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
frequency models to further enhance the overarching Advanced Framework for Simulation, Integration and Modeling software environment to address multi-spectral threats.  <b>FY 2022 to FY 2023 Increase/Decrease Statement:</b> FY 2023 decreased compared to FY 2022 by \$0.548 million. Justification for this decrease is described in plans above.				
<b>Title:</b> Transformational Technology Development  <b>Description:</b> Continually funded effort. This funding allocation will initiate new and continue existing Transformational Technology Development efforts. The Transformational Technology Development program will select new projects, in alignment with mission focused areas which include, but are not limited to: Intelligent Planning and Wargaming, Battlespace Awareness, Integrated Base Defense, and Hypersonic Multi-Mission Aircraft. Investments focus on technology development efforts including, but are not limited to technologies to enhance survivability, operability and performance of personnel, sensors, and structures in a threat environment through development and demonstration of advanced warning and countermeasure technologies required to negate electro-optical/infrared and laser threats to aerospace platforms. This investment is overseen by senior representatives from Air and Space Forces who participate in the submission, initial review, and down-selection of Transformational Technology Development proposed efforts. Final selections will be reviewed by the Air Force Deputy Assistant Secretary for Science, Technology, and Engineering before a final recommendation for Congressional approval is made.  <b>FY 2022 Plans:</b> Select Transformational Technology Development efforts in FY 2022 that support the National Defense Strategy and Department of Air Force priorities.  <b>FY 2023 Plans:</b> Continue to develop and enable multi-domain sense-making at the tactical edge. Continue to develop advanced warning and countermeasure technologies. Initiate projects selected from the annual WARTECH process that investigate Department of the Air Force prioritized topics. Continue to perform modeling, simulation, and analyses to establish the future force effect of candidate Transformational Component investments and continue the next cycle of WARTECH process.  <b>FY 2022 to FY 2023 Increase/Decrease Statement:</b> FY 2023 decreased compared to FY 2022 by \$0.305 million. Justification for this decrease is described in plans above.		0.000	0.914	0.609
<b>Accomplishments/Planned Programs Subtotals</b>		4.662	3.705	2.852
<b>C. Other Program Funding Summary (\$ in Millions)</b>				
N/A				
<b>Remarks</b>				

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<b>Exhibit R-2A, RDT&amp;E Project Justification:</b> PB 2023 Air Force		<b>Date:</b> April 2022
<b>Appropriation/Budget Activity</b> 3600 / 3	<b>R-1 Program Element (Number/Name)</b> PE 0603270F / <i>Electronic Combat Technology</i>	<b>Project (Number/Name)</b> 63691X / <i>EO/IR Warning &amp; Countermeasures Tech</i>

**D. Acquisition Strategy**  
Not applicable