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Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3600: Research, Development, Test & Evaluation, Air Force / BA 3: Advanced Technology Development (ATD)	R-1 Program Element (Number/Name) PE 0603035F / Next Gen Effects Dev/Demos
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COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	0.000	0.000	215.817	0.000	215.817	304.525	307.975	319.596	338.993	Continuing	Continuing
633151: High Power Solid State Laser Technology	-	0.000	0.000	13.036	0.000	13.036	13.355	8.478	14.366	18.691	Continuing	Continuing
633152: High Power Microwave Development and Integration	-	0.000	0.000	18.409	0.000	18.409	17.966	19.283	20.114	20.103	Continuing	Continuing
633720: EW Quick Reaction Capabilities	-	0.000	0.000	20.960	0.000	20.960	19.259	19.446	20.171	20.736	Continuing	Continuing
63431G: RF Warning & Countermeasures Tech	-	0.000	0.000	6.775	0.000	6.775	9.622	9.967	11.781	12.021	Continuing	Continuing
635329: Cyber Battlespace Dev & Demo	-	0.000	0.000	19.020	0.000	19.020	23.474	24.138	24.787	25.290	Continuing	Continuing
63670A: Weapon Technology Development	-	0.000	0.000	51.814	0.000	51.814	74.854	76.343	77.871	79.453	Continuing	Continuing
63670B: Weapon Concept Development	-	0.000	0.000	82.331	0.000	82.331	141.408	145.708	145.802	157.899	Continuing	Continuing
63691X: EO/IR Warning & Countermeasures Tech	-	0.000	0.000	3.472	0.000	3.472	4.587	4.612	4.704	4.800	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project develops and conducts both kinetic and non-kinetic technology demonstrations to advance warfighter capabilities. The technologies address enabling and enduring Air Force requirements as well as integrated enterprise transformational capabilities intended to reshape the future force. This project includes conventional weapons and component technologies; directed energy weapon technologies; electronic combat technologies; cyber-attack, cyber defense, and cyber support technologies; and development of corresponding susceptibility, vulnerability, and lethality databases. The transformational integrated technology demonstrations will utilize cross-discipline modeling and simulation to demonstrate capabilities in a near-operational environment. Using modeling and simulation, this project seeks to determine advanced science and technology capabilities which reduce operational risk and accelerate transition into existing and future operational systems.

Efforts in this program have been coordinated through the Department of Defense Science and Technology Executive Committee process to harmonize efforts and eliminate duplication.

In the FY 2021, the Air Force is consolidating its existing thirteen Advanced Technology Development (ATD), Research Development Test and Evaluation (RDT&E), Budget Activity 03 (BA 03) PEs into five new capability focused RDT&E BA 03 PEs to better align with the Air Force Science and Technology (S&T)

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Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603035F / <i>Next Gen Effects Dev/Demos</i>	
<p>Strategy signed by the Secretary of the Air Force in April 2019. This consolidation will improve and accelerate delivery of integrated transformational, multidisciplinary, collaborative technology solutions necessary to enable new Air Force warfighting capabilities that support of the National Defense Strategy. This new structure will provide the Air Force and Congress with a clearer understanding and increased transparency of integrated technology solutions and demonstrations key to enabling the Air Force future force design.</p> <p>In FY 2021, the entirety of PE 0603605F, Advanced Weapons Technology, and associated Projects 633151, High Power Solid State Laser Technology and 633152, High Power Microwave Technology, are transferred to PE 0603035F, Next Gen Effects Dev/Demos.</p> <p>In FY 2021, the entirety of Project 635329, Cyber Battlespace Dev & Demo, is transferred from PE 0603788F, Battlespace Knowledge Development and Demonstration, to PE 0603035F, Next Gen Effects Dev/Demos.</p> <p>In FY 2021, the entirety of Project 63431G, RF Warning & Countermeasures Tech, is transferred from PE 0603270F, Electronic Combat Technology, to PE 0603035F, Next Gen Effects Dev/Demos, with the exception of the work and funding that is associated with the Navigation Technology Satellite-3 Vanguard demonstration.</p> <p>In FY 2021, the entirety of Project 633720, EW Quick Reaction Capabilities, and Project 63691X, EO/IR Warning & Countermeasures Tech, are transferred from PE 0603270F, Electronic Combat Technology, to PE 0603035F, Next Gen Effects Dev/Demos.</p> <p>In FY 2021, the entirety of Project 63670A, Weapon Technology Development, is transferred from PE 0603601F, Conventional Weapons Technology, to PE 0603035F, Next Gen Effects Dev/Demos.</p> <p>In FY 2021, the entirety of Project 63670B, Weapon Concept Development, is transferred from PE 0603601F, Conventional Weapons Technology, to PE 0603035F, Next Gen Effects Dev/Demos, with the exception of the work and funding that is associated with the Golden Horde Vanguard demonstration.</p> <p>These transfers detailed above are part of the Air Force RDT&E BA 03 PE consolidation in order to realign technology areas that better support the National Defense Strategy, Air Force Future Operating Concept, and Air Force Science and Technology Strategy, April 2019. This is an administrative realignment, and not a new start.</p> <p>The Air Force Science and Technology portfolio will continued to be managed at the Enterprise level by the Air Force Technology Executive Officer, dual-hatted as the Air Force Research Laboratory (AFRL) Commander, and executed across the various AFRL Technology Directorates and locations.</p> <p>This program element may include necessary civilian pay expenses required to manage, execute, and deliver science & technology capabilities. The use of program funds in this PE would be in addition to the civilian pay expenses budgeted in program elements 0601102F, 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602602F, 0602605F, 0602788F, 1206601SF, and 0602298F.</p> <p>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.</p>		

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Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force</i> / BA 3: <i>Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603035F / <i>Next Gen Effects Dev/Demos</i>
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B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	0.000	0.000	0.000	0.000	0.000
Current President's Budget	0.000	0.000	215.817	0.000	215.817
Total Adjustments	0.000	0.000	215.817	0.000	215.817
• Congressional General Reductions	0.000	0.000			
• 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	0.000	0.000			
• Other Adjustments	0.000	0.000	215.817	0.000	215.817

Congressional Add Details (\$ in Millions, and Includes General Reductions)

Project: 63670A: *Weapon Technology Development*

Congressional Add: *Program increase - rotary launcher development*

	FY 2019	FY 2020
Congressional Add Subtotals for Project: 63670A	0.000	0.000
Congressional Add Totals for all Projects	0.000	0.000

Change Summary Explanation

Increase in FY 2021 of \$215.817 million is due to the following PEs, Projects, and efforts being transferred to PE 0603035F, Next Gen Effects Dev/Demos:

- 1) Entirety of PE 0603605F, Advanced Weapons Technology, and associated Projects 633151, High Power Solid State Laser Technology and 633152, High Power Microwave Technology
- 2) Entirety of Project 635329, Cyber Battlespace Dev & Demo, from PE 0603788F, Battlespace Knowledge Development and Demonstration
- 3) Entirety of Project 63431G, RF Warning & Countermeasures Tech, from PE 0603270F, Electronic Combat Technology, with the exception of the work and funding that is associated with the Navigation Technology Satellite-3 Vanguard demonstration.
- 4) Entirety of Project 633720, EW Quick Reaction Capabilities, and Project 63691X, EO/IR Warning & Countermeasures Tech, from PE 0603270F, Electronic Combat Technology
- 5) Entirety of Project 63670A, Weapon Technology Development, from PE 0603601F, Conventional Weapons Technology.

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Appropriation/Budget Activity	R-1 Program Element (Number/Name)
3600: <i>Research, Development, Test & Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)</i>	PE 0603035F / <i>Next Gen Effects Dev/Demos</i>

6) Entirety of Project 63670B, Weapon Concept Development, from PE 0603601F, Conventional Weapons Technology, with the exception of the work and funding that is associated with the Golden Horde Vanguard demonstration.

These transfers detailed above are part of the Air Force RDT&E BA 03 PE consolidation in order to realign technology areas that better support the National Defense Strategy, Air Force Future Operating Concept, and Air Force Science and Technology Strategy, April 2019.

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3600 / 3					R-1 Program Element (Number/Name) PE 0603035F / Next Gen Effects Dev/ Demos				Project (Number/Name) 633151 / High Power Solid State Laser Technology			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
633151: High Power Solid State Laser Technology	-	0.000	0.000	13.036	0.000	13.036	13.355	8.478	14.366	18.691	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project provides for the development, integration, demonstration, and detailed technical assessment of high energy laser devices, advanced imaging and beam control technologies needed for applications such as force protection, force application, precision engagement, and aircraft self-protection. Laser system concept assessments to include vulnerability assessments and target effect testing are performed. This project also exploits the synergy between high energy laser beam control and advanced optical imaging for space situational awareness.

In FY 2021, the entirety of Project 633151, High Power Solid State Laser Technology is transferred from PE 0603605F, Advanced Weapons Technology to PE 0603035F, Next Gen Effects Dev/Demos, Project 633151, High Power Solid State Laser Technology, as part of the Air Force RDT&E BA 03 PE Consolidation in order to realign technology areas that better support the National Defense Strategy, Air Force Operating Concept and AF Science and Technology Strategy, April 2019. The Project and associated efforts will continue to be executed by the Air Force Research Laboratory Directed Energy Technology Directorate located in Kirtland Air Force Base, New Mexico. This is an administrative realignment for consolidation, and not a new start.

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

	FY 2019	FY 2020	FY 2021
Title: High Energy Laser/Beam Control	0.000	0.000	13.036
Description: Develop and demonstrate advanced beam control technologies, integrated laser systems, and aircraft self-protection laser technologies. Demonstrate beam control components integrated with high energy lasers for Air Force utility.			
FY 2020 Plans: For FY 2020 and prior, the work is performed under High Energy Laser/Beam Control effort in PE 0603605F, Advanced Weapons Technology, Project 633151, High Power Solid State Laser Technology.			
FY 2021 Plans: Complete system integration of 50 kilo-Watt high power podded laser system for flight demonstration. Complete high power ground test for podded 50 kilo-Watt laser system. Begin preparations for high power flight test.			
FY 2020 to FY 2021 Increase/Decrease Statement: FY 2021 increased compared to FY 2020 by \$13.036 million. Funding increased due to transfer and realignment of this work from the High Energy Laser/Beam Control effort from PE 0603605F, Advanced Weapons Technology, Project 633151, High Power Solid State Laser Technology, as part of the Air Force RDT&E BA 03 PE Consolidation.			
Accomplishments/Planned Programs Subtotals	0.000	0.000	13.036

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603035F / <i>Next Gen Effects Dev/ Demos</i>	Project (Number/Name) 633151 / <i>High Power Solid State Laser Technology</i>

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

N/A

Remarks

D. Acquisition Strategy

N/A

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3600 / 3					R-1 Program Element (Number/Name) PE 0603035F / Next Gen Effects Dev/ Demos				Project (Number/Name) 633152 / High Power Microwave Development and Integration			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
633152: High Power Microwave Development and Integration	-	0.000	0.000	18.409	0.000	18.409	17.966	19.283	20.114	20.103	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project develops and demonstrates high power microwave and other unconventional electromagnetic field generation and transmission technologies that can be integrated into future weapon systems to support a wide range of Air Force missions such as air base defense or the damage/destruction of an adversary's electronic infrastructure. It also provides inputs to the susceptibility, vulnerability, and lethality databases used across the Department of Defense to understand thresholds for scalable effects of directed energy weapons.

In FY 2021, the entirety of Project 633152, High Power Microwave Development and Integration, is transferred from PE 0603605F, Advanced Weapons Technology, to PE 0603035F, Next Gen Effects Dev/Demos, Project 633152, High Power Microwave Development and Integration, as part of the Air Force RDT&E BA 03 PE Consolidation in order to realign technology areas that better support the National Defense Strategy, Air Force Operating Concept and AF Science and Technology Strategy, April 2019. The Project and associated efforts will continue to be executed by the Air Force Research Laboratory Directed Energy Technology Directorate located in Kirtland Air Force Base, New Mexico. This is an administrative realignment for consolidation, and not a new start.

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

	FY 2019	FY 2020	FY 2021
Title: High Power Microwave Technologies	0.000	0.000	18.409
Description: Develop and evaluate high power microwave and other unconventional weapon technologies for various platforms, including aerial, for applications such as counter-electronics. Develop and evaluate high power microwave technologies for non-kinetic and counter-electronic weapon applications.			
FY 2020 Plans: For FY 2020 and prior, this work is performed under the High Power Microwave Technologies effort in PE 0603605F, Advanced Weapons Technology, Project 633152, High Power Microwave Development and Integration.			
FY 2021 Plans: Downselect to an advance reuseable platform. Initiate high power microwave payload integration. Continue to characterize, model, test and evaluate current and projected blue directed energy threats on current red assets. Integrate the high power microwave payload into the aerial platform for the joint flight demonstration with the Navy. Design agile waveform high power sources.			
FY 2020 to FY 2021 Increase/Decrease Statement:			

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Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603035F / <i>Next Gen Effects Dev/ Demos</i>	Project (Number/Name) 633152 / <i>High Power Microwave Development and Integration</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
FY 2021 increased compared to FY 2020 by \$18.409 million. Funding increased due to to transfer and realignment of this work from the High Power Microwave Technologies effort in PE 0603605F, Advanced Weapons Technology, Project 633151, High Power Microwave Technology.				
Accomplishments/Planned Programs Subtotals		0.000	0.000	18.409
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3600 / 3					R-1 Program Element (Number/Name) PE 0603035F / Next Gen Effects Dev/ Demos				Project (Number/Name) 633720 / EW Quick Reaction Capabilities			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
633720: EW Quick Reaction Capabilities	-	0.000	0.000	20.960	0.000	20.960	19.259	19.446	20.171	20.736	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 technologies and capabilities in the context of systemic electronic warfare effects in a congested/contested electromagnetic spectrum, system-of-systems 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.

In FY 2021, the entirety of Project 633720, EW Quick Reaction Capabilities, from PE 0603270F, Electronic Combat Technology, is transferred to PE 0603035F, Next Gen Effects Dev/Demos, Project 633720, EW Quick Reaction Capabilities, as part of the Air Force RDT&E BA 03 PE Consolidation in order to realign technology areas that better support the National Defense Strategy, Air Force Operating Concept and AF Science and Technology Strategy, April 2019. The Project and associated efforts will continue to be executed by the Air Force Research Laboratory Sensors Technology Directorate located in Wright Patterson Air Force Base, Ohio. This is an administrative realignment for consolidation, and not a new start.

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

	FY 2019	FY 2020	FY 2021
Title: Radio Frequency Electronic Warfare	0.000	0.000	9.520
Description: Develop electronic warfare focused knowledge databases, engineering models, mission simulations, analysis tools, and assessment environments enabling 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 such as utilizing cognitive algorithms.			
FY 2020 Plans: For FY 2020 and prior, this work is performed under Radio Frequency Electronic Warfare effort in PE 0603270F, Electronic Combat Technology, Project 633720, EW Quick Reaction Capabilities.			
FY 2021 Plans: Continue expansion of simulations to accommodate advanced electronic warfare systems and emulate the complex radio frequency threats and signals environment. Begin implementation of advanced digital signal synthesis to better represent complex emitters operating in complex environments containing sophisticated background emitters. Continue development			

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Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603035F / <i>Next Gen Effects Dev/ Demos</i>	Project (Number/Name) 633720 / <i>EW Quick Reaction Capabilities</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<p>of 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 including cognitive and autonomous technologies. 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 achieve closed-loop system performance.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: FY 2021 increased compared to FY 2020 by \$9.520 Million. Funding increased due to the transfer and realignment of this work from the Radio Frequency Electronic Warfare effort in PE 0603270F, Electronic Combat Technology, Project 633720, EW Quick Reaction Capabilities, as part of the Air Force RDT&E BA 03 PE Consolidation.</p>				
<p>Title: Position, Navigation and Timing for Contested/Denied Environments</p> <p>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/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>FY 2020 Plans: For FY 2020, this work is performed under the Position, Navigation and Timing for Contested/Denied Environments effort in PE 0603270F, Electronic Combat Technology, Project 633720, EW Quick Reaction Capabilities.</p> <p>FY 2021 Plans: Continue to further research techniques to securely certify Global Navigation Satellite System software defined radio technology and methods to trust Global Navigation Satellite Systems. Complete advanced reconfigurable software defined radio navigation receivers to enable spectrum agile systems and integration as the user equipment component to the Navigation Technology Satellite-3 flight experimentation. Continue to develop alternative/complementary position, navigation and timing techniques which increase the availability of the position, navigation and timing solution and support creation of an integrated position, navigation and timing solution focused on increasing the precision needed to support novel radio frequency coherent sensing and electronic warfare techniques. Continue to define and refine navigational open architecture standards to allow for integration of Global Navigation Satellite System and alternative/complementary position, navigation and timing approaches into future systems. Demonstrate integration of improved Global Navigation Satellite System position, navigation and timing and alternative position, navigation and timing solutions into an advanced resilient embedded Global Positioning System-inertial government reference architecture.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement:</p>		0.000	0.000	9.663

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Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603035F / <i>Next Gen Effects Dev/ Demos</i>	Project (Number/Name) 633720 / <i>EW Quick Reaction Capabilities</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
FY 2021 increased compared to FY 2020 by \$9.663 Million. Funding increased due to the transfer and realignment of this work from the Position, Navigation and Timing for Contested/Denied Environments effort in PE 0603270F, Electronic Combat Technology, Project 633720, EW Quick Reaction Capabilities, as part of the Air Force RDT&E BA 03 PE consolidation.				
Title: Electro-Optical/Infrared Threat Warning and Countermeasures		0.000	0.000	1.777
Description: Develop next-generation countermeasure techniques to address the complete range of multispectral 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 2020 Plans: For FY 2020, this work is performed under the Electro-Optical/Infrared Threat Warning and Countermeasures effort in PE 0603270F, Electronic Combat Technology, Project 633720, EW Quick Reaction Capabilities.				
FY 2021 Plans: Apply analysis from field test to develop requirements for proactive detection and situation awareness for multiple Air Force platforms. Iterate and refresh techniques for in-house at range data collection capabilities. Perform test against real threats at significant range. Continue to evaluate acquisition alternatives for a proactive advanced technology demonstration. Continue efforts to develop multispectrum electro-optical/radio frequency countermeasures and insert capabilities into existing engagement modeling and simulation tools.				
FY 2020 to FY 2021 Increase/Decrease Statement: FY 2021 increased compared to FY 2020 by \$1.777 Million. Funding increased due to transfer and realignment of this work from the Electro-Optical/Infrared Threat Warning and Countermeasures effort in PE 0603270F, Electronic Combat Technology, Project 633720, EW Quick Reaction Capabilities, as part of the Air Force RDT&E BA03 PE consolidation.				
Accomplishments/Planned Programs Subtotals		0.000	0.000	20.960
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

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Appropriation/Budget Activity 3600 / 3					R-1 Program Element (Number/Name) PE 0603035F / <i>Next Gen Effects Dev/ Demos</i>				Project (Number/Name) 63431G / <i>RF Warning & Countermeasures Tech</i>			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
63431G: <i>RF Warning & Countermeasures Tech</i>	-	0.000	0.000	6.775	0.000	6.775	9.622	9.967	11.781	12.021	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.

In FY 2021, Project 63431G, RF Warning & Countermeasures Tech, is transferred from PE 0603270F, Electronic Combat Technology, to PE 0603035F, Next Gen Effects Dev/Demos, Project 63431G, RF Warning & Countermeasures Tech with the exception of the work and funding that is associated with the Navigation Technology Satellite-3 Vanguard demonstration which will be realigned to PE 0603032F, Future Air Force Integrated Tech Demos, Project 630320, Air Force Vanguard. These transfers are part of the Air Force RDT&E BA 03 PE Consolidation in order to realign technology areas that better support the National Defense Strategy, Air Force Operating Concept and AF Science and Technology Strategy, April 2019. The Project and non-Vanguard associated efforts will continue to be executed by the Air Force Research Laboratory Sensors Technology Directorate located in Wright Patterson Air Force Base, Ohio. This is an administrative realignment for consolidation, and not a new start.

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

	FY 2019	FY 2020	FY 2021
Title: Electronic Attack	0.000	0.000	6.775
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 2020 Plans: For FY 2020 and prior, this work is performed under the Electronic Attack effort in PE 0603270F, Electronic Combat Technology, Project 633720, RF Warning & Countermeasures Tech.			
FY 2021 Plans: Continue research into radio frequency receiver technologies enhancing the ability to detect threats, measure increased radio frequency features with greater accuracy, identify or classify signals more reliably, track and predict signals, use reasoning algorithms to reduce ambiguities and errors, and deduce greater knowledge from the radio frequency spectrum. Conduct			

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<p>technology demonstrations to support transition into Air Force platforms. Continue expansion of modeling, simulation and laboratory assessment environments commensurate with technologies being researched, developed and tested including cognitive and autonomous electronic warfare technologies. Start the implementation of emerging electronic attack and electronic support capabilities into open architectures. Demonstrate the capability to rapidly respond to new and unexpected threats in realistic environments.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: FY 2021 increased compared to FY 2020 by \$6.775 million. Funding increased due to transfer and realignment of this work from the Electronic Attack effort in PE 0603270F, Electronic Combat Technology, Project 633720, RF Warning & Countermeasures Tech, as part of the Air Force RDT&E BA 03 PE consolidation.</p>				
Accomplishments/Planned Programs Subtotals		0.000	0.000	6.775
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
N/A				

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Appropriation/Budget Activity 3600 / 3					R-1 Program Element (Number/Name) PE 0603035F / <i>Next Gen Effects Dev/ Demos</i>				Project (Number/Name) 635329 / <i>Cyber Battlespace Dev & Demo</i>			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
635329: <i>Cyber Battlespace Dev & Demo</i>	-	0.000	0.000	19.020	0.000	19.020	23.474	24.138	24.787	25.290	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Air Force requires the ability to deliver sovereign options in cyberspace through the development and integration of cyber-attack, cyber defense, and cyber support technologies for a strategic capability of cyber dominance. This project develops the ability to deliver cyber-attack capabilities (access, stealth, persistence, intelligence, and weapons delivery), cyber defense capabilities (attack detection, attack attribution, and response automation) and cyber support capabilities (situation awareness and war gaming). This project will also develop 1) a science and engineering capability demonstrating new models of computation, 2) novel approaches for high performance, interactive, net-centric, distributed and embedded computing systems, and 3) the technological tools enabling affordable, large-scale, and complex software-intensive systems.

The National Defense Strategy and Air Force Future Operating Concept established science and technology challenges to enable operational agility (the ability to rapidly generate and shift among multiple solutions for a given challenge) as a way to adapt swiftly to any situation or enemy action. In order to enable multi-domain operations, this project will begin to shape future research and development to focus on cyber technologies in support of multi-domain command and control.

In FY 2021, the entirety of Project 635329, Cyber Battlespace Dev & Demo, is transferred from PE 0603788F, Battlespace Knowledge Development and Demonstration, to PE 0603035F, Next Gen Effects Dev/Demos, Project 635329, Cyber Battlespace Dev & Demo, as part of the Air Force RDT&E BA 03 PE consolidation in order to realign technology areas to better support the National Defense Strategy, Air Force Future Operating Concept and Air Force Science and Technology Strategy, April 2019. The Project and associated efforts will continue to be managed by the Air Force Research Laboratory Information Technology Directorate located in Rome, New York. This is an administrative realignment for consolidation, and not a new start.

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

	FY 2019	FY 2020	FY 2021
Title: Resiliency	0.000	0.000	7.485
Description: Integrate and demonstrate a resilient and self-generating information enterprise that dynamically recognizes, characterizes, and understands novel cyber attacks, and then reconfigures and self-optimizes to resist new attacks.			
FY 2020 Plans: For FY 2020 and prior, this work is performed under the Resiliency effort in PE 0603788F, Battlespace Knowledge Development and Demonstration, Project 635329, Cyber Battlespace Dev & Demo.			
FY 2021 Plans: Continue to develop and evolve software capabilities and concept of operations for active guidance and automated processes addressing cyber resiliency and survivability. Continue to advance capability migration to form factors which more readily align			

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603035F / <i>Next Gen Effects Dev/ Demos</i>	Project (Number/Name) 635329 / <i>Cyber Battlespace Dev & Demo</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<p>with operational systems. Continue to demonstrate automated cyber survivability using integrated cyber technologies within the operational system laboratory in the context of risk management framework requirements. Continue development of an advanced secure processor hardware capability. Develop processor-agnostic sub-system for golden-image storage, verification, and re-flashing.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: FY 2021 increased compared to FY 2020 by \$7.485 million. Funding increased due to the transfer and realignment of this work from the Resiliency effort in PE 0603788F, Battlespace Knowledge Development and Demonstration, Project 635329, Cyber Battlespace Dev & Demo, as part of the Air Force RDT&E BA 03 PE consolidation.</p>				
<p>Title: Autonomous, Multi-level Access and Transfer</p> <p>Description: Develop autonomous, secure information access and sharing capabilities required by the Air Force net-centric information enterprise.</p> <p>FY 2020 Plans: For FY 2020 and prior, this work is performed under the Autonomous, Multi-level Access and Transfer effort in PE 0603788F, Battlespace Knowledge Development and Demonstration, Project 635329, Cyber Battlespace Dev & Demo.</p> <p>FY 2021 Plans: Continue to develop and integrate polyglot file identification filters to mitigate data exfiltration risks. Continue to sustain development of a modularized filter store to maximize filter re-usability and increase the agility of cross-domain solutions to support new file types.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: FY 2021 increased compared to FY 2020 by \$1.042 million. Funding increased due to the transfer and realignment of this work from the Autonomous, Multi-level Access and Transfer effort in PE 0603788F, Battlespace Knowledge Development and Demonstration, Project 635329, Cyber Battlespace Dev & Demo, as part of the Air Force RDT&E BA 03 PE consolidation.</p>		0.000	0.000	1.042
<p>Title: Cyber Power Projection</p> <p>Description: Develop and demonstrate offensive cyber capabilities in contested environments through a series of experiments and exercises.</p> <p>FY 2020 Plans: For FY 2020 and prior, this work is performed under the Cyber Power Projection effort in PE 0603788F, Battlespace Knowledge Development and Demonstration, Project 635329, Cyber Battlespace Dev & Demo.</p> <p>FY 2021 Plans:</p>		0.000	0.000	10.493

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603035F / <i>Next Gen Effects Dev/ Demos</i>	Project (Number/Name) 635329 / <i>Cyber Battlespace Dev & Demo</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
<p>Continue the development of systems to identify items of interest associated with the Internet of Things. Continue to advance the development of a counter small unmanned aerial system open architecture specification to enable interoperability between disparate protection systems. Develop processor-agnostic sub-system for golden-image storage, verification, and re-flashing. Continue to integrate and transition multiple Air Force Research Laboratory and Air Force Lifecycle Management Center counter small unmanned aerial system capabilities. Continue to develop a capability to enable the warfighter access into congested environments as directed by warfighter requirements. Research multiple-input, multiple-output state matrices to detect physical changes in base electromagnetic environments to monitor large areas using passive techniques for detection of commercial-off-the-shelf small unmanned aerial systems.</p> <p><i>FY 2020 to FY 2021 Increase/Decrease Statement:</i> FY 2021 increased compared to FY 2020 by \$10.493 million. Funding increased due to the transfer and realignment of this work from the Cyber Power Projection effort in PE 0603788F, Battlespace Knowledge Development and Demonstration, Project 635329, Cyber Battlespace Dev & Demo, as part of the Air Force RDT&E BA 03 PE consolidation.</p>			
Accomplishments/Planned Programs Subtotals	0.000	0.000	19.020

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

N/A

Remarks

D. Acquisition Strategy

N/A

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3600 / 3					R-1 Program Element (Number/Name) PE 0603035F / Next Gen Effects Dev/ Demos				Project (Number/Name) 63670A / Weapon Technology Development			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
63670A: <i>Weapon Technology Development</i>	-	0.000	0.000	51.814	0.000	51.814	74.854	76.343	77.871	79.453	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project develops, matures, assesses, and demonstrates advanced/innovative ordnance and guidance component and subsystem technologies for air-launched conventional weapons. The project focuses on maturation of advanced explosives, fuzes, warheads, sub-munitions, and weapon airframes, carriage and dispensing. Additionally, this project develops innovative munition seekers, weapon aerodynamics, navigation and control, and guidance subsystem integration/simulation.

In FY 2021, the entirety of Project 63670A, Weapon Technology Development, is transferred from PE 0603601F, Conventional Weapons Technology, to PE 0603035F, Next Gen Effects Dev/Demos, Project 63670A, Weapon Technology Development, as part of the Air Force RDT&E BA 03 PE consolidation in order to realign technology areas to better support the National Defense Strategy, Air Force Future Operating Concept and Air Force Science and Technology Strategy, April 2019. The Project and associated efforts will continue to be managed by the Air Force Research Laboratory Munitions Technology Directorate located in Eglin Air Force Base, Florida. This is an administrative realignment for consolidation, and not a new start.

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

	FY 2019	FY 2020	FY 2021
Title: Ordnance Technologies	0.000	0.000	27.082
Description: Develop and demonstrate integrated ordnance technologies to improve conventional air-delivered munitions. Specific technical areas of focus include energetic materials, fuze technology, warhead sciences, and modeling and simulation tools.			
FY 2020 Plans: For FY 2020 and prior, this work is performed under the Ordnance Technologies effort in PE 0603601F, Conventional Weapons Technology, Project 63670A, Weapon Technology Development.			
FY 2021 Plans: Complete joint technology demonstration for dialable effects technologies. Continue to demonstrate distributed, embedded fuzing concepts for close-controlled strike, area attack, and penetration applications such as layer counting at high speed, including assessing long-term safety, survivability, and functionality. Continue development of ordnance technologies to allow tailored lethality by controlling weapon fragmentation. Continue to mature ordnance technologies for rapid transition into high-speed strike weapon concepts, collecting complex arena test data for implementation into lethality modeling and simulation tools. Continue to develop test capabilities and high-fidelity analysis tools to generate more accurate, faster-running weaponing data. Continue to develop ordnance technologies/methodologies for high-speed impact and functional defeat. Continue research into armament systems for Special Operations applications. Continue to conduct lethality analyses for weapons and improve lethality and			

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603035F / <i>Next Gen Effects Dev/ Demos</i>	Project (Number/Name) 63670A / <i>Weapon Technology Development</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<p>survivability tools at the meso-scale and micro-scale. Continue to mature research on distributed, collaborative, cooperative effects munition technologies. Continue the development of high-fidelity test capabilities and analysis tools to evaluate ordnance technologies in relevant environments. Continue incorporation of previously developed material models and improve/advance additional joint kinetic/directed energy common target models. Continue synthesis and incorporation of warhead models for progressive collapse, multiple point initiation, secondary debris and others.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: FY 2021 increased compared to FY 2020 by \$27.082 million. Funding increased due to transfer and realignment of this work from the Ordnance Technologies effort in PE 0603601F, Conventional Weapons Technology, Project 63670A, Weapon Technology Development, as part of the Air Force RDT&E PE consolidation.</p>				
<p>Title: Guidance Technologies</p> <p>Description: Develop guidance technologies to improve the precision, controlled lethality, and flexibility of conventional, air-delivered munitions. Specific technical areas include precision navigation and terminal seekers.</p> <p>FY 2020 Plans: For FY 2020 and prior, this work is performed under the Guidance Technologies effort in PE 0603601F, Conventional Weapons Technology, Project 63670A, Weapon Technology Development.</p> <p>FY 2021 Plans: Continue integration of hardware-in-the-loop, software-in-the-loop, and other Modeling and Simulation technologies for the demonstration of open architecture, high-speed, cooperative, and modular munition concepts. Continue the design and development of seeker subsystem prototypes for platform self-defense. Continue development of advanced, high-resolution infrared scene projectors, distributed simulation concepts, software defined radio frequency test chamber, scene generation, mission, engagement, campaign level simulations, and panoramic infrared dome technologies. Continue to develop technologies for precision navigation of weapons in Global Positioning System-denied scenarios. Continue to mature and integrate advanced carriage and release concepts and sub-systems. Continue providing multi-security level, cross-domain distributed Modeling and Simulation support for munition research using distributed connectivity between multiple Eglin Air Force Base facilities. Begin integration of lethality models into guidance and control simulation to enhance weapon integrated performance. Begin development of sensor test technologies to enable verification of autonomous munition concepts. Initiate the integration of higher fidelity constructive analysis tools with engagement and mission level Modeling and Simulation.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement:</p>		0.000	0.000	24.732

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603035F / <i>Next Gen Effects Dev/ Demos</i>	Project (Number/Name) 63670A / <i>Weapon Technology Development</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
FY 2021 increased compared to FY 2020 by \$24.732 million. Funding increased due to transfer and realignment of this work from the Guidance Technologies effort in PE 0603601F, Conventional Weapons Technology, Project 63670A, Weapon Technology Development.			
Accomplishments/Planned Programs Subtotals	0.000	0.000	51.814

	FY 2019	FY 2020
Congressional Add: Program increase - rotary launcher development	0.000	0.000
FY 2019 Accomplishments: Conducted Congressionally directed efforts		
FY 2020 Plans: Not applicable		
Congressional Adds Subtotals	0.000	0.000

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

N/A

Remarks

D. Acquisition Strategy

N/A

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3600 / 3					R-1 Program Element (Number/Name) PE 0603035F / Next Gen Effects Dev/ Demos				Project (Number/Name) 63670B / Weapon Concept Development			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
63670B: <i>Weapon Concept Development</i>	-	0.000	0.000	82.331	0.000	82.331	141.408	145.708	145.802	157.899	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project develops, refines, integrates, demonstrates, and assesses ordnance and guidance technologies to reduce risk for potential air-launched conventional weapons acquisitions. The project concentrates in two effort areas, Air-to-Air Concept Development and Air-to-Ground Concept Development. The project focuses on risk reduction of advanced explosives, fuzes, warheads, sub-munitions, and weapon airframes, carriage and dispensing; as well as innovative munition seekers, weapon aerodynamics, navigation and control, and guidance subsystem integration/simulation.

In FY 2021, Project 63670B, Weapon Concept Development, is transferred from PE 0603601F, Conventional Weapons Technology, to PE 0603035F, Next Gen Effects Dev/Demo, Project 63670B, Weapon Concept Development with the exception of the work and funding that is associated with the Golden Horde Vanguard demonstration which will be realigned to PE 0603032F, Future Air Force Integrated Tech Demos, Project 630320, Air Force Vanguard. These transfers are part of the Air Force RDT&E BA 03 PE Consolidation in order to realign technology areas that better support the National Defense Strategy, Air Force Operating Concept and AF Science and Technology Strategy, April 2019. The Project and non-Vanguard associated efforts will continue to be executed by the Air Force Research Laboratory Munitions Technology Directorate located in Eglin Air Force Base, Florida. This is an administrative realignment for consolidation, and not a new start.

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

	FY 2019	FY 2020	FY 2021
Title: Air-to-Air Concept Development	0.000	0.000	52.091
Description: Mature, integrate, and demonstrate air-to-air weapon components and systems to include ordnance, guidance, carriage and release technologies to demonstrate war-fighter capability.			
FY 2020 Plans: For FY 2020 and prior, this work is performed under the Air-to-Air Concept Development effort in PE 0603601F, Conventional Weapons Technology, Project 63670B, Weapon Concept Development.			
FY 2021 Plans: Continue developing the technology trade space to enable air-to-air weapons with robust capability in the future threat environment, including technologies for efficient propulsion, high lethality, efficient flight / high agility, miniaturization, and cost and risk reduction for both offensive and defensive purposes. Continue to develop and test prototype propulsion systems with flexibility to enable more adaptable next generation air-to-air weapons. Continue to conduct lethality studies to enable design of small form factor warheads lethal against the 2030 plus target set. Transition advanced target models to other AF and DoD offices. Continue to develop preliminary design of air-to-air weapon concepts for sixth generation platforms. Continue to document missile flight dynamics trade space and conduct wind-tunnel experiments to characterize airframes and validate aerodynamic			

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603035F / <i>Next Gen Effects Dev/ Demos</i>	Project (Number/Name) 63670B / <i>Weapon Concept Development</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
<p>codes leading to development of highly maneuverable and efficient missiles to counter advanced targets, and improve persistence and survivability of future platforms. Continue to conduct ground and arena tests of advanced weapons experimental carriages for sixth generation weapon concept and prepare for flight worthiness testing. Continue to mature simulation architectures to assess the trade and synergies between kinetic and directed energy weapons. Continue to perform experiments with small warheads to obtain data for lethality analysis to validate and improve designs. Continue to plan and execute integrated subsystem experiments. Complete self defense munition maturation of hardware and software elements, integrate, assemble and test the complete munition.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: FY 2021 increased compared to FY 2020 by \$52.091 million. Funding increased due to transfer and realignment of this work from the Air-to-Air Concept Development effort in PE 0603601F, Conventional Weapons Technology, Project 63670B, Weapon Concept Development, as part of the Air Force RDT&E BA03 PE Consolidation.</p>			
<p>Title: Air-to-Ground Concept Development</p> <p>Description: Mature, integrate, and demonstrate air-to-ground weapon components and systems such as ordnance, guidance, and carriage and release technologies to demonstrate war-fighter capability.</p> <p>FY 2020 Plans: For FY 2020 and prior, this work is performed under the Air-to-Ground Concept Development effort in 0603601F, Conventional Weapons Technology, Project 63670B, Weapon Concept Development.</p> <p>FY 2021 Plans: Complete hypersonic boost glide testing. Initiate expanded integration of collaborative weapon technology onto additional weapon systems. Continue system integration of algorithms and software defined radios onto pathfinder weapon system to enable synchronized collaborative weapon effects. Continue planning and technology risk reduction including demonstration and flight testing for weapons concepts responsive to the future threat environment (including hypersonic and cooperative/collaborative concepts). Continue to mature simulation architectures to assess the trades and synergies between kinetic and directed energy weapons. Continue to develop kinetic/non-kinetic payloads, seeker, and fuze technology for hypersonic applications.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: FY 2021 increased compared to FY 2020 by \$30.240 million. Funding increased due to transfer and realignment of this work from the Air-to-Ground Concept Development effort in 0603601F, Conventional Weapons Technology, Project 63670B, Weapon Concept Development, as part of the Air Force RDT&E BA 03 PE Consolidation.</p>	0.000	0.000	30.240
Accomplishments/Planned Programs Subtotals	0.000	0.000	82.331

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603035F / <i>Next Gen Effects Dev/ Demos</i>	Project (Number/Name) 63670B / <i>Weapon Concept Development</i>

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

N/A

Remarks

D. Acquisition Strategy

N/A

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3600 / 3					R-1 Program Element (Number/Name) PE 0603035F / Next Gen Effects Dev/ Demos				Project (Number/Name) 63691X / EO/IR Warning & Countermeasures Tech			
COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
63691X: EO/IR Warning & Countermeasures Tech	-	0.000	0.000	3.472	0.000	3.472	4.587	4.612	4.704	4.800	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.

In FY 2021, the entirety of Project 63691X, EO/IR Warning & Countermeasures Tech is transferred from PE 0603270F, Electronic Combat Technologies to PE 0603035F, Project 63691X, EO/IR Warning & Countermeasures Tech, as part of the Air Force RDT&E BA 03 PE Consolidation in order to realign technology areas that better support the National Defense Strategy, Air Force Operating Concept and AF Science and Technology Strategy, April 2019. The Project and associated efforts will continue to be executed by the Air Force Research Laboratory Sensors Technology Directorate located in Wright Patterson Air Force Base, Ohio. This is an administrative realignment for consolidation, and not a new start.

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

	FY 2019	FY 2020	FY 2021
Title: Advanced Electro-Optical/Infrared Warning and Countermeasure Technologies	0.000	0.000	3.472
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 2020 Plans: For FY 2020 and prior, this work is performed under the Advanced Electro-Optical/Infrared Warning and Countermeasure Technologies effort in PE 0603270F, Electronic Combat Technology, Project 63691X, EO/IR Warning & Countermeasures Tech.			
FY 2021 Plans: Continue threat characterization and countermeasures development and field testing of new advanced threats to include laser jam codes and techniques. Continue 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 assessment of missile warning technologies and techniques for a variety of Air Force platforms. Develop the requirements			

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force		Date: February 2020		
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603035F / <i>Next Gen Effects Dev/ Demos</i>	Project (Number/Name) 63691X / <i>EO/IR Warning & Countermeasures Tech</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
for next generation laser threat sensors for combat aircraft and space situation awareness. Start the integration of the testbed supporting development of space sensors. <i>FY 2020 to FY 2021 Increase/Decrease Statement:</i> FY 2021 increased compared to FY 2020 by \$3.472 Million. Funding increased due to transfer and realignment of this work from the Advanced Electro-Optical/Infrared Warning and Countermeasure Technologies effort in PE 0603270F, Electronic Combat Technology, Project 63691X, EO/IR Warning & Countermeasures Tech, as part of the Air Force RDT&E BA 03 PE consolidation.				
Accomplishments/Planned Programs Subtotals		0.000	0.000	3.472
C. Other Program Funding Summary (\$ in Millions) N/A				
Remarks				
D. Acquisition Strategy N/A				