

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force **Date:** May 2021

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 0603788F / <i>Battlespace Knowledge Development and Demonstration</i>
--	--

COST (\$ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	-	53.036	63.106	56.772	0.000	56.772	-	-	-	-	-	-
635321: <i>C4I Battlespace Dev and Demo</i>	-	32.925	29.086	36.177	0.000	36.177	-	-	-	-	-	-
635329: <i>Cyber Battlespace Dev & Demo</i>	-	20.111	34.020	20.595	0.000	20.595	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

This program develops and demonstrates Air Force enterprise-centric information technologies for the warfighter. The Anticipatory Operations Intent and Response project develops the technologies for dynamic planning and execution with the accuracy, fidelity, and timeliness needed to dominate the battlespace. The Assured Worldwide Connectivity project provides advanced net-enabled architectures and communications technologies in support of global military operations, including a secure information grid for worldwide information exchange of near-real-time multimedia (i.e., voice, data, video, and imagery) information. In addition, this project develops and demonstrates advanced optical networking and communications for Air Force air and space-based information exchange on and between platforms. These optical networks will be rapidly deployable, mobile, interoperable, and seamless between Air and Space Operations Centers (AOCs) and air and space-based platforms either en route or in theater. This project also provides tools and applications leading to the development and integration of cyber deterrence technologies resulting in a strategic capability of cyber dominance within the secure information grid. The Global Battlespace Awareness project develops, integrates, and demonstrates advanced technologies to achieve comprehensive net-centric operations and total battlespace awareness by using and exploiting information from all sources. The Knowledge Management and Computing project develops the technology applications that will provide for a secure, tailored, seamless exchange of information among producers, consumers, and managers of information relevant to a particular community of interest (COI). The project also provides the development of interactive and real-time computing technologies that greatly improve the usability of high-performance computing for the exchange, utilization, and management of information in the enterprise. The Cyber Battlespace Development and Demonstration project develops 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.

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. Operational agility will require flexibility (manifested as multi-domain operations), speed (manifested as superior decision speed), coordination (manifested as dynamic command and control), balance (manifested as presenting a balanced capability mix), and strength (manifested as performance-optimized teams). In order to enable operational agility, this program will begin to shape future research and development (R&D) to focus on technologies in support of operational agility through multi-domain command and control (MDC2) capabilities.

This program has been coordinated through the Department of Defense Science and Technology Executive Committee process to harmonize efforts and eliminate duplication.

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force **Date:** May 2021

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 0603788F / <i>Battlespace Knowledge Development and Demonstration</i>

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.

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 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.

B. Program Change Summary (\$ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	56.414	0.000	0.000	0.000	0.000
Current President's Budget	53.036	63.106	56.772	0.000	56.772
Total Adjustments	-3.378	63.106	56.772	0.000	56.772
• Congressional General Reductions	0.000	-0.115			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	15.000			
• Congressional Directed Transfers	0.000	48.221			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-1.404	0.000			
• Other Adjustments	-1.974	0.000	56.772	0.000	56.772

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

Project: 635321: *C4I Battlespace Dev and Demo*

Congressional Add: *Program Increase- Assured Communication and Networks*

Congressional Add: *Program Increase- Command and Control Capability Development*

Congressional Add Subtotals for Project: 635321

Project: 635329: *Cyber Battlespace Dev & Demo*

Congressional Add: *Program Increase- assured communication and networks*

	FY 2020	FY 2021
	0.000	0.000
	0.000	0.000
Congressional Add Subtotals for Project: 635321	0.000	0.000
	0.000	10.000

UNCLASSIFIED

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
--	-----------------------

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 0603788F / <i>Battlespace Knowledge Development and Demonstration</i>
--	--

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

Congressional Add: *Program Increase- command and control capability development*

Congressional Add Subtotals for Project: 635329

Congressional Add Totals for all Projects

	FY 2020	FY 2021
0.000	0.000	5.000
0.000	0.000	15.000
0.000	0.000	15.000

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force										Date: May 2021		
Appropriation/Budget Activity 3600 / 3					R-1 Program Element (Number/Name) PE 0603788F / <i>Battlespace Knowledge Development and Demonstration</i>				Project (Number/Name) 635321 / <i>C4I Battlespace Dev and Demo</i>			
COST (\$ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
635321: <i>C4I Battlespace Dev and Demo</i>	-	32.925	29.086	36.177	0.000	36.177	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

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 technologies in support of multi-domain command and control.

In order to achieve operational agility, the Air Force must be able (a) to monitor, assess, plan, and execute missions rapidly across the full spectrum of operations at all levels of war and during all phases of conflict; (b) to field advanced, secure, net-enabled architectures and communications/network technologies in support of persistent, global, and survivable kinetic and non-kinetic military operations; (c) to process and exploit data and information from a variety of sources and domains to create a common operating picture of the battlespace; and (d) to provide the decision maker and staff with seamless access to tailored information within a mobile, dynamic, and scalable, globally distributed Air Operations Center, as well as among other producers, consumers, and managers of information relevant to other particular Communities of Interest (COI).

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 2020	FY 2021	FY 2022
Title: Transformational Technology Development	-	0.000	10.053
Description: Continually funded effort. This funding allocation will start new and continue Transformational Technology Developments. 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: Command and Control capabilities, satellite communication, assured communication, and information processing. 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.			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603788F / <i>Battlespace Knowledge Development and Demonstration</i>	Project (Number/Name) 635321 / <i>C4I Battlespace Dev and Demo</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2020	FY 2021	FY 2022
<p><i>FY 2021 Plans:</i> Select Transformational Technology Development efforts that support the National Defense Strategy and Department of Air Force priorities.</p> <p><i>FY 2022 Plans:</i> Fund the follow-on efforts for projects started in FY 2021. Select Transformational Technology Development efforts that support the National Defense Strategy and Department of the Air Force priorities.</p> <p><i>FY 2021 to FY 2022 Increase/Decrease Statement:</i> FY 2022 increased compared to FY 2021 by 10.053 million. Funding is increased due increased emphasis in transformational activities.</p>			
<p><i>Title:</i> Multi-Domain Command and Control</p> <p><i>Description:</i> Perform research and development (R&D) that will advance existing, or discover new, command and control capabilities to support multi-domain operations (MDO) for air, space, cyberspace, land, sea, and undersea.</p> <p><i>FY 2021 Plans:</i> Continue to execute experiments, based on operational scenarios, which incorporate process management execution into the extensible Space command and control framework, and which integrate disparate data and applications, providing a pedigree for proposed tasking options to decision makers. Continue to develop software capabilities that employ cyber, directed energy, and electronic warfare weaponry. Continue to provide on-the-fly valuable quantitative evaluations of cyber assets to cyber operators, enabling them to present viable cyber options to commanders in multi-domain settings. Develop tools, technology, and framework for execution management of operational center process workflows and applications.</p> <p><i>FY 2022 Plans:</i> Continue demonstration of communication, information management, and replication capabilities for intra base distribution of one C2 operational echelon function. Continue to execute experiments, based on operational scenarios, which incorporate process management execution into the extensible Space command and control framework, and which integrate disparate data and applications, providing a pedigree for proposed tasking options to decision makers. Continue to develop software capabilities that employ cyber, directed energy, and electronic warfare weaponry. Continue to provide on-the-fly valuable quantitative evaluations of cyber assets to cyber operators, enabling them to present viable cyber options to commanders in multi-domain settings. Continue development of tools, technology, and framework for execution management of operational center process workflows and applications.</p> <p><i>FY 2021 to FY 2022 Increase/Decrease Statement:</i></p>	7.635	6.919	6.975

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021		
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603788F / <i>Battlespace Knowledge Development and Demonstration</i>	Project (Number/Name) 635321 / <i>C4I Battlespace Dev and Demo</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2020	FY 2021	FY 2022
FY 2022 increased compared to FY 2021 by \$.056 million. Justification for increase is described in the plans above.				
<p>Title: Nuclear C3 Modernization</p> <p>Description: Develop and demonstrate the advancement of existing nuclear capable forces to ensure command, control, and connectivity for the President without constraints.</p> <p>FY 2021 Plans: Continue to perform real-time monitoring of ionospheric conditions over the Continental United States (CONUS). Continue testing of very-low-frequency (VLF) stub antenna for reachback. Continue testing of prototype compact high-frequency (HF) antennas. Enhance communication link availability prediction for better Command, Control, and Communications (C3) planning and simulation. Develop visualization tool for providing common operation picture (COP) to commanders and Nuclear C3 (NC3) operators.</p> <p>FY 2022 Plans: Starting in FY 2022, this work will be performed in PE 0603788F, Battlespace Knowledge, Development, and Demonstration, Project 635321, C4I Battlespace Dev and Demo, Assured Communications & Networks effort.</p> <p>FY 2021 to FY 2022 Increase/Decrease Statement: FY 2022 decreased compared to FY 2021 by \$3.308 million. Starting in FY 2022, this work will be performed in PE 0603788F, Battlespace Knowledge, Development, and Demonstration, Project 635321, C4I Battlespace Dev and Demo, Assured Communications & Networks effort.</p>		4.357	3.308	0.000
<p>Title: Artificial Intelligence/Autonomy/Machine Learning</p> <p>Description: Develop and demonstrate to harness the speed and scale of computers and machines to address problems of complexity.</p> <p>FY 2021 Plans: Continue to operationalize and implement state of the art learning models. Continue to integrate within the StreamlinedML framework. Continue development of model recommendation & user workflow capabilities.</p> <p>FY 2022 Plans: Continue development of robust artificial intelligence/machine learning (AI/ML) for targeted transition capabilities. Continue to operationalize and implement state of the art learning models. Continue to integrate within the StreamlinedML framework. Continue development of secure diode for cross-domain embedded solution.</p> <p>FY 2021 to FY 2022 Increase/Decrease Statement:</p>		4.802	2.597	3.274

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021		
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603788F / <i>Battlespace Knowledge Development and Demonstration</i>	Project (Number/Name) 635321 / <i>C4I Battlespace Dev and Demo</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2020	FY 2021	FY 2022
FY 2022 increased compared to FY 2021 by \$.677 million. Justification for increase is described in the plans above.				
<p>Title: Data to Decisions</p> <p>Description: Develop and demonstrate the collection, management, analysis, and exploitation of complex data for availability to Air Force and other stakeholders.</p> <p>FY 2021 Plans: Continue to refine and test technologies for ultra-wideband electronics intelligence signal detection and prosecution. Continue development and demonstration of intelligence analysis capabilities from multiple intelligence sources for both near-real time and post mission. Continue research and development in data analytics and strategic indications and warnings. Continue to perform service-based capability development. Complete work for object based production optimized processing and automated-association capability.</p> <p>FY 2022 Plans: Continue development and demonstration of intelligence analysis capabilities from multiple intelligence sources for both near-real time and post mission. Continue research and development in data analytics and strategic indications and warnings. Continue to perform service-based capability development. Conduct a demonstration of additional government fusion techniques applied to combined commercial/commodity hardware and existing military hardware within a trusted wrapper. Conduct an integrated demonstration of data flow into intelligence production environment. Continue to advance the prototype to deliver multi-INT exploitation on-board and in real-time.</p> <p>FY 2021 to FY 2022 Increase/Decrease Statement: FY 2022 decreased compared to FY 2021 by \$0.734 million. Funding decrease is described in plans above and moving to transformational future force capabilities.</p>		6.579	4.543	3.809
<p>Title: Game Changing Computing Power</p> <p>Description: Develop and demonstrate computer architectures with greater capacity and sophistication to enable game-changing computing power to the warfighter anywhere, anytime.</p> <p>FY 2021 Plans: Continue work to improve software specifications using evolutionary approaches to optimize computer processing. Continue work in the areas of nanotechnology for autonomous systems. Continue work in the area of neuromorphic intelligent computing systems.</p> <p>FY 2022 Plans:</p>		0.000	3.449	3.099

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021		
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603788F / <i>Battlespace Knowledge Development and Demonstration</i>	Project (Number/Name) 635321 / <i>C4I Battlespace Dev and Demo</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2020	FY 2021	FY 2022
Demonstrating secure, on-board, simultaneous processing of multi-INT data to correlate and identify surface targets. FY 2021 to FY 2022 Increase/Decrease Statement: FY 2022 decreased compared to FY 2021 by \$0.350 million. Funding decrease is described in plans above and moving to transformational future force capabilities.				
Title: Assured Communications & Networks Description: Develop and demonstrate secure and reliable communications to ensure the delivery of timely, reliable, and actionable information to warfighters and systems. FY 2021 Plans: Continue development and demonstration for rapid waveform development of multi-mission software defined radio frequency capability. Continue wideband high frequency waveform development and testing. Continue ionospheric research, propagation modeling and simulation. Continue beacon data collection on both the V and W frequency bands along with waveform development and simulation. Continue development of test platform for Common Very Low Frequency Receiver Increment Two. FY 2022 Plans: Continue development and demonstration for rapid waveform development of multi-mission software defined radio frequency capability. Continue wideband high frequency waveform development and testing. Continue ionospheric research, propagation modeling and simulation. Continue beacon data collection on both the V and W frequency bands along with waveform development and simulation. Develop robust mesh networking capability with both Line-of-Sight and Beyond Line-of-Sight communication links. Continue to add SATCOM links to multi-spectral capability. Continue to demonstrate a protected, single security domain commercial off-the-shelf (COTS) device hosting user and asset tracking, machine learning architecture provisioning and innovative aerial port (AMC) solutions for mobile situational awareness (SA) and decision making. Continue to enhance communication link availability prediction for better Command, Control, and Communications (C3) planning and simulation. FY 2021 to FY 2022 Increase/Decrease Statement: FY 2022 increased compared to FY 2021 by \$0.697 million. Justification for increase is described in the plans above.		9.552	8.270	8.967
Accomplishments/Planned Programs Subtotals		32.925	29.086	36.177
		FY 2020	FY 2021	
Congressional Add: Program Increase- Assured Communication and Networks		0.000	0.000	

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force	Date: May 2021
---	-----------------------

Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603788F / <i>Battlespace Knowledge Development and Demonstration</i>	Project (Number/Name) 635321 / <i>C4I Battlespace Dev and Demo</i>
--	--	--

	FY 2020	FY 2021
FY 2020 Accomplishments: Not applicable.		
FY 2021 Plans: Conduct congressionally directed effort.		
Congressional Add: Program Increase- Command and Control Capability Development	0.000	0.000
FY 2020 Accomplishments: Not applicable.		
FY 2021 Plans: Conduct congressionally directed effort.		
Congressional Adds Subtotals	0.000	0.000

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

N/A

Remarks

D. Acquisition Strategy

N/A

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force										Date: May 2021		
Appropriation/Budget Activity 3600 / 3					R-1 Program Element (Number/Name) PE 0603788F / <i>Battlespace Knowledge Development and Demonstration</i>				Project (Number/Name) 635329 / <i>Cyber Battlespace Dev & Demo</i>			
COST (\$ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
635329: <i>Cyber Battlespace Dev & Demo</i>	-	20.111	34.020	20.595	0.000	20.595	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

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.

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 2020	FY 2021	FY 2022
Title: Transformational Technology Development	-	0.000	4.064
Description: Continually funded effort. This funding allocation will start new and continue Transformational Technology Developments. 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: offensive and defensive cyber warfare capabilities, and cyber system and network resiliency. 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.			

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021		
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603788F / <i>Battlespace Knowledge Development and Demonstration</i>	Project (Number/Name) 635329 / <i>Cyber Battlespace Dev & Demo</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2020	FY 2021	FY 2022
<p>FY 2021 Plans: Select Transformational Technology Development efforts in FY 2021 that support the National Defense Strategy and Department of Air Force priorities.</p> <p>FY 2022 Plans: Fund the follow-on efforts for projects started in FY 2021. Select Transformational Technology Development efforts that support the National Defense Strategy and Department of the Air Force priorities.</p> <p>FY 2021 to FY 2022 Increase/Decrease Statement: FY 2022 increased compared to FY21 by 4.064 million. Funding is increased due increased emphasis in transformational activities.</p>				
<p>Title: Cyber Defense Technologies</p> <p>Description: Develop and demonstrate defensive cyber operations capabilities in a series of experimental technology demonstrations.</p> <p>FY 2021 Plans: Not applicable.</p> <p>FY 2022 Plans: Continue development of software capabilities and concept of operations for active guidance and automated processes addressing cyber defense. 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. Continue development and integration of 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. Continue development and demonstration of Air, Space, Cyber tasking order interoperability and ingestion by IKE Cyber system. Demonstrate additional government fusion techniques applied to combined commercial/commodity hardware and existing military hardware within a trusted wrapper. Demonstrate data flow into the intelligence production environment.</p> <p>FY 2021 to FY 2022 Increase/Decrease Statement: FY 2022 increased compared to FY 2021 by \$7.416 million. Funding increased due to increased emphasis in Cyber Defense Technologies effort and \$4.064 million moving to transformational future force capabilities.</p>		-	0.000	7.416
<p>Title: Cyber Offense Technologies</p>		-	0.000	9.115

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021		
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603788F / <i>Battlespace Knowledge Development and Demonstration</i>	Project (Number/Name) 635329 / <i>Cyber Battlespace Dev & Demo</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2020	FY 2021	FY 2022
<p>Description: Develop and demonstrate offensive cyber operations capabilities in a series of experimental technology demonstrations.</p> <p>FY 2021 Plans: Not applicable.</p> <p>FY 2022 Plans: Continue the development of a counter small unmanned aerial system open architecture specification to enable interoperability between disparate protection systems. Develop a base-threat awareness toolkit. Develop a framework for quickly adapting new features to allow for increased efficiency in updating cyber offense capabilities. Continue development of 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 the development of a capability to enable the warfighter access into congested environments as directed by warfighter requirements. Continue development of cellular testbed with 5G and Internet of Things representative technologies. Demonstrate an initial SIGINT hardware prototype.</p> <p>FY 2021 to FY 2022 Increase/Decrease Statement: FY 2022 increased compared to FY 2021 by \$9.115 million. Starting in FY 2022, this work will be performed within this PE, under Project 635329, Cyber Battlespace Dev & Demo, in the Cyber Offense Technologies effort.</p>				
<p>Title: Resiliency</p> <p>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 itself to resist new attacks.</p> <p>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 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 2022 Plans:</p>		7.339	7.485	0.000

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021		
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603788F / <i>Battlespace Knowledge Development and Demonstration</i>	Project (Number/Name) 635329 / <i>Cyber Battlespace Dev & Demo</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2020	FY 2021	FY 2022
Starting in FY 2022, this work will be performed within this PE, under Project 635329, Cyber Battlespace Dev & Demo, in the Cyber Defense Technologies effort.				
FY 2021 to FY 2022 Increase/Decrease Statement: FY 2022 decreased compared to FY 2021 by \$7.485 million. Starting in FY 2022, this work will be performed within this PE, under Project 625329, Cyber Battlespace Dev & Demo, in the Cyber Defense Technologies effort.				
Title: Game Changing Computing Power		4.962	0.000	0.000
Description: Develop and demonstrate computer architectures with greater capacity and sophistication to enable game-changing computing power to the warfighter anywhere, anytime.				
FY 2021 Plans: In FY 2021, the cyber component of this work is completed and the non-cyber component of this work is performed under the Game Changing Computing Power effort in PE 0603788F, Battlespace Knowledge Development and Demonstration, Project 635321, C4I Battlespace Dev and Demo.				
FY 2022 Plans: Not Applicable				
FY 2021 to FY 2022 Increase/Decrease Statement: Not Applicable				
Title: Autonomous, Multi-level Access and Transfer		1.422	1.042	0.000
Description: Develop autonomous, secure information access and sharing capabilities required by the Air Force net-centric information enterprise.				
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.				
FY 2022 Plans: Starting in FY 2022, this work will be performed within this PE, under Project 635329, Cyber Battlespace Dev & Demo, in the Cyber Defense Technologies effort.				
FY 2021 to FY 2022 Increase/Decrease Statement:				

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021		
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603788F / <i>Battlespace Knowledge Development and Demonstration</i>	Project (Number/Name) 635329 / <i>Cyber Battlespace Dev & Demo</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2020	FY 2021	FY 2022
FY 2022 decreased compared to FY 2021 by \$1.042 million. Starting in FY 2022, this work will be performed within this PE, under Project 625329, Cyber Battlespace Dev & Demo, in the Cyber Defense Technologies effort.				
Title: Cyber Power Projection		6.388	10.493	0.000
Description: Develop and demonstrate offensive cyber capabilities in contested environments through a series of experiments and exercises.				
FY 2021 Plans: 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.				
FY 2022 Plans: Starting in FY 2022, this work will be performed within this PE, under Project 635329, Cyber Battlespace Dev & Demo, in the Cyber Offense Technologies effort.				
FY 2021 to FY 2022 Increase/Decrease Statement: FY 2022 decreased compared to FY 2021 by \$10.493 million. Starting in FY 2022, this work will be performed within this PE, under Project 625329, Cyber Battlespace Dev & Demo, in the Cyber Offense Technologies effort.				
Accomplishments/Planned Programs Subtotals		20.111	19.020	20.595
		FY 2020	FY 2021	
Congressional Add: Program Increase- assured communication and networks		0.000	10.000	
FY 2020 Accomplishments: Not applicable.				
FY 2021 Plans: Conduct congressionally directed efforts. To be executed from Project 635321, C4I Battlespace Dev and Demo.				
Congressional Add: Program Increase- command and control capability development		0.000	5.000	

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021	
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603788F / <i>Battlespace Knowledge Development and Demonstration</i>	Project (Number/Name) 635329 / <i>Cyber Battlespace Dev & Demo</i>	
		FY 2020	FY 2021
FY 2020 Accomplishments: Not applicable.			
FY 2021 Plans: Conduct congressionally directed efforts. To be executed from Project 635321, C4I Battlespace Dev and Demo.			
Congressional Adds Subtotals		0.000	15.000
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
D. Acquisition Strategy			
N/A			