Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force	Date: March 2024
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603788F / *Battlespace Knowledge Development and Demonstration*

COST ($ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	-	50.138	37.779	26.172	0.000	26.172	31.468	36.409	37.745	38.535	Continuing	Continuing
635321: *C4I Battlespace Dev and Demo*	-	32.633	24.682	16.925	0.000	16.925	18.544	21.015	21.786	22.242	Continuing	Continuing
635329: *Cyber Battlespace Dev & Demo*	-	17.505	13.097	9.247	0.000	9.247	12.924	15.394	15.959	16.293	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program develops and demonstrates Air Force enterprise-centric information technologies for the warfighter. The C4I Battlespace Dev and Demo project provides technology enabling the Air Force (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). The Cyber Battlespace Dev & Demo 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 (a) a science and engineering capability demonstrating new models of computation; (b) novel approaches for high performance, interactive, net-centric, distributed and embedded computing systems; and (c) 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. 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.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver science and technology capabilities. The use of program funds in this PE would be in addition to the civilian pay expenses budgeted in program elements 0601102F, 0602020F, 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602602F, 0602605F, 0602788F, 1206601SF, and 0602298F

Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force	Date: March 2024
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603788F / *Battlespace Knowledge Development and Demonstration*

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 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Previous President's Budget	55.919	37.779	39.528	0.000	39.528
Current President's Budget	50.138	37.779	26.172	0.000	26.172
Total Adjustments	-5.781	0.000	-13.356	0.000	-13.356
• 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	-2.090	0.000			
• SBIR/STTR Transfer	-2.136	0.000			
• Other Adjustments	-1.555	0.000	-13.356	0.000	-13.356

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2023	FY 2024
Project: 635321: *C4I Battlespace Dev and Demo*		
Congressional Add: *Program Increase - Assured Communication and Networks*	9.707	-
Congressional Add: *Program Increase - Non-PKI Based Advanced Encryption Modalities*	6.795	-
Congressional Add Subtotals for Project: 635321	16.502	-
Congressional Add Totals for all Projects	16.502	-

Change Summary Explanation

Decrease in FY 2025 funding is due to re-prioritization to meet the nation's future security needs.

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force			Date: March 2024
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603788F / *Battlespace Knowledge Development and Demonstration*	Project (Number/Name) 635321 / *C4I Battlespace Dev and Demo*	

COST ($ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
635321: *C4I Battlespace Dev and Demo*	-	32.633	24.682	16.925	0.000	16.925	18.544	21.015	21.786	22.242	Continuing	Continuing
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).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Title: Multi-Domain Command and Control	7.298	10.118	4.780
Description: Perform research and development that will advance existing, or discover new, command and control capabilities to support multi-domain operations for air, space, cyberspace, land, sea, and undersea.			
FY 2024 Plans: Continue demonstration of communication, information management, and replication capabilities for intra base distribution of one Command and Control operational echelon function. Continue executing 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 development of tools, technology, and framework for execution management of operational center process workflows and applications. Initiate demonstration of a fused installation security architecture- air, ground, and cyber, multi-mission Unmanned Air System "wingmen" for installation security capabilities. Initiate development and demonstration of distributed operational-echelon Command and Control deployable kits for rapid distribution and dispersion of Air Operations Center functions theater-wide.			
FY 2025 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603788F / *Battlespace Knowledge Development and Demonstration*	**Project (Number/Name)** 635321 / *C4I Battlespace Dev and Demo*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
- Initiate advanced development and demonstration of a triple component system to support both single Joint Air-to-Surface Standoff Missile (JASSM) and multi-JASSM planning from airborne platforms. - Initiate advanced development and demonstration of an an Artificial Intelligence (AI)-enhanced planning capability and battle management architecture at a relevant AF exercise with operationally relevant data to support a common operational picture for selection, tracking, and deployment of AI capabilities in-mission. - Complete demonstration of communication, information management, and replication capabilities for intra-base distribution of Command and Control (C2) operational echelon kits for rapid distribution and dispersion of Air Operations Center functions theater-wide. - Complete execution of 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. - Complete development of tools, technology, and a framework for execution management of operational center process workflows and applications. - Complete demonstration of a fused installation security architecture- air, ground, and cyber, multi-mission Unmanned Air System (UAS) "wingmen" for installation security capabilities. - Complete development of robust artificial intelligence/machine learning for targeted transition capabilities. - Complete development and implementation of state of the art learning models. - Complete integration within the StreamlinedML framework. - Complete implementation and testing of neuromorphic based algorithms for processing and exploitation of multiple data feeds. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** FY 2025 funding decreased compared to FY 2024 by $5.338 million due to re-prioritization to meet the nation's future security needs. This thrust has also decreased emphasis in the area of installation security architecture and Unmanned Air System asset management for assured base operations, and in the area of communication and information management for distributed air operations centers (AOCs). Research efforts from the Artificial Intelligence/Autonomy/Machine Learning thrust within the overarching project are being moved to this thrust.			
Title: Artificial Intelligence/Autonomy/Machine Learning ***Description:*** Develop and demonstrate the ability to harness the speed and scale of computers and machines to address problems of complexity. ***FY 2024 Plans:*** Continue development of robust artificial intelligence/machine learning for targeted transition capabilities. Continue development operationalizing and implement state of the art learning models. Continue to integrate within the StreamlinedML framework.	1.527	2.774	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603788F / *Battlespace Knowledge Development and Demonstration*	**Project (Number/Name)** 635321 / *C4I Battlespace Dev and Demo*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Complete development of secure diode for cross-domain embedded solution. Continue implementing and testing neuromorphic-based algorithms for processing and exploitation of multiple data feeds. ***FY 2025 Plans:*** - In FY 2025, this research is continued in the Multi-Domain Command and Control thrust. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** FY 2025 funding decreased compared to FY 2024 by $2.774 million due to research efforts in this thrust being moved to the Multi-Domain Command and Control thrust.			
Title: Data to Decisions ***Description:*** Develop and demonstrate the collection, management, analysis, and exploitation of complex data for availability to Air Force and other stakeholders. ***FY 2024 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 for the air and space domains. Continue performing service-based capability development. Complete efforts advancing systems to deliver multi-INT exploitation on-board and in real-time. Continue software development for automatic detection, characterization, and classification of relative maneuver behaviors between multiple resident space objects. ***FY 2025 Plans:*** - Initiate integration of targeting and communications technologies for rapid dynamic targeting of high-mobility enemy threat systems, focusing on interoperability between technologies. - Complete development and demonstration of intelligence analysis capabilities from multiple intelligence sources for both near-real time and post mission. - Complete research and development in data analytics and strategic indications and warnings for the air and space domains. - Complete performing service-based capability development. - Complete software development for automatic detection, characterization, and classification of relative maneuver behaviors between multiple resident space objects. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** FY 2025 funding increased compared to FY 2024 by $0.986 million due to re-prioritization to meet the nation's future security needs. Justification for the increase is described in the plans above.	1.267	2.444	3.430
Title: Game Changing Computing Power	1.551	2.805	1.833

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603788F / *Battlespace Knowledge Development and Demonstration*	**Project (Number/Name)** 635321 / *C4I Battlespace Dev and Demo*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Description: Develop and demonstrate computer architectures with greater capacity and sophistication to enable game-changing computing power to the warfighter anywhere, anytime. ***FY 2024 Plans:*** Continue demonstrating secure, on-board, simultaneous processing of multi-INT data to correlate and identify surface targets. Complete integration and testing to utilize pod for additional data sources. Continue development of artificial intelligence/machine learning for data sources with correlation and automated alert to enable human-machine tip and cue on surrogate platform. ***FY 2025 Plans:*** - Complete demonstration of secure, on-board, simultaneous processing of multi-INT data to correlate and identify surface targets. - Complete development of artificial intelligence/machine learning for data sources with correlation and automated alerts to enable human-machine tip and cue on surrogate platform. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** FY 2025 funding decreased compared to FY 2024 by $0.972 million due to re-prioritization to meet the nation's future security needs. Justification for the decrease is described in the plans above.			
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 2024 Plans:*** Continue development and demonstration for rapid waveform development of multi-mission software defined radio frequency capability. Continue development of wideband high frequency waveform development and testing. Continue development of enhancing communication link availability prediction for better Command, Control, and Communications planning and simulation. Continue demonstrating a protected, single security domain commercial off-the-shelf device hosting user and asset tracking. ***FY 2025 Plans:*** - Initiate the development of a low SWaP rapidly deployable information management system and development of a capability to support data compression, mission prioritization, & intelligent caching over high and low-capacity data links. - Complete development and demonstration for rapid waveform development of multi-mission software defined radio frequency capability. - Complete development of wideband high frequency waveform development and testing. - Complete development of enhancing communication link availability prediction for better Command, Control, and Communications planning and simulation.	4.488	6.541	6.882

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603788F / *Battlespace Knowledge Development and Demonstration*	**Project (Number/Name)** 635321 / *C4I Battlespace Dev and Demo*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
- Complete demonstration of a protected, single security domain commercial off-the-shelf device hosting user and asset tracking. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** FY 2025 funding increased compared to FY 2024 by $0.341 million due to re-prioritization to meet the nation's future security needs. Justification for the increase is described in the plans above.			
Accomplishments/Planned Programs Subtotals	16.131	24.682	16.925

	FY 2023	FY 2024
Congressional Add: Program Increase - Assured Communication and Networks ***FY 2023 Accomplishments:*** Conduct Congressionally directed effort.	9.707	-
Congressional Add: Program Increase - Non-PKI Based Advanced Encryption Modalities ***FY 2023 Accomplishments:*** Conduct Congressionally directed efforts.	6.795	-
Congressional Adds Subtotals	16.502	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force			Date: March 2024
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603788F / *Battlespace Knowledge Development and Demonstration*	Project (Number/Name) 635329 / *Cyber Battlespace Dev & Demo*	

COST ($ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
635329: *Cyber Battlespace Dev & Demo*	-	17.505	13.097	9.247	0.000	9.247	12.924	15.394	15.959	16.293	Continuing	Continuing
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.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Title: Cyber Defense Technologies	3.789	3.219	0.000
Description: Develop and demonstrate defensive cyber operations capabilities in a series of experimental technology demonstrations. Starting in FY 2025, this research is continued in the Cyber Offensive and Defensive Technologies thrust.			
FY 2024 Plans: Continue development of software capabilities and concept of operations for active guidance and automated processes addressing cyber defense. Continue demonstration of 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. Continue development, demonstration, and integration of the Project IKE Cyber system (an end-to-end military system and cyber mission execution framework). Initiate research into dynamic management tailored towards unmanned aerial systems.			
FY 2025 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603788F / *Battlespace Knowledge Development and Demonstration*	**Project (Number/Name)** 635329 / *Cyber Battlespace Dev & Demo*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
- In FY 2025, this research is continued in the Cyber Offensive and Defensive Technologies thrust. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** FY 2025 funding decreased compared to FY 2024 by $3.219 million due to research being moved from the Cyber Defense Technologies thrust to the Cyber Offensive and Defensive Technologies thrust.			
Title: Cyber Offense Technologies ***Description:*** Develop and demonstrate offensive cyber operations capabilities in a series of experimental technology demonstrations. Starting in FY 2025, this research is continued in the Cyber Offensive and Defensive Technologies thrust. ***FY 2024 Plans:*** Continue the advancement of research towards development of non-kinetic cyber effects against high-impact, critical targets within Areas of Responsibility or Areas of Interest to enable stand-off power projection options that enable cyber-only and coordinated cyber-kinetic target prosecution. Continue development in signal identification capabilities in adverse environments addressing advanced communications signals and networks. Continue investments for the development of a counter small unmanned aerial system open architecture specification to enable interoperability between disparate protection systems. Continue development of a base-threat awareness toolkit. Continue development of processor-agnostic sub-system for golden-image storage, verification, and re-flashing. Continue investments to integrate and transition multiple Air Force Research Laboratory and Air Force Lifecycle Management Center counter small unmanned aerial system capabilities. Decrease investments for the development of a capability to enable the warfighter access into congested environments as directed by warfighter requirements. Continue investments for the development of cellular testbed with 5G and Internet of Things representative technologies. Complete demonstration of an initial SIGINT hardware prototype. ***FY 2025 Plans:*** - In FY 2025, this research is continued in the Cyber Offensive and Defensive Technologies thrust. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** FY 2025 funding decreased compared to FY 2024 by $9.878 million due to research being moved from the Cyber Offense Technologies thrust to the Cyber Offensive and Defensive Technologies thrust.	13.716	9.878	0.000
Title: Cyber Offensive and Defensive Technologies ***Description:*** Develop and demonstrate cyber warfighting, assurance, and electromagnetic (EM) convergence capabilities in a series of experiments in operationally relevant environments.	0.000	0.000	9.247

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603788F / *Battlespace Knowledge Development and Demonstration*	**Project (Number/Name)** 635329 / *Cyber Battlespace Dev & Demo*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
For FY 2024 and prior years, these activities were performed in the Cyber Defense Technologies and Cyber Offense Technologies thrust. ***FY 2024 Plans:*** Not applicable ***FY 2025 Plans:*** - Initiate development of 5G cyber operations tool suite for integration into DAF cyber operations platforms. - Initiate development of 5G exploitation tools for Intelligence, Surveillance, and Reconnaissance (ISR) and for Offensive Cyber Operations (OCO) capabilities. - Continue the development of a counter small unmanned aerial system open architecture specification to enable interoperability between disparate protection systems. - Continue integration and transition of multiple Air Force Research Laboratory and Air Force Lifecycle Management Center counter small unmanned aerial system capabilities. - Complete development of software capabilities and concept of operations for active guidance and automated processes addressing cyber defense. - Complete the demonstration of automated cyber survivability using integrated cyber technologies within the operational system laboratory in the context of risk management framework requirements. - Complete development of an advanced secure processor hardware capability. - Complete development, demonstration, and integration of the Project IKE Cyber system (an end-to-end military system and cyber mission execution framework). - Complete research into dynamic management tailored towards unmanned aerial systems. - Complete the advancement of research towards development of non-kinetic cyber effects against high-impact, critical targets within Areas of Responsibility or Areas of Interest to enable stand-off power projection options that enable cyber-only and coordinated cyber-kinetic target prosecution. - Complete development of signal identification capabilities in adverse environments addressing advanced communications signals and networks. - Complete development of a base-threat awareness toolkit. - Complete development of a processor-agnostic sub-system for golden-image storage, verification, and re-flashing. - Complete the development of a capability to enable the warfighter access into congested environments as directed by warfighter requirements. - Complete investments for the development of a cellular testbed with 5G and Internet of Things representative technologies. ***FY 2024 to FY 2025 Increase/Decrease Statement:***			

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603788F / *Battlespace Knowledge Development and Demonstration*	**Project (Number/Name)** 635329 / *Cyber Battlespace Dev & Demo*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
FY 2025 funding increased compared to FY 2024 by $9.247 million due to consolidation of the Cyber Defense Technologies and the Cyber Offense Technologies thrusts into a single Cyber Offensive and Defensive Technologies thrust.			
Accomplishments/Planned Programs Subtotals	17.505	13.097	9.247

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable