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 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602788F / *Dominant Information Sciences and Methods*

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	-	258.606	182.076	176.333	0.000	176.333	176.607	184.546	201.492	205.485	Continuing	Continuing
625315: *C4I Dominance Technology*	-	178.679	89.429	87.270	0.000	87.270	85.683	92.773	100.445	102.451	Continuing	Continuing
625319: *Cyberspace Dominance Technology*	-	56.570	65.335	62.674	0.000	62.674	63.997	65.304	71.593	73.006	Continuing	Continuing
62OMMS: *Research Site Support*	-	23.357	27.312	26.389	0.000	26.389	26.927	26.469	29.454	30.028	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program develops enterprise-centric information technology for the Department of the Air Force. Advances in enterprise-centric information technologies are required to increase warfighter readiness and effectiveness by providing the right information, at the right time, in the right format, anytime, anywhere in the world. The C4I Dominance Technology project provides the technologies for (a) secure, self-configuring, self-healing, seamless networks; (b) timely delivery of information to tactical assets; (c) scaling, robustness, and collaboration features required of the Department of the Air Force net-centric information management environment; and (d) real-time effective portrayal of complex data sets. This project also provides a network-centric, collaborative intelligence analysis capability that enables the fusion of multi-intelligence and sensor sources to provide timely situational awareness, understanding, and anticipation of the threats in the battlespace; and the advanced, novel exploitation technologies needed to intercept, collect, locate, and process both covert and overt raw data from intelligence and sensor sources. The Cyberspace Dominance Technology project provides technologies to deliver a full range of options in cyberspace on par with air and space dominance in each of the areas of cyber-attack, cyber defense, and cyber support to achieve the strategic capability of cyber dominance. This project also provides technology that ensures Department of Air Force ability to (a) access, maintain presence on, and deliver effects to adversary systems; (b) detect, defend, and respond to attacks on friendly computer systems and provide forensic analysis concerning those attack attempts; (c) bring game-changing computing power to the warfighter and disruptive computing power at the tactical edge and for federated grid services; and (d) provide cyber situational awareness to Department of the Air Force Commanders. The Research Site Support project provides the Rome Research Site infrastructure at Rome, New York and provides for the continued operations of all Rome Research Site properties, buildings, and services necessary for the research mission. Efforts in this program have been coordinated through the Department of Defense (DoD) Science and Technology (S&T) Executive Committee process to harmonize efforts and eliminate duplication.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver science 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, 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602602F, 0602605F, 0603788F, and 0602298F.

Funds in this program element may be used to investigate specified technology advancements in air, space and/or cyber domains.

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 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602788F / *Dominant Information Sciences and Methods*

This program is in Budget Activity 2, Applied Research because this budget activity includes studies, investigations, and non-system specific technology efforts directed toward general military needs with a view toward developing and evaluating the feasibility and practicality of proposed solutions and determining their parameters.

B. Program Change Summary ($ in Millions)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Previous President's Budget	271.005	182.076	175.548	0.000	175.548
Current President's Budget	258.606	182.076	176.333	0.000	176.333
Total Adjustments	-12.399	0.000	0.785	0.000	0.785
• 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	-5.757	0.000			
• Other Adjustments	-6.642	0.000	0.785	0.000	0.785

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2023	FY 2024
Project: 625315: *C4I Dominance Technology*		
Congressional Add: *Program Increase - Quantum Network Testbed*	9.787	-
Congressional Add: *Internet of Things Innovation Ecosystem*	4.893	-
Congressional Add: *University-based Quantum Materials Applied Research*	29.363	-
Congressional Add: *Program Increase - Secure Quantum Computing Facility*	19.575	-
Congressional Add: *Program Increase - Trapped Ion Quantum Computer*	29.363	-
Congressional Add: *Traffic management operational readiness*	9.787	-
Congressional Add Subtotals for Project: 625315	102.768	-
Congressional Add Totals for all Projects	102.768	-

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 / 2	R-1 Program Element (Number/Name) PE 0602788F / *Dominant Information Sciences and Methods*	Project (Number/Name) 625315 / *C4I Dominance Technology*	

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
625315: *C4I Dominance Technology*	-	178.679	89.429	87.270	0.000	87.270	85.683	92.773	100.445	102.451	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Department of the Air Force requires advanced technologies which support the Department of the Air Force core missions and enable the Department of the Air Force to achieve Global Vigilance, Global Reach, and Global Power in support of national security objectives. The technologies developed under this project enable the National Defense Strategy and Department of the Air Force future operating concepts which require operational agility (the ability to rapidly generate—and shift among—multiple solutions for a given challenge), creating combinations of air, space, and cyberspace capabilities to achieve desired effects in the battlespace.

This project provides the technologies for secure, self-configuring, self-healing, seamless networks; advanced communications processors; anti-jam and low probability of intercept communications techniques; agile and dynamic policy-based network management capabilities; and modular, programmable, low-cost software radios. In addition, it develops both the technology base for ultra-wide bandwidth and multi-channeled communications networks (both air and space based) on and between platforms.

This project provides the technologies which enable the ability to globally share, discover, and access information across organizational, functional, and coalition boundaries and between and among domains, the timely delivery of information to tactical assets, the tailoring and prioritization of information based on mission needs and importance, and the scaling, robustness, and collaboration features required of the Department of the Air Force net-centric information management environment.

This project advances technologies enabling the effective execution of military objectives that will vastly improve the ability to support the commander and staff's ability to command all viable options to achieve desired effects across the full spectrum of operations (air, space, and cyberspace) at all levels of war (strategic, operational, and tactical) and during all phases of conflict. This project provides technologies for anticipatory decision support; course of action development, planning, scheduling, and assessment; and the real-time effective portrayal of complex data sets.

This project improves and automates the capability to generate, process, manage, fuse, exploit, interpret, and disseminate timely and accurate information. This project provides not only a network-centric, collaborative intelligence analysis capability that enables the fusion of multi-intelligence and sensor sources to provide timely situational awareness, understanding, and anticipation of the threats in the battlespace, but also the advanced, novel exploitation technologies needed to intercept, collect, locate, and process both covert and overt raw data from intelligence and sensor sources.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Title: Assured Communications & Networks	17.861	17.355	22.920
Description: Develop communications, networking, and signal processing technologies with improved survivability and capacity to provide secure, adaptive, covert, anti-jam, and assured global battlespace connectivity tailored to anti-access and area-denial			

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602788F / *Dominant Information Sciences and Methods*	**Project (Number/Name)** 625315 / *C4I Dominance Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025

environments and contested operations. Includes the research and development to advance existing nuclear capable forces to ensure command, control, and connectivity for the President without constraints.

FY 2024 Plans:

Continue the research and development of technologies for robust, adaptive, and mission aware airborne networks. Continue the research and development of large-scale hardware-in-the-loop verification of developed directional networking protocols. Continue the research and development of propagation models. Decrease the development of a network stack suitable for high-bandwidth terahertz links. Continue the development, verification, and validation of advanced, airborne high-frequency antenna/ionospheric structure. Continue the development of an airborne mesh networking capability that utilizes adaptive and responsive antennas for a dynamic and reliable high capacity mesh network suitable for communications in contested environments. Continue the development, verification, and test of advanced waveforms. Continue the development, verification, and test of software-defined radio prototypes. Continue development of enhanced assurance and filtration offloading. Continue to develop, verify, and validate software-defined radio prototypes. Continue to develop capabilities that incorporate communications network connectivity into information extraction tools. Initiate implementation and simulation against several adversarial interference conditions, and initiate developing and testing the operationally-relevant scenario.

FY 2025 Plans:

- Initiate research and development on control technology for modular analog antenna arrays and begin developing tracking algorithms and software interfaces for use with these arrays.
- Initiate research and development of a wireless communications system operating at frequencies above 100 GHz (terahertz band) with low probability of detection and anti-jam properties, for communications in contested environments.
- Initiate development on Artificial Intelligence/Machine Learning (AI/ML)-based tactical communications waveforms and an emulation environment to test the performance of developed waveforms.
- Continue implementation and simulation against several adversarial interference conditions for operationally-relevant scenarios.
- Complete the research and development of technologies for robust, adaptive, and mission-aware airborne networks.
- Complete the research and development of large-scale hardware-in-the-loop verification of developed directional networking protocols.
- Complete the research and development of propagation models.
- Complete the development of a network stack suitable for high-bandwidth terahertz links.
- Complete the development, verification, and validation of an advanced, airborne high-frequency antenna/ionospheric structure.
- Complete the development of an airborne mesh networking capability that utilizes adaptive and responsive antennas for a dynamic and reliable high capacity mesh network suitable for communications in contested environments.
- Complete the development, verification, and test of advanced waveforms.
- Complete the development, verification, validation, and test of software-defined radio prototypes.

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602788F / *Dominant Information Sciences and Methods*	**Project (Number/Name)** 625315 / *C4I Dominance Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
- Complete the development of enhanced assurance and filtration offloading. - Complete the development of capabilities that incorporate communications network connectivity into information extraction tools. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** FY 2025 funding increased compared to FY 2024 by $5.565 million due to re-prioritization to meet the nation's future security needs; and increased emphasis in assured and resilient communications and networks for modular analog antenna arrays for autonomous collaborative platforms, AI/ML-based tactical communications waveforms, and wireless devices at frequencies above 100 GHz for distributed command and control in highly contested environments.			
Title: Data to Decisions ***Description:*** Investigate and develop technologies for decision quality information dissemination services via publish, subscribe, and query across the Global Information Grid to enterprise and tactical assets and coalition partners. ***FY 2024 Plans:*** Continue the research and development of data analytics and strategic indications and warnings technologies (including large data alignment, indexing and search on textual data, large-scale and disparate data sources, both structured and unstructured data, and employment of various ontologies and machine learning techniques). Continue the development of Conversational Artificial Intelligence (CAI) capabilities to deliver conversational agents capable of answering complex analytical questions. Continue the development of a user customizable entity, event, and relation text extraction capability with automatic performance estimates of the user-customized extractors on new documents and mission areas. Continue research and development of a Request for Information dialog system that can help answer RFIs for single service applications across 10 essential Intelligence enterprise identified RFIs. Continue the development of a Multi-Source Intelligence, Surveillance, and Reconnaissance ontology connecting Air Force analytics, Application Programming Interfaces, and services. Continue research and development of an integrated threat detection system based on vetted events from Publicly Available Information fused and corroborated with ISR sources. Continue the research and development of autonomous, heterogeneous, distributed multi-sensor management and upstream data fusion for improved target detection, tracking, and classification. Continue the development of new methods that exploit traditional and non-traditional data to categorize and predict engagement scenarios of coordinated, non-cooperative targets, and that assess the threats based on situation-driven adversary capabilities. Continue to develop capabilities to automate emitter corridor extraction and mode tagging to deploy capabilities onboard the collection platform. Continue research to add new data sources to identify signatures corresponding to different categories of multi-satellite actions. Continue researching methods that allow for change detection and pattern recognition. Continue research to seek correlations between non-traditional data source signatures and multi-satellite actions. Initiate development of a machine-learning environment to autonomously govern the execution of composite tasks. Initiate development of an analyst recognition engine for application programming interfaces, data, and services. Complete development of Counter Small Unmanned Air Systems detection and identification technology. Complete	13.124	16.512	21.875

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602788F / *Dominant Information Sciences and Methods*	**Project (Number/Name)** 625315 / *C4I Dominance Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
a proof-of-concept assistant to perform composite tasks over multiple turns. Initiate development of an advanced multimodal threat forecasting system. ***FY 2025 Plans:*** - Initiate research and development for a High-Value Target (HVT) recommendation system and system architecture. - Initiate research and development of an automated multi-source data fusion and spatio-temporal grounding capability, seeking opportunities for future applications with existing targeting systems. - Initiate research and development of multi-channel emitter detection and geolocation system hardware, intercept processing software, distributed sensing and automated target detection, recognition software, and ontology development. - Continue research to seek correlations between non-traditional data source signatures and multi-satellite actions. - Continue research to advance the Strategic Sensing Grid orchestration and data exploitation. Starting in FY 2025, this work moved from the Processing Technologies effort to the Data to Decisions effort. - Complete the research and development of data analytics and strategic indications and warnings technologies (including large data alignment, indexing and search on textual data, large-scale and disparate data sources, both structured and unstructured data, and employment of various ontologies and machine learning techniques). - Complete the development of Conversational Artificial Intelligence (CAI) capabilities to deliver conversational agents capable of answering complex analytical questions. - Complete the development of a user customizable entity, event, and relation text extraction capability with automatic performance estimates of the user-customized extractors on new documents and mission areas. - Complete research and development of a Request for Information dialog system that can help answer RFIs for single service applications across 10 essential Intelligence enterprise identified RFIs. - Complete the development of a Multi-Source Intelligence, Surveillance, and Reconnaissance ontology connecting Air Force analytics, Application Programming Interfaces, and services. - Complete research and development of an integrated threat detection system based on vetted events from Publicly Available Information fused and corroborated with ISR sources. - Complete the research and development of autonomous, heterogeneous, distributed multi-sensor management and upstream data fusion for improved target detection, tracking, and classification. - Complete the development of new methods that exploit traditional and non-traditional data to categorize and predict engagement scenarios of coordinated, non-cooperative targets, and that assess the threats based on situation-driven adversary capabilities. - Complete the development of capabilities to automate emitter corridor extraction and mode tagging to deploy capabilities onboard the collection platform. - Complete the research of methods that allow for change detection and pattern recognition. - Complete development of a machine-learning environment to autonomously govern the execution of composite tasks. - Complete development of an analyst recognition engine for application programming interfaces, data, and services.			

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602788F / *Dominant Information Sciences and Methods*	**Project (Number/Name)** 625315 / *C4I Dominance Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
- Complete development of an advanced multimodal threat forecasting system. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** FY 2025 funding increased compared to FY 2024 by $5.363 million due to re-prioritization to meet the nation's future security needs; and increased emphasis in algorithm development for recommending and tracking of HVTs, multi-source data fusion for targeting, and development of multi-INT targeting through emitter detection, geolocation, recognition, and intercept processing.			
Title: Processing Technologies ***Description:*** Develop automatic and dynamically reconfigurable, scalable, affordable distributed peta-flop processing technologies for real-time global information systems. ***FY 2024 Plans:*** Continue advancing the application of novel neuromorphic systems for robust machine learning. Continue advancing research and development of the neuromorphic processor and validate capabilities for dynamic learning on mobile and power-constrained platforms. Complete the development of a model integrated with existing embedded high performance computing systems. Complete the development and delivery of a Neuromorphic High-Performance-Computing (Brain-in-the-Box). Initiate research to advance the Strategic Sensing Grid orchestration and data exploitation. ***FY 2025 Plans:*** - Initiate research and development to collaborate with designated universities to produce a super computer in a compact container. - Continue advancing the application of novel neuromorphic systems for robust and dynamic machine learning, including on mobile or power-constrained platforms. - Starting in FY 2025, the Strategic Sensing Grid orchestration and data exploitation work moved from the Processing Technologies effort to the Data to Decisions effort. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** FY 2025 funding increased compared to FY 2024 by $1.271 million due to re-prioritization to meet the nation's future security needs; and increased emphasis in edge computing and neuromorphic computing with associated artificial intelligence/machine learning (AI/ML) applications through the development of a super computer in a compact container.	6.202	6.616	7.887
Title: Multi-Domain Command & Control (MDC2) ***Description:*** Develop advanced monitoring, planning, and assessment technologies enabling aerospace commanders to develop effects-based campaigns. Investigate, analyze, and develop technologies for planning, execution, and automatic rapid reconfiguration of distributed intelligent and integrated command and control information systems to achieve the commander's intent throughout varying crisis levels.	16.828	19.435	23.011

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602788F / *Dominant Information Sciences and Methods*	**Project (Number/Name)** 625315 / *C4I Dominance Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
FY 2024 Plans: Continue research for applying machine learning techniques to enhance and optimize multi domain operations (including space). Complete research into a mathematical framework and provide a method for evaluating and presenting multi-domain courses of action to maximize operational effects for decisive advantage. Continue the development of tools, technology, and a framework for execution management of operational center process workflows and applications. Continue the research and development of a novel composable planning paradigm to overcome the serial and time-intensive nature of existing planning techniques. ***FY 2025 Plans:*** - Initiate research and development to manage the complexity of distributed C2 resources and assess the ability to perform task redistribution in a highly-resource constrained environment. - Initiate development of standards that will be used to create an end-to-end (Australia, United States, and United Kingdom) joint machine learning ecosystem for the rapid development, sharing, and deployment of machine learning and artificial intelligence (AI) tools to enable joint AI missions for national and coalition operational capabilities. - Initiate research and development of generative AI techniques applied to AF data and problem sets through selected use cases focusing on indicators and warnings analysis and multi-modal knowledge analysis through sensor fusion. - Continue advancing the research and development of machine learning approaches for supporting and performing operations in complex adversarial environments. - Complete research for applying machine learning techniques to enhance and optimize multi-domain operations (including space). - Complete the development of tools, technology, and a framework for execution management of operational center process workflows and applications. - Complete the research and development of a novel composable planning paradigm to overcome the serial and time-intensive nature of existing planning techniques. - Complete research to understand operational needs of machine learning algorithms and systems with the multi-domain command and control connect. - Complete research into the application of Interactive Learning (IL) techniques to the auto-planning problem and development of an IL based planning capability to augment existing auto-planning tools. - Complete the research and development of machine learning approaches for supporting and performing operations in complex adversarial environments. ***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 / 2	**R-1 Program Element (Number/Name)** PE 0602788F / *Dominant Information Sciences and Methods*	**Project (Number/Name)** 625315 / *C4I Dominance Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
FY 2025 funding increased compared to FY 2024 by $3.576 million due to re-prioritization to meet the nation's future security needs; S&T research efforts planned for the Artificial Intelligence/Autonomy/Machine Learning thrust are being moved to this thrust.			
Title: Artificial Intelligence/Autonomy/Machine Learning ***Description:*** Perform research and development (R&D) to harness the speed and scale of computers and machines to address problems of complexity. ***FY 2024 Plans:*** Continue advancing the research and development of machine learning approaches for supporting and performing operations in complex adversarial environments. Continue the research to understand operational needs of machine learning algorithms and systems with the multi-domain command and control connect. Continue research into the application of Interactive Learning techniques to the auto-planning problem and development of an IL based planning capability to augment existing auto-planning tools. Continue the research and development of machine learning approaches for supporting and performing operations in complex adversarial environments. ***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 $15.596 million due to the research efforts in this thrust being moved to the Multi-Domain Command and Control thrust.	14.517	15.596	0.000
Title: Quantum Information Science ***Description:*** Perform research and development (R&D) that will utilize quantum physics for the storage, transmission, manipulation, computing, or measurement of information in ways that offer advantages to classical capabilities. ***FY 2024 Plans:*** Continue research and development in the area of supreme and quantum computing information sciences. Continue to advance development of further reducing SWaP of network node demonstrations. Continue demonstration of quantum information processing on a single chip by using developed quantum photonics processor with photon sources. Initiate research and development of quantum photonic integrated circuits for transmission/node operations. Initiate research into designs for network architecture and connectivity. ***FY 2025 Plans:*** - Continue research and analysis into designs for network architecture and connectivity and advanced network node operation.	7.379	13.915	11.577

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602788F / *Dominant Information Sciences and Methods*	**Project (Number/Name)** 625315 / *C4I Dominance Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
- Continue research and development in the area of supreme and quantum computing information sciences. - Continue to advance development of further reducing Size, Weight, and Power (SWaP) of network node demonstrations. - Continue demonstration of quantum information processing on a single chip by using developed quantum photonics processor with photon sources. - Continue research and development of quantum photonic integrated circuits for transmission/node operations. - Continue research into designs for network architecture and connectivity. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** FY 2025 funding decreased compared to FY 2024 by $2.338 million due to re-prioritization to meet the nation's future security needs; and decreased emphasis in quantum network and communications, and quantum computing information science.			
Accomplishments/Planned Programs Subtotals	75.911	89.429	87.270

	FY 2023	FY 2024
Congressional Add: Program Increase - Quantum Network Testbed ***FY 2023 Accomplishments:*** Conduct Congressionally directed efforts.	9.787	-
Congressional Add: Internet of Things Innovation Ecosystem ***FY 2023 Accomplishments:*** Conduct Congressionally directed efforts.	4.893	-
Congressional Add: University-based Quantum Materials Applied Research ***FY 2023 Accomplishments:*** Conduct Congressionally directed efforts.	29.363	-
Congressional Add: Program Increase - Secure Quantum Computing Facility ***FY 2023 Accomplishments:*** Conduct Congressionally directed efforts.	19.575	-
Congressional Add: Program Increase - Trapped Ion Quantum Computer ***FY 2023 Accomplishments:*** Conduct Congressionally directed efforts.	29.363	-
Congressional Add: Traffic management operational readiness ***FY 2023 Accomplishments:*** Conduct Congressionally directed efforts.	9.787	-
Congressional Adds Subtotals	102.768	-

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
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C. Other Program Funding Summary ($ in Millions)

Remarks

D. Acquisition Strategy

Not applicable

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force			Date: March 2024
Appropriation/Budget Activity 3600 / 2	R-1 Program Element (Number/Name) PE 0602788F / *Dominant Information Sciences and Methods*	Project (Number/Name) 625319 / *Cyberspace Dominance Technology*	

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
625319: *Cyberspace Dominance Technology*	-	56.570	65.335	62.674	0.000	62.674	63.997	65.304	71.593	73.006	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Department of the Air Force requires technologies to deliver a full range of options in cyberspace on par with air and space dominance in each of the areas of cyber-attack, cyber defense, and cyber support to achieve the strategic capability of cyber dominance. The Department of the Air Force requires the development of superior, intelligent, on-demand computing to enable information superiority to include advances in secure information sharing across domains and boundaries as well as technologies that successfully deter any adversary from attacking computer systems anytime, anywhere by ensuring the Department of the Air Force's ability to: access, maintain presence on, and deliver effects to adversary systems; detect, defend, and respond to attacks on friendly computer systems and provide forensic analysis concerning those attack attempts; and provide cyber situational awareness to Department of the Air Force Commanders. In addition, the Department of the Air Force requires technology development that produces computing architectures with greater capacity and sophistication for addressing constrained, dynamic mission objectives; game-changing computing power to the warfighter, disruptive computing power at the tactical edge and for federated grid services; and interactive and real-time computing improving the usability of high-performance computing to the Department of the Air Force. It includes technologies in computational sciences and engineering, computer architectures and software intensive systems.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Title: Cyber Defense Technologies	27.923	32.035	0.000
Description: Develop cyber defense and supporting technologies to detect, defend, and respond to attacks on computer systems as well as provide forensic concerning attacks. Starting in FY 2025, this research is continued in the Cyber Offensive and Defensive Technologies thrust. ***FY 2024 Plans:*** Continue research in the area of autonomous integrated cyber operations. Continue research into mission-specific block-chain capabilities and the alignment of cyber resilient services. Continue research and validation of a cyber-hardened (robust, secure) processor for embedded weapon systems. Continue applied research to create trusted and resilient embedded systems that are capable of identifying, localizing, and automatically repairing previously unknown and/or unintended vulnerabilities. Continue development of software using evolutionary approaches to make embedded systems tolerant to unexpected and unforeseen situations. Continue research effort to discover concepts and capabilities for cyber survivability techniques and algorithms for counter-unmanned aerial systems. Continue development of a counter-unmanned aerial systems open architecture to enable interoperability. Continue evolution of autonomous machine learning functions, including the validation and demonstration of automated workflows into defensive cyber operations systems. Continue development of a model-assisted concolic firmware exploration and threat models based on device behavior. Continue conducting large scale device analysis and demonstration			

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602788F / *Dominant Information Sciences and Methods*	**Project (Number/Name)** 625319 / *Cyberspace Dominance Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
on AF-relevant system. Continue to create a capability to model, intercept, and synchronize the state of all embedded devices connected on a single bus. Continue development of a physics-based and topologically-based model of an intra-connected and inter-connected electric power grid and communications network. Continue research and develop the design, implementation, and evaluation of a proof-of-concept model to enable secure and efficient outsourcing of relational queries and Machine Learning training. Initiate research on the inference to untrusted clouds with cost-based optimization options, under Multiparty Computation (MPC) protocols with different threat models, guarantees, and physical deployments (i.e., Local Area Network, Wide Area Networks, Blockchain, or mixed) settings. Initiate research to implement a binary injection suite on software binaries. Initiate research on expansion of software introspection techniques to exploit introspection accelerator capabilities. Complete the implementation of multiparty computation and zero knowledge proof schemes over multiple content service providers. ***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 $32.035 million due to research being moved to the Cyber Offensive and Defensive Technologies thrust.			
Title: Cyber Offense Technologies ***Description:*** Develop offensive cyber operations technologies to access, maintain presence on, and deliver effects to adversary systems. Starting in FY 2025, this research is continued in the Cyber Offensive and Defensive Technologies thrust. ***FY 2024 Plans:*** Continue research and development of game changing technologies which employ dominant power for cyber offensive operations and information warfare to change the future fight. Continue research and development in capabilities for multi-function, non-kinetic cyber effects against adversarial systems. Continue to demonstrate ground-based and airborne delivery of disrupt, deny, degrade, destroy, or deceive effects that are both cyber and physical/kinetic. Continue the advancement of research in systems to perform blind data discovery associated with the Internet of Things. Continue research and development for the identification of items of interest associated with the Internet of Things. Continue research for specific items of interest within the Internet of Things. Initiate development of a model of an Electrical Power and interconnected communication network. Initiate and complete the design, implementation, and test of user equipment positioning and geofencing methods. ***FY 2025 Plans:***	28.647	33.300	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602788F / *Dominant Information Sciences and Methods*	**Project (Number/Name)** 625319 / *Cyberspace Dominance Technology*

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 $33.3 million due to research being moved to the Cyber Offensive and Defensive Technologies thrust.			
Title: Cyber Offensive and Defensive Technologies ***Description:*** Research, design, and develop cyber warfighting, assurance, and electromagnetic (EM) convergence technologies to support offensive and defensive operations across multiple domains. For FY 2024 and prior years, this research was performed in the Cyber Defense Technologies and Cyber Offense Technologies thrusts. ***FY 2024 Plans:*** Not applicable ***FY 2025 Plans:*** - Initiate applied research for software assurance, vulnerability discovery, and analysis of source and executable code. - Continue development of algorithms and a physics and topologically-based model to detect critical nodes within an intra-connected and inter-connected critical infrastructure electrical power grid and communications network. - Complete research in the area of autonomous integrated cyber operations. - Complete research into mission-specific block-chain capabilities and the alignment of cyber resilient services. - Complete research and validation of a cyber-hardened (robust, secure) processor for embedded weapon systems. - Complete development of software using evolutionary approaches to make embedded systems tolerant to unexpected and unforeseen situations. - Complete research to discover concepts and capabilities for cyber survivability techniques and algorithms for counter-unmanned aerial systems. - Complete development of a counter-unmanned aerial system open architecture to enable interoperability. - Complete evolution of autonomous machine learning functions, including the validation and demonstration of automated workflows into defensive cyber operations systems. - Complete development of a model-assisted concolic firmware exploration and threat models based on device behavior. - Complete large scale device analysis and demonstration on an AF-relevant system. - Complete creation of a capability to model, intercept, and synchronize the state of all embedded devices connected on a single bus.	-	0.000	62.674

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602788F / *Dominant Information Sciences and Methods*	**Project (Number/Name)** 625319 / *Cyberspace Dominance Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
- Complete research and development of the design, implementation, and evaluation of a proof-of-concept model to enable secure and efficient outsourcing of relational queries and machine learning training. - Complete research and development of game changing technologies which employ dominant power for cyber offensive operations and information warfare to change the future fight. - Complete research and development in capabilities for multi-function, non-kinetic cyber effects against adversarial systems. - Complete demonstration of ground-based and airborne delivery of disrupt, deny, degrade, destroy, or deceive effects that are both cyber and physical/kinetic. - Complete the advancement of research in systems to perform blind data discovery associated with the Internet of Things. - Complete research and development for the identification of items of interest associated with the Internet of Things. - Complete research on the inference to untrusted clouds with cost-based optimization options, under Multiparty Computation (MPC) protocols with different threat models, guarantees, and physical deployments (i.e., Local Area Network, Wide Area Networks, Blockchain, or mixed) settings. - Terminate research to implement a binary injection suite on software binaries and research on expansion of software introspection techniques to exploit introspection accelerator capabilities. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** FY 2025 funding increased compared to FY 2024 by $62.674 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	56.570	65.335	62.674

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 / 2	R-1 Program Element (Number/Name) PE 0602788F / *Dominant Information Sciences and Methods*	Project (Number/Name) 62OMMS / *Research Site Support*	

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
62OMMS: *Research Site Support*	-	23.357	27.312	26.389	0.000	26.389	26.927	26.469	29.454	30.028	Continuing	Continuing

A. Mission Description and Budget Item Justification

The Air Force Research Laboratory Information Directorate leads the discovery, development and implementation of information science and technology to drive transformation within the Department of the Air Force and across the Department of Defense. The focus of the work is to provide the warfighter with the required technology-based capabilities to defend the Nation by unleashing the power of innovative information science and technology to anticipate, find, fix, track, target, engage, and assess anything, anytime, anywhere. Since the site is a single-purpose location which is not located on a military installation, the Information Directorate has unique requirements for supporting its science and technology mission. As the host unit, the directorate is responsible to provide the Rome Research Site infrastructure at Rome, New York and provide for the continued operations of all Rome Research Site properties, buildings, and services necessary for the research mission. Operations include: logistics and communication services, utilities, maintenance of facilities and structures, safety and security of the workforce and visiting researchers, and ensures compliance with the laws, regulations, and directives that pertain to site operations. These services are host unit responsibilities and are necessary to provide a safe and effective environment for the Research Site's workforce and mission.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Title: Rome Research Infrastructure	23.357	27.312	26.389
Description: Provide the necessary services and support including, but not limited to: fire inspections, refuse collection, water, electricity, steam, heat, custodial, and grounds maintenance services to the Research Site. Provide the necessary support for the maintenance and repair of Research Site facilities (buildings and other structures), vehicle and equipment lease and security/ safety inspections and services as necessary for compliance and safety/security of personnel and research assets. Provide the Research Site with long haul communications (using the Government Services Administration set of Networx contracts for Continental United States), trunk connectivity and wireless communications.			
FY 2024 Plans: Continue providing civilian payroll and non-pay costs for installation operations in support of the Rome Research Site property and all onsite personnel. Continue providing facilities, facility operations, facility sustainment, support equipment, contracts, and associated costs to plan, manage and execute the following functions: fire prevention, disaster preparedness, plant operation and purchase of commodity, refuse collection, pavement clearance of snow and ice, grounds maintenance including landscaping, real property special inspections, pest control, and custodial services. Continue providing Real Property Management and Engineering Services, including: (1) Facility Management and Administration and (2) Installation Engineering Services. Facility Management includes public works management costs, contract management, material procurement, facility data management, furnishings management costs, and real estate management. Installation Engineering Services includes annual inspection of facilities, master planning, overhead of planning and design, overhead of construction management, and non-Site Recovery Management service			

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602788F / *Dominant Information Sciences and Methods*	**Project (Number/Name)** 62OMMS / *Research Site Support*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
calls. Continue providing basic installation communication services, including long haul trunk and telecommunications services. Continue providing site vehicle lease for logistics, security, and mission support under the Government Services Administration. ***FY 2025 Plans:*** - Continue providing civilian payroll and non-pay costs for installation operations in support of the Rome Research Site property and all onsite personnel. - Continue providing facilities, facility operations, facility sustainment, support equipment, contracts, and associated costs to plan, manage and execute the following functions: fire prevention, disaster preparedness, plant operation and purchase of commodity, refuse collection, pavement clearance of snow and ice, grounds maintenance including landscaping, real property special inspections, pest control, and custodial services. - Continue providing Real Property Management and Engineering Services, including: (1) Facility Management and Administration and (2) Installation Engineering Services. Facility Management includes public works management costs, contract management, material procurement, facility data management, furnishings management costs, and real estate management. Installation Engineering Services includes annual inspection of facilities, master planning, overhead of planning and design, overhead of construction management, and non Site Recovery Management service calls. - Continue providing basic installation communication services, including long haul trunk and telecommunications services. - Continue providing site vehicle lease for logistics, security, and mission support under the Government Services Administration. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** FY 2025 funding decreased as compared to FY 2024 by $0.923 million. Justification for the decrease is described in the plans above.			
Accomplishments/Planned Programs Subtotals	23.357	27.312	26.389

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable