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Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force **Date:** March 2024

Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force</i> / BA 1: <i>Basic Research</i>	R-1 Program Element (Number/Name) PE 0601102F / <i>Defense Research Sciences</i>
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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	0.000	377.616	401.486	361.930	0.000	361.930	308.870	333.612	382.456	405.800	Continuing	Continuing
613001: <i>Physics and Electronics</i>	0.000	110.951	117.740	102.282	0.000	102.282	89.962	95.019	109.404	115.176	Continuing	Continuing
613002: <i>Aerospace, Chemical and Material Sciences</i>	0.000	112.790	117.926	107.377	0.000	107.377	95.819	104.896	118.342	126.123	Continuing	Continuing
613003: <i>Mathematics, Information and Life Sciences</i>	0.000	117.022	118.511	110.237	0.000	110.237	97.943	102.723	116.654	122.155	Continuing	Continuing
613004: <i>Education and Outreach</i>	0.000	36.853	38.911	34.282	0.000	34.282	17.239	22.909	29.830	33.944	Continuing	Continuing
613005: <i>STEM Pipeline Development</i>	0.000	0.000	8.398	7.752	0.000	7.752	7.907	8.065	8.226	8.402	Continuing	Continuing

A. Mission Description and Budget Item Justification

Defense Research Sciences consists of basic research activities in academia and industry along with research performed in the Department of the Air Force, including the Air Force Research Laboratory, Air Force Institute of Technology, and the United States Air Force Academy. This program supports basic broad-based scientific and engineering research in areas critical to Department of the Air Force weapon, sensor, and support systems. All research areas are subject to long-range planning and technical review by both Department of the Air Force and tri-Service scientific planning groups. 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 program element would be in addition to the civilian pay expenses budgeted in program elements 0602020F, 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602298F, 0602602F, 0602605F, 0602788F, and 1206601SF.

This program element may include necessary expenses to support the operation and maintenance of facilities to manage, execute, and deliver science and technology capabilities.

Funds in this program element may be used to investigate specified science advancements in air, cyber, and/or multidomains.

This program is in Budget Activity 1, Basic Research because this budget activity includes scientific study and experimentation directed toward increasing fundamental knowledge and understanding in those fields of the physical, engineering, environmental, and life sciences related to long-term national security needs.

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Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force</i> / BA 1: <i>Basic Research</i>	R-1 Program Element (Number/Name) PE 0601102F / <i>Defense Research Sciences</i>
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B. Program Change Summary (\$ in Millions)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Previous President's Budget	406.125	401.486	382.183	0.000	382.183
Current President's Budget	377.616	401.486	361.930	0.000	361.930
Total Adjustments	-28.509	0.000	-20.253	0.000	-20.253
• 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	-3.090	0.000			
• SBIR/STTR Transfer	-10.406	0.000			
• Other Adjustments	-15.013	0.000	-20.253	0.000	-20.253

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

	FY 2023	FY 2024
Project: 613001: <i>Physics and Electronics</i>		
Congressional Add: <i>Program Increase - basic research</i>	7.795	0.000
Congressional Add Subtotals for Project: 613001	7.795	0.000
Project: 613002: <i>Aerospace, Chemical and Material Sciences</i>		
Congressional Add: <i>Program Increase - basic research</i>	7.795	0.000
Congressional Add Subtotals for Project: 613002	7.795	0.000
Project: 613003: <i>Mathematics, Information and Life Sciences</i>		
Congressional Add: <i>Program Increase - basic research</i>	7.795	0.000
Congressional Add: <i>Program increase - Space Force human performance optimization research</i>	5.651	0.000
Congressional Add Subtotals for Project: 613003	13.446	0.000
Project: 613004: <i>Education and Outreach</i>		
Congressional Add: <i>Program increase: basic research</i>	0.974	0.000
Congressional Add Subtotals for Project: 613004	0.974	0.000
Congressional Add Totals for all Projects	30.010	0.000

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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 1: Basic Research*

R-1 Program Element (Number/Name)
PE 0601102F / *Defense Research Sciences*

Change Summary Explanation

Decrease in FY 2025 is due to Space-focused basic research transferring to 3620F: Research, Development, Test & Evaluation, Space Force; Program Element 0601102SF, Defense Research Sciences; Project 610001: Defense Research Sciences - Space.

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Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force										Date: March 2024		
Appropriation/Budget Activity 3600 / 1					R-1 Program Element (Number/Name) PE 0601102F / <i>Defense Research Sciences</i>				Project (Number/Name) 613001 / <i>Physics and Electronics</i>			
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
613001: <i>Physics and Electronics</i>	0.000	110.951	117.740	102.282	0.000	102.282	89.962	95.019	109.404	115.176	Continuing	Continuing

A. Mission Description and Budget Item Justification

Basic research in the Physics and Electronics Project seeks to enable revolutionary advances and expand the fundamental knowledge supporting technologies critical to the future of the Department of the Air Force. Research prioritizes high-risk, high-reward, game-changing scientific breakthroughs essential for future leaps in warfighter system performance, functionality, reliability, and survivability while simultaneously reducing component and system power, size, mass, and life cycle costs. Major areas being investigated in this project are complex electronics and fundamental quantum processes; plasma physics and high energy density non-equilibrium processes; and lasers and optics, electromagnetics, communication, and signal processing. While the following specific efforts are the focus of the project, there is interest in exploring novel ideas that may bridge these major efforts as well as those in the other projects within this program.

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

	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Title: Complex Electronics and Fundamental Quantum Processes	41.262	47.096	49.454	0.000	49.454
Description: Scientific focus areas are atomic and molecular physics, photonics, quantum electronic solids, gigahertz-terahertz electronics and materials, semiconductor and electromagnetic materials, and optoelectronics.					
FY 2024 Plans: Explore a wide range of complex materials and devices, including non-linear optical materials, photonics, optoelectronics, metamaterials, cathodes, dielectric and magnetic materials, memristive systems, new classes of high-temperature superconductors, quantum dots, quantum wells and graphene. Includes generating and controlling quantum states, such as superposition and entanglement, in photonic systems, quantum dots and defects in solids, and ultracold atoms and molecules.					
FY 2025 Base Plans: - Continue exploring a wide range of complex materials and devices, including non-linear optical materials, photonics, optoelectronics, metamaterials, cathodes, dielectric and magnetic materials, memristive systems, new classes of high-temperature superconductors, quantum dots, quantum wells and graphene. - Continue exploration related to generating and controlling quantum states, such as superposition and entanglement, in photonic systems, quantum dots and defects in solids, and ultracold atoms and molecules.					
FY 2025 OCO Plans: Not Applicable					
FY 2024 to FY 2025 Increase/Decrease Statement:					

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Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force			Date: March 2024		
Appropriation/Budget Activity 3600 / 1	R-1 Program Element (Number/Name) PE 0601102F / <i>Defense Research Sciences</i>	Project (Number/Name) 613001 / <i>Physics and Electronics</i>			
B. Accomplishments/Planned Programs (\$ in Millions)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
FY 2025 increased compared to FY 2024 by \$2.358 million. Funding increased due to added emphasis in this effort.					
<p>Title: Plasma Physics and High Energy Density Non-Equilibrium Processes</p> <p>Description: Scientific focus areas are plasma and electro-energetic physics.</p> <p>FY 2024 Plans: Explore a wide range of activities characterized by processes sufficiently energetic to require understanding and managing plasma phenomenology and the non-linear response of materials to high electric and magnetic fields. Includes space weather, plasma discharges, radio frequency propagation, radio frequency-plasma interaction, and high-power, beam-driven microwave devices.</p> <p>FY 2025 Base Plans: - Continue exploring a wide range of activities characterized by processes sufficiently energetic to require understanding and managing plasma phenomenology and the non-linear response of materials to high electric and magnetic fields. - Continue exploring plasma discharges, radio frequency propagation, radio frequency-plasma interaction, and high-power, beam-driven microwave devices. - Note: In FY 2025 and beyond space science research will be accomplished in 3620F: Research, Development, Test & Evaluation, Space Force; Program Element 0601102SF, Defense Research Sciences; Project 610001: Defense Research Sciences - Space.</p> <p>FY 2025 OCO Plans: Not Applicable</p> <p>FY 2024 to FY 2025 Increase/Decrease Statement: FY 2025 decreased compared to FY 2024 by \$8.977 million due to movement of effort to USSF program as shown in FY 2025 plans.</p>	21.663	24.725	15.748	0.000	15.748
<p>Title: Lasers and Optics, Electromagnetics, Communication and Signal Processing</p> <p>Description: Scientific focus areas are physical mathematics and applied analysis, novel computational methods, electromagnetics and wave propagation in complex media, ultra-fast dynamics, for revolutionary approaches to remote sensing and imaging physics, and surveillance and navigation.</p> <p>FY 2024 Plans:</p>	40.231	45.919	37.080	0.000	37.080

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Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 1	R-1 Program Element (Number/Name) PE 0601102F / <i>Defense Research Sciences</i>	Project (Number/Name) 613001 / <i>Physics and Electronics</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
<p>Explore all aspects of producing and receiving electromagnetic and electro-optical signals, as well as their propagation through complex media, including adaptive optics and optical imaging. Investigate aspects of the phenomenology of lasers including high energy lasers, non-linear optics, and ultra-short pulse laser science. Includes the development of sophisticated mathematics and algorithm development for extracting information from complex and/or sparse signals as well as calculating astrodynamical spacecraft orbits.</p> <p>FY 2025 Base Plans:</p> <ul style="list-style-type: none"> - Continue exploring all aspects of producing and receiving electromagnetic and electro-optical signals, as well as their propagation through complex media, including adaptive optics and optical imaging. - Continue to investigate aspects of the phenomenology of lasers including high energy lasers, non-linear optics, and ultra-short pulse laser science. - Continue sophisticated mathematics and algorithm development for extracting information from complex and/or sparse signals. - Note: In FY 2025 and beyond astrodynamics research will be accomplished in 3620F: Research, Development, Test & Evaluation, Space Force; Program Element 0601102SF, Defense Research Sciences; Project 610001: Defense Research Sciences - Space. <p>FY 2025 OCO Plans: Not Applicable</p> <p>FY 2024 to FY 2025 Increase/Decrease Statement: FY 2025 decreased compared to FY 2024 by \$8.839 million due to movement of effort to USSF program as shown in FY 2025 plans.</p>					
Accomplishments/Planned Programs Subtotals	103.156	117.740	102.282	0.000	102.282

	FY 2023	FY 2024
Congressional Add: Program Increase - basic research	7.795	0.000
FY 2023 Accomplishments: Conducted Congressionally directed effort.		
FY 2024 Plans: Not Applicable		
Congressional Adds Subtotals	7.795	0.000

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

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Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force Date: March 2024

Appropriation/Budget Activity 3600 / 1	R-1 Program Element (Number/Name) PE 0601102F / <i>Defense Research Sciences</i>	Project (Number/Name) 613001 / <i>Physics and Electronics</i>
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C. Other Program Funding Summary (\$ in Millions)

Remarks

D. Acquisition Strategy

Not Applicable

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Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force										Date: March 2024		
Appropriation/Budget Activity 3600 / 1					R-1 Program Element (Number/Name) PE 0601102F / <i>Defense Research Sciences</i>				Project (Number/Name) 613002 / <i>Aerospace, Chemical and Material Sciences</i>			
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
613002: <i>Aerospace, Chemical and Material Sciences</i>	0.000	112.790	117.926	107.377	0.000	107.377	95.819	104.896	118.342	126.123	Continuing	Continuing

A. Mission Description and Budget Item Justification

Basic research in the Aerospace, Chemical, and Materials Sciences Project seeks to enable revolutionary advances and expand the fundamental knowledge supporting technologies critical to the future of the Department of the Air Force. Research stresses high-risk, high-reward, game-changing scientific breakthroughs essential for future leaps in warfighter system performance, functionality, reliability, and survivability while simultaneously reducing component and system power, size, mass, and life cycle costs. Research topics include: aero-structure interactions and control; energy, power, and propulsion; complex materials and structures; and cross-disciplinary research reflecting the highly integrated nature of future weapon systems. While the following specific efforts are the focus of the project there is interest in exploring novel ideas that may bridge these major efforts as well as those in other projects within this program.

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

	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Title: Aero-Structure Interactions and Control	31.499	35.378	36.236	0.000	36.236
Description: Scientific focus areas are high temperature aerospace materials, non-equilibrium aerothermodynamics and chemistry, unsteady, compressible flow turbulence, multiscale fluid-material interactions, and flow control.					
FY 2024 Plans: Investigate the characterization, modeling, and exploitation of interactions between the unsteady aerodynamic flow field and the dynamic air vehicle structure to enable enhanced performance in next-generation Department of the Air Force systems. Explore the synergy gained from an interdisciplinary look at multiple technologies and the integration of core disciplines of fluid mechanics, high-performance structures, and thermodynamics.					
FY 2025 Base Plans: - Continue investigating the characterization, modeling, and exploitation of interactions between the unsteady aerodynamic flow field and the dynamic air vehicle structure to enable enhanced performance in next-generation Department of the Air Force systems. - Continue to explore the synergy gained from an interdisciplinary look at multiple technologies and the integration of core disciplines of fluid mechanics, high-performance structures, and thermodynamics.					
FY 2025 OCO Plans:					

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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Not Applicable					
<p><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i> FY 2025 increased compared to FY 2024 by \$0.858 million. Justification for this increase is described in the plans above.</p>					
<p><i>Title:</i> Energy, Power, and Propulsion</p> <p><i>Description:</i> Scientific focus areas are thermal control, theoretical chemistry, molecular dynamics, power and propulsion, and combustion and diagnostics.</p> <p><i>FY 2024 Plans:</i> Develop potentially revolutionary scientific advances by integrating core disciplines of combustion, plasma dynamics, chemistry, hydrodynamics, structural dynamics, and multi-fidelity simulations. Investigate processes associated with the generation, storage, and utilization of energy, specifically for Department of the Air Force systems including developing novel energetic materials as well as understanding optimizing and controlling combustion processes.</p> <p><i>FY 2025 Base Plans:</i> - Continue developing potentially revolutionary scientific advances by integrating core disciplines of combustion, plasma dynamics, chemistry, hydrodynamics, structural dynamics, and multi-fidelity simulations. - Continue to investigate processes associated with the generation, storage, and utilization of energy, specifically for Department of the Air Force systems including developing novel energetic materials as well as understanding optimizing and controlling combustion processes.</p> <p><i>FY 2025 OCO Plans:</i> Not Applicable</p> <p><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i> FY 2025 decreased compared to FY 2024 by \$5.294 million. Funding decreased due to decreased emphasis in this effort.</p>	32.548	36.557	31.263	0.000	31.263
<p><i>Title:</i> Complex Materials and Structures</p> <p><i>Description:</i> Scientific focus areas are design, manufacturing, and dynamics and control of multifunctional materials and microsystems, multi-scale mechanics, diagnostics and prognosis, and physio-chemistry of novel organic materials.</p>	40.948	45.991	39.878	0.000	39.878

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Appropriation/Budget Activity 3600 / 1	R-1 Program Element (Number/Name) PE 0601102F / <i>Defense Research Sciences</i>	Project (Number/Name) 613002 / <i>Aerospace, Chemical and Material Sciences</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
<p><i>FY 2024 Plans:</i> Investigate multifunctional materials and structures composed of different classes of materials, both organic and inorganic, that can adapt to environmental constraints or mission requirements. Explore complex materials, microsystems, and structures that incorporate hierarchical design and functionality from the nanoscale through the mesoscale, ultimately leading to controlled, well-understood material or structural behavior capable of dynamic functionality and/or performance characteristics to enhance mission versatility.</p> <p><i>FY 2025 Base Plans:</i> - Continue investigating multifunctional materials and structures composed of different classes of materials, both organic and inorganic, that can adapt to environmental constraints or mission requirements. - Continue to explore complex materials, microsystems, and structures that incorporate hierarchical design and functionality from the nanoscale through the mesoscale, ultimately leading to controlled, well-understood material or structural behavior capable of dynamic functionality and/or performance characteristics to enhance mission versatility.</p> <p><i>FY 2025 OCO Plans:</i> Not Applicable</p> <p><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i> FY 2025 decreased compared to FY 2024 by \$6.113 million. Funding decreased due to merging two portfolios into a single structures-focused research portfolio.</p>					
Accomplishments/Planned Programs Subtotals	104.995	117.926	107.377	0.000	107.377
	FY 2023	FY 2024			
<i>Congressional Add:</i> Program Increase - basic research	7.795	0.000			
<i>FY 2023 Accomplishments:</i> Conducted Congressionally directed effort.					
<i>FY 2024 Plans:</i> Not Applicable					
Congressional Adds Subtotals	7.795	0.000			

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

N/A

Remarks

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Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 1	R-1 Program Element (Number/Name) PE 0601102F / <i>Defense Research Sciences</i>	Project (Number/Name) 613002 / <i>Aerospace, Chemical and Material Sciences</i>

D. Acquisition Strategy
Not Applicable

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Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force										Date: March 2024		
Appropriation/Budget Activity 3600 / 1					R-1 Program Element (Number/Name) PE 0601102F / <i>Defense Research Sciences</i>				Project (Number/Name) 613003 / <i>Mathematics, Information and Life Sciences</i>			
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
613003: <i>Mathematics, Information and Life Sciences</i>	0.000	117.022	118.511	110.237	0.000	110.237	97.943	102.723	116.654	122.155	Continuing	Continuing

A. Mission Description and Budget Item Justification

Basic research in the Mathematics, Information Sciences, and Life Sciences Project seeks to expand fundamental knowledge and enable revolutionary advances and supporting technologies critical to the future of the Department of the Air Force. Major areas being investigated in this project are data fusion, machine learning and artificial intelligence, information and complex networks, cyber-security, autonomous decision making, dynamical systems, optimization and control, and natural materials and systems. While the following are specific sub-areas within this project, there is a continuing interest to explore novel ideas to bridge disciplines within this program.

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

	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Title: Information and Complex Networks	25.894	29.628	24.047	0.000	24.047
Description: Scientific focus areas are information operations and security, data and information fusion, advanced computing, artificial intelligence and complex networks.					
FY 2024 Plans: Design and analyze techniques to enable reliable and secure exchange of information and predictable operation of networks and systems, including hardware and software interactions. Investigate traditional aspects of information assurance with an emphasis on the underlying mathematics of secure-by-design architectures of networked communications and neural information processing. Analyze, optimize, and design multi-scale networks with resilient features against noise and corruption from difficult environments and adversarial operations, using rigorous mathematical models of information exchange, physical operations, and human-machine interactions. Develop new computing approaches and algorithms for network-of-network information processing at the speed of warfare and new mathematical approaches for predictive, multi-scale and multi-physics simulations of Department of the Air Force systems and systems-of-systems in realistic environments.					
FY 2025 Base Plans: - Continue designing and analyzing techniques to enable reliable and secure exchange of information and predictable operation of networks and systems, including hardware and software interactions. - Continue to investigate traditional aspects of information assurance with an emphasis on the underlying mathematics of secure-by-design architectures of networked communications and neural information processing.					

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Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 1	R-1 Program Element (Number/Name) PE 0601102F / <i>Defense Research Sciences</i>	Project (Number/Name) 613003 / <i>Mathematics, Information and Life Sciences</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
<p>- Continue to analyze, optimize, and design multi-scale networks with resilient features against noise and corruption from difficult environments and adversarial operations, using rigorous mathematical models of information exchange, physical operations, and human-machine interactions.</p> <p>- Continue to develop new computing approaches and algorithms for network-of-network information processing at the speed of warfare and new mathematical approaches for predictive, multi-scale and multi-physics simulations of Department of the Air Force systems and systems-of-systems in realistic environments.</p> <p>FY 2025 OCO Plans: Not Applicable</p> <p>FY 2024 to FY 2025 Increase/Decrease Statement: FY 2025 decreased compared to FY 2024 by \$5.581 million. Funding decreased due to decreased emphasis in this effort.</p>					
<p>Title: Decision Making</p> <p>Description: Scientific focus areas are mathematical modeling of cognition and decision making, development and testing of advanced representations and processes for higher-level artificial intelligence, trust between humans and autonomous agents, mixed human-machine decision making, and computational social science for asymmetric threat detection and predictive largescale influence.</p> <p>FY 2024 Plans: Investigate new mathematical laws, scientific principles, and robust algorithms that underlie intelligent, mixed human-machine decision-making to achieve accurate real-time integration of human expertise and knowledge into a machine-based battlespace network. Develop new mathematical models for information capture; object, scene and relation identification; and multi-level reasoning and meta-learning. Advance the critical knowledge base in modeling of individual and group cognitive processing and decision making, and construct advanced methodologies for predictive, verifiable simulations of large-scale socio-cultural and human-machine hybrid networks.</p> <p>FY 2025 Base Plans: - Continue investigating new mathematical laws, scientific principles, and robust algorithms that underlie intelligent, mixed human-machine decision-making to achieve accurate real-time integration of human expertise and knowledge into a machine-based battlespace network. - Continue to develop new mathematical models for information capture; object, scene and relation identification; and multi-level reasoning and meta-learning.</p>	20.715	23.702	24.150	0.000	24.150

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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
<p>- Continue to advance the critical knowledge base in modeling of individual and group cognitive processing and decision making, and construct advanced methodologies for predictive, verifiable simulations of large-scale socio-cultural and human-machine hybrid networks.</p> <p>FY 2025 OCO Plans: Not Applicable</p> <p>FY 2024 to FY 2025 Increase/Decrease Statement: FY 2025 increased compared to FY 2024 by \$0.448 million. Justification for this increase is described in the plans above.</p>					
<p>Title: Dynamical Systems, Optimization, and Control</p> <p>Description: Scientific focus areas are computer models of dynamical data and communication networks, data-fusion, dynamics and control theory for multi-scale and complex networks, and mathematics of distributed optimization in uncertain, variable, continuous and discrete networked systems. Includes the development of advanced computing architectures for solving optimization and data-fusion problems in real time and by embedded processors in autonomous or semi-autonomous platforms.</p> <p>FY 2024 Plans: Develop new scientific concepts supported by rigorous analysis for advancing the science of autonomy and promoting the understanding necessary to analyze and design complex multi-scale systems as well as to provide guaranteed levels of performance. Develop novel adaptive control strategies for coordinating heterogeneous, autonomous, or semiautonomous aerospace vehicles in uncertain, information rich, dynamically changing, adversarial, and networked environments.</p> <p>FY 2025 Base Plans: - Continue developing new scientific concepts supported by rigorous analysis for advancing the science of autonomy and promoting the understanding necessary to analyze and design complex multi-scale systems as well as to provide guaranteed levels of performance. - Continue to develop novel adaptive control strategies for coordinating heterogeneous, autonomous, or semiautonomous aerospace vehicles in uncertain, information rich, dynamically changing, adversarial, and networked environments.</p> <p>FY 2025 OCO Plans:</p>	26.930	30.813	31.323	0.000	31.323

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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Not Applicable					
<p><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i> FY 2025 increased compared to FY 2024 by \$0.510 million. Justification for this increase is described in the plans above.</p>					
<p><i>Title:</i> Natural Materials and Systems</p> <p><i>Description:</i> Scientific focus areas are natural materials and nature inspired systems, human performance and biosystems, cognitive neuroscience and biophysics.</p> <p><i>FY 2024 Plans:</i> Investigate multidisciplinary approaches for studying, using, mimicking, synthesizing, and adapting to the ways natural systems are built, assembled and organized, and functioning to accomplish their objectives. Develop a fundamental understanding of bio-chemical mechanisms and control procedures for the production and manufacture of natural materials and develop reverse-engineering approaches to optimize the bio-chemical functionality. Develop approaches to adapt, blend, and mimic existing natural sensory systems and neural systems of varying complexity, to add existing capabilities to these organisms and design in-silico replicas with similar or advanced capabilities.</p> <p><i>FY 2025 Base Plans:</i> - Continue investigating multidisciplinary approaches for studying, using, mimicking, synthesizing, and adapting to the ways natural systems are built, assembled and organized, and functioning to accomplish their objectives. - Continue to develop a fundamental understanding of bio-chemical mechanisms and control procedures for the production and manufacture of natural materials and develop reverse-engineering approaches to optimize the bio-chemical functionality. - Continue to develop approaches to adapt, blend, and mimic existing natural sensory systems and neural systems of varying complexity, to add existing capabilities to these organisms and design in-silico replicas with similar or advanced capabilities.</p> <p><i>FY 2025 OCO Plans:</i> Not Applicable</p> <p><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i></p>	30.037	34.368	30.717	0.000	30.717

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Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 1	R-1 Program Element (Number/Name) PE 0601102F / <i>Defense Research Sciences</i>	Project (Number/Name) 613003 / <i>Mathematics, Information and Life Sciences</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
FY 2025 decreased compared to FY 2024 by \$3.651 million. Funding decreased due to decreased emphasis in this effort.					
Accomplishments/Planned Programs Subtotals	103.576	118.511	110.237	0.000	110.237
	FY 2023	FY 2024			
Congressional Add: Program Increase - basic research	7.795	0.000			
FY 2023 Accomplishments: Conducted Congressionally directed effort.					
FY 2024 Plans: Not Applicable					
Congressional Add: Program increase - Space Force human performance optimization research	5.651	0.000			
FY 2023 Accomplishments: Conducted Congressionally directed effort.					
FY 2024 Plans: Not Applicable					
Congressional Adds Subtotals	13.446	0.000			

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

N/A

Remarks

D. Acquisition Strategy

Not Applicable

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Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force										Date: March 2024		
Appropriation/Budget Activity 3600 / 1					R-1 Program Element (Number/Name) PE 0601102F / <i>Defense Research Sciences</i>				Project (Number/Name) 613004 / <i>Education and Outreach</i>			
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
613004: <i>Education and Outreach</i>	0.000	36.853	38.911	34.282	0.000	34.282	17.239	22.909	29.830	33.944	Continuing	Continuing

A. Mission Description and Budget Item Justification

The major efforts in the Science and Technology (S&T) Education and Outreach Project are to facilitate interactions between the international and domestic research communities and Department of the Air Force researchers, and to develop scientists and engineers with an awareness of Department of the Air Force basic research priorities. These professional interactions and collaborations benefit the Department of the Air Force by increasing awareness of basic research priorities in the research community as a whole and attracting talented scientists and engineers to address Department of the Air Force needs. International interactions foster relationships with scientific partners and leverage international expertise in nascent scientific developments. This project also seeks to enhance interactions with Historically Black Colleges and Universities, Hispanic-Serving Institutions, and other minority institutions.

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

	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Title: Outreach to International S&T Community	12.558	14.008	17.055	0.000	17.055
Description: Foster international basic research discovery by supporting direct interchanges with a broad range of key international researchers and communities. Identify and leverage international scientific advances when appropriate.					
FY 2024 Plans: Leverage international expertise to identify and maintain awareness of foreign scientific developments. Explore foreign investments and influence world-class scientific research on specific topics of interest to the Department of the Air Force. Pursue access to fundamental scientific discoveries outside the U.S. relevant to the Department of the Air Force. Support international visits by scientists and high-level DoD fundamental science delegations, providing primary interface to coordinate international science and technology participation among DoD organizations.					
FY 2025 Base Plans: - Continue leveraging international expertise to identify and maintain awareness of foreign scientific developments. - Continue to explore foreign investments and influence world-class scientific research on specific topics of interest to the Department of the Air Force. - Continue to pursue access to fundamental scientific discoveries outside the U.S. relevant to the Department of the Air Force.					

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Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force	Date: March 2024
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Appropriation/Budget Activity 3600 / 1	R-1 Program Element (Number/Name) PE 0601102F / <i>Defense Research Sciences</i>	Project (Number/Name) 613004 / <i>Education and Outreach</i>
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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
<p>- Continue to support international visits by scientists and high-level DoD fundamental science delegations, providing primary interface to coordinate international science and technology participation among DoD organizations.</p> <p>FY 2025 OCO Plans: Not Applicable</p> <p>FY 2024 to FY 2025 Increase/Decrease Statement: FY 2025 increased compared to FY 2024 by \$3.047 million. Funding increased due to added emphasis in international research.</p>					
<p>Title: Outreach to U.S. S&T Workforce</p> <p>Description: Strengthen science, mathematics, and engineering research and infrastructure in the U.S., thereby strengthening current and future Department of the Air Force S&T capabilities.</p> <p>FY 2024 Plans: Identify, recruit, and increase opportunities for new investigators to participate in critical Department of the Air Force research. Support basic science, mathematics, and engineering research efforts with Historically Black Colleges and Universities (HBCU), Hispanic-Serving Institutions, and other minority institutions. Focus investment and outreach to HBCUs to include funding in microelectronics, materials, energy, aerospace, and chemistry and other fields of importance to the Department of the Air Force.</p> <p>FY 2025 Base Plans: - Continue identifying, recruiting, and increasing opportunities for new investigators to participate in critical Department of the Air Force research. - Continue to support basic science, mathematics, and engineering research efforts with Historically Black Colleges and Universities (HBCU), Hispanic-Serving Institutions, and other minority institutions. - Continue to focus investment and outreach to HBCUs to include funding in microelectronics, materials, energy, aerospace, and chemistry and other fields of importance to the Department of the Air Force. - Note: In FY 2025 and beyond some work in this effort will be accomplished in 3620F: Research, Development, Test & Evaluation, Space Force; Program Element 0601102SF, Defense Research Sciences; Project 610001: Defense Research Sciences - Space.</p> <p>FY 2025 OCO Plans: Not Applicable</p> <p>FY 2024 to FY 2025 Increase/Decrease Statement:</p>	23.321	24.903	17.227	0.000	17.227

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Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force	Date: March 2024
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Appropriation/Budget Activity 3600 / 1	R-1 Program Element (Number/Name) PE 0601102F / <i>Defense Research Sciences</i>	Project (Number/Name) 613004 / <i>Education and Outreach</i>
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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
FY 2025 decreased compared to FY 2024 by \$7.676 million due to movement of effort to USSF program as shown in FY 2025 plans and decreased emphasis in this effort.					
Accomplishments/Planned Programs Subtotals	35.879	38.911	34.282	0.000	34.282

	FY 2023	FY 2024
Congressional Add: Program increase: basic research	0.974	0.000
FY 2023 Accomplishments: Conducted Congressionally directed effort.		
FY 2024 Plans: Not Applicable		
Congressional Adds Subtotals	0.974	0.000

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

N/A

Remarks

D. Acquisition Strategy

Not Applicable

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Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force										Date: March 2024		
Appropriation/Budget Activity 3600 / 1					R-1 Program Element (Number/Name) PE 0601102F / <i>Defense Research Sciences</i>				Project (Number/Name) 613005 / <i>STEM Pipeline Development</i>			
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
613005: <i>STEM Pipeline Development</i>	0.000	0.000	8.398	7.752	0.000	7.752	7.907	8.065	8.226	8.402	Continuing	Continuing

A. Mission Description and Budget Item Justification

The major efforts in the Science, Technology, Engineering, and Mathematics (STEM) Pipeline Development Project are initiatives to support STEM education and outreach activities for kindergarten through 12th grade (K-12) students, and to support activities that encourage elementary, middle, and high-school youths to develop an interest in, and pursue, higher education and employment in the science, mathematics, and engineering career fields. These initiatives benefit the Department of the Air Force by cultivating a progressive pipeline of highly-trained and knowledgeable scientists and engineers aimed at filling Department of the Air Force science and engineering (S&E) workforce needs. This project seeks to cultivate STEM opportunities across the Department of the Air Force by supporting education and outreach activities that promote foundational knowledge building and experiential learning to inspire young students to pursue STEM-related career fields of critical importance to the Department of the Air Force.

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

	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Title: K-12 STEM Outreach	0.000	6.373	5.687	0.000	5.687
<p>Description: Foster Science, Technology, Engineering, and Mathematics (STEM) education and outreach activities for kindergarten through 12th grade (K-12) students and their educators to encourage an interest in STEM, provide exposure to STEM careers and opportunities, and to inspire the pursuit of higher education and employment in the Department of the Air Force science, mathematics, and engineering fields.</p> <p>FY 2024 Plans: Develop, institutionalize, and coordinate K-12 STEM outreach activities throughout the Department of the Air Force. Leverage ongoing partnerships with industry, schools, and other government agencies, in order to enhance the effectiveness of investments in outreach that promotes foundational knowledge building, experiential learning, and STEM workforce development.</p> <p>FY 2025 Base Plans: - Continue developing, institutionalizing, and coordinating K-12 STEM outreach activities throughout the Department of the Air Force. - Continue leveraging ongoing partnerships with industry, schools, and other government agencies, in order to enhance the effectiveness of investments in outreach that promotes foundational knowledge building, experiential learning, and STEM workforce development.</p> <p>FY 2025 OCO Plans:</p>					

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Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force	Date: March 2024
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Appropriation/Budget Activity 3600 / 1	R-1 Program Element (Number/Name) PE 0601102F / <i>Defense Research Sciences</i>	Project (Number/Name) 613005 / <i>STEM Pipeline Development</i>
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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Not Applicable					
<p><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i> FY 2025 decreased compared to FY 2024 by \$0.686 million. Funding decreased due to alignment with approved funding profile.</p>					
<p><i>Title:</i> Leadership Experience Growing Apprenticeships Committed to Youth (LEGACY)</p> <p><i>Description:</i> Attract, inspire and develop the next generation of our nation's scientific and technical workforce, thereby strengthening future Department of the Air Force S&T capabilities.</p> <p><i>FY 2024 Plans:</i> Identify, cultivate, and increase Science, Technology, Engineering, and Mathematics (STEM) opportunities across the Department of the Air Force through a progressive pipeline aimed at filling future science and engineering (S&E) workforce needs. Support STEM activities that identify and retain talented elementary, middle school, high-school, and undergraduate students to develop a young, diverse talent pool that will form the future S&E workforce.</p> <p><i>FY 2025 Base Plans:</i> - Continue identifying, cultivating, and increasing Science, Technology, Engineering, and Mathematics (STEM) opportunities across the Department of the Air Force through a progressive pipeline aimed at filling future science and engineering (S&E) workforce needs. - Continue supporting STEM activities that identify and retain talented elementary, middle school, high-school, and undergraduate students to develop a young, diverse talent pool that will form the future S&E workforce.</p> <p><i>FY 2025 OCO Plans:</i> Not Applicable</p> <p><i>FY 2024 to FY 2025 Increase/Decrease Statement:</i> FY 2025 increased compared to FY 2024 by \$0.040 million. Justification for this increase is described in the plans above.</p>	0.000	2.025	2.065	0.000	2.065
Accomplishments/Planned Programs Subtotals	0.000	8.398	7.752	0.000	7.752

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

Remarks

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Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 1	R-1 Program Element (Number/Name) PE 0601102F / <i>Defense Research Sciences</i>	Project (Number/Name) 613005 / <i>STEM Pipeline Development</i>

D. Acquisition Strategy

Not Applicable