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

Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force / BA 1: 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 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	374.047	356.107	315.348	0.000	315.348	331.452	367.809	381.631	362.629	Continuing	Continuing
613001: <i>Physics and Electronics</i>	-	110.757	105.346	91.504	0.000	91.504	96.609	108.465	112.774	109.771	Continuing	Continuing
613002: <i>Aerospace, Chemical and Material Sciences</i>	-	115.888	109.915	96.084	0.000	96.084	101.264	113.213	117.619	113.427	Continuing	Continuing
613003: <i>Mathematics, Information and Life Sciences</i>	-	111.670	105.513	91.504	0.000	91.504	96.743	108.594	112.947	110.719	Continuing	Continuing
613004: <i>Education and Outreach</i>	-	35.732	35.333	36.256	0.000	36.256	36.836	37.537	38.291	28.712	Continuing	Continuing

A. Mission Description and Budget Item Justification

Defense Research Sciences consists of extramural research activities in academia and industry along with in-house investigations performed in the Air Force Research Laboratory (AFRL). This program supports fundamental broad-based scientific and engineering research in areas critical to Air Force weapon, sensor, and support systems. All research areas are subject to long-range planning and technical review by both 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 & technology capabilities. The use of program funds in this PE would be in addition to the civilian pay expenses budgeted in program elements 0602102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602602F, 0602605F, 0602788F, 0602298F, and 1206601SF.

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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B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	383.322	356.107	363.097	0.000	363.097
Current President's Budget	374.047	356.107	315.348	0.000	315.348
Total Adjustments	-9.275	0.000	-47.749	0.000	-47.749
• 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	-9.820	0.000			
• Other Adjustments	0.545	0.000	-47.749	0.000	-47.749

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

	FY 2019	FY 2020
Project: 613001: <i>Physics and Electronics</i>		
Congressional Add: <i>Program Increase - Basic Research</i>	10.718	0.000
Congressional Add Subtotals for Project: 613001	10.718	0.000
Project: 613002: <i>Aerospace, Chemical and Material Sciences</i>		
Congressional Add: <i>Program Increase - Basic Research</i>	10.718	0.000
Congressional Add Subtotals for Project: 613002	10.718	0.000
Project: 613003: <i>Mathematics, Information and Life Sciences</i>		
Congressional Add: <i>Program Increase - Basic Research</i>	10.718	0.000
Congressional Add Subtotals for Project: 613003	10.718	0.000
Project: 613004: <i>Education and Outreach</i>		
Congressional Add: <i>Program Increase - Basic Research</i>	1.949	0.000
Congressional Add Subtotals for Project: 613004	1.949	0.000
Congressional Add Totals for all Projects	34.103	0.000

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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>	
<u>Change Summary Explanation</u> Decrease in FY 2021 of \$47.749 million is due to civilian pay reprice adjustments and reduced emphasis in Defense Research Sciences projects/efforts based on higher Department of Defense and Air Force priorities.		

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
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 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
613001: <i>Physics and Electronics</i>	-	110.757	105.346	91.504	0.000	91.504	96.609	108.465	112.774	109.771	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 Air Force. Research stresses high-risk, far-term, game-changing capability 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 sub-areas 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 2019	FY 2020	FY 2021
<p>Title: Complex Electronics and Fundamental Quantum Processes</p> <p>Description: Scientific focus areas are atomic and molecular physics, photonics, quantum electronic solids, gigahertz-terahertz electronics and material, semiconductor and electromagnetic materials, and optoelectronics.</p> <p>FY 2020 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.</p> <p>FY 2021 Plans: Continue to 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.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: FY 2021 decreased compared to FY 2020 by \$5.603 million. Funding decreased due civilian pay reprice adjustments and reduced emphasis in Electronics and Fundamental Quantum Processes research based on higher Department of Defense and Air Force priorities.</p>	39.024	42.639	37.036
<p>Title: Plasma Physics and High Energy Density Non-Equilibrium Processes</p> <p>Description: Scientific focus areas are plasma, electro-energetic physics and space sciences.</p>	21.371	21.964	19.078

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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) 613001 / <i>Physics and Electronics</i>
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<p><i>FY 2020 Plans:</i> 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><i>FY 2021 Plans:</i> Continue to 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><i>FY 2020 to FY 2021 Increase/Decrease Statement:</i> FY 2021 decreased compared to FY 2020 by \$2.886 million. Funding decreased due civilian pay reprice adjustments and reduced emphasis in Plasma Physics and High Energy Density Non-Equilibrium Processes research based on higher Department of Defense and Air Force priorities.</p>				
<p><i>Title:</i> Lasers and Optics, Electromagnetics, Communication and Signal Processing</p> <p><i>Description:</i> 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><i>FY 2020 Plans:</i> 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.</p> <p><i>FY 2021 Plans:</i> Continue to 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. Continue to 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.</p> <p><i>FY 2020 to FY 2021 Increase/Decrease Statement:</i></p>		39.644	40.743	35.390

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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) 613001 / <i>Physics and Electronics</i>
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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
FY 2021 decreased compared to FY 2020 by \$5.353 million. Funding decreased due to civilian pay reprice adjustments and reduced emphasis in Lasers and Optics, Electromagnetics, Communication and Signal Processing research based on higher Department of Defense and Air Force priorities.			
Accomplishments/Planned Programs Subtotals	100.039	105.346	91.504

	FY 2019	FY 2020
Congressional Add: Program Increase - Basic Research	10.718	0.000
FY 2019 Accomplishments: Conducted Congressionally directed effort.		
FY 2020 Plans: Not applicable		
Congressional Adds Subtotals	10.718	0.000

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

N/A

Remarks

D. Acquisition Strategy

N/A

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3600 / 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 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
613002: <i>Aerospace, Chemical and Material Sciences</i>	-	115.888	109.915	96.084	0.000	96.084	101.264	113.213	117.619	113.427	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 Air Force. Research stresses high-risk, far-term, game-changing capability 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.

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

	FY 2019	FY 2020	FY 2021
Title: Aero Structure Interactions and Control	29.170	32.397	28.320
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 2020 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 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 2021 Plans: Continue to 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 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 2020 to FY 2021 Increase/Decrease Statement: FY 2021 decreased compared to FY 2020 by \$4.077 million. Funding decreased due to civilian pay reprice adjustments and reduced emphasis in Aero Structure Interactions and Control research based on higher Department of Defense and Air Force priorities.			
Title: Energy, Power, and Propulsion	34.269	34.953	30.555

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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
<p>Description: Scientific focus areas are thermal control, theoretical chemistry, molecular dynamics, space power and propulsion, and combustion and diagnostics.</p> <p>FY 2020 Plans: Exploit technological innovations and develop potentially revolutionary technologies 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 Air Force systems. This includes developing novel energetic materials as well as understanding optimizing and controlling combustion processes.</p> <p>FY 2021 Plans: Continue to exploit technological innovations and develop potentially revolutionary technologies 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 Air Force systems including developing novel energetic materials as well as understanding optimizing and controlling combustion processes.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: FY 2021 decreased compared to FY 2020 by \$4.398 million. Funding decreased due to civilian pay reprice adjustments and reduced emphasis in Energy, Power, and Propulsion research based on higher Department of Defense and Air Force priorities.</p>			
<p>Title: Complex Materials and Structures</p> <p>Description: Scientific focus areas are design, manufacturing, and dynamics and control of multifunctional materials and microsystems, multi-scale mechanics, diagnostics and prognosis, and physico-chemistry of novel organic materials.</p> <p>FY 2020 Plans: 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 nano-scale 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>FY 2021 Plans: Continue to investigate 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 nano-scale through the mesoscale,</p>	41.731	42.565	37.209

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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
ultimately leading to controlled, well-understood material or structural behavior capable of dynamic functionality and/or performance characteristics to enhance mission versatility.			
<i>FY 2020 to FY 2021 Increase/Decrease Statement:</i> FY 2021 decreased compared to FY 2020 by \$5.356 million. Funding decreased due to civilian pay reprice adjustments and reduced emphasis in Complex Materials and Structures research based on higher Department of Defense and Air Force priorities.			
Accomplishments/Planned Programs Subtotals	105.170	109.915	96.084

	FY 2019	FY 2020
<i>Congressional Add:</i> Program Increase - Basic Research	10.718	0.000
<i>FY 2019 Accomplishments:</i> Conducted Congressionally directed effort.		
<i>FY 2020 Plans:</i> Not applicable		
Congressional Adds Subtotals	10.718	0.000

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

N/A

Remarks

D. Acquisition Strategy

N/A

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3600 / 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 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
613003: <i>Mathematics, Information and Life Sciences</i>	-	111.670	105.513	91.504	0.000	91.504	96.743	108.594	112.947	110.719	Continuing	Continuing

A. Mission Description and Budget Item Justification

Basic research in the Mathematics, Information Sciences, and Life Sciences seeks to expand fundamental knowledge and enable revolutionary advances and supporting technologies critical to the future 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 2019	FY 2020	FY 2021
Title: Information and Complex Networks	23.883	26.898	23.327
Description: Scientific focus areas are information operations and security, data and information fusion, advanced computing, artificial intelligence and complex networks.			
FY 2020 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. This includes traditional aspects of information assurance, but 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. Develop new mathematical approaches for predictive, multi-scale and multi-physics simulations of Air Force systems and systems-of-systems in realistic environments.			
FY 2021 Plans: Continue to design and analyze techniques to enable reliable and secure exchange of information and predictable operation of networks and systems, including hardware and software interactions, including traditional aspects of information assurance, but with an emphasis on the underlying mathematics of secure-by-design architectures of networked communications and neural information processing. 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. Continue to develop new computing approaches and algorithms for			

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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) 613003 / <i>Mathematics, Information and Life Sciences</i>		
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
network-of-network information processing at the speed of warfare and new mathematical approaches for predictive, multi-scale and multi-physics simulations of Air Force systems and systems-of-systems in realistic environments. FY 2020 to FY 2021 Increase/Decrease Statement: FY 2021 decreased compared to FY 2020 by \$3.571 million. Funding decreased due to civilian pay reprice adjustments and reduced emphasis in Information and Complex Networks research based on higher Department of Defense and Air Force priorities.				
Title: Decision Making 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 large-scale influence. FY 2020 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. FY 2021 Plans: Continue to 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. Continue to develop new mathematical models for information capture; object, scene and relation identification; and multi-level reasoning and meta-learning. 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. FY 2020 to FY 2021 Increase/Decrease Statement: FY 2021 decreased compared to FY 2020 by \$2.785 million. Funding decreased due to civilian pay reprice adjustments and reduced emphasis in Information and Complex Networks research based on higher Department of Defense and Air Force priorities.		20.565	20.978	18.193
Title: Dynamical Systems, Optimization, and Control		27.180	27.725	24.044

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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
<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 2020 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 provide guaranteed levels of performance. Develop novel adaptive control strategies for coordinating heterogeneous, autonomous, or semi-autonomous aerospace vehicles in uncertain, information rich, dynamically changing, adversarial, and networked environments.</p> <p>FY 2021 Plans: Continue to 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 provide guaranteed levels of performance. Continue to develop novel adaptive control strategies for coordinating heterogeneous, autonomous, or semi-autonomous aerospace vehicles in uncertain, information rich, dynamically changing, adversarial, and networked environments.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: FY 2021 decreased compared to FY 2020 by \$3.681 million. Funding decreased due to civilian pay reprice adjustments and reduced emphasis in Dynamical Systems, Optimization, and Control research based on higher Department of Defense and Air Force priorities.</p>			
<p>Title: Natural Materials and Systems</p> <p>Description: Scientific focus areas are natural materials and nature inspired systems, human performance and biosystems, cognitive neuroscience and biophysics.</p> <p>FY 2020 Plans: Investigate multi-disciplinary 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 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>FY 2021 Plans:</p>	29.324	29.912	25.940

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B. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Continue to investigate multi-disciplinary 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 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.			
<i>FY 2020 to FY 2021 Increase/Decrease Statement:</i> FY 2021 decreased compared to FY 2020 by \$3.972 million. Funding decreased due to civilian pay reprice adjustments and reduced emphasis in Natural Materials and Systems research based on higher Department of Defense and Air Force priorities.			
Accomplishments/Planned Programs Subtotals	100.952	105.513	91.504

	FY 2019	FY 2020
<i>Congressional Add:</i> Program Increase - Basic Research	10.718	0.000
<i>FY 2019 Accomplishments:</i> Conducted Congressionally directed effort.		
<i>FY 2020 Plans:</i> Not applicable		
Congressional Adds Subtotals	10.718	0.000

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

N/A

Remarks

D. Acquisition Strategy

N/A

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Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force										Date: February 2020		
Appropriation/Budget Activity 3600 / 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 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
613004: <i>Education and Outreach</i>	-	35.732	35.333	36.256	0.000	36.256	36.836	37.537	38.291	28.712	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 Air Force researchers, and to support and develop scientists and engineers with an awareness of Air Force basic research priorities. These professional interactions and collaborations benefit the Air Force by increasing awareness of Air Force basic research priorities in the research community as a whole, and attracting talented scientists and engineers to address Air Force needs. International interactions facilitate future interoperability of coalition systems and foster relationships with future coalition partners. 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 2019	FY 2020	FY 2021
Title: Outreach to International S&T Community	11.355	12.441	12.766
Description: Foster international S&T cooperation by supporting direct interchanges with a broad range of key international researchers and communities. Identify and leverage international scientific advances when appropriate.			
FY 2020 Plans: Leverage international expertise and support international technology liaison missions to identify and maintain awareness of foreign science and technology developments. Explore current foreign investments and influence world-class scientific research on specific topics of Air Force interest. Pursue access to technical information on foreign research capabilities within our interests. Support international visits by scientists and high-level DoD science and technology delegations, and provide primary interface to coordinate international science and technology participation among DoD organizations.			
FY 2021 Plans: Continue to leverage international expertise and support international technology liaison missions to identify and maintain awareness of foreign science and technology developments. Continue to explore current foreign investments and influence world-class scientific research on specific topics of Air Force interest. Continue to pursue access to technical information on foreign research capabilities within our interests. Continue to support international visits by scientists and high-level DoD science and technology delegations, and provide primary interface to coordinate international science and technology participation among DoD organizations.			
FY 2020 to FY 2021 Increase/Decrease Statement: FY 2021 increased compared to FY 2020 by \$0.325 million. Justification for the increase is described in the plans above.			
Title: Outreach to U.S. S&T Workforce	22.428	22.892	23.490

UNCLASSIFIED

Exhibit R-2A, RDT&E Project Justification: PB 2021 Air Force	Date: February 2020
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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 2019	FY 2020	FY 2021
<p>Description: Strengthen science, mathematics, and engineering research and infrastructure in the U.S., thereby strengthening current and future Air Force S&T capabilities.</p> <p>FY 2020 Plans: Identifying, recruiting, and increasing opportunities for new young investigators to participate in critical Air Force research. Support science, mathematics, and engineering research including Historically Black Colleges and Universities, Hispanic serving institutions, and other minority institutions. Support science activities that encourage elementary/middle/high school youths to develop an interest in and pursue higher education and employment in the science, mathematics, and engineering fields.</p> <p>FY 2021 Plans: Continue identifying, recruiting, and increasing opportunities for new young investigators to participate in critical Air Force research. Support science, mathematics, and engineering research including Historically Black Colleges and Universities, Hispanic serving institutions, and other minority institutions. Continue to support science activities that encourage elementary/middle/high school youths to develop an interest in and pursue higher education and employment in the science, mathematics, and engineering fields.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: FY 2021 increased compared to FY 2020 by \$0.598 million. Justification for the increase is described in the plans above.</p>			
Accomplishments/Planned Programs Subtotals	33.783	35.333	36.256

	FY 2019	FY 2020
Congressional Add: Program Increase - Basic Research	1.949	0.000
FY 2019 Accomplishments: Conducted Congressionally directed effort.		
FY 2020 Plans: Not applicable		
Congressional Adds Subtotals	1.949	0.000

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

N/A

Remarks

D. Acquisition Strategy

N/A