Exhibit R-2, RDT&E Budget Item Justification: PB 2014 Air Force											DATE: April 2013	
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 1: *Basic Research*					R-1 ITEM NOMENCLATURE PE 0601102F: *Defense Research Sciences*							
COST ($ in Millions)	**All Prior Years**	**FY 2012**	**FY 2013#**	**FY 2014 Base**	**FY 2014 OCO ##**	**FY 2014 Total**	**FY 2015**	**FY 2016**	**FY 2017**	**FY 2018**	**Cost To Complete**	**Total Cost**
Total Program Element	-	347.833	361.787	373.151	-	373.151	379.833	387.765	395.622	402.882	Continuing	Continuing
613001: *Physics and Electronics*	-	104.444	112.422	107.174	-	107.174	112.149	114.116	114.233	116.953	Continuing	Continuing
613002: *Aerospace, Chemical and Material Sciences*	-	133.781	108.982	116.611	-	116.611	116.607	119.012	121.988	124.432	Continuing	Continuing
613003: *Mathematics, Information and Life Sciences*	-	99.413	119.236	119.873	-	119.873	119.966	121.900	124.693	126.808	Continuing	Continuing
613004: *Education and Outreach*	-	10.195	21.147	29.493	-	29.493	31.111	32.737	34.708	34.689	Continuing	Continuing

FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012

The FY 2014 OCO Request will be submitted at a later date

A. Mission Description and Budget Item Justification

This program consists of extramural research activities in academia and industry along with in-house investigations performed in the Air Force Research Laboratory. This program funds fundamental broad-based scientific and engineering research in areas critical to Air Force weapon 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 is in Budget Activity 1, Basic Research, because it funds scientific study and experimentation.

B. Program Change Summary ($ in Millions)	FY 2012	FY 2013	FY 2014 Base	FY 2014 OCO	FY 2014 Total
Previous President's Budget	364.328	361.787	374.267	-	374.267
Current President's Budget	347.833	361.787	373.151	-	373.151
Total Adjustments	-16.495	0.000	-1.116	-	-1.116
• Congressional General Reductions	-	0.000			
• Congressional Directed Reductions	-	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	-	0.000			
• Congressional Directed Transfers	-	0.000			
• Reprogrammings	-8.648	0.000			
• SBIR/STTR Transfer	-7.847	0.000			
• Other Adjustments	0.000	0.000	-1.116	-	-1.116

Change Summary Explanation

Decrease in FY14 is due to higher DoD priorities.

Exhibit R-2, RDT&E Budget Item Justification: PB 2014 Air Force	DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 1: *Basic Research*	**R-1 ITEM NOMENCLATURE** PE 0601102F: *Defense Research Sciences*

Reprogrammed for specific projects in accordance with Section 219 of the Duncan Hunter National Defense Authorization Act for Fiscal Year (FY) 2009, as amended by Section 2801 of the National Defense Authorization Act for FY 2010.

Exhibit R-2A, RDT&E Project Justification: PB 2014 Air Force			DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601102F: *Defense Research Sciences*	PROJECT 613001: *Physics and Electronics*	

COST ($ in Millions)	All Prior Years	FY 2012	FY 2013#	FY 2014 Base	FY 2014 OCO ##	FY 2014 Total	FY 2015	FY 2016	FY 2017	FY 2018	Cost To Complete	Total Cost
613001: *Physics and Electronics*	-	104.444	112.422	107.174	-	107.174	112.149	114.116	114.233	116.953	Continuing	Continuing

FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012

The FY 2014 OCO Request will be submitted at a later date

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 thrust 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. Although the major thrust descriptions that follow are specific sub-areas of focus within this project, there is interest in exploring novel ideas that may bridge these major thrusts as well as those in the other projects within this program element.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
Title: Complex Electronics and Fundamental Quantum Processes	61.622	61.429	50.182
Description: Scientific focus areas are atomic and molecular physics, optical physics, photonics, quantum electronic solids, adaptive multi-mode sensing and ultra-high speed electronics, semiconductor and electromagnetic materials, and optoelectronics.			
FY 2012 Accomplishments: Demonstrated for the first time that two images can be stored and retrieved at different times in a room-temperature vapor of atoms, allowing storage of information in an atomic or quantum memory device. Explored a wide range of complex materials and devices, including non-linear optical materials, photonics, optoelectronics, meta-materials, cathodes, di-electric and magnetic materials, semiconductor lasers, memristive systems, new classes of high-temperature superconductors, quantum dots, quantum wells and graphene. Included research to understand mechanisms of generating and controlling quantum states, such as superposition and entanglement, in photons and ultra-cold atoms and molecules.			
FY 2013 Plans: Explore a wide range of complex materials and devices, including non-linear optical materials, photonics, optoelectronics, meta-materials, cathodes, di-electric and magnetic materials, semiconductor lasers, 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 photons and ultra-cold atoms and molecules.			
FY 2014 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2014 Air Force		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601102F: *Defense Research Sciences*	PROJECT 613001: *Physics and Electronics*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
Continue to explore a wide range of complex materials and devices, including non-linear optical materials, photonics, optoelectronics, meta-materials, cathodes, di-electric and magnetic materials, semiconductor lasers, 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 photons and ultra-cold atoms and molecules.			
Title: Plasma Physics and High Energy Density Non-Equilibrium Processes ***Description:*** Scientific focus areas are electro-energetic physics and space sciences. ***FY 2012 Accomplishments:*** Created the world's smallest three-dimensional optical cavities with the potential to generate the world's most intense nanolaser beams. Explored a wide range of activities characterized by processes sufficiently energetic to require the understanding and managing of plasma phenomenology and the non-linear response of materials to high electric and magnetic fields. Included space weather, plasma control of boundary layers in turbulent flow, plasma discharges, radio frequency (RF) propagation, RF-plasma interaction, and high-power, beam-driven microwave devices. ***FY 2013 Plans:*** Explore a wide range of activities characterized by processes sufficiently energetic to require the understanding and managing of plasma phenomenology and the non-linear response of materials to high electric and magnetic fields. Includes space weather, plasma control of boundary layers in turbulent flow, plasma discharges, RF propagation, RF-plasma interaction, and high-power, beam-driven microwave devices. ***FY 2014 Plans:*** Continue to explore a wide range of activities characterized by processes sufficiently energetic to require the understanding and managing of plasma phenomenology and the non-linear response of materials to high electric and magnetic fields. Includes space weather, plasma control of boundary layers in turbulent flow, plasma discharges, RF propagation, RF-plasma interaction, and high-power, beam-driven microwave devices.	13.578	14.615	18.450
Title: Lasers and Optics, Electromagnetics, Communication and Signal Processing ***Description:*** Scientific focus areas are physical mathematics and applied analysis, electromagnetics, remote sensing and imaging physics, and surveillance and navigation. ***FY 2012 Accomplishments:*** Created a new type of optical device small enough to fit millions on a computer chip that could lead to faster, more powerful information processing and supercomputers. Explored 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. Investigated aspects	29.244	36.378	38.542

Exhibit R-2A, RDT&E Project Justification: PB 2014 Air Force		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601102F: *Defense Research Sciences*	PROJECT 613001: *Physics and Electronics*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
of the phenomenology of lasers including high energy lasers and non-linear optics. Included the development of sophisticated mathematics and algorithm development for extracting information from complex and/or sparse signals. ***FY 2013 Plans:*** 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 and non-linear optics. Includes the development of sophisticated mathematics and algorithm development for extracting information from complex and/or sparse signals. ***FY 2014 Plans:*** 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. Investigate aspects of the phenomenology of lasers including high energy lasers and non-linear optics. Includes the development of sophisticated mathematics and algorithm development for extracting information from complex and/or sparse signals.			
Accomplishments/Planned Programs Subtotals	104.444	112.422	107.174

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

Exhibit R-2A, RDT&E Project Justification: PB 2014 Air Force			DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601102F: *Defense Research Sciences*	PROJECT 613002: *Aerospace, Chemical and Material Sciences*	

COST ($ in Millions)	All Prior Years	FY 2012	FY 2013#	FY 2014 Base	FY 2014 OCO ##	FY 2014 Total	FY 2015	FY 2016	FY 2017	FY 2018	Cost To Complete	Total Cost
613002: *Aerospace, Chemical and Material Sciences*	-	133.781	108.982	116.611	-	116.611	116.607	119.012	121.988	124.432	Continuing	Continuing

FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012

The FY 2014 OCO Request will be submitted at a later date

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. Major thrust areas being investigated in this project are aero-structure interactions and control; energy, power, and propulsion; and complex materials and structures. Although the major thrust descriptions that follow are specific sub-areas of focus within this project, there is interest in exploring novel ideas that may bridge these major thrusts as well as those in the other projects within this program element.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
Title: Aero Structure Interactions and Control	33.445	27.245	30.148
Description: Scientific focus areas are high temperature aerospace materials, hypersonics, aerothermodynamics and turbulence, and flow interactions and control.			
FY 2012 Accomplishments: Developed new method to control an airfoil using actuators which will lead to greater air vehicle maneuverability and is being considered for applications to wind turbine research. Investigated 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. Explored the synergy gained from an interdisciplinary look at multiple technologies and the integration of core disciplines of fluid mechanics, structures, and thermodynamics.			
FY 2013 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, structures, and thermodynamics.			
FY 2014 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2014 Air Force		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601102F: *Defense Research Sciences*	PROJECT 613002: *Aerospace, Chemical and Material Sciences*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
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. Explore the synergy gained from an interdisciplinary look at multiple technologies and the integration of core disciplines of fluid mechanics, structures, and thermodynamics.			
Title: Energy, Power, and Propulsion ***Description:*** Scientific focus areas are thermal control, theoretical chemistry, molecular dynamics, space power and propulsion, and combustion and diagnostics. ***FY 2012 Accomplishments:*** Developed a new nanomaterials-based technology that has the potential to increase the efficiency of photovoltaic cells up to 45 percent. Exploited technological innovations and developed potentially revolutionary technologies by integrating core disciplines of combustion, plasma dynamics, chemistry, hybrid simulation, structures, and materials. Investigated processes associated with the generation, storage, and utilization of energy, specifically for Air Force systems. Included developing novel energetic materials as well as understanding and optimizing combustion processes. ***FY 2013 Plans:*** Exploit technological innovations and develop potentially revolutionary technologies by integrating core disciplines of combustion, plasma dynamics, chemistry, hybrid simulation, structures, and materials. Investigates processes associated with the generation, storage, and utilization of energy, specifically for Air Force systems. Includes developing novel energetic materials as well as understanding and optimizing combustion processes. ***FY 2014 Plans:*** Continue to exploit technological innovations and develop potentially revolutionary technologies by integrating core disciplines of combustion, plasma dynamics, chemistry, hybrid simulation, structures, and materials. Investigates processes associated with the generation, storage, and utilization of energy, specifically for Air Force systems. Includes developing novel energetic materials as well as understanding and optimizing combustion processes.	44.148	35.964	40.081
Title: Complex Materials and Structures ***Description:*** Scientific focus areas are mechanics of multifunctional materials and microsystems, multi-scale mechanics and prognosis, low density materials, and polymer chemistry. ***FY 2012 Accomplishments:*** Investigated carbon nanotube sheet research that offers key advantages for photothermal deflection. Investigated multifunctional materials and structures composed of different classes of materials that may be able to change functionality or performance characteristics to enhance the mission versatility of future air and space systems, with a key goal of increasing functionality	56.188	45.773	46.382

Exhibit R-2A, RDT&E Project Justification: PB 2014 Air Force		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601102F: *Defense Research Sciences*	PROJECT 613002: *Aerospace, Chemical and Material Sciences*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
while decreasing weight and volume. Explored complex materials, microsystems, and structures that incorporate hierarchical design and functionality from the nano-scale through the meso-scale, ultimately leading to controlled, well-understood material or structural behavior capable of dynamic functionality and/or performance characteristics to enhance mission versatility. ***FY 2013 Plans:*** Investigate multifunctional materials and structures composed of different classes of materials that may be able to change functionality or performance characteristics to enhance the mission versatility of future air and space systems, with a key goal of increasing functionality while decreasing weight and volume. Explore complex materials, microsystems, and structures that incorporate hierarchical design and functionality from the nano-scale through the meso-scale, ultimately leading to controlled, well-understood material or structural behavior capable of dynamic functionality and/or performance characteristics to enhance mission versatility. ***FY 2014 Plans:*** Continue to investigate multifunctional materials and structures composed of different classes of materials that may be able to change functionality or performance characteristics to enhance the mission versatility of future air and space systems, with a key goal of increasing functionality while decreasing weight and volume. Explore complex materials, microsystems, and structures that incorporate hierarchical design and functionality from the nano-scale through the meso-scale, ultimately leading to controlled, well-understood material or structural behavior capable of dynamic functionality and/or performance characteristics to enhance mission versatility.			
Accomplishments/Planned Programs Subtotals	133.781	108.982	116.611

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

Exhibit R-2A, RDT&E Project Justification: PB 2014 Air Force			DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601102F: *Defense Research Sciences*	PROJECT 613003: *Mathematics, Information and Life Sciences*	

COST ($ in Millions)	All Prior Years	FY 2012	FY 2013#	FY 2014 Base	FY 2014 OCO ##	FY 2014 Total	FY 2015	FY 2016	FY 2017	FY 2018	Cost To Complete	Total Cost
613003: *Mathematics, Information and Life Sciences*	-	99.413	119.236	119.873	-	119.873	119.966	121.900	124.693	126.808	Continuing	Continuing

FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012

The FY 2014 OCO Request will be submitted at a later date

A. Mission Description and Budget Item Justification

Basic research in the Mathematics, Information, and Life 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. Major thrust areas being investigated in this project are information and complex networks, decision making, dynamical systems, optimization and control, and natural materials and systems. Although the major thrust descriptions that follow are specific sub-areas of focus within this project, there is interest in exploring novel ideas that may bridge these major thrusts as well as those in the other projects within this program element.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
Title: Information and Complex Networks	27.836	34.386	34.542
Description: Scientific focus areas are systems and software, information operations and security, information fusion, and complex networks.			
FY 2012 Accomplishments: Studied feedback failure correction mechanisms that can augment software to adapt to failures and continue to function in the presence of residual defects. Designed and analyzed techniques to enable reliable and secure exchange of information and predictable operation of networks and systems. Included traditional aspects of information assurance, software engineering, and reliable systems, but the emphasis was on the underlying mathematics of secure-by-design architectures of networked communications and neural information processing. Sub-areas included system and network performance prediction, design and analysis, and modeling of human-machine systems.			
FY 2013 Plans: Design and analyze techniques to enable reliable and secure exchange of information and predictable operation of networks and systems. Includes traditional aspects of information assurance, software engineering, and reliable systems, but the emphasis is on the underlying mathematics of secure-by-design architectures of networked communications and neural information processing. Sub-areas include system and network performance prediction, design and analysis, and modeling of human-machine systems.			
FY 2014 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2014 Air Force		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601102F: *Defense Research Sciences*	PROJECT 613003: *Mathematics, Information and Life Sciences*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
Continue to design and analyze techniques to enable reliable and secure exchange of information and predictable operation of networks and systems. Includes traditional aspects of information assurance, software engineering, and reliable systems, but the emphasis is on the underlying mathematics of secure-by-design architectures of networked communications and neural information processing. Sub-areas include system and network performance prediction, design and analysis, and modeling of human-machine systems.			
Title: Decision Making ***Description:*** Scientific focus areas are mathematical modeling of cognition and decision making, and collective behavior and socio-cultural modeling. ***FY 2012 Accomplishments:*** Developed a model based on the geographical size of groups to quantify and predict the possibility of social violence. Investigated new mathematical laws, scientific principles, and robust algorithms that underlie intelligent, mixed human-machine decision making to achieve accurate real-time projection of expertise and knowledge into and out of the battlespace. Included efforts to advance the critical knowledge base in information sciences and information fusion, and to model individual and group cognitive processing and decision making. ***FY 2013 Plans:*** Investigate new mathematical laws, scientific principles, and robust algorithms that underlie intelligent, mixed human-machine decision making to achieve accurate real-time projection of expertise and knowledge into and out of the battlespace. Includes efforts to advance the critical knowledge base in information sciences and information fusion, and to model individual and group cognitive processing and decision making. ***FY 2014 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 projection of expertise and knowledge into and out of the battlespace. Includes efforts to advance the critical knowledge base in information sciences and information fusion, and to model individual and group cognitive processing and decision making.	13.918	18.693	21.013
Title: Dynamical Systems, Optimization, and Control ***Description:*** Scientific focus areas are computational mathematics, dynamics and control, and optimization and discrete mathematics. ***FY 2012 Accomplishments:*** Designed a three-dimensional virtual reality tracking system to charactize sensory-motor feedback mechanisms in an insect brain that could inspire new approaches to flight control stabilization and navigation. Developed new scientific concepts supported	37.776	42.309	38.185

Exhibit R-2A, RDT&E Project Justification: PB 2014 Air Force		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601102F: *Defense Research Sciences*	PROJECT 613003: *Mathematics, Information and Life Sciences*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
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. Included study of novel adaptive control strategies for coordinating heterogeneous, autonomous, or semi autonomous aerospace vehicles in uncertain, information rich, dynamically changing, adversarial, and networked environments. ***FY 2013 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. Includes study of novel adaptive control strategies for coordinating heterogeneous, autonomous, or semi-autonomous aerospace vehicles in uncertain, information rich, dynamically changing, adversarial, and networked environments. ***FY 2014 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. Includes study of novel adaptive control strategies for coordinating heterogeneous, autonomous, or semi-autonomous aerospace vehicles in uncertain, information rich, dynamically changing, adversarial, and networked environments.			
Title: Natural Materials and Systems ***Description:*** Scientific focus areas are renewable energy, natural materials and nature inspired systems. ***FY 2012 Accomplishments:*** Created a new crystal erbium compound in the form of single-crystal nanowire that offers superior optical properties. Investigated multi-disciplinary approaches for studying, using, mimicking, synthesizing and adapting to the ways natural systems accomplish their required tasks. Studied how to adapt and mimic existing natural sensory systems and add existing capabilities to these organisms with the intent to gain more precise control over their material production. ***FY 2013 Plans:*** Investigate multi-disciplinary approaches for studying, using, mimicking, synthesizing and adapting to the ways natural systems accomplish their required tasks. Study how to adapt and mimic existing natural sensory systems and add existing capabilities to these organisms with the intent to gain more precise control over their material production. ***FY 2014 Plans:*** Continue to investigate multi-disciplinary approaches for studying, using, mimicking, synthesizing and adapting to the ways natural systems accomplish their required tasks. Study how to adapt and mimic existing natural sensory systems and add existing capabilities to these organisms with the intent to gain more precise control over their material production.	19.883	23.848	26.133
Accomplishments/Planned Programs Subtotals	99.413	119.236	119.873

Exhibit R-2A, RDT&E Project Justification: PB 2014 Air Force		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601102F: *Defense Research Sciences*	PROJECT 613003: *Mathematics, Information and Life Sciences*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

Exhibit R-2A, RDT&E Project Justification: PB 2014 Air Force			DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601102F: *Defense Research Sciences*	PROJECT 613004: *Education and Outreach*	

COST ($ in Millions)	All Prior Years	FY 2012	FY 2013#	FY 2014 Base	FY 2014 OCO ##	FY 2014 Total	FY 2015	FY 2016	FY 2017	FY 2018	Cost To Complete	Total Cost
613004: *Education and Outreach*	-	10.195	21.147	29.493	-	29.493	31.111	32.737	34.708	34.689	Continuing	Continuing

FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012

The FY 2014 OCO Request will be submitted at a later date

A. Mission Description and Budget Item Justification

The major thrust areas 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 2012	FY 2013	FY 2014
Title: Outreach to International S&T Community	5.125	9.935	12.907
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 2012 Accomplishments: Collaborated with Australia and Brazil on hypersonics research. Leveraged international expertise and supported international technology liaison missions to identify and maintain awareness of foreign science and technology developments. Explored current foreign investments and influenced world-class scientific research on specific topics of Air Force interest. Pursued access to technical information on foreign research capabilities within our interests. Supported international visits by scientists and high-level Department of Defense (DoD) S&T delegations, and provided primary interface to coordinate international S&T participation among DoD organizations.			
FY 2013 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 S&T delegations, and provide primary interface to coordinate international S&T participation among DoD organizations.			
FY 2014 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2014 Air Force		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601102F: *Defense Research Sciences*	PROJECT 613004: *Education and Outreach*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2012	FY 2013	FY 2014
Continue to 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 S&T delegations, and provide primary interface to coordinate international S&T participation among DoD organizations.			
Title: Outreach to U.S. S&T Workforce ***Description:*** Strengthen science, mathematics, and engineering research and infrastructure in the U.S., thereby strengthening current and future Air Force S&T capabilities. ***FY 2012 Accomplishments:*** Awarded 48 grants through the Air Force's Young Investigator Research Program. Increased awareness of Air Force research needs and opportunities throughout the civilian scientific community, while simultaneously identifying, recruiting, and increasing opportunities for new young investigators to participate in critical Air Force research. Supported science, mathematics, and engineering research, and educational outreach programs at U.S. colleges and universities, including historically black colleges and universities, Hispanic serving institutions, and other minority institutions. ***FY 2013 Plans:*** Increase awareness of Air Force research needs and opportunities throughout the civilian scientific community, while simultaneously identifying, recruiting, and increasing opportunities for new young investigators to participate in critical Air Force research. Support science, mathematics, and engineering research, and educational outreach programs at U.S. colleges and universities, including historically black colleges and universities, Hispanic serving institutions, and other minority institutions. ***FY 2014 Plans:*** Continue to increase awareness of Air Force research needs and opportunities throughout the civilian scientific community, while simultaneously identifying, recruiting, and increasing opportunities for new young investigators to participate in critical Air Force research. Support science, mathematics, and engineering research at U.S. colleges and universities, including historically black colleges and universities, Hispanic serving institutions, and other minority institutions.	5.070	11.212	16.586
Accomplishments/Planned Programs Subtotals	10.195	21.147	29.493

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2014 Air Force		DATE: April 2013
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 1: *Basic Research*	R-1 ITEM NOMENCLATURE PE 0601102F: *Defense Research Sciences*	PROJECT 613004: *Education and Outreach*

D. Acquisition Strategy

N/A

E. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.