Exhibit R-2, RDT&E Budget Item Justification: PB 2011 Air Force										DATE: February 2010	
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*				R-1 ITEM NOMENCLATURE PE 0602102F: *Materials*							
COST ($ in Millions)	**FY 2009 Actual**	**FY 2010 Estimate**	**FY 2011 Base Estimate**	**FY 2011 OCO Estimate**	**FY 2011 Total Estimate**	**FY 2012 Estimate**	**FY 2013 Estimate**	**FY 2014 Estimate**	**FY 2015 Estimate**	**Cost To Complete**	**Total Cost**
Total Program Element	185.583	179.202	137.273	0.000	137.273	135.649	135.476	134.063	136.891	Continuing	Continuing
6201SP: *Space Materials Development*	31.727	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
624347: *Materials for Structures, Propulsion, and Subsystems*	79.314	110.280	84.865	0.000	84.865	81.649	80.713	78.623	80.669	Continuing	Continuing
624348: *Materials for Electronics, Optics, and Survivability*	34.044	33.744	31.687	0.000	31.687	30.746	30.840	30.967	31.255	Continuing	Continuing
624349: *Materials Technology for Sustainment*	28.853	22.697	16.893	0.000	16.893	19.320	20.022	20.364	20.715	Continuing	Continuing
624915: *Deployed Air Base Technology*	11.645	12.481	3.828	0.000	3.828	3.934	3.901	4.109	4.252	Continuing	Continuing

Note

Note: In FY 2010 and out, funds from Project 01SP have been moved to Project 4347, Project 4348, and Project 4349 within this Program Element to more accurately align efforts.

A. Mission Description and Budget Item Justification

This program develops advanced materials, processing, and inspection technologies to reduce life cycle costs and improve performance, sustainability, availability, affordability, supportability, reliability, and survivability of current and future Air Force systems and operations. The program has five projects that develop: (1) the materials and processing technology base for spacecraft and launch systems; (2) structural, propulsion, and sub-systems materials and processes technologies; (3) electronic, optical, and survivability materials and processes technologies; (4) sustainment materials, processes technologies, and advanced non-destructive inspection methodologies; and (5) air base operations technologies including deployable base infrastructure, force protection, and fire fighting capabilities. This program is in Budget Activity 2, Applied Research, since it develops and determines the technical feasibility and military utility of evolutionary and revolutionary technologies.

Exhibit R-2, RDT&E Budget Item Justification: PB 2011 Air Force	DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602102F: *Materials*

B. Program Change Summary ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
Previous President's Budget	188.152	127.957	0.000	0.000	0.000
Current President's Budget	185.583	179.202	137.273	0.000	137.273
Total Adjustments	-2.569	51.245	137.273	0.000	137.273
• Congressional General Reductions		0.000			
• Congressional Directed Reductions		0.000			
• Congressional Rescissions	0.000	-0.755			
• Congressional Adds		52.000			
• Congressional Directed Transfers		0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	-2.569	0.000	137.273	0.000	137.273

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2009	FY 2010
Project: 624347: *Materials for Structures, Propulsion, and Subsystems*		
Congressional Add: *Advanced Carbon Fiber Research and Test Initiative.*	2.393	0.000
Congressional Add: *Advanced Thermal Control Coatings for Space Applications.*	1.596	0.000
Congressional Add: *Ceramic Matrix Composite Turbine Blade Demonstration.*	3.989	0.000
Congressional Add: *Innovative Polymeric Materials for Three-Dimensional (3-D) Microdevice Construction.*	1.596	0.000
Congressional Add: *Intelligent Manufacturing Initiative.*	2.393	0.000
Congressional Add: *Nanocomposites for Lightning Protection of Composite Airframe Structures.*	1.197	0.000
Congressional Add: *Partnership for Emerging Technologies.*	1.596	0.000
Congressional Add: *Air Force Minority Leaders Program.*	7.978	4.780
Congressional Add: *Pennsylvania Nanomaterials Commercialization Center.*	1.995	0.797
Congressional Add: *Carbon Nanomaterials for Advanced Aerospace Applications.*	2.393	0.797
Congressional Add: *ONAMI Safer Nanomaterials and Nanomanufacturing.*	3.989	3.505

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Congressional Add Details ($ in Millions, and Includes General Reductions)	**FY 2009**	**FY 2010**
Congressional Add: *Consortium for Nanomaterials for Aerospace Commerce and Technology (CONTACT).*	2.393	3.187
Congressional Add: *Advanced Aerospace Carbon Foam Heat Exchangers.*	1.596	3.187
Congressional Add: *Institute for Science and Engineering Simulation/Aircraft Fatigue Modeling and Simulation.*	3.351	3.585
Congressional Add: *Development of Mobile Wind Turbine Systems to Power Forward Bases.*	0.798	1.195
Congressional Add: *Aerospace Laser Micro Engineering Station.*	0.000	0.797
Congressional Add: *Hybrid Nanoparticle-based Coolant Technology Development and Manufacturing.*	0.000	0.797
Congressional Add: *Lightning Protection Composites.*	0.000	2.987
Congressional Add: *Ultra-High Temperature Materials for Hypersonic Aerospace Vehicles.*	0.000	2.390
Congressional Add Subtotals for Project: 624347	39.253	28.004
Project: 624348: *Materials for Electronics, Optics, and Survivability*		
Congressional Add: *Free Electron Laser Capabilities for Aerospace Microfabrication.*	1.117	0.000
Congressional Add: *Gallium Nitride (GaN) RF Power Technology.*	1.596	0.000
Congressional Add: *Plasma-Sphere Array for Flexible Electronics.*	2.792	0.000
Congressional Add: *Diamond Substrate for Cooling of Micro-Electronics.*	1.995	0.000
Congressional Add: *High Power Broadly Tunable Middle-Infrared Laser Sources.*	2.393	0.000
Congressional Add: *Light Weight Organic Photovoltaic Technologies.*	1.197	0.000
Congressional Add: *Liquid Crystal Laser Eye Protection.*	1.596	0.000
Congressional Add: *Optic Band Control Program.*	0.798	0.000
Congressional Add: *Large Area, APVT Materials Development for High Power Devices.*	0.798	1.593
Congressional Add: *Gallium Nitride (GaN) Microelectronics and Materials.*	0.000	1.593
Congressional Add: *Low-Defect Density Gallium Nitride Materials for High-Performanace Electronics Devices.*	0.000	2.788
Congressional Add: *Mid-IR Laser Materials.*	0.000	0.797

Exhibit R-2, RDT&E Budget Item Justification: PB 2011 Air Force	DATE: February 2010
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Congressional Add Details ($ in Millions, and Includes General Reductions)	**FY 2009**	**FY 2010**
Congressional Add Subtotals for Project: 624348	14.282	6.771
Project: 624349: *Materials Technology for Sustainment*		
Congressional Add: *Aircraft Fatigue Modeling and Simulation.*	2.992	0.000
Congressional Add: *Science for Sustainment.*	1.596	0.000
Congressional Add: *Accelerated Insertion of Advanced Materials and Certification for Military Aircraft Structure Material Substitution and Repair.*	2.992	1.992
Congressional Add: *Conducting Polymer Stress and Polymer Damage Sensors for Composites.*	1.436	2.868
Congressional Add: *LGX High Temperature Acoustic Wave Sensors.*	1.596	1.593
Congressional Add: *Hybrid Materials Integration (HMI).*	0.000	1.992
Congressional Add Subtotals for Project: 624349	10.612	8.445
Project: 624915: *Deployed Air Base Technology*		
Congressional Add: *Advanced Military Installations that Integrate Renewable Energy and Advanced Energy Storage Technologies.*	3.989	0.000
Congressional Add: *Tactical Shelters Next Generation Composite Initiative.*	1.596	0.000
Congressional Add: *Fire and Blast Resistant Materials for Force Protection.*	1.596	3.187
Congressional Add: *Energy Efficiency, Recovery, and Generation (ENERGy).*	0.000	0.996
Congressional Add: *Fine Water Mist Fire Suppression Technology to Replace Halon.*	0.000	1.992
Congressional Add: *Partnership for Energy and Automation Technologies.*	0.000	1.593
Congressional Add: *Temperature Resistant Landing Pad Jet Blast Protection.*	0.000	0.797
Congressional Add Subtotals for Project: 624915	7.181	8.565
Congressional Add Totals for all Projects	71.328	51.785

Exhibit R-2, RDT&E Budget Item Justification: PB 2011 Air Force	DATE: February 2010
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Change Summary Explanation

The FY 2010 President's Budget submittal did not reflect FY 2011 through FY 2015 funding. A detailed explanation of changes between the two budget positions is not provided because it cannot be made in a relevant manner.

In FY 2010, Congress added $2.0 million for Accelerated Insertion of Advanced Materials and Certification for Military Aircraft Structure Material Substitution and Repair, $3.2 million for Advanced Aerospace Carbon Foam Heat Exchangers, $0.8 million for Aerospace Laser Micro Engineering Station, $4.8 million for Air Force Minority Leaders Program, $0.8 million for Carbon Nanomaterials for Advanced Aerospace Applications, $2.88 million for Conducting Polymer Stress and Polymer Damage Sensors for Composites, $3.2 million for Consortium for Nanomaterials for Aerospace Commerce and Technology (CONTACT), $1.2 million for Development of Mobile Wind Turbine Systems to Power Forward Bases, $1.0 million for Energy Efficiency, Recovery, and Generation (ENERGy), $2.0 million for Fine Water Mist Fire Suppression Technology to Replace Halon, $3.2 million for Fire and Blast Resistant Materials for Force Protection, $1.6 million for Gallium Nitride (GaN) Microelectronics and Materials, $2.0 million for Hybrid Materials Integration (HMI), $0.8 million for Hybrid Nanoparticle-based Coolant Technology Development and Manufacturing, $3.6 million for Institute for Science and Engineering Simulation/Aircraft Fatigue Modeling and Simulation, $1.6 million for Large Area, APVT Materials Development for High Power Devices, $3.0 million for Lightning Protection Composites, $1.6 million for LGX High Temperature Acoustic Wave Sensors, $2.8 million for Low-Defect Density Gallium Nitride Materials for High-Performance Electronics Devices, $0.8 million for Mid-IR Laser Materials, $3.52 million for ONAMI Safer Nanomaterials and Nanomanufacturing, $1.6 million for Partnership for Energy and Automation Technologies, $0.8 million for Pennsylvania NanoMaterials Commercialization Center, $0.8 million for Temperature Resistant Landing Pad Jet Blast Protection, and $2.4 million for Ultra-High Temperature Materials for Hypersonic Aerospace Vehicles.

C. Performance Metrics
Under Development.

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force			DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602102F: *Materials*	PROJECT 6201SP: *Space Materials Development*	

COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	FY 2011 Base Estimate	FY 2011 OCO Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
6201SP: *Space Materials Development*	31.727	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

Note

Note: Funds from Project 01SP have been moved to Project 4347, Project 4348, and Project 4349 within this Program Element to more accurately align efforts.

A. Mission Description and Budget Item Justification

This project develops the materials and processing technology base for spacecraft and launch systems to improve affordability, maintainability, and performance of current and future Air Force space systems. Families of affordable lightweight materials are being developed, including metals, polymers, ceramics, metallic composites, and nonmetallic composites to provide new capabilities for spacecraft, ballistic missile, and propulsion systems to meet the future space requirements. Rocket propulsion materials development in this project supports the Integrated High Payoff Rocket Propulsion Technology program. Advanced high-temperature protection materials are being developed that are affordable, lightweight, dimensionally stable, thermally conductive, and/or ablation and erosion resistant to meet space and ballistic missile requirements. Materials technologies are also being developed to enable surveillance and terrestrial situational awareness systems and subsystems for space and ballistic missile applications.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
MAJOR THRUST: Develop materials and processes to dramatically improve performance, durability, and cost of rocket propulsion systems.	3.550	0.000	0.000	0.000	0.000
FY 2009 Accomplishments: In FY 2009: Downselected the highest payoff materials and processes for high-speed turbopump housings and turbines, ducts, valves, solid rocket casings, insulation, and nozzle throats and develop mechanical property databases for design consideration. Optimized processes to produce full scale test components that can be tested in rocket engine environment. Analyzed material behavior in rocket combustion environment. Focused development plans on pervasive materials requirements to					

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602102F: *Materials*	PROJECT 6201SP: *Space Materials Development*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
meet advanced performance and cost goals. Optimized selected materials, test sub-elements, and sub-components for thrust chambers, nozzles, and catalysts. *FY 2010 Plans:* In FY 2010: Not Applicable. *FY 2011 Base Plans:* In FY 2011: Not Applicable. *FY 2011 OCO Plans:* In FY2011 OCO: N/A.					
MAJOR THRUST: Develop affordable, advanced structural and non-structural materials and processing technologies for Air Force space applications. *FY 2009 Accomplishments:* In FY 2009: Optimized initial test methodology and evaluation techniques for processing, durability, and life prediction of thermal protection system applications for component operation in robust high-temperature, long-duration cruise, or access to space environments. Continued materials processing development and demonstrate structural integration into sub-scale components for testing in relative environments. Developed materials candidates for high-temperature protection systems for expendable and reusable high-speed vehicle applications in collaboration with industry. Evaluated candidate space materials and collect critical data to facilitate materials transition. *FY 2010 Plans:* In FY 2010: Not Applicable. *FY 2011 Base Plans:* In FY 2011: Not Applicable.	16.059	0.000	0.000	0.000	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2011 OCO Plans: In FY 2011 OCO: N/A.					
MAJOR THRUST: Develop materials and M&P technologies to enable improved performance & affordability of surveillance, tracking, targeting, situational awareness systems, & space-based communications. *FY 2009 Accomplishments:* In FY 2009: Continued to demonstrate processes and process control methodology to enable very long wavelength infrared focal plane arrays. Demonstrated processing technology for short wavelength infrared detectors by hybridization and characterization of 2k x 2k format focal plane array. Demonstrated nano-photonic materials for high performance optoelectronic devices for optical communications and system control architectures. Transitioned suitable materials and materials process technologies for application in combined optical and radio frequency communication system apertures. *FY 2010 Plans:* In FY 2010: Not Applicable. *FY 2011 Base Plans:* In FY 2011: Not Applicable. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A.	12.118	0.000	0.000	0.000	0.000
Accomplishments/Planned Programs Subtotals	31.727	0.000	0.000	0.000	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
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C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost
• PE Not Provided (236): *Activity Not Provided*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

D. Acquisition Strategy

Not applicable.

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 2011 Air Force			DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602102F: *Materials*	PROJECT 624347: *Materials for Structures, Propulsion, and Subsystems*	

COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	FY 2011 Base Estimate	FY 2011 OCO Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
624347: *Materials for Structures, Propulsion, and Subsystems*	79.314	110.280	84.865	0.000	84.865	81.649	80.713	78.623	80.669	Continuing	Continuing

Note

Note: Funds from Project 01SP have been moved to Project 4347 within this Program Element to more accurately align efforts.

A. Mission Description and Budget Item Justification

This project develops the materials and processing technology base for aircraft, spacecraft, launch systems and missiles to improve affordability, maintainability, and performance of current and future Air Force systems. A family of affordable lightweight materials is being developed, including metals, polymers, ceramics, metallic and nonmetallic composites, and hybrid materials to provide upgraded capabilities for existing aircraft, missile, and propulsion systems to meet the future system requirements. Develops high-temperature turbine engine materials that will enable engine designs to double the turbine engine thrust-to-weight ratio. Advanced high temperature protection materials are being developed that are affordable, lightweight, dimensionally stable, thermally conductive, and/or ablation and erosion resistant to meet aerospace and missile requirements. Alternative or replacement materials are being developed to maintain the performance of aging operational systems. Materials for thermal management including coolants, adaptive thermally conductive materials, coatings, friction and wear-resistant materials, and other pervasive nonstructural materials technologies are being developed for directed energy, propulsion, and subsystems on aircraft, spacecraft, and missiles. Develops nanostructured and biological materials for aircraft structures, munitions, air vehicle subsystems, and personnel. Develops novel materials for electromagnetic interactions with matter for electromagnetic pulse (EMP), high power microwave, and lightning strike protection. Concurrently develops advanced processing methods to enable adaptive processing of aerospace materials.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
MAJOR THRUST: Develop ceramic, ceramic matrix composite, & hybrid materials technologies for performance & supportability improvement in propulsion systems & high temperature aerospace structures.	2.166	11.340	13.073	0.000	13.073
FY 2009 Accomplishments: In FY 2009: Validated advanced ceramic composite performance through testing under real and simulated engine service life conditions. Validated the life prediction model to address time dependent					

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
degradation associated with environmental exposure. Validated the severe environment durability of advanced ceramic composite systems with advanced interfaces via mechanical testing. *FY 2010 Plans:* In FY 2010: Complete validation of advanced ceramic composite performance through testing under real and simulated engine service life conditions. Validated the life prediction model to address time dependent degradation associated with environmental exposure. Validate the severe environment durability of advanced ceramic composite systems with advanced interfaces via mechanical testing. Initiate development of new spacecraft catalyst bed systems. Assess performance of ultra high temperature ceramics leading edges in a relevant hypersonic environment (arc jet test rig) and validate oxidation models. Validate materials and materials process technologies for application in combined optical and radio frequency communication system apertures. *FY 2011 Base Plans:* In FY 2011: Initiate development of new advanced processing method, environmental coatings and life prediction for higher temperature capable CMCs. Continue validation of the life prediction model to address time dependent degradation associated with environmental exposure. Continue validation of the severe environment durability of advanced ceramic composite systems with advanced interfaces via mechanical testing. Initiate development of new CMC systems with higher temperature capability. Continue assessment of thermal protection system materials for hypersonic applications. Transition suitable materials and materials process technologies for application in combined optical and radio frequency communication system apertures. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A.					
MAJOR THRUST: Develop nanostructured materils and nanoscale architectures to address electromagnetic applications. Develop metamaterials for sensors, antennas, electronics, and optical elements.	11.966	19.019	22.109	0.000	22.109

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2009 Accomplishments: In FY 2009: Developed organic-inorganic metamaterials for Air Force electromagnetic and photonic applications for reduced aperture size, conformal radar, and antenna systems. Developed EMI and HPM shielding for electronics hardening. Investigated and developed lightweight, conformal metamaterials with properties that will enable compact sensor applications including: conformal array antennas, low EMI electronics, and optical elements based upon complex media. Evaluated the properties of these materials and determine performance enhancement of fixed frequency metamaterial optical elements. Assessed the viability of obtaining metamaterial properties consistent with the demonstration of highly integrated subsystems based on radio frequency integrated circuit applications to enable small, highly directional antenna element device drivers. *FY 2010 Plans:* In FY 2010: Explore material concepts for adaptive and multifunctional aircraft structures. Explore low-cost processing methodologies for photovoltaics for unmanned aerial systems (UAS) applications. Explore new materials systems and nano geometries to improve electrochemical energy storage including development of long-life electrodes. Investigate materials for high frequency passive microwave components for reduced size and lightweight application to air vehicles. Explore concepts for multifunctional and conformal radio frequency (RF) passive components for air vehicles. Explore metamaterials options for electro-optic/infrared (EO/IR) applications. Explore metamaterials for high frequency RF passive microwave applications. *FY 2011 Base Plans:* In FY 2011: Develop material concepts for adaptive and multifunctional aircraft structures. Validate and demonstrate materials and process low-cost processing methodologies for photovoltaics for UAS applications. Investigate new materials systems and nano geometries to improve electrochemical energy storage including development of long-life electrodes. Advance concepts for RF passive metamaterials-based components. Explore RF/IR photonics for compact air vehicle applications.					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
Develop fabrication and characterization for EO/IR metamaterials. Develop fabrication and characterization for emerging metamaterial applications. *FY 2011 OCO Plans:* In FY2011 OCO:					
MAJOR THRUST: Develop lightweight metallic & intermetallic high temperature materials, life prediction & metals processing technologies to lower costs, increase durability & improve reliability. *FY 2009 Accomplishments:* In FY 2009: Validated materials-damage predictive approaches for engine health determination and life extension capability. Developed and validate advanced metallic materials for enhanced performance propulsion for air platforms with an emphasis on higher temperature capability. Transitioned computational methods supporting development and processing to reduce costs to accelerate insertion of advanced metals into Air Force systems. *FY 2010 Plans:* In FY 2010: Continue development and validation of advanced metallic materials and processes for enhanced performance propulsion for air platforms with an emphasis on higher temperature capability. Initiate development of an advanced disk system concept for insertion into advanced propulsion concepts for air platforms. Initiate development of advanced materials and processes for liquid rocket engine applications. Initiate development of advanced computation methods to support modeling of materials for advanced propulsion systems. Demonstrate processing for thin gage metallics and fabrication of honeycomb and sandwich panels. Validate panel analysis methodology. Develop quantitative models linking microstructure with thermal and physical properties of metallic thermal management materials.	10.003	15.611	13.903	0.000	13.903

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2011 Base Plans: In FY 2011: Continue development of an advanced disk system concept for insertion into advanced propulsion concepts for air platforms. Continue development of advanced computation methods to support modeling of materials for advanced propulsion systems. Continue development and demonstration of lightweight metallic thermal protection systems. Optimize fabrication methods for hybrid composite material systems. Continue development and validation of quantitative, predictive models for performance of metallic-based thermal management systems. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A.					
MAJOR THRUST: Develop organic matrix composite, hybrid & multifunctional materials; C-C composites & technologies for systems requiring thermal &/or structural management for environmental control. *FY 2009 Accomplishments:* In FY 2009: Validated benefits of life prediction tools for engine and airframe applications. Demonstrated improved performance of new material systems for space and high-speed vehicle applications. Integrated the developed models into commercial and industry tools. Developed advanced material concepts and processes to address thermal management applications for weapon and air vehicle platforms. *FY 2010 Plans:* In FY 2010: Continue to demonstrate improved performance of new material systems for space and high-speed vehicle applications. Complete development of advanced material concepts and processes to address weapon and air vehicle platforms. Initiate investigation of new advanced composites systems for solid rocket motor cases. Explore composite and hybrid life prediction tools for engine and airframe applications. Explore lightweight, active, adaptive, high temperature, and durable composite and hybrid materials for engine and airframe applications. Demonstrate durable passive leading edge concepts for responsive access to space. Investigate advanced	7.200	16.252	15.905	0.000	15.905

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
carbon fibers modified by carbon nanotubes. Explore novel high-performance coolants for directed energy and aircraft systems. Explore cost effective, high-conductivity, lightweight, phase change, thermal management and thermoelectric materials with adaptable, tunable heat transfer properties. Explore high-fidelity, multiscale predictive tools for thermal management across heterogeneous material systems and interfaces. Integrate ceramic and metallic thermal protection systems (TPS) subcomponents and evaluate in a relevant space vehicle environment. *FY 2011 Base Plans:* In FY 2011: Transition high-performance material systems for space and high-speed vehicle applications. Develop composite and hybrid life prediction tools for engine and airframe applications. Develop lightweight, active, adaptive, high temperature and durable composite and hybrid materials for engine and airframe applications. Transition durable passive leading edge concepts for responsive access to space. Analyze advanced carbon fibers modified by carbon nanotubes. Develop novel high-performance coolants for directed energy and aircraft systems. Explore cost-effective, high-conductivity, lightweight, phase change, thermal management and thermoelectric materials with adaptable, tunable heat transfer properties. Develop high-fidelity, multiscale predictive tools for thermal management across heterogeneous material systems and interfaces. Continue assessment of integrated TPS structure in relevant environment (combined thermal-acoustic facility). *FY 2011 OCO Plans:* In FY2011 OCO: N/A.					
MAJOR THRUST: Develop materials for fluids, lubricants, aircraft topcoat and corrosion resistant coatings, and specialty treatments to improve system performance and reduce life cycle costs. *FY 2009 Accomplishments:* In FY 2009: Integrated the analytical models into the coatings development applications. Demonstrated chrome-free primer for corrosion protection systems with a 30-year life expectancy. Continued to demonstrate improved low friction wear, multifunctional coatings on engineering	3.948	3.531	2.950	0.000	2.950

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602102F: *Materials*	PROJECT 624347: *Materials for Structures, Propulsion, and Subsystems*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
components. Demonstrated surface treatment candidates for friction, stiction, and wear control in micro devices. *FY 2010 Plans:* In FY 2010: Initiate effort to develop combined thermal/friction coating materials for extreme environments. Develop alternative/renewable energy materials and technologies for Air Force deployed applications, including biomass and other alternative energy solutions. *FY 2011 Base Plans:* In FY 2011: Continue to develop combined thermal/friction coating materials for extreme environments. Analyze integration and continue development of alternative/renewable material and technologies for agile and adaptive deployed applications. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A.					
MAJOR THRUST: Develop nanomaterials for munitions & propulsion energetics. Develop S&T for pervasive nanostructured & biological material, & device processing mechanisms for systems & sub-systems. *FY 2009 Accomplishments:* In FY 2009: Developed large-scale synthesis and characterization of energetic nanomaterials to provide stable, triggerable, nanoscale energetic materials for enhanced energy release munitions, high efficiency air-breathing propulsion, and access to space. Established modeling and simulation tools to support nanoenergetics development. Analyzed the transport and compartmentalization of nanoparticles being investigated as nanoenergetics to evaluate potential environmental impact. Developed microstructural characterization tools to provide robust processing-performance correlations of nanoenergetic systems. Investigated multi-component, structured nanoparticle catalyses as controlled release agents for enhancing stability and storage as well as providing enhanced ignition.	4.778	14.523	14.199	0.000	14.199

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2010 Plans: In FY 2010: Demonstrate large-scale synthesis and characterization techniques for energetic nanomaterials to provide stable, triggerable, nanoscale energetic materials for enhanced energy release munitions, high efficiency air-breathing propulsion, and access to space. Validate the transport and compartmentalization of nanoparticles being investigated as nanoenergetics to evaluate potential environmental impact. Analyze microstructural characterization tools to provide robust processing-performance correlations of nanoenergetic systems. Develop multi-component, structured nanoparticle catalyses as controlled release agents for enhancing stability and storage as well as providing enhanced ignition. Downselect most promising biological/nanomaterial hybrids for the detection and identification of threat agents. *FY 2011 Base Plans:* In FY 2011: Demonstrate nanomaterials that provide stable, triggerable, nanoscale energetic materials for enhanced energy release munitions, high efficiency air-breathing propulsion, and access to space. Develop understanding of rapid propulsion methods for nano bio material devices for aircraft and space structures, actuators, sensors and electronics. Demonstrate the transport and compartmentalization of nanoparticles being investigated as nanoenergetics to evaluate potential environmental impact. Validate microstructural characterization tools to provide robust processing-performance correlations of nanoenergetic systems. Continue to develop multi-component, structured nanoparticle catalyses as controlled release agents for enhancing stability and storage as well as providing enhanced ignition. Demonstrate biological/nanomaterial hybrids for the detection and identification of threat agents. *FY 2011 OCO Plans:* In FY2011 OCO: N/A.					
MAJOR THRUST: Develop high temperature materials, structures, and thermal management concepts to enable future defense capabilities for prompt global strike concepts.	0.000	2.000	2.726	0.000	2.726

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2009 Accomplishments: In FY 2009: Not Applicable. *FY 2010 Plans:* In FY 2010: Investigate advanced ceramics, ceramic matrix composites, hybrids, and metallic concepts for hot structure and thermal protection systems. *FY 2011 Base Plans:* In FY 2011: Continue to investigate advanced ceramics, CMCs, hybrids and metallic concepts for hot structure and thermal protection systems. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A.					
Accomplishments/Planned Programs Subtotals	40.061	82.276	84.865	0.000	84.865

	FY 2009	FY 2010
Congressional Add: Advanced Carbon Fiber Research and Test Initiative. *FY 2009 Accomplishments:* In FY 2009: Conducted Congressionally-directed effort for Advanced Carbon Fiber Research and Test Initiative. *FY 2010 Plans:* In FY 2010: Not Applicable.	2.393	0.000
Congressional Add: Advanced Thermal Control Coatings for Space Applications.	1.596	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
FY 2009 Accomplishments: In FY 2009: Conducted Congressionally-directed effort for Advanced Thermal Control Coatings for Space Applications. *FY 2010 Plans:* In FY 2010: Not Applicable.		
Congressional Add: Ceramic Matrix Composite Turbine Blade Demonstration. *FY 2009 Accomplishments:* In FY 2009: Conducted Congressionally-directed effort for Ceramic Matrix Composite Turbine Blade Demonstration. *FY 2010 Plans:* In FY 2010: Not Applicable.	3.989	0.000
Congressional Add: Innovative Polymeric Materials for Three-Dimensional (3-D) Microdevice Construction. *FY 2009 Accomplishments:* In FY 2009: Conducted Congressionally-directed effort for Innovative Polymeric Materials for 3-D Microdevice Construction. *FY 2010 Plans:* In FY 2010: Not Applicable.	1.596	0.000
Congressional Add: Intelligent Manufacturing Initiative.	2.393	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
FY 2009 Accomplishments: In FY 2009: Conducted Congressionally-directed effort for Intelligent Manufacturing Initiative. *FY 2010 Plans:* In FY 2010: Not Applicable.		
Congressional Add: Nanocomposites for Lightning Protection of Composite Airframe Structures. *FY 2009 Accomplishments:* In FY 2009: Conducted Congressionally-directed effort for Nanocomposites for Lightning Protection of Composite Airframe Structures. *FY 2010 Plans:* In FY 2010: Not Applicable.	1.197	0.000
Congressional Add: Partnership for Emerging Technologies. *FY 2009 Accomplishments:* In FY 2009: Conducted Congressionally-directed effort for Partnership for Emerging Technologies. *FY 2010 Plans:* In FY 2010: Not Applicable.	1.596	0.000
Congressional Add: Air Force Minority Leaders Program. *FY 2009 Accomplishments:* In FY 2009: Conducted Congressionally-directed effort for Air Force Minority Leaders Program.	7.978	4.780

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
FY 2010 Plans: In FY 2010: Conduct Congressionally-directed effort for Air Force Minority Leaders Program.		
Congressional Add: Pennsylvania Nanomaterials Commercialization Center. *FY 2009 Accomplishments:* In FY 2009: Conducted Congressionally-directed effort for Pennsylvania Nanomaterials Commercialization Center. *FY 2010 Plans:* In FY 2010: Conduct Congressionally-directed effort for Pennsylvania Nanomaterials Commercialization Center.	1.995	0.797
Congressional Add: Carbon Nanomaterials for Advanced Aerospace Applications. *FY 2009 Accomplishments:* In FY 2009: Conducted Congressionally-directed effort for Carbon Nanomaterials for Advanced Aerospace Applications. *FY 2010 Plans:* In FY 2010: Conduct Congressionally-directed effort for Carbon Nanomaterials for Advanced Aerospace Applications.	2.393	0.797
Congressional Add: ONAMI Safer Nanomaterials and Nanomanufacturing. *FY 2009 Accomplishments:* In FY 2009: Conducted Congressionally-directed effort for ONAMI Safer Nanomaterials and Nanomanufacturing.	3.989	3.505

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
FY 2010 Plans: In FY 2010: Conduct Congressionally-directed effort for ONAMI Safer Nanomaterials and Nanomanufacturing.		
Congressional Add: Consortium for Nanomaterials for Aerospace Commerce and Technology (CONTACT). *FY 2009 Accomplishments:* In FY 2009: Conducted Congressionally-directed effort for CONTACT. *FY 2010 Plans:* In FY 2010: Conduct Congressionally-directed effort for CONTACT.	2.393	3.187
Congressional Add: Advanced Aerospace Carbon Foam Heat Exchangers. *FY 2009 Accomplishments:* In FY 2009: Conducted Congressionally-directed effort for Advanced Aerospace Carbon Foam Heat Exchangers. *FY 2010 Plans:* In FY 2010: Conduct Congressionally-directed effort for Advanced Aerospace Carbon Foam Heat Exchangers.	1.596	3.187
Congressional Add: Institute for Science and Engineering Simulation/Aircraft Fatigue Modeling and Simulation. *FY 2009 Accomplishments:* In FY 2009: Conducted Congressionally-directed effort for Institute for Science and Engineering Simulation/Aircraft Fatigue Modeling and Simulation.	3.351	3.585

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
FY 2010 Plans: In FY 2010: Conduct Congressionally-directed effort for Institute for Science and Engineering Simulation/Aircraft Fatigue Modeling and Simulation.		
Congressional Add: Development of Mobile Wind Turbine Systems to Power Forward Bases. *FY 2009 Accomplishments:* In FY 2009: Conducted Congressionally-directed effort for Development of Mobile Wind Turbine Systems to Power Forward Bases. *FY 2010 Plans:* In FY 2010: Conduct Congressionally-directed effort for Development of Mobile Wind Turbine Systems to Power Forward Bases.	0.798	1.195
Congressional Add: Aerospace Laser Micro Engineering Station. *FY 2009 Accomplishments:* In FY 2009: Not Applicable. *FY 2010 Plans:* In FY 2010: Conduct Congressionally-directed effort for Aerospace Laser Micro Engineering Station.	0.000	0.797
Congressional Add: Hybrid Nanoparticle-based Coolant Technology Development and Manufacturing. *FY 2009 Accomplishments:* In FY 2009: Not Applicable.	0.000	0.797

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
FY 2010 Plans: In FY 2010: Conduct Congressionally-directed effort for Hybrid Nanoparticle-based Coolant Technology Development and Manufacturing.		
Congressional Add: Lightning Protection Composites. *FY 2009 Accomplishments:* In FY 2009: Not Applicable. *FY 2010 Plans:* In FY 2010: Conduct Congressionally-directed effort for Lightning Protection Composites.	0.000	2.987
Congressional Add: Ultra-High Temperature Materials for Hypersonic Aerospace Vehicles. *FY 2009 Accomplishments:* In FY 2009: Not Applicable. *FY 2010 Plans:* In FY 2010: Conduct Congressionally-directed effort for Ultra-High Temperature Materials for Hypersonic Aerospace Vehicles.	0.000	2.390
Congressional Adds Subtotals	39.253	28.004

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost
• PE 0603112F: *Advanced Materials for Weapon Systems.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
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C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost
• PE 0603211F: *Aerospace Technology Dev/Demo.*											
• PE 0603216F: *Aerospace Propulsion and Power Technology.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

D. Acquisition Strategy

Not Applicable.

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 2011 Air Force			DATE: February 2010
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COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	FY 2011 Base Estimate	FY 2011 OCO Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
624348: *Materials for Electronics, Optics, and Survivability*	34.044	33.744	31.687	0.000	31.687	30.746	30.840	30.967	31.255	Continuing	Continuing

Note

Note: Funds from Project 01SP have been moved to Project 4348 within this Program Element to more accurately align efforts.

A. Mission Description and Budget Item Justification

This project develops materials technologies for surveillance and situational awareness systems and subsystems for aircraft and missile applications, including sensor, microwave, and infrared detection and countermeasures devices used for targeting, electronic warfare, and active aircraft protection. Materials for protection of aircrews, sensors, and aircraft from laser and high-power microwave directed energy threats are also developed. Electronic and optical materials are being developed to enable surveillance and situational awareness with faster operating speeds, greater tunability, higher power output, improved thermal management (including higher operating temperatures), greater sensitivity, and extended dynamic range. New materials are being developed to counter the most prominent laser threats and to respond to emerging and agile threat wavelengths without impairing mission effectiveness.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
MAJOR THRUST: Develop IR detector & hybrid materials, M&P technologies for performance, affordability, & operational capability of surveillance, tracking, targeting, & situational awareness systems.	1.769	8.234	8.665	0.000	8.665
FY 2009 Accomplishments: In FY 2009: Developed materials and transition strategies for innovative IR materials while continuing to exploit newly emerging material concepts. Validated and optimized IR materials systems capable of responses to more than two discrete wavelengths. Developed candidate materials for three-dimensional growth to exploit unique detection properties of complex IR materials. Developed promising materials growth technologies for nano-scale IR detection materials. Demonstrated epitaxial materials device and substrate improvements. Developed design capability, leveraging new					

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
materials and substrates. Developed tools and methodologies that address the physics of failure for power dense devices. *FY 2010 Plans:* In FY 2010: Increase yield of full wafer focal plane arrays of 2k x 2k and develop multifunction readout integrated circuit. Investigate alternative IR materials for long wavelength detection. Pursue emerging IR materials in the short wave regime for day-night operation. Model and evaluate optical behavior of materials for low observable (LO), intelligence, surveillance, and reconnaissance (ISR), and other applications. Investigate materials constructs for multi-wavelength detection. Explore single material, multi-wavelength materials schemes. Extend capability of three-dimensional detection to multiple bands and explore tailoring options for diverse mission requirements. Advance and refine growth technology for nano-scale IR detection. Explore options for novel nano-scale detection. Scale up growth technology for nano-scale IR. Advance novel nano-scale materials options. *FY 2011 Base Plans:* In FY 2011: Optimize 2k x 2k detector and readout integrated circuit design, processing and packaging for enhanced focal plane array yields. Further IR materials development for long wavelength. Advance mid wavelength materials development for high temperature, low-noise operation for use on low-power systems. Model and evaluate optical behavior of materials for LO, ISR, and other applications. Explore enhancing detection capability of three-dimensional detection. Investigate next generation alternative three-dimension schemes. Scale up growth technology for nano-scale IR. Advance novel nano-scale materials options. Continue to model and evaluate materials optical/IR behavior for LO, ISR, and other applications. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A.					
MAJOR THRUST: Develop and demonstrate technologies to enhance the safety, survivability, and mission effectiveness of aircrews, sensors, viewing systems, and related assets.	8.784	5.969	9.115	0.000	9.115

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2009 Accomplishments: In FY 2009: Developed nonlinear optical limiter materials into device concepts for damage protection of eyes and sensor systems. Developed photorefractive materials into device concepts for Air Force passive protection applications. Demonstrated devices using switchable filter technology into eye and sensor system protection concepts. *FY 2010 Plans:* In FY 2010: Develop nonlinear optical limiter solid-state materials into device concepts for damage protection of space-based sensor systems. Investigate photorefractive materials growth repeatability for increased probability of technology transition to Air Force passive protection applications. Demonstrate electrically tunable liquid crystal filters for sensor system protection concepts. Develop thin film concepts for enhanced fixed filter performance. Develop and analyze electromagnetic interference and high power microwave shielding for electronics hardening. *FY 2011 Base Plans:* In FY 2011: Demonstrate optimized nonlinear optical limiter materials for damage protection for systems. Demonstrate enhanced photorefractive hybrid materials concepts for Air Force passive protection applications. Mature improved liquid crystal materials for photo-tunable devices for sensor system protection concepts. Demonstrate thin film growth capabilities for enhanced fixed filter performance. Demonstrate semiconductor optical limiter materials performance for damage protection in the short wave infrared. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A.					
MAJOR THRUST: Develop M&P technologies for power generation and control, and microwave components for surveillance, tracking, targeting, situational awareness, and lethal and non-lethal systems.	7.640	5.355	5.830	0.000	5.830

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2009 Accomplishments: In FY 2009: Optimized materials properties for enhanced device reliability. Assessed the reliability of materials for ultra-lightweight, ultra-high-power aircraft electrical generator applications, enabling airborne lethal and non-lethal directed energy weapons in fighter-sized aircraft. Demonstrated performance of candidate materials for use in terahertz components, supporting high speed communications and advanced sensors. *FY 2010 Plans:* In FY 2010: Explore and identify materials-to-materials interactions responsible for reduced reliability. Refine thin film growth process for improved wide bandgap semiconductor material. Investigate performance issues in materials components of high power microwave directed energy weapons. Develop nanostructured materials using multiple approaches for high energy density capacitors for pulsed power applications. *FY 2011 Base Plans:* In FY 2011: Develop materials growth adjustment/mitigation methodologies for improved reliability. Improve materials and materials applications for increased reliability and power for high power microwave directed energy applications. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A.					
MAJOR THRUST: Develop enabling and foundational biotechnologies for guidance and control, rapid tagging, tracking, and identification of targets, and bio-integrated electronics and sensing. *FY 2009 Accomplishments:* In FY 2009: Developed new biological/nanomaterial hybrids for the detection and identification of threat agents. Analyzed efficacy data of using taggants for preemptive destruction of threat agents. Incorporated taggants into a variety of media (polymers, paints) for optimal and mission-specific	1.569	4.960	4.970	0.000	4.970

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
dispersal. Modeled dispersion properties of polymer-encapsulated taggants for optimal release and coverage. *FY 2010 Plans:* In FY 2010: Validate efficacy of using taggants for preemptive destruction of threat agents. Incorporate taggants into a variety of media (polymer, paints) for optimal and mission -specific dispersal. Model dispersion properties of polymer-encapsulated taggants for optimal release and coverage. *FY 2011 Base Plans:* In FY 2011: Develop new bio/nano materials that enable broad spectrum mitigation of environmental threats. Integrate delivery methods and bio/nano materials appropriate for specific AF requirements. Demonstrate materials with specific performance characteristic. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A.					
MAJOR THRUST: Develop materials enabling higher performance lasing media, new laser architectures, optical isolators, beam steering, and other high energy laser components for directed energy. *FY 2009 Accomplishments:* In FY 2009: Not Applicable. *FY 2010 Plans:* In FY 2010: Investigate host/dopant materials for fiber lasers in the eye-safe regime. Demonstrate preliminary fiber development. Demonstrate solid state, very high speed beam steering materials options. Investigate very high speed beam steering configurations. Explore options and develop alternate materials and processes for high energy lasers.	0.000	2.455	3.107	0.000	3.107

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2011 Base Plans: In FY 2011: Pursue materials for enabling improved laser source components operating in the mid-infrared range. Improve very high speed beam steering materials and pursue most promising beam steering configurations. Improve materials to increase high energy laser efficiency and gain. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A.					
Accomplishments/Planned Programs Subtotals	19.762	26.973	31.687	0.000	31.687

	FY 2009	FY 2010
Congressional Add: Free Electron Laser Capabilities for Aerospace Microfabrication. *FY 2009 Accomplishments:* In FY 2009: Conducted Congressionally-directed effort for Free Electron Laser Capabilities for Aerospace Microfabrication. *FY 2010 Plans:* In FY 2010: Not Applicable.	1.117	0.000
Congressional Add: Gallium Nitride (GaN) RF Power Technology. *FY 2009 Accomplishments:* In FY 2009: Conducted Congressionally-directed effort for GaN RF Power Technology. *FY 2010 Plans:* In FY 2010: Not Applicable.	1.596	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
Congressional Add: Plasma-Sphere Array for Flexible Electronics. *FY 2009 Accomplishments:* In FY 2009: Conducted Congressionally-directed effort for Plasma-Sphere Array for Flexible Electronics. *FY 2010 Plans:* In FY 2010: Not Applicable.	2.792	0.000
Congressional Add: Diamond Substrate for Cooling of Micro-Electronics. *FY 2009 Accomplishments:* In FY 2009: Conducted Congressionally-directed effort for Diamond Substrate for Cooling of Micro-Electronics. *FY 2010 Plans:* In FY 2010: Not Applicable.	1.995	0.000
Congressional Add: High Power Broadly Tunable Middle-Infrared Laser Sources. *FY 2009 Accomplishments:* In FY 2009: Conducted Congressionally-directed effort for High Power Broadly Tunable Middle-Infrared Laser Sources. *FY 2010 Plans:* In FY 2010: Not Applicable.	2.393	0.000
Congressional Add: Light Weight Organic Photovoltaic Technologies.	1.197	0.000

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
FY 2009 Accomplishments: In FY 2009: Conducted Congressionally-directed effort for Light Weight Organic Photovoltaic Technologies. *FY 2010 Plans:* In FY 2010: Not Applicable.		
Congressional Add: Liquid Crystal Laser Eye Protection. *FY 2009 Accomplishments:* In FY 2009: Conducted Congressionally-directed effort for Liquid Crystal Laser Eye Protection. *FY 2010 Plans:* In FY 2010: Not Applicable.	1.596	0.000
Congressional Add: Optic Band Control Program. *FY 2009 Accomplishments:* In FY 2009: Conducted Congressionally-directed effort for Optic Band Control Program. *FY 2010 Plans:* In FY 2010: Not Applicable.	0.798	0.000
Congressional Add: Large Area, APVT Materials Development for High Power Devices. *FY 2009 Accomplishments:* In FY 2009: Conducted Congressionally-directed effort for Large Area, APVT Materials Development for High Power Devices.	0.798	1.593

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
FY 2010 Plans: In FY 2010: Conduct Congressionally-directed effort for Large Area, APVT Materials Development for High Power Devices.		
Congressional Add: Gallium Nitride (GaN) Microelectronics and Materials. *FY 2009 Accomplishments:* In FY 2009: Not Applicable. *FY 2010 Plans:* In FY 2010: Conduct Congressionally-directed effort for Gallium Nitride (GaN) Microelectronics and Materials.	0.000	1.593
Congressional Add: Low-Defect Density Gallium Nitride Materials for High-Performanace Electronics Devices. *FY 2009 Accomplishments:* In FY 2009: Not Applicable. *FY 2010 Plans:* In FY 2010: Conduct Congressionally-directed effort for Low-Defect Density Gallium Nitride Materials for High-Performanace Electronics Devices.	0.000	2.788
Congressional Add: Mid-IR Laser Materials. *FY 2009 Accomplishments:* In FY 2009: Not Applicable.	0.000	0.797

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602102F: *Materials*	PROJECT 624348: *Materials for Electronics, Optics, and Survivability*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
FY 2010 Plans: In FY 2010: Conduct Congressionally-directed effort for Mid-IR Laser Materials.		
Congressional Adds Subtotals	14.282	6.771

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost
• PE 0603112F: *Advanced Materials for Weapon Systems.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0602202F: *Human Effectiveness Applied Research.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0602204F: *Aerospace Sensors.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603211F: *Aerospace Technology Dev/Demo.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603231F: *Crew Systems and Personnel Protection Technology.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

D. Acquisition Strategy

Not Applicable.

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 2011 Air Force			DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602102F: *Materials*	PROJECT 624349: *Materials Technology for Sustainment*	

COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	FY 2011 Base Estimate	FY 2011 OCO Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
624349: *Materials Technology for Sustainment*	28.853	22.697	16.893	0.000	16.893	19.320	20.022	20.364	20.715	Continuing	Continuing

Note

Note: Funds from Project 01SP have been moved to Project 4349 within this Program Element to more accurately align efforts.

A. Mission Description and Budget Item Justification

This project develops materials and materials processing technologies to support operational Air Force mission areas by providing the ability to inspect the quality of delivered systems, transitioning more reliable and maintainable materials, establishing a capability to detect and characterize performance threatening defects, characterizing materials processes and properties necessary for materials transition, and providing quick reaction support and failure analysis to the operational commands and repair centers. Repair techniques and nondestructive inspection/evaluation (NDI/E) methods are developed that are needed for metallic and non-metallic structures, coatings, corrosion control processes, and to support integration of composite structures for aerospace systems. Various NDI/E methods are essential to ensure optimum quality in the design and production of aircraft, propulsion, and missile systems. These NDI/E methods are also essential to monitor and detect the onset of any service-initiated damage and/or deterioration due to aging of operational systems.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
MAJOR THRUST: Develop sensing and life prediction technologies to identify damage and characterize the health of aging structures, propulsion systems, and low-observable materials and structures.	6.716	3.012	5.079	0.000	5.079
FY 2009 Accomplishments: In FY 2009: Demonstrated novel NDI/E methods and techniques to detect and track damage in a wide variety of materials and components for aerospace systems. Demonstrated NDI/E technologies for inspection of thick (multi-layer) aging aircraft structures with complex geometries. Developed sensing technology to detect changes in temperature, strain, pressure, and vibration to enable on-demand health status of turbine engines, aircraft structures, wiring systems, and thermal protection systems.					

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602102F: *Materials*	PROJECT 624349: *Materials Technology for Sustainment*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2010 Plans: In FY 2010: Advance novel sensing methods and techniques to detect and track damage to other materials and components for aerospace systems. Augment multi-layer sensing capabilities to more extensive applications and potential alternative damage modes on aerospace structures. Augment development of sensing technology to detect changes in material properties, damage evolution, and other factors that detrimentally affect aerospace systems. Develop materials-damage predictive approaches to engine and structure prognosis for life cycle management and life extension capability. Develop and demonstrate novel LO point inspection probes to enable rapid assessment of LO material performance. *FY 2011 Base Plans:* In FY 2011: Demonstrate advanced sensing methods and techniques to detect and track damage to other materials and components for aerospace systems. Demonstrate augmented multi-layer sensing capabilities on aerospace structures. Demonstrate sensing technologies that detect changes in material properties, damage evolution, and other factors that detrimentally affect aerospace systems. Develop and validate affordable prognosis approaches for life cycle management and life extension capability. Demonstrate novel LO point inspection probes to enable rapid assessment of LO material performance. Investigate next generation of LO point inspection needs. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A.					
MAJOR THRUST: Develop support capabilities, information, and processes to resolve problems with materials in the production and repair of systems components and structures. *FY 2009 Accomplishments:* In FY 2009: Validated advanced techniques to evaluate corrosion and erosion resistance of new and emerging materials used in operationally fielded Air Force systems. Evaluated advanced materials and processes technologies to repair Air Force legacy systems and test failure limits for emerging	5.040	4.944	5.140	0.000	5.140

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
Air Force systems. Developed test methods and techniques to understand the effects of materials processes, such as the application of residual stress on the surface of steel and other structural metals, to support studies and point design solutions that will extend the life of specific structural components on Air Force systems. Demonstrated and transitioned technologies for improved maintainability of advanced LO materials and designs, such as conductive outer-mold-line, applique, door edges and seals, and multifunctional systems. *FY 2010 Plans:* In FY 2010: Evaluate advanced materials and processes technologies to repair Air Force legacy systems and test failure limits for emerging Air Force systems. Develop and demonstrate test methods and techniques to understand the effects of in-service environments and materials processes, such as the application of residual stress on the surface of steel and other structural metals, to support studies and point design solutions that will extend the life of specific structural components on Air Force systems. Demonstrate and transition technologies for improved maintainability and life cycle cost of advanced LO materials and designs, such as conductive outer-mold-line, applique, door edges and seals, and multifunctional systems. Develop and demonstrate laboratory test methods to evaluate and characterize candidate space materials for properties and material behavior suitable for use in space applications. *FY 2011 Base Plans:* FY 2011: Evaluate advanced materials and processes technology to repair Air Force legacy systems and test failure limits for emerging Air Force systems. Develop and demonstrate test methods and techniques to understand the effects of in-service environments and materials processes, such as the application of residual stress on the surface of steel and other structural metals, to support studies and point design solutions that will extend the life of specific structural components on Air Force systems. Demonstrate and transition technologies for improved maintainability and life cycle cost of advanced materials and designs, such as conductive outer-mold-line, films, coatings, assess panel treatments and multifunctional systems. Develop and demonstrate laboratory test methods to evaluate and					

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602102F: *Materials*	PROJECT 624349: *Materials Technology for Sustainment*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
characterize candidate space materials for properties and material behavior suitable for use in space applications. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A.					
MAJOR THRUST: Develop support capabilities, information, and processes to resolve materials problems and provide electronic and structural failure analysis of components. *FY 2009 Accomplishments:* In FY 2009: Performed quick response failure analysis and materials investigations for fielded system, acquisition organization, depot system materials failures, and provide advanced materials solutions to ensure system availability and safety of flight. Developed advanced electrostatic discharge protection technologies and procedures for emerging avionics subsystems. Demonstrated advanced test methodologies for analyzing structural failures of emerging materials for Air Force systems. Developed advanced wiring materials technologies to replace aging wiring systems and new wiring technologies for emerging weapons systems. *FY 2010 Plans:* In FY 2010: Perform quick response failure analysis and materials investigations for fielded system, acquisition organization, depot system materials failures, and provide advanced materials solutions to ensure system availability and safety of flight. Develop advanced electrostatic discharge protection technologies and procedures for emerging avionics subsystems. Demonstrate advanced test methodologies for analyzing structural failures of emerging materials for Air Force systems. Develop advanced wiring materials technologies to replace aging wiring systems and new wiring technologies for emerging weapons systems.	6.485	6.296	6.674	0.000	6.674

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2011 Base Plans: In FY 2011: Perform quick response failure analysis and materials investigations for fielded system, acquisition organization, depot system materials failures, and provide advanced materials solutions to ensure system availability and safety of flight. Develop advanced electrostatic discharge protection technologies and procedures for emerging avionics subsystems. Demonstrate advanced test methodologies for analyzing structural failures of emerging materials for Air Force systems. Develop advanced wiring materials technologies to replace aging wiring systems and new wiring technologies for emerging weapons systems. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A.					
Accomplishments/Planned Programs Subtotals	18.241	14.252	16.893	0.000	16.893

	FY 2009	FY 2010
Congressional Add: Aircraft Fatigue Modeling and Simulation. *FY 2009 Accomplishments:* In FY 2009: Conducted Congressionally-directed effort for Aircraft Fatigue Modeling and Simulation. *FY 2010 Plans:* In FY 2010: Not Applicable.	2.992	0.000
Congressional Add: Science for Sustainment.	1.596	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
FY 2009 Accomplishments: In FY 2009: Conducted Congressionally-directed effort for Science for Sustainment. *FY 2010 Plans:* In FY 2010: Not Applicable.		
Congressional Add: Accelerated Insertion of Advanced Materials and Certification for Military Aircraft Structure Material Substitution and Repair. *FY 2009 Accomplishments:* In FY 2009: Conducted Congressionally-directed effort for Accelerated Insertion of Advanced Materials and Certification for Military Aircraft Structure Material Substitution and Repair. *FY 2010 Plans:* In FY 2010: Conduct Congressionally-directed effort for Accelerated Insertion of Advanced Materials and Certification for Military Aircraft Structure Material Substitution and Repair.	2.992	1.992
Congressional Add: Conducting Polymer Stress and Polymer Damage Sensors for Composites. *FY 2009 Accomplishments:* In FY 2009: Conducted Congressionally-directed effort for Conducting Polymer Stress and Polymer Damage Sensors for Composites. *FY 2010 Plans:* In FY 2010: Conduct Congressionally-directed effort for Conducting Polymer Stress and Polymer Damage Sensors for Composites.	1.436	2.868
Congressional Add: LGX High Temperature Acoustic Wave Sensors.	1.596	1.593

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
FY 2009 Accomplishments: In FY 2009: Conducted Congressionally-directed effort for LGX High Temperature Acoustic Wave Sensors. *FY 2010 Plans:* In FY 2010: Conduct Congressionally-directed effort for LGX High Temperature Acoustic Wave Sensors.		
Congressional Add: Hybrid Materials Integration (HMI). *FY 2009 Accomplishments:* In FY 2009: Not Applicable. *FY 2010 Plans:* In FY 2010: Conducted Congressionally-directed effort for Hybrid Materials Integration (HMI).	0.000	1.992
Congressional Adds Subtotals	10.612	8.445

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost
• PE 0603112F: *Advanced Materials for Weapons Systems.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
• PE 0603211F: *Aerospace Technology Dev/Demo.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

D. Acquisition Strategy

Not Applicable.

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	**R-1 ITEM NOMENCLATURE** PE 0602102F: *Materials*	**PROJECT** 624349: *Materials Technology for Sustainment*

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 2011 Air Force			DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602102F: *Materials*	PROJECT 624915: *Deployed Air Base Technology*	

COST ($ in Millions)	FY 2009 Actual	FY 2010 Estimate	FY 2011 Base Estimate	FY 2011 OCO Estimate	FY 2011 Total Estimate	FY 2012 Estimate	FY 2013 Estimate	FY 2014 Estimate	FY 2015 Estimate	Cost To Complete	Total Cost
624915: *Deployed Air Base Technology*	11.645	12.481	3.828	0.000	3.828	3.934	3.901	4.109	4.252	Continuing	Continuing

Note

Note: FY 2008 funding totals include $3.7 million in supplemental funding.

A. Mission Description and Budget Item Justification

This project develops new deployable airbase technologies to reduce airlift and manpower requirements, setup times, and sustainment costs, and to improve protection and survivability of deployed Air Expeditionary Force (AEF) warfighters. Affordable, efficient technologies are developed for base infrastructure, fire fighting, and force protection to improve Expeditionary Combat Support operations.

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
MAJOR THRUST: Develop deployable infrastructure airbase technologies to reduce airlift and manpower requirements, setup times, and sustainment costs in support of AEF operations.	2.026	2.160	1.911	0.000	1.911
FY 2009 Accomplishments: In FY 2009: Analyzed and demonstrated renewable power technologies applicable to deployed forces. Demonstrated advanced integrated power technologies. Evaluated and developed mitigation for high temperature effects on operating surfaces. Demonstrated and analyzed nondestructive inspection of airfield surface evaluation technologies.					
FY 2010 Plans: In FY 2010: Develop deployable applications of higher efficiency collection and conversion of solar power for deployed applications. Analyze performance of candidate high temperature aircraft operating surface materials. Develop remote nondestructive inspection of airfield surface evaluation technologies.					

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602102F: *Materials*	PROJECT 624915: *Deployed Air Base Technology*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2011 Base Plans: In FY 2011: Developed and demonstrated deployable applications of higher efficiency collection and conversion of solar power for deployed applications. Developed and optimized performance of candidate high temperature operating surface materials. Developed and improved remote and autonomous nondestructive inspection of airfield surface evaluation technologies. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A.					
MAJOR THRUST: Develop affordable technologies to provide force protection and survivability to AEF deployed warfighters and infrastructure. *FY 2009 Accomplishments:* In FY 2009: Developed and demonstrated methodologies to characterize candidate fire suppression agents and continue to develop supporting fire suppression technologies for crash/rescue. Developed and analyzed combined technologies for fire fighter effectiveness. Validated and demonstrated resilient structural materials and methodologies for improved protection of structures and inhabitants. Developed and demonstrated effectiveness of innovative defeat of improvised explosive device (IED) and high energy threats. *FY 2010 Plans:* In FY 2010: Analyze fire suppression agents using methodologies supporting deployed warfighters and infrastructure. Investigate novel, cost-effective technologies for fire fighter effectiveness and optimize developed technologies. Investigate novel structural materials and technologies to support deployed warfighters and infrastructure, using methodologies developed for protection. Analyze and conduct experiments to verify effectiveness for defeat of IED and high energy threat technologies. Transition mature defeat technologies and investigate emerging threats. Explore functions of microbes and develop effective methodologies to capture biological processes for use in Air Force applications.	2.438	1.756	1.917	0.000	1.917

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602102F: *Materials*	PROJECT 624915: *Deployed Air Base Technology*

B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total
FY 2011 Base Plans: In FY 2011: Develop and optimize fire suppression agents using methodologies supporting deployed warfighters and infrastructure. Develop novel cost effective technologies for fire fighter effectiveness in deployed environments. Develop novel structural materials and technologies to support deployed warfighters and infrastructure using methodologies developed for protection from emerging threats. Develop and optimize techniques and materials for defeat of new and evolving IED and high energy threats. Analyze functions of microbes and develop effective methodologies to capture biological processes for use in Air Force applications, such as sensing and development of solid state materials. Evaluate design and performance of microbial-based technologies. *FY 2011 OCO Plans:* In FY 2011 OCO: N/A.					
Accomplishments/Planned Programs Subtotals	4.464	3.916	3.828	0.000	3.828

	FY 2009	FY 2010
Congressional Add: Advanced Military Installations that Integrate Renewable Energy and Advanced Energy Storage Technologies. *FY 2009 Accomplishments:* In FY 2009: Conducted Congressionally-directed effort for Advanced Military Installations that Integrate Renewable Energy and Advanced Energy Storage Technologies. *FY 2010 Plans:* In FY 2010: Not Applicable.	3.989	0.000
	1.596	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
Congressional Add: Tactical Shelters Next Generation Composite Initiative. *FY 2009 Accomplishments:* In FY 2009: Conducted Congressionally-directed effort for Tactical Shelters Next Generation Composite Initiative. *FY 2010 Plans:* In FY 2010: Not Applicable.		
Congressional Add: Fire and Blast Resistant Materials for Force Protection. *FY 2009 Accomplishments:* In FY 2009: Conducted Congressionally-directed effort for Fire and Blast Resistant Materials for Force Protection. *FY 2010 Plans:* In FY 2010: Conduct Congressionally-directed effort for Fire and Blast Resistant Materials for Force Protection	1.596	3.187
Congressional Add: Energy Efficiency, Recovery, and Generation (ENERGy). *FY 2009 Accomplishments:* In FY 2009: Not Applicable. *FY 2010 Plans:* In FY 2010: Conduct Congressionally-directed effort for ENERGy.	0.000	0.996
Congressional Add: Fine Water Mist Fire Suppression Technology to Replace Halon.	0.000	1.992

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B. Accomplishments/Planned Program ($ in Millions)

	FY 2009	FY 2010
FY 2009 Accomplishments: In FY 2009: Not Applicable. *FY 2010 Plans:* In FY 2010: Conduct Congressionally-directed effort for Fine Water Mist Fire Suppression Technology to Replace Halon.		
Congressional Add: Partnership for Energy and Automation Technologies. *FY 2009 Accomplishments:* In FY 2009: Not Applicable. *FY 2010 Plans:* In FY 2010: Conduct Congressionally-directed effort for Partnership for Energy and Automation Technologies.	0.000	1.593
Congressional Add: Temperature Resistant Landing Pad Jet Blast Protection. *FY 2009 Accomplishments:* In FY 2009: Not Applicable. *FY 2010 Plans:* In FY 2010: Conduct Congressionally-directed effort forTemperature Resistant Landing Pad Jet Blast Protection.	0.000	0.797
Congressional Adds Subtotals	7.181	8.565

Exhibit R-2A, RDT&E Project Justification: PB 2011 Air Force		DATE: February 2010
APPROPRIATION/BUDGET ACTIVITY 3600: *Research, Development, Test & Evaluation, Air Force* BA 2: *Applied Research*	R-1 ITEM NOMENCLATURE PE 0602102F: *Materials*	PROJECT 624915: *Deployed Air Base Technology*

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2009	FY 2010	FY 2011 Base	FY 2011 OCO	FY 2011 Total	FY 2012	FY 2013	FY 2014	FY 2015	Cost To Complete	Total Cost
• PE 0603112F: *Advanced Materials for Weapon Systems.*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

D. Acquisition Strategy

Not Applicable.

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.