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PE NUMBER: 0603112F
 PE TITLE: Advanced Materials for Weapon Systems

Exhibit R-2, RDT&E Budget Item Justification	DATE February 2008
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BUDGET ACTIVITY 03 Advanced Technology Development (ATD)	PE NUMBER AND TITLE 0603112F Advanced Materials for Weapon Systems
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Cost (\$ in Millions)	FY 2007 Actual	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	Cost to Complete	Total
Total Program Element (PE) Cost	83.546	54.871	41.926	45.030	43.904	46.278	46.165	Continuing	TBD
2100 Laser Hardened Materials	32.202	25.443	24.152	28.162	29.300	30.491	30.452	Continuing	TBD
3153 Non-Destructive Inspection Development	16.657	7.424	4.185	4.335	4.393	4.749	4.705	Continuing	TBD
3946 Materials Transition	15.652	11.268	4.459	6.654	4.242	4.584	4.512	Continuing	TBD
4918 Deployed Air Base Demonstrations	13.919	6.374	5.918	2.550	2.592	2.802	2.876	Continuing	TBD
77SP Advanced Space Materials	5.116	4.362	3.212	3.329	3.377	3.652	3.620	Continuing	TBD

Note: FY 2008 funding totals do not include \$5.9 million FY 2008 GWOT requirements still pending Congressional consideration.

(U) A. Mission Description and Budget Item Justification

This program develops and demonstrates materials technology for transition into Air Force systems. The program has five projects which develop: (1) hardened materials technologies for the protection of aircrews and sensors; (2) non-destructive inspection and evaluation technologies; (3) transition data on structural and non-structural materials for aerospace applications; (4) airbase operations technologies including deployable base infrastructure, force protection, and fire fighting capabilities; and (5) advanced materials for space applications. Note: In FY 2008, Congress added \$1.2 million for Continuous Integrated Vehicle Health Monitoring System, \$1.0 million for Encapsulated Ballistic Protection System (EBPS), \$1.0 million for Coated Field Repair (2K Gun), \$1.6 million for EMI Grid Fabrication Technology, \$2.0 million for Aircraft Evaluation Readiness Initiative (AERI), \$5.0 million for Metals Affordability Initiative, \$1.6 million for Strategic Bio-fuels Supply Program, \$0.5 million for Materials Integrity Management Research, and \$1.6 million for Body Armor Improved Ballistic Protection. This program is in Budget Activity 3, Advanced Technology Development, since it develops and demonstrates technologies for existing system upgrades and/or new system developments that have military utility and address warfighter needs.

(U) B. Program Change Summary (\$ in Millions)

	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
(U) Previous President's Budget	82.290	39.730	39.324
(U) Current PBR/President's Budget	83.546	54.871	41.926
(U) Total Adjustments	1.256	15.141	
(U) Congressional Program Reductions			
Congressional Rescissions		-0.359	
Congressional Increases		32.300	
Reprogrammings	3.245	-16.800	
SBIR/STTR Transfer	-1.989		

(U) Significant Program Changes:

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Not Applicable.

C. Performance Metrics
Under Development.

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BUDGET ACTIVITY 03 Advanced Technology Development (ATD)				PE NUMBER AND TITLE 0603112F Advanced Materials for Weapon Systems			PROJECT NUMBER AND TITLE 2100 Laser Hardened Materials			
Cost (\$ in Millions)		FY 2007 Actual	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	Cost to Complete	Total
2100	Laser Hardened Materials	32.202	25.443	24.152	28.162	29.300	30.491	30.452	Continuing	TBD
	Quantity of RDT&E Articles	0	0	0	0	0	0	0		

- (U) **A. Mission Description and Budget Item Justification**
 This project develops and demonstrates advanced materials technologies that enhance protection for Air Force aircrews to ensure safety and to enable aircrews to perform required missions in threat environments. Advanced materials technologies are also developed and demonstrated to enhance protection for Air Force sensor systems to ensure safety, survivability, and operability in threat environments.
- (U) **B. Accomplishments/Planned Program (\$ in Millions)**
- | | | | |
|---|----------------|----------------|----------------|
| | <u>FY 2007</u> | <u>FY 2008</u> | <u>FY 2009</u> |
| (U) MAJOR THRUST/CONGRESSIONAL ADD: Develop and demonstrate advanced materials technologies that enhance hardening for sensors, avionics, and components to increase survivability and mission effectiveness of aerospace systems. Note: This effort includes Congressional Add funding of \$1.2 million in FY 2007 for Large Panel Sapphire Producibility. | 24.827 | 19.683 | 17.834 |
| (U) In FY 2007: Matured hardening technology and developed a hardened candidate system. Developed candidate dual band limiter materials. Developed protection strategies for large format CCDs. | | | |
| (U) In FY 2008: Demonstrate mature hardening materials technology for an Air Force tactical system. Characterize and incorporate candidate dual band limiter materials for tactical systems. Demonstrate protection strategies for large format CCDs. | | | |
| (U) In FY 2009: Transition mature hardening materials technology for an Air Force tactical system. Demonstrate performance of dual band limiter materials in tactical systems. | | | |
| (U) MAJOR THRUST/CONGRESSIONAL ADD: Develop and demonstrate advanced materials technologies that enhance protection for Air Force aircrews to ensure safety and to enable aircrews to perform required missions in a threat environment. Note: This effort includes Congressional Add funding of \$1.0 million in FY 2007 for Optical Filters for Hardened Night Vision Goggles (NVGs). | 7.375 | 5.760 | 6.318 |
| (U) In FY 2007: Demonstrated brassboard performance using state-of-the-art agile filters and optical power limiters. Characterized and incorporated agile filter and optical limiter technologies into devices for Air Force applications. | | | |
| (U) In FY 2008: Validate performance of state-of-the-art agile filters and optical power limiters in a system configuration. Optimize agile filter and optical limiter devices for Air Force applications. | | | |
| (U) In FY 2009: Transition advanced agile filters and optical power limiters technologies in a system configuration. Demonstrate agile filter and optical limiter devices for Air Force applications. | | | |
| (U) Total Cost | 32.202 | 25.443 | 24.152 |

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Weapon Systems

PROJECT NUMBER AND TITLE

2100 Laser Hardened Materials

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

	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011</u>	<u>FY 2012</u>	<u>FY 2013</u>	<u>Cost to</u>	<u>Total Cost</u>
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	

(U) Related Activities:

(U) PE 0602102F, Materials.

(U) PE 0602202F, Human Effectiveness Applied Research.

(U) PE 0603231F, Crew Systems and Personnel Protection Technology.

(U) PE 0603500F, Multi-Disciplinary Advanced Development Space Technology.

(U) PE 0604706F, Life Support Systems.

(U) This project has been coordinated through the Tri-Service Laser Hardened Materials and Structures Group and the Joint Service Agile Laser Eye Protection Program.

(U) This project has been coordinated through the Reliance 21 process to harmonize efforts and eliminate duplication.

(U) **D. Acquisition Strategy**

Not Applicable.

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BUDGET ACTIVITY 03 Advanced Technology Development (ATD)				PE NUMBER AND TITLE 0603112F Advanced Materials for Weapon Systems			PROJECT NUMBER AND TITLE 3153 Non-Destructive Inspection Development		
Cost (\$ in Millions)	FY 2007 Actual	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	Cost to Complete	Total
3153 Non-Destructive Inspection Development	16.657	7.424	4.185	4.335	4.393	4.749	4.705	Continuing	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0		

(U) A. Mission Description and Budget Item Justification

This project develops and demonstrates advanced nondestructive inspection/evaluation (NDI/E) technologies to monitor performance integrity and to detect failure causing conditions in weapon systems components and materials. NDI/E capabilities greatly influence and/or limit many design, manufacturing, and maintenance practices. This project provides technology to satisfy Air Force requirements to extend the lifetime of current systems through increased reliability and cost-effectiveness at field and depot maintenance levels. Equally important is assuring manufacturing quality, integrity, and safety requirements.

(U) B. Accomplishments/Planned Program (\$ in Millions)

	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
(U) MAJOR THRUST: Develop and demonstrate advanced technologies to improve capabilities to inspect for cracks and other damage to extend the total safe life of turbine engines.	0.890	0.483	0.527
(U) In FY 2007: Transitioned methods to detect and characterize damage in repaired (linear friction welded) turbine engine components. Transitioned enhanced NDI/E approaches to extend the life of superalloy engine components.			
(U) In FY 2008: Develop NDI/E approaches to extend the life of fracture-critical gas turbine engine components.			
(U) In FY 2009: Validate NDI/E approaches to extend the life of fracture-critical gas turbine engine components.			
(U) MAJOR THRUST: Develop and demonstrate advanced inspection technologies supporting low-observable (LO) systems to enhance affordability and ensure full performance and survivability.	0.315	0.264	0.339
(U) In FY 2007: Transitioned a portable, multifunctional, multiplatform diagnostics tool for use in battle damage assessment and repair of LO materials and structures.			
(U) In FY 2008: Develop and demonstrate multiuse, multiplatform LO NDI/E hand tool that meets user requirements.			
(U) In FY 2009: Transition multiuse, multiplatform LO NDI/E hand tool that meets user requirements.			
(U) MAJOR THRUST/CONGRESSIONAL ADD: Develop and demonstrate advanced technologies for improved capabilities in materials corrosion, fatigue monitoring, and testing of aging aircraft to reduce operations and maintenance costs. These technologies will contribute to full operability and safety of the aircraft fleet. Note: This effort includes Congressional Add funding of \$7.0 million in FY 2007 (\$2.0 million for Aging Aircraft Fleet Support - National Institute for Aviation Research, \$2.0 million for Assessing Aging of Military Aircraft, \$2.0 million for Inspection and Analysis Methods for Aging Military Aircraft, and \$1.0 million for Quantitative Inspection Techniques for Assessing Aging Military Aircraft).	8.114	1.621	1.739

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BUDGET ACTIVITY	PE NUMBER AND TITLE	PROJECT NUMBER AND TITLE		
03 Advanced Technology Development (ATD)	0603112F Advanced Materials for Weapon Systems	3153 Non-Destructive Inspection Development		
(U) B. Accomplishments/Planned Program (\$ in Millions)		<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
(U) In FY 2007: Demonstrated application-focused NDI/E technologies to meet emerging inspection requirements for aging aircraft.				
(U) In FY 2008: Validate NDI/E technologies to meet emerging inspection requirements for aging aircraft and develop processes.				
(U) In FY 2009: Transition application-focused NDI/E technologies to meet emerging inspection requirements for aging aircraft.				
(U)				
(U) MAJOR THRUST/CONGRESSIONAL ADD: Develop and demonstrate advanced systems status monitoring technologies to provide on-board and embedded sensing to gain continuous awareness of the state of key subsystems. Note: This effort includes Congressional Add funding of \$2.0 million in FY 2007 (\$1.0 million for Materials Integrity Management Research for AF Systems and \$1.0 million for Continuous Integrated Vehicle Health Monitoring System).		3.322	1.380	1.580
(U) In FY 2007: Validated optimal sensing approaches for real-time health monitoring of high-temperature protection systems and characterized power scavenging and signal transmission issues. Validated smart sensor technologies for wiring health analysis. Validated field-level inspection tools for assessing the structural health of airframes.				
(U) In FY 2008: Develop optimal sensing approaches for real-time health monitoring of high-temperature protection systems and characterize power scavenging and signal transmission issues. Develop improved, smaller smart sensor technologies for wiring health analysis. Develop data fusion to be used with field-level inspection tools for assessing the structural health of airframes.				
(U) In FY 2009: Develop optimal sensing approaches for real-time health monitoring of high-temperature protection systems and characterize power scavenging and signal transmission issues. Transition smart sensor technologies for wiring health analysis. Transition total field-level inspection tool for assessing the structural health of airframes.				
(U)				
(U) CONGRESSIONAL ADD: Low Observable Multi-Purpose Inspection Tool.		0.972	0.000	0.000
(U) In FY 2007: Conducted Congressionally-directed effort for Low Observable Multi-Purpose Inspection Tool.				
(U) In FY 2008: Not Applicable.				
(U) In FY 2009: Not Applicable.				
(U)				
(U) CONGRESSIONAL ADD: Improved Stealth Aircraft Availability/Functionality.		1.944	0.000	0.000
(U) In FY 2007: Conducted Congressionally-directed effort for Improved Stealth Aircraft Availability/Functionality.				
(U) In FY 2008: Not Applicable.				

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BUDGET ACTIVITY 03 Advanced Technology Development (ATD)	PE NUMBER AND TITLE 0603112F Advanced Materials for Weapon Systems	PROJECT NUMBER AND TITLE 3153 Non-Destructive Inspection Development
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(U) <u>B. Accomplishments/Planned Program (\$ in Millions)</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
(U) In FY 2009: Not Applicable.			
(U) CONGRESSIONAL ADD: Advanced Inspection Techniques and Analysis Methods for Multi-layer Structures and Widespread Fatigue Damage in Aging Military Aircraft.	1.100	0.000	0.000
(U) In FY 2007: Conducted Congressionally-directed effort for Advanced Inspection Techniques and Analysis Methods for Multi-layer Structures and Widespread Fatigue Damage in Aging Military Aircraft.			
(U) In FY 2008: Not Applicable.			
(U) In FY 2009: Not Applicable.			
(U) CONGRESSIONAL ADD: Aircraft Evaluation Readiness Initiative (AERI).	0.000	1.987	0.000
(U) In FY 2007: Not Applicable.			
(U) In FY 2008: Conduct Congressionally-directed effort for AERI.			
(U) In FY 2009: Not Applicable.			
(U) CONGRESSIONAL ADD: Continuous Integrated Vehicle Health Monitoring System.	0.000	1.192	0.000
(U) In FY 2007: Not Applicable.			
(U) In FY 2008: Conduct Congressionally-directed effort for Continuous Integrated Vehicle Health Monitoring System.			
(U) In FY 2009: Not Applicable.			
(U) CONGRESSIONAL ADD: Materials Integrity Management Research.	0.000	0.497	0.000
(U) In FY 2007: Not Applicable.			
(U) In FY 2008: Conduct Congressionally-directed effort for Materials Integrity Management Research.			
(U) In FY 2009: Not Applicable.			
(U) Total Cost	16.657	7.424	4.185

(U) <u>C. Other Program Funding Summary (\$ in Millions)</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011</u>	<u>FY 2012</u>	<u>FY 2013</u>	<u>Cost to Complete</u>	<u>Total Cost</u>
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>		
(U) Related Activities:									
(U) PE 0602102F, Materials.									
(U) This project has been									

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**3153 Non-Destructive Inspection
Development****(U) C. Other Program Funding Summary (\$ in Millions)**

coordinated through the
Reliance 21 process to
harmonize efforts and eliminate
duplication.

(U) D. Acquisition Strategy

Not Applicable.

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BUDGET ACTIVITY 03 Advanced Technology Development (ATD)				PE NUMBER AND TITLE 0603112F Advanced Materials for Weapon Systems			PROJECT NUMBER AND TITLE 3946 Materials Transition		
Cost (\$ in Millions)	FY 2007 Actual	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	Cost to Complete	Total
3946 Materials Transition	15.652	11.268	4.459	6.654	4.242	4.584	4.512	Continuing	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0		

- (U) **A. Mission Description and Budget Item Justification**
 This project develops and demonstrates advanced materials and processing technologies for fielded and planned Air Force weapon, airframe, and propulsion applications. Advanced materials and processes that have matured beyond applied research are characterized, critical data are collected, and critical evaluations in the proposed operating environment are performed. These design and scale-up data improve the overall affordability of promising materials and processing technologies, providing needed initial incentives for their industrial development.
- | | | | |
|--|----------------|----------------|----------------|
| (U) <u>B. Accomplishments/Planned Program (\$ in Millions)</u> | <u>FY 2007</u> | <u>FY 2008</u> | <u>FY 2009</u> |
| (U) MAJOR THRUST/CONGRESSIONAL ADD: Develop and demonstrate advanced materials and processing technologies for air vehicles and subsystems to enhance the lift, propulsion, low-observable performance, and overall affordability of air vehicles. Note: This effort includes Congressional Add funding of \$2.3 million in FY 2007 for Metals Affordability Initiative. | 6.616 | 3.500 | 3.347 |
- (U) In FY 2007: Developed materials-damage predictive approaches for engine health determination and life extension capability. Completed transition of high-temperature organic matrix composites for turbine engine components. Characterized advanced materials and materials process capabilities for scaled-up processing techniques and assessed process repeatability for power generation materials for airborne directed energy weapons. Demonstrated functionality of integrated methods for a mid-infrared laser source enabling aircraft countermeasures. Demonstrated flexible/lightweight conductive gap filler. Evaluated processes for removal of radar absorbing material on large aircraft areas. Demonstrated primer/sealer material for improved durability of LO materials in fluid contaminated areas on emerging fighter aircraft. Evaluated improved processing of room-temperature-storable radar absorbing structure repair materials. Demonstrated nondestructive evaluation tool for limited access areas on aircraft.
- (U) In FY 2008: Validate materials-damage predictive approaches for engine health determination and life extension capability. Transition advanced materials and materials process capabilities for component-level demonstrations of power generation materials for airborne directed energy weapons. Transition materials and processing concepts for component-level demonstrations of new material for enabling mid-IR laser output with energy sufficient for enabling new aircraft self-protection schemes. Transition flexible/lightweight conductive gap filler. Validate advanced materials and processing technologies for transition to fielded and planned Air Force weapon, airframe, and propulsion applications as well as support systems including Air Force Material Command (AFMC) center infrastructure.
- (U) In FY 2009: Validate materials-damage predictive approaches for engine health determination and life extension

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	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>	
(U) B. Accomplishments/Planned Program (\$ in Millions) capability. Transition advanced materials and processing technologies to fielded and planned Air Force weapon, airframe, and propulsion applications as well as support systems including AFMC center infrastructure. Evaluate domestic lithium ion precursor materials, active materials, associated testing, and battery-cell manufacturing for acceleration of industrial development.				
(U) MAJOR THRUST/CONGRESSIONAL ADD: Develop and demonstrate advanced materials and processing technologies to enhance the sustainability of Air Force aerospace systems by lowering operations and maintenance costs and ensuring the full operability and safety of systems and personnel. Note: This effort includes Congressional Add funding of \$1.0 million in FY 2007 for Coated Field Repair.	1.648	0.218	1.112	
(U) In FY 2007: Developed test methodologies and evaluation techniques to facilitate transition of emerging materials and processes for sustainment of Air Force systems.				
(U) In FY 2008: Identify and prioritize critical issues that are preventing transition of emerging materials and processes for sustainment of Air Force systems.				
(U) In FY 2009: Develop test methodologies and evaluation techniques to facilitate transition of emerging materials and processes for sustainment of Air Force systems.				
(U) CONGRESSIONAL ADD: Advanced Power Technology: Silicon Carbide Power, Bipolar Junction Transistors.	1.750	0.000	0.000	
(U) In FY 2007: Conducted Congressionally-directed effort for Advanced Power Technology: Silicon Carbide Power, Bipolar Junction Transistors.				
(U) In FY 2008: Not Applicable.				
(U) In FY 2009: Not Applicable.				
(U) CONGRESSIONAL ADD: Silicon Carbide Electronics Material Producibility Initiative.	5.638	0.000	0.000	
(U) In FY 2007: Conducted Congressionally-directed effort for Silicon Carbide Electronics Material Producibility Initiative.				
(U) In FY 2008: Not Applicable.				
(U) In FY 2009: Not Applicable.				
(U) CONGRESSIONAL ADD: Metals Affordability Initiative.	0.000	4.968	0.000	
(U) In FY 2007: Not Applicable.				
(U) In FY 2008: Conduct Congressionally-directed effort for Metals Affordability Initiative.				

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(U) <u>B. Accomplishments/Planned Program (\$ in Millions)</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
(U) In FY 2009: Not Applicable.			
(U)			
(U) CONGRESSIONAL ADD: Coated Field Repair (2K Gun).	0.000	0.993	0.000
(U) In FY 2007: Not Applicable.			
(U) In FY 2008: Conduct Congressionally-directed effort for Coated Field Repair (2K Gun).			
(U) In FY 2009: Not Applicable.			
(U)			
(U) CONGRESSIONAL ADD: EMI Grid Fabrication Technology.	0.000	1.589	0.000
(U) In FY 2007: Not Applicable.			
(U) In FY 2008: Conduct Congressionally-directed effort for EMI Grid Fabrication Technology.			
(U) In FY 2009: Not Applicable.			
(U)			
(U) Total Cost	15.652	11.268	4.459

(U) <u>C. Other Program Funding Summary (\$ in Millions)</u>	<u>FY 2007</u> <u>Actual</u>	<u>FY 2008</u> <u>Estimate</u>	<u>FY 2009</u> <u>Estimate</u>	<u>FY 2010</u> <u>Estimate</u>	<u>FY 2011</u> <u>Estimate</u>	<u>FY 2012</u> <u>Estimate</u>	<u>FY 2013</u> <u>Estimate</u>	<u>Cost to</u> <u>Complete</u>	<u>Total Cost</u>
(U) Related Activities:									
(U) PE 0602102F, Materials.									
(U) PE 0603203F, Advanced Aerospace Sensors.									
(U) PE 0603211F, Aerospace Technology Dev/Demo.									
(U) PE 0603216F, Aerospace Propulsion and Power Technology.									
(U) PE 0603500F,									
(U) Multi-Disciplinary Advanced Development Space Technology.									
(U) This project has been coordinated through the Reliance 21 process to									

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3946 Materials Transition**(U) C. Other Program Funding Summary (\$ in Millions)**

harmonize efforts and eliminate
duplication.

(U) D. Acquisition Strategy

Not Applicable.

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BUDGET ACTIVITY 03 Advanced Technology Development (ATD)				PE NUMBER AND TITLE 0603112F Advanced Materials for Weapon Systems			PROJECT NUMBER AND TITLE 4918 Deployed Air Base Demonstrations			
Cost (\$ in Millions)		FY 2007 Actual	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	Cost to Complete	Total
4918	Deployed Air Base Demonstrations	13.919	6.374	5.918	2.550	2.592	2.802	2.876	Continuing	TBD
Quantity of RDT&E Articles		0	0	0	0	0	0	0		

- (U) **A. Mission Description and Budget Item Justification**
 This project develops and demonstrates advanced, rapidly deployable airbase technologies that reduce airlift and manpower requirements, setup times, and sustainment costs, and improve protection and survivability of deployed Air Expeditionary Force (AEF) warfighters. Affordable, efficient technologies are developed and demonstrated to provide deployable infrastructure, advanced weapon system support, force protection, and fire fighting capability for deployed AEF operations.
- (U) **B. Accomplishments/Planned Program (\$ in Millions)**
- | | | | |
|---|----------------|----------------|----------------|
| | <u>FY 2007</u> | <u>FY 2008</u> | <u>FY 2009</u> |
| (U) MAJOR THRUST/CONGRESSIONAL ADD: Demonstrate and transition advanced rapidly deployable airbase infrastructure technologies that reduce airlift and manpower requirements, setup times, and sustainment costs in support of AEF operations. Note: In FY 2009, this effort increases emphasis on airfield damage repair technologies. This effort includes Congressional Add funding of \$3.3 million in FY 2007 for Hydrothermal Oxidation (HTO) for Alaska. | 4.680 | 0.897 | 4.395 |
- (U) In FY 2007: Demonstrated a 10 kW fuel cell power system that improves deployable power systems performance. Demonstrated packed bed fuel treatment technology. Demonstrated advanced integrated shelter power/heating, ventilation, and air conditioning concept. Developed continuous load deflection technology and improved crater/spall repair materials and methodologies for improved airfield assessment and rapid repair.
- (U) In FY 2008: Develop transition plan and specifications for system development and demonstration. Characterize catalytic and surface chemistry technologies for application to bare base utilities. Develop and demonstrate continuous load deflection technologies and improved crater/spall repair.
- (U) In FY 2009: Develop best methods for integration of advanced power generation and distribution. Characterize and ensure processes for innovative technologies.
 Begin development and demonstration of airfield damage repair and matting technologies that address field critical conditions, represented by key performance parameters, including issues like reduced weight and ease of installation and repair in the field.
- | | | | |
|---|-------|-------|-------|
| (U) MAJOR THRUST: Demonstrate and transition affordable, efficient technologies to provide force protection and fire fighting capability for deployed AEF operations. | 1.487 | 1.306 | 1.523 |
|---|-------|-------|-------|
- (U) In FY 2007: Demonstrated improved blast suppression technologies and fragmentation protection materials for new and existing structures and for explosive storage facilities. Completed demonstration of improved fire fighter safety technologies and transitioned technology to operational units. Initiated an integrated crash/rescue fire fighting

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03 Advanced Technology Development (ATD)	0603112F Advanced Materials for Weapon Systems	4918 Deployed Air Base Demonstrations		
(U) <u>B. Accomplishments/Planned Program (\$ in Millions)</u>		<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
demonstration. Integrated air filtration technologies into demonstration for expeditionary structures.				
(U) In FY 2008: Develop and analyze effectiveness of improved blast suppression technologies and fragmentation protection materials for new and existing structures. Demonstrate explosives detection technologies. Transition technical orders and construction standards supporting fire suppression technologies for fire fighter safety technologies. Evaluate ultrahigh pressure, standoff nozzles, and other innovative technologies with test bed vehicles. Develop air filtration and model/evaluate reactive filtration effectiveness for expeditionary structures.				
(U) In FY 2009: Validate and fabricate improved blast suppression technologies and fragmentation protection materials for new and existing structures. Demonstrate and validate explosives detection technologies. Evaluate and characterize improved fire fighter safety technologies and transition technology to operational units. Characterize and analyze/evaluate ultrahigh pressure, standoff nozzles, and other innovative technologies with test bed vehicles. Characterize air filtration and model/evaluate reactive filtration effectiveness for expeditionary structures.				
(U) CONGRESSIONAL ADD: Blast Resistant Barriers and Structural Design for Homeland Defense.		1.264	0.000	0.000
(U) In FY 2007: Conducted Congressionally-directed effort for Blast Resistant Barriers and Structural Design for Homeland Defense.				
(U) In FY 2008: Not Applicable.				
(U) In FY 2009: Not Applicable.				
(U) CONGRESSIONAL ADD: Body Armor Improved Ballistic Protection.		1.361	1.589	0.000
(U) In FY 2007: Conducted Congressionally-directed effort for Body Armor Underarm and Side Protection with Smart Materials.				
(U) In FY 2008: Conduct Congressionally-directed effort for Body Armor Improved Ballistic Protection.				
(U) In FY 2009: Not Applicable.				
(U) CONGRESSIONAL ADD: Combined Agent Fire Fighting System.		0.972	0.000	0.000
(U) In FY 2007: Conducted Congressionally-directed effort for Combined Agent Fire Fighting System.				
(U) In FY 2008: Not Applicable.				
(U) In FY 2009: Not Applicable.				
(U) CONGRESSIONAL ADD: Encapsulated Ballistic Protection System (EBPS).		1.555	0.993	0.000
(U) In FY 2007: Conducted Congressionally-directed effort for EBPS.				

Exhibit R-2a, RDT&E Project Justification

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BUDGET ACTIVITY 03 Advanced Technology Development (ATD)	PE NUMBER AND TITLE 0603112F Advanced Materials for Weapon Systems	PROJECT NUMBER AND TITLE 4918 Deployed Air Base Demonstrations
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(U) <u>B. Accomplishments/Planned Program (\$ in Millions)</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
(U) In FY 2008: Conduct Congressionally-directed effort for EBPS.			
(U) In FY 2009: Not Applicable.			
(U)			
(U) CONGRESSIONAL ADD: Iodinated Ionic Antimicrobial Disposal Masks.	2.600	0.000	0.000
(U) In FY 2007: Conducted Congressionally-directed effort for Iodinated Ionic Antimicrobial Disposal Masks.			
(U) In FY 2008: Not Applicable.			
(U) In FY 2009: Not Applicable.			
(U)			
(U) CONGRESSIONAL ADD: Strategic Bio-fuels Supply Program.	0.000	1.589	0.000
(U) In FY 2007: Not Applicable.			
(U) In FY 2008: Conduct Congressionally-directed effort for Strategic Bio-fuels Supply Program.			
(U) In FY 2009: Not Applicable.			
(U)			
(U) Total Cost	13.919	6.374	5.918

(U) <u>C. Other Program Funding Summary (\$ in Millions)</u>	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>	<u>FY 2010</u>	<u>FY 2011</u>	<u>FY 2012</u>	<u>FY 2013</u>	<u>Cost to</u>	<u>Total Cost</u>
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Complete</u>	
(U) Related Activities:									
(U) PE 0602102F, Materials.									
(U) PE 0603287F, Physical Security Equipment.									
(U) PE 0604617F, Agile Combat Support.									
(U) This project has been coordinated through the Reliance 21 process to harmonize efforts and eliminate duplication.									
(U) <u>D. Acquisition Strategy</u>									
Not Applicable.									

Exhibit R-2a, RDT&E Project Justification

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BUDGET ACTIVITY 03 Advanced Technology Development (ATD)				PE NUMBER AND TITLE 0603112F Advanced Materials for Weapon Systems			PROJECT NUMBER AND TITLE 77SP Advanced Space Materials		
Cost (\$ in Millions)	FY 2007 Actual	FY 2008 Estimate	FY 2009 Estimate	FY 2010 Estimate	FY 2011 Estimate	FY 2012 Estimate	FY 2013 Estimate	Cost to Complete	Total
77SP Advanced Space Materials	5.116	4.362	3.212	3.329	3.377	3.652	3.620	Continuing	TBD
Quantity of RDT&E Articles	0	0	0	0	0	0	0		

Note: In FY 2007, Project 77SP, Advanced Space Materials, efforts transfer from PE 0603500F, Multidisciplinary Space Technology, Project 5032, Advanced Space Materials, in order to more effectively manage and provide oversight of the efforts.

(U) A. Mission Description and Budget Item Justification

This project develops and demonstrates materials and processing technologies for transition into Air Force space systems. Materials and processes development is scaled up to the appropriate level to demonstrate materials capability in the relative environment. Sub-scale components and nonstructural material components are developed and demonstrated to validate expected materials characteristics. Critical data on both structural and nonstructural materials is developed and provided for engineering and system design decisions. Laser hardened materials technologies are developed, demonstrated, and transitioned for the broadband protection of space sensors from a variety of laser threats. Reducing risk in materials technology improves the affordability, reliability, survivability, and operational performance of current and future space systems.

(U) B. Accomplishments/Planned Program (\$ in Millions)

	<u>FY 2007</u>	<u>FY 2008</u>	<u>FY 2009</u>
(U) MAJOR THRUST: Develop and demonstrate advanced materials and processing technologies to enable revolutionary improvements in the performance of air-breathing and rocket-based aerospace vehicles and weapons.	5.116	2.016	1.496
(U) In FY 2007: Developed advanced materials approaches to provide durable, maintainable high-temperature protection systems for leading edge applications on high-speed, reusable launch, and future reentry vehicle concepts. Investigated combinations of candidate materials, including organic matrix composites, ceramics, metals, carbon foams, aerogels, heat pipes, and phase change materials, for management of thermal and structural loads. Developed advanced ceramic materials and processing technologies for load bearing structures designed for high-temperature, multicycle applications in an oxidizing environment. Developed rocket propulsion materials for liquid and solid rocket engine components and validate performance in scaled component demonstrations.			
(U) In FY 2008: Refine developed materials formulations and approaches for thermal protection systems and aeroshells that provide solutions for cost-effective scale-up, fabrication, and integration techniques. Validate performance of high temperature composites on integrated cryogenic tanks and hypersonic structures, demonstrating low cost component fabrication and scale-up of design and process methodologies.			
(U) In FY 2009: Utilizing newly developed materials approaches, fabricate thermal protection system sub-components for high temperature testing. Develop a sub-component cryogenic tank article and demonstrate the integration of ceramic, metallic, and carbon-carbon thermal protection system components.			
(U) MAJOR THRUST: Develop and demonstrate advanced materials technologies that enhance hardening for space	0.000	2.346	1.716

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BUDGET ACTIVITY

03 Advanced Technology Development (ATD)

PE NUMBER AND TITLE

0603112F Advanced Materials for
Weapon Systems

PROJECT NUMBER AND TITLE

77SP Advanced Space Materials

(U) **B. Accomplishments/Planned Program (\$ in Millions)**

systems. Note: Efforts in this major thrust were delayed until FY 2008 due to higher Air Force priorities.

FY 2007

FY 2008

FY 2009

(U) In FY 2007: Not Applicable.

(U) In FY 2008: Optimize and validate limiter and filter technology for protection against low and high power lasers. Analyze laser phenomenology for intrinsic hardening solutions to jamming and damage susceptibility in electro-optical sensors.

(U) In FY 2009: Fabricate and demonstrate limiter and filter technology for protection of space systems. Investigate impact of inserting state-of-the-art filters and optical power limiters into a realistic system configuration.

(U) Total Cost

5.116

4.362

3.212

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

FY 2007

FY 2008

FY 2009

FY 2010

FY 2011

FY 2012

FY 2013

Cost to

Total Cost

Actual

Estimate

Estimate

Estimate

Estimate

Estimate

Estimate

Complete

(U) Not Applicable.

(U) **D. Acquisition Strategy**

Not Applicable.