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Exhibit R-2, RDT&E Budget Item Justification: PB 2014 Air Force **DATE:** April 2013

APPROPRIATION/BUDGET ACTIVITY					R-1 ITEM NOMENCLATURE							
3600: <i>Research, Development, Test & Evaluation, Air Force</i> BA 3: <i>Advanced Technology Development (ATD)</i>					PE 0603112F: <i>Advanced Materials for Weapon Systems</i>							
COST (\$ in Millions)	All Prior Years	FY 2012	FY 2013[#]	FY 2014 Base	FY 2014 OCO ^{##}	FY 2014 Total	FY 2015	FY 2016	FY 2017	FY 2018	Cost To Complete	Total Cost
Total Program Element	-	60.626	47.890	39.572	-	39.572	35.229	33.649	38.072	38.184	Continuing	Continuing
632100: <i>Laser Hardened Materials</i>	-	22.209	11.564	20.450	-	20.450	19.531	16.170	17.735	17.480	Continuing	Continuing
633153: <i>Non-Destructive Inspection Development</i>	-	3.788	8.413	6.766	-	6.766	4.831	4.870	4.962	5.052	Continuing	Continuing
633946: <i>Materials Transition</i>	-	30.980	27.020	12.356	-	12.356	10.867	12.609	15.375	15.652	Continuing	Continuing
634918: <i>Deployed Air Base Demonstrations</i>	-	3.649	0.893	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

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

^{##} The FY 2014 OCO Request will be submitted at a later date

A. Mission Description and Budget Item Justification

This program develops and demonstrates materials technology for transition into Air Force systems. The program has four 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; and (4) airbase operations technologies including deployable base infrastructure, force protection, and fire fighting capabilities. Efforts in the program have been coordinated through the Department of Defense (DoD) Science and Technology (S&T) Executive Committee process to harmonize efforts and eliminate duplication. This program is in Budget Activity 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.

B. Program Change Summary (\$ in Millions)	FY 2012	FY 2013	FY 2014 Base	FY 2014 OCO	FY 2014 Total
Previous President's Budget	60.719	47.890	29.672	-	29.672
Current President's Budget	60.626	47.890	39.572	-	39.572
Total Adjustments	-0.093	0.000	9.900	-	9.900
• Congressional General Reductions	-	0.000			
• Congressional Directed Reductions	-	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	-	0.000			
• Congressional Directed Transfers	-	0.000			
• Reprogrammings	0.750	0.000			
• SBIR/STTR Transfer	-0.843	0.000			
• Other Adjustments	0.000	0.000	9.900	-	9.900

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<u>Congressional Add Details (\$ in Millions, and Includes General Reductions)</u>		FY 2012	FY 2013
Project: 633946: <i>Materials Transition</i>			
Congressional Add: <i>Silicon Carbide Composites Research</i>		12.500	0.000
Congressional Add: <i>Advanced Materials Research</i>		8.500	0.000
Congressional Add Subtotals for Project: 633946		21.000	0.000
Congressional Add Totals for all Projects		21.000	0.000
 <u>Change Summary Explanation</u> Increase in FY14 is due to increased emphasis on laser protection for aircrew and aerospace systems and on sustainment materials and process technologies to decrease lifecycle costs of Air Force systems.			

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APPROPRIATION/BUDGET ACTIVITY 3600: Research, Development, Test & Evaluation, Air Force BA 3: Advanced Technology Development (ATD)					R-1 ITEM NOMENCLATURE PE 0603112F: Advanced Materials for Weapon Systems				PROJECT 632100: Laser Hardened Materials			
COST (\$ in Millions)	All Prior Years	FY 2012	FY 2013 [#]	FY 2014 Base	FY 2014 OCO ^{##}	FY 2014 Total	FY 2015	FY 2016	FY 2017	FY 2018	Cost To Complete	Total Cost
632100: Laser Hardened Materials	-	22.209	11.564	20.450	-	20.450	19.531	16.170	17.735	17.480	Continuing	Continuing
[#] FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012 ^{##} The FY 2014 OCO Request will be submitted at a later date												
A. Mission Description and Budget Item Justification												
This 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 sensors and systems to ensure safety, survivability, and operability in threat environments.												
B. Accomplishments/Planned Programs (\$ in Millions)										FY 2012	FY 2013	FY 2014
Title: Aerospace Systems Protection										18.122	5.996	10.800
Description: Develop and demonstrate materials technologies that enhance hardening for sensors, avionics, and components to increase survivability and mission effectiveness of aerospace systems.												
FY 2012 Accomplishments: Continued to evaluate and prioritize advanced optical coatings and optical power limiter technologies as protection against laser and directed energy threats aimed at sensors and avionics. Transitioned most mature coatings and optical limiter technologies for next generation targeting platforms. Initiated demonstrations of promising coating technologies into next generation of persistent surveillance sensor designs as well as demonstrated strategies to mitigate directed energy damage for Visible/Near Infrared (Vis/NIR) detectors and Short Wave Infrared (SWIR) detectors that are critical for Intelligence, Surveillance, and Reconnaissance (ISR) sensors. Continued testing of damage limiting semiconductor materials in test bed configuration to determine viability for protection of tactical and strategic space sensors and for SWIR systems. Assessed vulnerability of current seekers/munitions against emerging countermeasure threats.												
FY 2013 Plans: Continue demonstrations of viable coating and hardened focal planes for future persistent surveillance sensor designs as well as continue demonstrating strategies to mitigate directed energy damage for Vis/NIR, SWIR, and Mid Wave Infrared (MWIR) detectors critical to ISR sensors. Demonstrate damage-limiting semiconductor materials in a test bed configuration representing protection of both Vis/NIR and SWIR ISR sensors. Employ computation materials science to model materials characteristics to increase accuracy and shorten design cycle time of coatings and dyes for use in sensor hardening.												
FY 2014 Plans:												

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2012	FY 2013
Ensure process repeatability and perform demonstrations of protection technologies for future ISR sensor designs as well as continue demonstrating strategies to mitigate directed energy damage for Vis/NIR, SWIR, and MWIR detectors. Assess impacts to image quality performance due to hardening insertion of damage-limiting semiconductor materials in a test bed configuration. Continue to employ computation materials science to model materials characteristics to increase accuracy and shorten design cycle time of coatings for use in sensor hardening. Initiate air systems airframe and anti-access munitions hardening assessment.			
Title: Aircrew Protection		4.087	5.568
Description: Develop and demonstrate materials technologies that enhance protection for Air Force aircrews to ensure safety and to enable aircrews to perform required missions in a threat environment.			
FY 2012 Accomplishments: Developed and demonstrated personnel protection technologies, including tailored rugate coatings and liquid crystal materials technologies specific for visor applications against visible and SWIR directed energy laser threats. Also investigated emerging limiter technologies and next generation dye concepts for the personnel protection across the visible and SWIR. Continued to evaluate performance and initiate process development of optical coatings within visor applications.			
FY 2013 Plans: Continue development and demonstration of personnel protection technologies for daytime operation across the visible/NIR and SWIR spectral bands. Fabricate and demonstrate performance of agile optical coatings and dyes for use in daytime visor configurations. Characterize eye protection technologies using computational materials science tools. Insure process repeatability and perform demonstrations of personnel protection technologies in realistic operation environments.			
FY 2014 Plans: Continue development and demonstration of personnel protection technologies. Transition agile optical coatings and dyes for use in night-time applications. Characterize eye protection technologies using computational materials science tools. Continue to improve process repeatability and perform demonstrations of personnel protection technologies in realistic operation environments.			
Accomplishments/Planned Programs Subtotals		22.209	11.564
C. Other Program Funding Summary (\$ in Millions) N/A			
Remarks			
D. Acquisition Strategy Not Applicable.			

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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.

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APPROPRIATION/BUDGET ACTIVITY 3600: Research, Development, Test & Evaluation, Air Force BA 3: Advanced Technology Development (ATD)					R-1 ITEM NOMENCLATURE PE 0603112F: Advanced Materials for Weapon Systems				PROJECT 633153: Non-Destructive Inspection Development			
COST (\$ in Millions)	All Prior Years	FY 2012	FY 2013 [#]	FY 2014 Base	FY 2014 OCO ^{##}	FY 2014 Total	FY 2015	FY 2016	FY 2017	FY 2018	Cost To Complete	Total Cost
633153: Non-Destructive Inspection Development	-	3.788	8.413	6.766	-	6.766	4.831	4.870	4.962	5.052	Continuing	Continuing
[#] FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012												
^{##} The FY 2014 OCO Request will be submitted at a later date												
A. Mission Description and Budget Item Justification												
This 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.												
B. Accomplishments/Planned Programs (\$ in Millions)										FY 2012	FY 2013	FY 2014
Title: Advanced Engine Inspection Technologies										1.023	1.772	1.300
Description: Develop and demonstrate advanced technologies to improve capabilities to inspect for cracks and other damage to extend the total safe life of turbine engines.												
FY 2012 Accomplishments: Investigated NDI/E approaches to measure material properties to extend the life and increase durability of fracture-critical gas turbine engine components.												
FY 2013 Plans: Develop NDI/E approaches to nondestructively measure material properties, detect and characterize materials and damage state for the purpose of extending the life and increasing durability of fracture critical gas turbine engine components.												
FY 2014 Plans: Continue development of NDI/E approaches to nondestructively measure material properties, detect and characterize materials and damage state for the purpose of extending the life and increasing durability of fracture critical gas turbine engine components.												
Title: Low-Observable Inspection Technologies										0.421	0.541	0.466
Description: Develop and demonstrate advanced inspection technologies supporting low-observable (LO) systems to enhance affordability and ensure full performance and survivability.												
FY 2012 Accomplishments:												

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B. Accomplishments/Planned Programs (\$ in Millions)			FY 2012	FY 2013	FY 2014
Advanced inspection methods and sensor technology for signature and material integrity of next generation LO material systems.					
FY 2013 Plans: Develop and demonstrate inspection methods and sensor technology for signature and material integrity of existing and next generation LO material systems. Develop, demonstrate, and validate inspection methods to identify damage and register positions that enable/ensure signature assessment.					
FY 2014 Plans: Continue to develop and demonstrate inspection methods and sensor technology for signature and material integrity of existing and next generation LO material systems. Continue to develop, demonstrate, and validate inspection methods to identify damage and register positions that enable/ensure signature assessment.					
Title: Advanced System Monitoring Technologies			2.344	6.100	5.000
Description: 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.					
FY 2012 Accomplishments: Continued to transition smart sensor technologies for wiring health analysis. Continued to transition field and depot-level inspection tools for assessing the structural health of airframes.					
FY 2013 Plans: Continue to develop and transition augmented field and depot-level inspection technologies for assessing the structural integrity of airframes. Integrate computational materials science tools with life prediction methods to increase accuracy of life prediction. Demonstrate and transition advanced turbine engine process/status monitoring technologies to enable adaptive functions.					
FY 2014 Plans: Transition augmented field and depot-level inspection technologies for assessing the structural integrity of airframes. Integrate computational materials science tools with life prediction methods to increase accuracy of life prediction. Continue to demonstrate and transition advanced turbine engine process/status monitoring technologies to enable adaptive functions.					
Accomplishments/Planned Programs Subtotals			3.788	8.413	6.766
C. Other Program Funding Summary (\$ in Millions)					
N/A					
Remarks					

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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.		

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APPROPRIATION/BUDGET ACTIVITY 3600: Research, Development, Test & Evaluation, Air Force BA 3: Advanced Technology Development (ATD)					R-1 ITEM NOMENCLATURE PE 0603112F: Advanced Materials for Weapon Systems				PROJECT 633946: Materials Transition			
COST (\$ in Millions)	All Prior Years	FY 2012	FY 2013 [#]	FY 2014 Base	FY 2014 OCO ^{##}	FY 2014 Total	FY 2015	FY 2016	FY 2017	FY 2018	Cost To Complete	Total Cost
633946: Materials Transition	-	30.980	27.020	12.356	-	12.356	10.867	12.609	15.375	15.652	Continuing	Continuing
[#] FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012												
^{##} The FY 2014 OCO Request will be submitted at a later date												
A. Mission Description and Budget Item Justification												
This 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. This design and scale-up data improves the overall affordability of promising materials and processing technologies, providing needed initial incentives for their industrial development.												
B. Accomplishments/Planned Programs (\$ in Millions)										FY 2012	FY 2013	FY 2014
Title: Air Vehicle Materials Technologies										4.934	6.320	7.721
Description: Develop and demonstrate materials and processes technologies for air vehicle and subsystems to enhance lift, propulsion, LO performance, power generation management, and affordability of air vehicles.												
FY 2012 Accomplishments: Demonstrated high rate production-capable processes for producing large area, high quality diamond windows for airborne high power microwave directed energy weapons. Developed materials enabling critical components for next-generation airborne high energy lasers that are solid state, electrically-powered, and significantly higher efficiency. Advanced validation of processing methods and lifing tools for graded microstructure turbine engine disk concepts. Advanced validation of processing methods and lifing methodologies for advanced high temperature silicon carbide (SiC)/SiC-based composites. Developed and validated next generation NDE/I sensor systems for advanced LO material systems.												
FY 2013 Plans: Continue to advance validation of processing methods and lifing tools for graded microstructure turbine engine disk concepts. Transition validation of next generation NDE/I sensor systems for advanced LO material systems. Develop advanced materials and processes for mature materials technologies to enhance mission effectiveness, air vehicle performance, and efficiency.												
FY 2014 Plans: Continue to advance validation of processing methods and lifing tools for ceramic matrix composites and graded microstructure turbine engine disk concepts. Continue to transition validated next generation NDE/I sensor systems for advanced LO material												

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2012	FY 2013	FY 2014
systems. Continue to develop advanced materials and processes for mature materials technologies to enhance mission effectiveness, air vehicle performance, and efficiency.				
Title: Lifecycle and Sustainment Technologies Description: Develop and demonstrate materials and process technologies to enhance sustainability and decrease lifecycle costs of Air Force systems. FY 2012 Accomplishments: Demonstrated and transitioned innovative technologies for bare base utilities. FY 2013 Plans: Work completed in FY12. FY 2014 Plans: N/A		0.750	0.000	0.000
Title: High Temperature Material Technologies Description: Develop and demonstrate affordable, novel high temperature materials/structures and thermal management concepts to enable future defense capabilities for prompt global strike concepts. FY 2012 Accomplishments: Advanced multi-material structure to optimally address operational temperature zones for hot structure and thermal protection systems from advanced ceramics, ceramic matrix composites, hybrids, advanced metals, and intermetallics. FY 2013 Plans: Continue to advance multimaterial structure to optimally address operational temperature zones for hot structure and thermal protection systems. FY 2014 Plans: Develop and demonstrate multimaterial structures to optimally address operational temperature zones for hot structure and expendable thermal protection systems made out of advanced ceramics, ceramic matrix composites, hybrids, advanced metals, and intermetallics.		4.296	1.000	2.635
Title: Adapative Turbine Engine Technologies Description: Develop and demonstrate material and process technologies to increase power and efficiency for adaptive turbine engine propulsion and subsystem integration.		0.000	19.700	2.000

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		PROJECT 633946: <i>Materials Transition</i>	
B. Accomplishments/Planned Programs (\$ in Millions)		FY 2012	FY 2013
FY 2012 Accomplishments: N/A			
FY 2013 Plans: Transition production processes and materials to enable an adaptive turbine engine prototype. Perform critical evaluations of technology in the operating environment.			
FY 2014 Plans: Complete materials and production processes assessments for an adaptive turbine engine prototype.			
Accomplishments/Planned Programs Subtotals		9.980	27.020
	FY 2012	FY 2013	
Congressional Add: Silicon Carbide Composites Research	12.500	0.000	
FY 2012 Accomplishments: Conducted Congressionally-directed effort.			
FY 2013 Plans: N/A			
Congressional Add: Advanced Materials Research	8.500	0.000	
FY 2012 Accomplishments: Conducted Congressionally-directed effort.			
FY 2013 Plans: N/A			
Congressional Adds Subtotals	21.000	0.000	
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
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.			

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COST (\$ in Millions)	All Prior Years	FY 2012	FY 2013 [#]	FY 2014 Base	FY 2014 OCO ^{##}	FY 2014 Total	FY 2015	FY 2016	FY 2017	FY 2018	Cost To Complete	Total Cost
634918: Deployed Air Base Demonstrations	-	3.649	0.893	0.000	-	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
# FY 2013 Program is from the FY 2013 President's Budget, submitted February 2012												
## The FY 2014 OCO Request will be submitted at a later date												
A. Mission Description and Budget Item Justification												
This project develops and demonstrates advanced, rapidly deployable airbase technologies that enable agile combat support by reducing airbase manpower requirements, reducing airbase setup times and improving the protection and survivability of deployed Air Force Expeditionary (AFE) warfighters. Affordable, efficient technologies are developed and demonstrated to provide deployable infrastructure, weapon system support, blast and munition force protection and firefighting capability for deployed AEF operations.												
B. Accomplishments/Planned Programs (\$ in Millions)										FY 2012	FY 2013	FY 2014
Title: Deployable Airbase Infrastructure										1.591	0.000	0.000
Description: Demonstrate and transition deployable infrastructure airbase technologies, to reduce airlift and manpower requirements, setup time, and sustainment costs in support of AEF operations.												
FY 2012 Accomplishments: Characterized, demonstrated, and fabricated airbase alternative energy generation, power grid conditioning, and distribution methods. Characterized and developed best practices for aircraft operating surface evaluation and repair technologies. Characterized, fabricated, and demonstrated aircraft operating surface high operating temperature materials and technologies.												
FY 2013 Plans: Work completed in FY12. Future work in this area transitioned to the Air Force Civil Engineering Center.												
FY 2014 Plans: N/A												
Title: Deployable Airbase Force Protection										2.058	0.893	0.000
Description: Demonstrate and transition technologies to provide force protection and fire fighting capability for deployed AEF operations.												
FY 2012 Accomplishments:												

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2012	FY 2013
Characterized and maintained competency for fabrication and demonstration of technologies for airbase structural protection against blast and fragmentation. Characterized and developed technologies for airbase fire fighting and composite materials combustion. FY 2013 Plans: Transitioned work to the Air Force Civil Engineering Center. FY 2014 Plans: Work completed in FY13. Future work in this area transitioned to the Air Force Civil Engineering Center.			
Accomplishments/Planned Programs Subtotals		3.649	0.893
C. Other Program Funding Summary (\$ in Millions)			
N/A			
Remarks			
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.			