Exhibit R-2, RDT&E Budget Item Justification: PB 2015 Air Force											Date: March 2014	
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 3: *Advanced Technology Development (ATD)*					R-1 Program Element (Number/Name) PE 0603112F / *Advanced Materials for Weapon Systems*							
COST ($ in Millions)	**Prior Years**	**FY 2013**	**FY 2014**	**FY 2015 Base**	**FY 2015 OCO #**	**FY 2015 Total**	**FY 2016**	**FY 2017**	**FY 2018**	**FY 2019**	**Cost To Complete**	**Total Cost**
Total Program Element	-	54.334	54.572	32.177	-	32.177	39.975	39.075	38.819	40.576	Continuing	Continuing
632100: *Laser Hardened Materials*	-	18.643	20.450	17.285	-	17.285	15.934	17.381	17.127	17.496	Continuing	Continuing
633153: *Non-Destructive Inspection Development*	-	7.015	6.766	5.275	-	5.275	5.558	6.601	6.383	6.478	Continuing	Continuing
633946: *Materials Transition*	-	27.582	27.356	9.617	-	9.617	18.483	15.093	15.309	16.602	Continuing	Continuing
634918: *Deployed Air Base Demonstrations*	-	1.094	-	-	-	-	-	-	-	-	Continuing	Continuing

The FY 2015 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: hardened materials technologies for the protection of aircrews and sensors; non-destructive inspection and evaluation technologies; transition data on structural and non-structural materials for aerospace applications; and 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 Science and Technology 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 2013	FY 2014	FY 2015 Base	FY 2015 OCO	FY 2015 Total
Previous President's Budget	47.890	39.572	35.229	-	35.229
Current President's Budget	54.334	54.572	32.177	-	32.177
Total Adjustments	6.444	15.000	-3.052	-	-3.052
• Congressional General Reductions	-0.080	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	13.000	15.000			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-1.049	-			
• Other Adjustments	-5.427	-	-3.052	-	-3.052

Exhibit R-2, RDT&E Budget Item Justification: PB 2015 Air Force	Date: March 2014
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603112F / *Advanced Materials for Weapon Systems*

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2013	FY 2014
Project: 633946: *Materials Transition*		
Congressional Add: *Materials Research and Technology*	11.830	10.000
Congressional Add: *Metals Affordability Research*	-	5.000
Congressional Add Subtotals for Project: 633946	11.830	15.000
Congressional Add Totals for all Projects	11.830	15.000

Change Summary Explanation

Increase in FY13 Congressional Adds for enhanced efforts in materials research and technology.

Decrease in FY13 Other Adjustments was due to Sequestration.

Increase in FY14 Congressional Adds for enhanced efforts in (a) materials research and technology and (b) metals affordability.

Decrease in FY15 is due to higher DoD priorities.

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force			Date: March 2014
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603112F / *Advanced Materials for Weapon Systems*	Project (Number/Name) 632100 / *Laser Hardened Materials*	

COST ($ in Millions)	Prior Years	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO #	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost
632100: *Laser Hardened Materials*	-	18.643	20.450	17.285	-	17.285	15.934	17.381	17.127	17.496	Continuing	Continuing

The FY 2015 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 2013	FY 2014	FY 2015
Title: Aerospace Systems Protection	9.596	10.800	8.161

Description: Develop and demonstrate materials technologies that enhance hardening for sensors, avionics, and components to increase survivability and mission effectiveness of aerospace systems.

FY 2013 Accomplishments:
Demonstrated viable coating and hardened focal planes for future persistent surveillance sensor designs. Demonstrated strategies to mitigate directed energy damage for visual/near-infrared (NIR), short wave infrared (SWIR), and mid wave infrared (MWIR) detectors critical to Intelligence, Surveillance and Reconnaissance (ISR) sensors. Demonstrated damage-limiting semiconductor materials in a test bed configuration representing protection of both visual/NIR and SWIR ISR sensors. Employed 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:
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 visual/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.

FY 2015 Plans:
Continue development of protection materials for visual/NIR ISR Sensors. Demonstrate use of protection technologies for future ISR sensor designs and strategies to mitigate directed energy damage for visual/NIR, SWIR, and MWIR detectors. Develop survivable electro-optic sensors that provide full spectrum protection for missile warning. Continue evaluating the

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force		Date: March 2014
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603112F / *Advanced Materials for Weapon Systems*	**Project (Number/Name)** 632100 / *Laser Hardened Materials*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
performance impact of damage-limiting semiconductor materials designed to harden electro-optic imaging sensors. Develop laser countermeasures for survivability of dynamic electro-optional and infrared (EO/IR) imagers. 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 ***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 2013 Accomplishments:*** Developed and demonstrated personnel protection technologies for daytime operation across the visible/NIR and SWIR spectral bands. Fabricated and demonstrated performance of agile optical coatings and dyes for use in daytime visor configurations. Characterized eye protection technologies using computational materials science tools. Insured 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. ***FY 2015 Plans:*** Develop and demonstrate laser protection materials and technologies for personnel protection. Continue development of helmet mounted sensor hardening materials. Continue development of visor based aircrew protection materials. Characterize eye protection technologies using computational materials science tools. Continue to improve functionality and performance of personnel protection technologies in expected operational conditions.	9.047	9.650	9.124
Accomplishments/Planned Programs Subtotals	18.643	20.450	17.285

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not Applicable.

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force		Date: March 2014
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603112F / *Advanced Materials for Weapon Systems*	**Project (Number/Name)** 632100 / *Laser Hardened Materials*

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 2015 Air Force			Date: March 2014
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603112F / *Advanced Materials for Weapon Systems*	Project (Number/Name) 633153 / *Non-Destructive Inspection Development*	

COST ($ in Millions)	Prior Years	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO #	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost
633153: *Non-Destructive Inspection Development*	-	7.015	6.766	5.275	-	5.275	5.558	6.601	6.383	6.478	Continuing	Continuing

The FY 2015 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 technologies to monitor performance integrity and to detect failure causing conditions in weapon systems components and materials. Nondestructive inspection/evaluation 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 2013	FY 2014	FY 2015
Title: Advanced Engine Inspection Technologies	1.474	1.300	1.298
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 2013 Accomplishments: Initiated development of novel, whole-field nondestructive inspection/evaluation approaches to nondestructively assess material and damage state of critical turbine engine components for the purpose of extending the useful life without increasing risk of in-flight failure of fracture to critical gas turbine engine components.			
FY 2014 Plans: Continue development of nondestructive inspection/evaluation approaches to nondestructively assess material and damage state of critical turbine engine components for the purpose of extending the useful life without increasing risk of in-flight failure of fracture to critical gas turbine engine components.			
FY 2015 Plans: Demonstrate nondestructive inspection/evaluation approaches to nondestructively assess material and damage state of critical turbine engine components for the purpose of extending the useful life without increasing risk of in-flight failure of fracture critical to gas turbine engine components.			
Title: Low-Observable Inspection Technologies	0.541	0.466	0.985
Description: Develop and demonstrate advanced inspection technologies supporting low-observable (LO) systems to enhance affordability and ensure full performance and survivability.			

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force		Date: March 2014
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603112F / *Advanced Materials for Weapon Systems*	**Project (Number/Name)** 633153 / *Non-Destructive Inspection Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
FY 2013 Accomplishments: Developed and demonstrated a handheld nondestructive inspection tool for signature and material integrity assessment of existing and next generation LO material systems. Developed and demonstrated that the handheld nondestructive inspection tool could identify damage and register position relative to an aircraft, enabling more affordable signature assessment. ***FY 2014 Plans:*** Validate handheld inspection method and sensor system for signature and material integrity assessment of existing and next generation LO material systems. Validate that the handheld nondestructive inspection tool can identify damage and register position relative to an aircraft, enabling more affordable signature assessment. ***FY 2015 Plans:*** Initiate development of improved methods to acquire and analyze data to facilitate improved characterization, registration, and tracking of degradation and damage of LO materials that enables/ensures more affordable signature assessment.			
Title: Advanced System Monitoring Technologies ***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 2013 Accomplishments:*** Continued development of improved field and depot-level nondestructive inspection/evaluation technologies and methodologies for assessing the structural integrity of airframes. Initiated development of improved nondestructive inspection/evaluation methods to minimize maintenance burden to access critical, hard to reach locations on aircraft structures. Initiated development of technologies to analyze material susceptibility in microbial contamination fuel. Initiated development of technologies to analyze materials state awareness and prevent corrosion. Initiated the integration of computational materials science tools with life prediction methods to enable risk-based life management. ***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. ***FY 2015 Plans:*** Validate and transition improved field and depot-level nondestructive inspection/evaluation technologies and methodologies for assessing the structural integrity of airframes. Validate and transition improved nondestructive inspection/evaluation methods to minimize maintenance burden to access critical, hard to reach locations on aircraft structures. Initiate enhanced methods for collecting and analyzing digital nondestructive inspection/evaluation data necessary for improved damage detection and	5.000	5.000	2.992

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force		Date: March 2014
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603112F / *Advanced Materials for Weapon Systems*	**Project (Number/Name)** 633153 / *Non-Destructive Inspection Development*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
characterization. Validate the integration of computational materials science tools with life prediction methods to enable risk-based life management. Validate and demonstrate technologies to analyze materials state awareness and prevent corrosion. Initiate development of digitally enhanced nondestructive inspection/evaluation techniques.			
Accomplishments/Planned Programs Subtotals	7.015	6.766	5.275

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.

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force			Date: March 2014
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603112F / *Advanced Materials for Weapon Systems*	Project (Number/Name) 633946 / *Materials Transition*	

COST ($ in Millions)	Prior Years	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO #	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost
633946: *Materials Transition*	-	27.582	27.356	9.617	-	9.617	18.483	15.093	15.309	16.602	Continuing	Continuing

The FY 2015 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 2013	FY 2014	FY 2015
Title: Air Vehicle Materials Technologies	6.990	7.721	8.213
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 2013 Accomplishments:*** Advanced validation of processing methods and lifing tools for graded microstructure turbine engine disk concepts. Validated initial capability of next generation nondestructive inspection/evaluation sensor systems for advanced LO material systems. Initiated development of magnetoresistive sensing technologies. ***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 validation and initiate transition of next generation nondestructive inspection/evaluation sensor systems for advanced LO material systems. Continue to advance development of magnetoresistive sensing technologies. Initiate integration of damage characterization with risk-based life management strategies for turbine engines. Initiate development of materials and processes to increase LO materials affordability. ***FY 2015 Plans:*** Validate and demonstrate processing methods and lifing tools for ceramic matrix composites and graded microstructure turbine engine disk concepts. Demonstrate repeatability of magnetoresistive sensing technologies. Continue integration of damage with risk-based life management strategies for turbine engines. Continue development of materials and processes to increase LO materials affordability.			
Title: High Temperature Material Technologies	2.168	2.635	1.404

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force		Date: March 2014
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603112F / *Advanced Materials for Weapon Systems*	**Project (Number/Name)** 633946 / *Materials Transition*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2013	FY 2014	FY 2015
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 2013 Accomplishments:*** Advanced multimaterial structure development to optimally address operational temperature zones for hot structure and thermal protection systems. Continued development of 2700F ceramic matrix composites for turbine hot section components. ***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. Continue development of 2700F ceramic matrix composites for turbine hot section components. ***FY 2015 Plans:*** Validate repeatability of 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. Demonstrate 2700F ceramic matrix composites for turbine hot section components.			
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. ***FY 2013 Accomplishments:*** Transitioned production processes and materials to enable an adaptive turbine engine prototype. Performed critical evaluations of technology in the operating environment. ***FY 2014 Plans:*** Complete materials and production process assessments for an adaptive turbine engine prototype. ***FY 2015 Plans:*** Work completed in FY14.	6.594	2.000	-
Accomplishments/Planned Programs Subtotals	15.752	12.356	9.617

	FY 2013	FY 2014
Congressional Add: Materials Research and Technology	11.830	10.000

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force		Date: March 2014
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603112F / *Advanced Materials for Weapon Systems*	**Project (Number/Name)** 633946 / *Materials Transition*

	FY 2013	FY 2014
FY 2013 Accomplishments: Conducted Congressionally-directed effort. ***FY 2014 Plans:*** Conduct Congressionally-directed effort.		
Congressional Add: Metals Affordability Research ***FY 2014 Plans:*** Conduct Congressionally-directed effort.	-	5.000
Congressional Adds Subtotals	11.830	15.000

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.

Exhibit R-2A, RDT&E Project Justification: PB 2015 Air Force			Date: March 2014
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603112F / *Advanced Materials for Weapon Systems*	Project (Number/Name) 634918 / *Deployed Air Base Demonstrations*	

COST ($ in Millions)	Prior Years	FY 2013	FY 2014	FY 2015 Base	FY 2015 OCO #	FY 2015 Total	FY 2016	FY 2017	FY 2018	FY 2019	Cost To Complete	Total Cost
634918: *Deployed Air Base Demonstrations*	-	1.094	-	-	-	-	-	-	-	-	Continuing	Continuing

The FY 2015 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 2013	FY 2014	FY 2015
Title: Deployable Airbase Force Protection	1.094	-	-
Description: Demonstrate and transition technologies to provide force protection and fire fighting capability for deployed AEF operations. ***FY 2013 Accomplishments:*** Transitioned current and future work to the Air Force Civil Engineering Center. ***FY 2014 Plans:*** Work completed in FY13.			
Accomplishments/Planned Programs Subtotals	1.094	-	-

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.