Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Air Force											Date: February 2016	
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 2: *Applied Research*					R-1 Program Element (Number/Name) PE 0602102F / *Materials*							
COST ($ in Millions)	**Prior Years**	**FY 2015**	**FY 2016**	**FY 2017 Base**	**FY 2017 OCO**	**FY 2017 Total**	**FY 2018**	**FY 2019**	**FY 2020**	**FY 2021**	**Cost To Complete**	**Total Cost**
Total Program Element	-	114.302	133.734	126.152	0.000	126.152	129.016	129.860	132.539	131.030	Continuing	Continuing
624347: *Materials for Structures, Propulsion, and Subsystems*	-	35.119	55.665	46.444	0.000	46.444	47.094	49.233	50.271	47.597	Continuing	Continuing
624348: *Materials for Electronics, Optics, and Survivability*	-	34.541	34.530	32.866	0.000	32.866	33.146	34.395	35.091	35.666	Continuing	Continuing
624349: *Materials Technology for Sustainment*	-	44.642	43.539	46.842	0.000	46.842	48.776	46.232	47.177	47.767	Continuing	Continuing

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 three projects that develop: structural, propulsion, and sub-systems materials and processes technologies; electronic, optical, and survivability materials and processes technologies; and sustainment materials, processes technologies, and advanced non-destructive inspection methodologies. 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 2, Applied Research because this budget activity includes studies, investigations, and non-system specific technology efforts directed toward general military needs with a view toward developing and evaluating the feasibility and practicality of proposed solutions and determining their parameters.

B. Program Change Summary ($ in Millions)	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total
Previous President's Budget	110.680	125.234	127.175	0.000	127.175
Current President's Budget	114.302	133.734	126.152	0.000	126.152
Total Adjustments	3.622	8.500	-1.023	0.000	-1.023
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	8.500			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	5.385	0.000			
• SBIR/STTR Transfer	-1.763	0.000			
• Other Adjustments	0.000	0.000	-1.023	0.000	-1.023

Exhibit R-2, RDT&E Budget Item Justification: PB 2017 Air Force	Date: February 2016
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602102F / *Materials*

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2015	FY 2016
Project: 624347: *Materials for Structures, Propulsion, and Subsystems*		
Congressional Add: *Air Force Educational and Outreach Program*	-	8.500
Congressional Add Subtotals for Project: 624347	-	8.500
Project: 624348: *Materials for Electronics, Optics, and Survivability*		
Congressional Add: *Nanotechnology Research*	5.000	-
Congressional Add Subtotals for Project: 624348	5.000	-
Congressional Add Totals for all Projects	5.000	8.500

Change Summary Explanation

Increase in FY 2015 reflects reprogramming to support Research and Development Projects, 10 U.S.C. Section 2358.

Decrease in FY 2017 due to higher DoD priorities.

Exhibit R-2A, RDT&E Project Justification: PB 2017 Air Force			Date: February 2016
Appropriation/Budget Activity 3600 / 2	R-1 Program Element (Number/Name) PE 0602102F / *Materials*	Project (Number/Name) 624347 / *Materials for Structures, Propulsion, and Subsystems*	

COST ($ in Millions)	Prior Years	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
624347: *Materials for Structures, Propulsion, and Subsystems*	-	35.119	55.665	46.444	0.000	46.444	47.094	49.233	50.271	47.597	Continuing	Continuing

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. The project 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. The project concurrently develops advanced processing methods to enable adaptive processing of aerospace materials.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Title: Ceramics and Composites	20.720	27.803	27.378
Description: Develop ceramic, ceramic matrix composite, and hybrid materials technologies for performance and supportability improvement in propulsion systems and high temperature aerospace structures.			
FY 2015 Accomplishments: Demonstrated new advanced processing methods, coating technologies, and behavior and life prediction for higher temperature capable organic and ceramic matrix composites. Validated severe environment durability of advanced composite materials for aerospace structures. Continued to advance the development of new ceramic and organic matrix composite materials and processes with higher temperature capability for propulsion systems and aerospace structures. Assessed novel electromagnetic and laser protection materials and processes concepts for suitability for aerospace structures.			
FY 2016 Plans: Continue to demonstrate new advanced processing methods, coating technologies, and behavior and life prediction for higher temperature capable organic and ceramic matrix composites. Demonstrate severe environment durability of advanced composite systems via mechanical testing. Continue to advance the development and validate new ceramic and organic matrix composite materials and processes with higher temperature capability for propulsion systems and aerospace structures. Continue to advance and integrate the computational material science infrastructure for composite materials in an effort to accelerate the			

Exhibit R-2A, RDT&E Project Justification: PB 2017 Air Force		Date: February 2016
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602102F / *Materials*	**Project (Number/Name)** 624347 / *Materials for Structures, Propulsion, and Subsystems*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
development and certification of advanced composite materials. Demonstrate multi-functional materials and processes for applications requiring advanced electromagnetic and laser protection for aerospace structures. ***FY 2017 Plans:*** Validate repeatability of new advanced processing methods, coating technologies, and behavioral life prediction for higher temperature capable organic and ceramic matrix composites. Continue to demonstrate severe environment durability of advanced composite systems via mechanical testing. Continue to advance the development and validate new ceramic and organic matrix composite materials and processes with higher temperature capability for propulsion systems and aerospace structures. Continue to advance and integrate the computational material science infrastructure for composite materials in an effort to accelerate the development and certification of advanced composite materials. Continue to demonstrate multi-functional materials and processes for applications requiring advanced electromagnetic and laser protection for aerospace structures.			
Title: Metals ***Description:*** Develop lightweight and high temperature metallics, life prediction, and metals processing technologies for increased affordability, durability, and reliability. ***FY 2015 Accomplishments:*** Demonstrated repeatability of advanced computation methods to support material development and characterization modeling. Demonstrated quantitative, predictive models for performance of metallic based thermal management systems. Continued to analyze relationships between microstructure, processing, properties, and performance of metallic, hybrid, nanoscale, and gradient metallic materials. Demonstrated analysis techniques for understanding, mitigating, and utilizing residual stress in nickel-base superalloys for turbine engines. Continued development of integrated material/manufacturing and component analysis for life management and development of structural materials innovative research. Continued development of next generation turbine engine disk. ***FY 2016 Plans:*** Validate repeatability of advanced computation methods to support material development and characterization modeling. Continue demonstration of quantitative, predictive models for performance of metallic based thermal management systems. Continue to analyze relationships between microstructure, processing, properties, and performance of metallic, hybrid, nanoscale, and gradient metallic materials. Continue demonstration of analysis techniques for understanding and mitigating residual stress in nickel-base superalloys. Continue development of integrated material/manufacturing and component analysis for life management and development of structural materials innovative research focusing on affordable metals. Continue to advance development of next generation turbine engine disk. ***FY 2017 Plans:***	10.887	14.580	14.357

Exhibit R-2A, RDT&E Project Justification: PB 2017 Air Force		Date: February 2016
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602102F / *Materials*	**Project (Number/Name)** 624347 / *Materials for Structures, Propulsion, and Subsystems*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Implement advanced computation methods to support material development and characterization modeling. Continue demonstration of quantitative, predictive models for performance of metallic based thermal management systems. Continue to analyze relationships between microstructure, processing, properties, and performance of metallic, hybrid, nanoscale, and gradient metallic materials. Validate repeatability of analysis techniques for understanding and mitigating residual stress in nickel-base superalloys. Continue development of integrated material/manufacturing and component analysis for life management and development of structural materials innovative research. Continue to advance development of next generation turbine engine disk and reliable affordable metallic structural components through computational methods.			
Title: Thermal Protection Materials ***Description:*** Develop lightweight and high temperature metallics, life prediction, and metals processing technologies for increased affordability, durability, and reliability. ***FY 2015 Accomplishments:*** Worked towards refining and improving processing methods to fabricate structurally integrated thermal protection systems for expendable hypersonic applications. Developed unique experimental techniques to assess mechanical properties and time-dependent behavior. Validated material properties and performance meets design needs for control surfaces, leading edges and acreage. Developed computational models to assess environmental degradation of materials in a hypersonic environment. ***FY 2016 Plans:*** Continue to refine and improve processing methods to fabricate structurally integrated thermal protection systems for expendable hypersonic applications. Continue development of unique experimental techniques to assess mechanical properties and time-dependent behavior. Assess material properties and performance against requirements for control surfaces, leading edges and acreage. Validate computational models to assess environmental degradation of materials in a hypersonic environment. ***FY 2017 Plans:*** Continue to refine and demonstrate improved processing methods for fabricating structurally integrated thermal protection systems for expendable hypersonic applications. Refine and continue development of unique experimental techniques to assess mechanical properties and time-dependent behavior. Continue to validate and demonstrate material properties and performance meet design needs for control surfaces, leading edges and acreage. Continue to validate computational models to assess environmental degradation of materials in a hypersonic environment.	3.512	4.782	4.709
Accomplishments/Planned Programs Subtotals	35.119	47.165	46.444

	FY 2015	FY 2016
Congressional Add: Air Force Educational and Outreach Program	-	8.500

Exhibit R-2A, RDT&E Project Justification: PB 2017 Air Force		Date: February 2016
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602102F / *Materials*	**Project (Number/Name)** 624347 / *Materials for Structures, Propulsion, and Subsystems*

	FY 2015	FY 2016
FY 2016 Plans: Conduct congressionally directed effort		
Congressional Adds Subtotals	-	8.500

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 2017 Air Force			Date: February 2016
Appropriation/Budget Activity 3600 / 2	R-1 Program Element (Number/Name) PE 0602102F / *Materials*	Project (Number/Name) 624348 / *Materials for Electronics, Optics, and Survivability*	

COST ($ in Millions)	Prior Years	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
624348: *Materials for Electronics, Optics, and Survivability*	-	34.541	34.530	32.866	0.000	32.866	33.146	34.395	35.091	35.666	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project develops materials technologies for Intelligence, Surveillance, and Reconnaissance (ISR), situational awareness, and low observable (LO) systems and subsystems for aircraft and missile applications, including sensor, microwave, and short, mid, and long-wave infrared (SWIR, MWIR, LWIR) detection and countermeasures devices used for targeting, electronic warfare, and active aircraft protection. Materials for protection of aircrews, sensors, and aircraft from laser, 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. The project develops nanostructured and biological materials for aircraft structures, munitions, air vehicle subsystems, and personnel. The project develops novel materials for electromagnetic interactions with matter for electromagnetic pulse, high power microwave, and lightning strike protection.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Title: Infrared Detector Materials	9.749	11.364	10.846
Description: Develop infrared (IR) detector materials and processes technologies for performance, affordability, and operational capability of surveillance, tracking, targeting, and situational awareness systems.			
FY 2015 Accomplishments: Validated and continue to develop materials for use in high resolution IR focal plane arrays for various uses in airborne ISR. Demonstrated materials to support and provide persistent air and space ISR. Demonstrated models of materials optical/IR behavior for LO, ISR, and other applications. Validated nanoscale materials for use in producing detectors. Validated and continue to utilize computational materials science to improve performance prediction models. Demonstrate quantum materials for aerospace applications. Continue to advance the development of short wave IR detector materials and hyperspectral long wave IR materials. Continue to advance the development of Radio Frequency (RF)/IR photonics for air vehicle applications.			
FY 2016 Plans: Continue to develop materials for use in high resolution MWIR applications. Continue to develop materials to support and provide persistent air and space ISR. Demonstrate models of materials optical/IR behavior for LO, ISR, and other applications. Demonstrate nanoscale materials for use in producing detectors. Continue to utilize computational materials science to improve performance prediction models. Demonstrate quantum materials for aerospace applications. Continue development of short			

Exhibit R-2A, RDT&E Project Justification: PB 2017 Air Force		Date: February 2016
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602102F / *Materials*	**Project (Number/Name)** 624348 / *Materials for Electronics, Optics, and Survivability*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
wave IR detector materials and hyperspectral long wave IR materials. Continue development of RF/IR photonics for air vehicle applications. Develop nanostructured materials for components to enable agile RF capability. ***FY 2017 Plans:*** Continue to develop and demonstrate materials for use in high resolution MWIR applications. Continue to develop and demonstrate materials to support and provide persistent air and space ISR. Demonstrate models of materials optical/IR behavior for LO, ISR, and other applications. Demonstrate nanoscale materials for use in producing detectors. Continue to utilize computational materials science to improve performance prediction and reliability models. Continue to demonstrate quantum materials for aerospace applications. Continue to develop and demonstrate short wave IR detector materials and hyperspectral long wave IR materials. Continue development of RF/IR photonics for air vehicle applications. Demonstrate nanostructured materials for components to enable agile RF capability.			
Title: Directed Energy Hardened Materials ***Description:*** Develop and demonstrate technologies to enhance the safety, survivability, and mission effectiveness of aircrews, sensors, viewing systems, and related assets. ***FY 2015 Accomplishments:*** Continued to demonstrate repeatability of materials and technologies to protect against directed energy threats. Projects included optimized nonlinear optical limiter materials for damage protection, robust in-band optical limiter materials, enhanced photorefractive hybrid materials concepts, tunable/switchable materials and concepts, and passive optical coating technology for advanced applications in airborne, space, and personnel systems. Validated materials for high energy laser interactions. Utilized computational materials science to enhance multi-scale modeling. Demonstrated materials and processes for hardening and optical materials applications. Continued development of photonic enabled RF phased arrays and tunable inductors/large area films. ***FY 2016 Plans:*** Continue to demonstrate repeatability of materials and technologies to protect against directed energy threats. Projects include optimized nonlinear optical limiter materials for damage protection, robust in-band optical limiter materials, enhanced photorefractive hybrid materials concepts, tunable/switchable materials and concepts, and passive optical coating technology for advanced applications in airborne, space, and personnel systems. Continue to validate materials for high energy laser interactions. Develop approaches for integration of multi-modal hardening into structures and devices. Continue to utilize computational materials science to employ multi-scale modeling for design of robust, reliable integrated protection. Continue to demonstrate materials and processes for hardening materials applications. ***FY 2017 Plans:***	11.226	13.017	12.160

Exhibit R-2A, RDT&E Project Justification: PB 2017 Air Force		Date: February 2016
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602102F / *Materials*	**Project (Number/Name)** 624348 / *Materials for Electronics, Optics, and Survivability*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Continue to demonstrate repeatability of materials and technologies to protect against directed energy threats. Projects include optimized nonlinear optical limiter materials for damage protection, robust in-band optical limiter materials, enhanced photorefractive hybrid materials concepts, tunable/switchable materials and concepts, and passive optical coating technology for advanced applications in airborne, space, and personnel systems. Assess response of new materials for high energy laser interactions. Develop approaches for integration of multi-modal hardening into structures and devices. Validate repeatability and continue to utilize computational materials science to enhance multi-scale modeling for design of robust, reliable integrated protection. Continue to demonstrate materials and processes for hardening materials applications.			
Title: Laser Source Materials ***Description:*** Develop materials to enable higher performance high power laser sources (quasi-Continuous Wave to Continuous Wave) with emphasis on laser output in the mid-infrared spectral region (2-5 microns). ***FY 2015 Accomplishments:*** Produced crystal fiber waveguides using adhesive free bonding methods for high power lasing as a pump source for nonlinear elements. Developed quasi-phase-matched nonlinear structures and wavelength conversion to the MWIR region. ***FY 2016 Plans:*** Refine and demonstrate material and growth processes for fabricating phase-matched crystals with record low optical absorption and high laser damage threshold. Improve design and fabrication of crystal fiber waveguides for higher power pump lasing, using improved waveguide confinement designs for single mode output. Investigate power limitations of lasing of crystal fiber waveguide structures and performance limitations. Continue investigation of quasi-phase-matched materials and develop processes to reduce absorption, model and produce optical confinement designs, and demonstrate increased power per pulse in the mid-infrared spectral region. ***FY 2017 Plans:*** Continue development of both phase-matched crystals and crystal fiber waveguides sufficiently to demonstrate subsystem capability. And generate band-IV MWIR spectral output with average power exceeding one kilowatt and energy per pulse exceeding one Joule.	1.181	1.425	1.315
Title: Nanostructured and Biological Materials ***Description:*** Develop enabling and foundational biotechnologies for guidance and control, rapid tagging, tracking, and identification of targets, and bio-integrated electronics and sensing for Air Force applications. ***FY 2015 Accomplishments:*** Continued to develop nano and biological engineering methods for complex hybrid materials addressing unique requirements of Air Force sensors and electronic components. Continued to advance the use of computational materials science to model	7.385	8.724	8.545

Exhibit R-2A, RDT&E Project Justification: PB 2017 Air Force		Date: February 2016
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602102F / *Materials*	**Project (Number/Name)** 624348 / *Materials for Electronics, Optics, and Survivability*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
material development and to enable rapid in-situ experimental data acquisition. Validated reliable materials and processes to optimize components for compact, lightweight, flexible, multi-functional devices for use in unique Air Force autonomy and human performance monitoring applications. Developed methods to assess microbial interactions with material to establish risk for property degradation like microbially influenced corrosion. Demonstrated materials and processes for developing robust hybrid electronic packages on varied flexible and stretchable substrates, and the development of structurally resilient architectures and nanostructures with embedded energy and/or communications for use in sustainment, munitions and remotely piloted aircraft (RPAs). Developed methods to assess reliability of nano and bio materials and processes for Air Force applications. Support Flexible Hybrid Electronics Institute for Manufacturing Innovation and the NanoBio Manufacturing Consortiums.			
FY 2016 Plans: Continue to validate nano and biological engineering methods for complex hybrid materials addressing unique requirements of Air Force sensors and electronic components. Continue to advance the use of computational materials science to model material development and to enable rapid in-situ experimental data acquisition. Validate reliable materials and processes to optimize components for compact, flexible, multi-functional devices for use in unique Air Force autonomy and human performance monitoring applications. Develop methods to assess microbial interactions with material to establish risk for property degradation. Demonstrate materials and processes for developing robust hybrid electronic packages on varied flexible and stretchable substrates with embedded energy and/or comm for use in sustainment, munitions and RPAs. Focused material and process develop for integration of flexible components into multi-modal platform. Initiate investigation of materials and processes for strain resilient electronics. Develop methods to assess reliability of nano and bio materials and processes for Air Force applications and demonstrate computational techniques and models to characterize failure modes. Support Flexible Hybrid Electronics Institute for Manufacturing Innovation and the NanoBio Manufacturing Consortiums.			
FY 2017 Plans: Continue to validate nano and biological engineering methods for complex hybrid materials addressing unique requirements of Air Force sensors and electronic components. Demonstrate the use of computational materials science and rapid in-situ experimental data acquisition to lead nano-bio material development. Continue to validate reliable materials and processes to optimize components for compact, flexible, multi-functional devices for use in unique Air Force autonomy and human performance monitoring applications. Develop methods to assess microbial interactions with material to establish risk for property degradation. Continue to demonstrate materials and processes for developing robust hybrid electronic packages on varied flexible and stretchable substrates with embedded energy and/or comm for use in sustainment, munitions and RPAs. Demonstrate material and processes for integration of flexible components into multi-modal platform. Continue to demonstrate materials and processes for strain resilient electronics. Continue to develop methods to assess reliability of nano and bio materials and processes for Air			

Exhibit R-2A, RDT&E Project Justification: PB 2017 Air Force		Date: February 2016
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602102F / *Materials*	**Project (Number/Name)** 624348 / *Materials for Electronics, Optics, and Survivability*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Force applications and demonstrate computational techniques and models to characterize failure modes. Support Flexible Hybrid Electronics Institute for Manufacturing Innovation and the NanoBio Manufacturing Consortiums.			
Accomplishments/Planned Programs Subtotals	29.541	34.530	32.866

	FY 2015	FY 2016
Congressional Add: Nanotechnology Research ***FY 2015 Accomplishments:*** Conducted Congressionally-directed effort.	5.000	-
Congressional Adds Subtotals	5.000	-

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 2017 Air Force			Date: February 2016
Appropriation/Budget Activity 3600 / 2	R-1 Program Element (Number/Name) PE 0602102F / *Materials*	Project (Number/Name) 624349 / *Materials Technology for Sustainment*	

COST ($ in Millions)	Prior Years	FY 2015	FY 2016	FY 2017 Base	FY 2017 OCO	FY 2017 Total	FY 2018	FY 2019	FY 2020	FY 2021	Cost To Complete	Total Cost
624349: *Materials Technology for Sustainment*	-	44.642	43.539	46.842	0.000	46.842	48.776	46.232	47.177	47.767	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project develops materials and 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 Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
Title: Sensing Technologies	16.964	16.503	16.255
Description: Develop sensing and life prediction technologies to identify damage and characterize the health of aging structures, propulsion systems, and low-observable (LO) materials and structures.			
FY 2015 Accomplishments: Continued to improve and validate nondestructive evaluation modeling capabilities and use these competences to drive improvements in capability to detect and characterize damage in realistic aerospace structures and engine components. Began to develop approaches to address the variability inherent in aerospace systems and materials and begin to quantify the impact of that variability on nondestructive inspection capability and reliability. Validated advanced sensing technologies to detect and characterize changes in material properties, damage evolution, and other factors that detrimentally affect aerospace systems. Initiated development and validation of damage state awareness approaches and methodologies for use on aerospace structures and engine components. Assessed repeatability and functionality of innovative LO inspection methods to enable rapid assessment of LO material performance. Initiated development of advanced methods to monitor and evaluate LO material state awareness. Demonstrated enhanced metals performance in aerospace systems. Initiated development of risk-based life management approaches for turbine engine structural materials.			
FY 2016 Plans: Demonstrate nondestructive evaluation modeling capabilities and use these competences to drive improvements in capability to detect and characterize damage in realistic aerospace structures and engine components. Continue to develop approaches to address the variability inherent in aerospace systems and materials and begin to quantify the impact of that variability on			

Exhibit R-2A, RDT&E Project Justification: PB 2017 Air Force		Date: February 2016
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602102F / *Materials*	**Project (Number/Name)** 624349 / *Materials Technology for Sustainment*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
nondestructive inspection capability and reliability. Demonstrate advanced sensing technologies to detect and characterize changes in material properties, damage evolution, and other factors that detrimentally affect aerospace systems. Continue development and validation of damage state awareness approaches and methodologies for use on aerospace structures and engine components. Continue development of advanced methods to monitor and evaluate LO material state awareness. Continue to demonstrate enhanced metals performance in aerospace systems. Continue to develop risk-based life management approaches for turbine engine structural materials. ***FY 2017 Plans:*** Continue to demonstrate nondestructive evaluation modeling capabilities and use these competences to drive improvements in capability to detect and characterize damage in realistic aerospace structures and engine components. Continue to develop approaches to address the variability inherent in aerospace systems and materials and begin to quantify the impact of that variability on nondestructive inspection capability and reliability. Continue to demonstrate advanced sensing technologies to detect and characterize changes in material properties, damage evolution, and other factors that detrimentally affect aerospace systems. Continue development and validation of damage state awareness approaches and methodologies for use on aerospace structures and engine components. Continue development of advanced methods to monitor and evaluate low observable material state awareness. Continue to demonstrate enhanced metals performance in aerospace systems. Continue to develop risk-based life management approaches for turbine engine structural materials.			
Title: Production and Repair Technologies	12.053	11.862	12.261
Description: Develop support capabilities, information, and processes to resolve problems with materials in the production and repair of systems components and structures. ***FY 2015 Accomplishments:*** Continued to validate and demonstrate advanced materials and processes technology to repair and extend the life of Air Force legacy systems. Developed improved lifecycle prediction test methods and techniques to understand effects of service environments, corrosion, residual stresses, and material processes on structural and functional materials. Assessed advanced materials, processes and designs for improved repair and maintainability and life cycle cost of outer-moldline coatings, access panel treatments, and multifunctional systems. Initiated LO affordability technologies and processes to reduce maintenance costs of LO materials. ***FY 2016 Plans:*** Demonstrate nondestructive evaluation modeling capabilities and use these competences to drive improvements in capability to detect and characterize damage in realistic aerospace structures and engine components. Continue to develop approaches to address the variability inherent in aerospace systems and materials and begin to quantify the impact of that variability on nondestructive inspection capability and reliability. Demonstrate advanced sensing technologies to detect and characterize			

Exhibit R-2A, RDT&E Project Justification: PB 2017 Air Force		Date: February 2016
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602102F / *Materials*	**Project (Number/Name)** 624349 / *Materials Technology for Sustainment*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
changes in material properties, damage evolution, and other factors that detrimentally affect aerospace systems. Continue development and validation of damage state awareness approaches and methodologies for use on aerospace structures and engine components. Continue development of advanced methods to monitor and evaluate LO material state awareness. Continue to demonstrate enhanced metals performance in aerospace systems. Continue to develop risk-based life management approaches for turbine engine structural materials. ***FY 2017 Plans:*** Continue to demonstrate nondestructive evaluation modeling capabilities and use these competences to drive improvements in capability to detect and characterize damage in realistic aerospace structures and engine components. Continue to develop approaches to address the variability inherent in aerospace systems and materials and begin to quantify the impact of that variability on nondestructive inspection capability and reliability. Continue to demonstrate advanced sensing technologies to detect and characterize changes in material properties, damage evolution, and other factors that detrimentally affect aerospace systems. Continue development and validation of damage state awareness approaches and methodologies for use on aerospace structures and engine components. Continue development of advanced methods to monitor and evaluate LO material state awareness. Continue to demonstrate enhanced metals performance in aerospace systems. Continue to develop risk-based life management approaches for turbine engine structural materials.			
Title: Failure Analysis Technologies ***Description:*** Develop support capabilities, information, and processes to resolve materials problems and provide electronic and structural failure analysis of components. ***FY 2015 Accomplishments:*** Performed quick response failure analyses and materials investigations. Continued to investigate improved analysis techniques to determine root cause materials failure/degradation. Continued to provide advanced materials solutions to ensure critical warfighter system availability and safety of flight. Continued development of functional materials and Micro Electromechanical Systems (MEMS) failure analysis capabilities. Continued to validate advanced electrostatic discharge protection technologies and procedures for emerging avionics subsystems. Continued to transition advanced test methods for analyzing electrical and structural failures of emerging materials. Initiated development on new, more durable materials and protection for high power wiring technologies for Air Force weapon systems. Continued research to provide advanced materials to improve systems sustainment in field and Air Force Program Offices. ***FY 2016 Plans:*** Continue to perform quick response failure analyses and materials investigations. Continue to investigate improved analysis techniques to determine root cause materials failure/degradation. Continue to provide advanced materials solutions to ensure critical warfighter system availability and safety of flight. Continue development of functional materials and MEMS failure analysis	15.625	15.174	18.326

Exhibit R-2A, RDT&E Project Justification: PB 2017 Air Force		Date: February 2016
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602102F / *Materials*	**Project (Number/Name)** 624349 / *Materials Technology for Sustainment*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2015	FY 2016	FY 2017
capabilities. Continue to validate advanced electrostatic discharge protection technologies and procedures for emerging avionics subsystems. Continue to transition advanced test methods for analyzing electrical and structural failures of emerging materials. Continue development on new, more durable materials and protection for high power wiring technologies for Air Force weapon systems. Continue research to provide advanced materials to improve systems sustainment in field and Air Force Program Offices. ***FY 2017 Plans:*** Continue to perform quick response failure analyses and materials investigations. Continue to develop and investigate improved analysis techniques to determine root cause materials failure/degradation. Continue to develop and provide advanced materials solutions to ensure critical warfighter system availability and safety of flight. Continue development of functional materials and MEMS failure analysis capabilities. Continue to analyze and validate advanced electrostatic discharge protection technologies and procedures for emerging avionics subsystems. Continue to transition advanced test methods for analyzing electrical and structural failures of emerging materials. Continue development and demonstrate new, more durable materials and protection for high power wiring technologies for Air Force weapon systems. Continue research and development to provide advanced materials to improve systems sustainment in field and Air Force Program Offices.			
Accomplishments/Planned Programs Subtotals	44.642	43.539	46.842

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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