Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Air Force											Date: February 2018	
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 2017**	**FY 2018**	**FY 2019 Base**	**FY 2019 OCO**	**FY 2019 Total**	**FY 2020**	**FY 2021**	**FY 2022**	**FY 2023**	**Cost To Complete**	**Total Cost**
Total Program Element	-	158.243	124.264	125.373	0.000	125.373	136.526	135.741	140.244	133.091	Continuing	Continuing
624347: *Materials for Structures, Propulsion, and Subsystems*	-	57.300	45.059	47.375	0.000	47.375	51.539	49.212	50.877	48.283	Continuing	Continuing
624348: *Materials for Electronics, Optics, and Survivability*	-	50.353	31.523	32.475	0.000	32.475	36.066	36.839	38.358	36.401	Continuing	Continuing
624349: *Materials Technology for Sustainment*	-	50.590	47.682	45.523	0.000	45.523	48.921	49.690	51.009	48.407	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 Science and Technology Executive Committee process to harmonize efforts and eliminate duplication.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver science & technology capabilities. The use of program funds in this PE would be in addition to the civilian pay expenses budgeted in program elements 0601102F, 0602201F, 0602202F, 0602203F, 0602204F, 0602601F, 0602602F, 0602605F, 0602788F, 1206601F, and 0602298F."

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.

Exhibit R-2, RDT&E Budget Item Justification: PB 2019 Air Force	Date: February 2018
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602102F / *Materials*

B. Program Change Summary ($ in Millions)	FY 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total
Previous President's Budget	126.152	124.264	124.561	0.000	124.561
Current President's Budget	158.243	124.264	125.373	0.000	125.373
Total Adjustments	32.091	0.000	0.812	0.000	0.812
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	33.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	1.631	0.000			
• SBIR/STTR Transfer	-2.540	0.000			
• Other Adjustments	0.000	0.000	0.812	0.000	0.812

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2017	FY 2018
Project: 624347: *Materials for Structures, Propulsion, and Subsystems*		
Congressional Add: *Program increase - Structures, propulsion, subsystems*	4.916	-
Congressional Add: *Program increase - Certification of advanced materials*	5.899	-
Congressional Add Subtotals for Project: 624347	10.815	-
Project: 624348: *Materials for Electronics, Optics, and Survivability*		
Congressional Add: *Program increase - Electronics, optics, and survivability*	7.865	-
Congressional Add: *Program Increase - Air Force Education and Outreach program*	9.832	-
Congressional Add Subtotals for Project: 624348	17.697	-
Project: 624349: *Materials Technology for Sustainment*		
Congressional Add: *Program increase - Coatings Technology*	3.933	-
Congressional Add Subtotals for Project: 624349	3.933	-
Congressional Add Totals for all Projects	32.445	-

Change Summary Explanation

Increase in FY 2017 reflects reprogramming to support Research and Development projects, 10 U.S.C. Section 2358.

Exhibit R-2A, RDT&E Project Justification: PB 2019 Air Force			Date: February 2018
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 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
624347: *Materials for Structures, Propulsion, and Subsystems*	-	57.300	45.059	47.375	0.000	47.375	51.539	49.212	50.877	48.283	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 2017	FY 2018	FY 2019
Title: Ceramics and Composites	27.443	26.585	27.771
Description: Develop ceramic, ceramic matrix composite, and hybrid materials technologies for performance and supportability improvement in propulsion systems and high temperature aerospace structures. ***FY 2018 Plans:*** Continue the validation of repeatability of new advanced processing methods, coating technologies, and behavioral life prediction for higher temperature capable organic and ceramic matrix composites. Demonstrate severe environment durability of advanced composite systems via mechanical testing. Explore new ceramic and polymer matrix composite materials and processes with higher temperature capability for next generation 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. Verify and validate damage progression models on increasingly complex polymer matrix composite structural applications. Develop composite damage progression models for application in an engineering environment. ***FY 2019 Plans:*** Demonstrate and mature new advanced processing methods, coating technologies, and behavioral life prediction for higher temperature capable organic and ceramic matrix composites. Continue to analyze severe environment durability of advanced composite systems via mechanical testing. Continue development of new ceramic and polymer matrix composite materials and			

Exhibit R-2A, RDT&E Project Justification: PB 2019 Air Force		Date: February 2018
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 2017	FY 2018	FY 2019
processes with higher temperature capability for next generation 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 verify and validate damage progression models on increasingly complex polymer matrix composite structural applications. Continue development of composite damage progression models for application in an engineering environment. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** FY 2019 increased compared to FY 2018 by $1.186 million. Justification for this increase is increased emphasis in ceramic and composite materials.			
Title: Metals ***Description:*** Develop lightweight and high temperature metallics, life prediction, and metals processing technologies for increased affordability, durability, and reliability. ***FY 2018 Plans:*** Implement of advanced computation methods to support material development and characterization modeling. Demonstrate quantitative, predictive models for performance of metallic based thermal management systems. Analyze relationships between microstructure, processing, properties, and performance of metallic, hybrid, nanoscale, and gradient metallic materials. Validate and continue development of affordable integrated material/manufacturing and component analysis for life management and development of affordable structural materials innovative research. Continue to advance development of next generation turbine engine disk and reliable affordable metallic structural components through computational methods. Demonstrate the value of integrated analytical tools in the optimization of design and certification of additively manufactured metallic components. Initiate the development of integrated spatial registration capability addressing accuracy, precision, and durability for all intended state awareness applications. ***FY 2019 Plans:*** Continue demonstration and implementation of advanced computation methods to support material development and characterization modeling. Continue to validate quantitative, predictive models for performance of metallic based thermal management systems through coupon specimen testing. Continue to analyze relationships between microstructure, processing, properties, and performance of metallic, hybrid, nanoscale, and gradient metallic materials. Validate and continue development of affordable integrated material/manufacturing and component analysis for life management and development of affordable structural materials innovative research. Continue to advance development of next generation turbine engine disk and reliable affordable metallic structural components through computational methods. Validate the value of integrated analytical tools in the	14.398	13.968	14.822

Exhibit R-2A, RDT&E Project Justification: PB 2019 Air Force		Date: February 2018
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 2017	FY 2018	FY 2019
optimization of design and certification of additively manufactured metallic components. Continue development and refine low cost processing methods for low cost, attritable propulsion systems. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** FY 2019 increased compared to FY 2018 by $0.854 million. Justification for this increase is described in the plans above.			
Title: Thermal Protection Materials ***Description:*** Develop and evaluate lightweight, active, adaptive, multifunctional, high temperature, and durable material systems for extreme environments and hypersonic applications. ***FY 2018 Plans:*** Validate and refine processing methods for fabricating materials required for expendable hypersonic applications. Continue to refine and develop unique experimental techniques to assess mechanical properties and time-dependent behavior. Validate and demonstrate material properties and performance to meet design needs for control surfaces, leading edges and acreage. Validate computational models to assess environmental degradation of materials in a hypersonic environment. ***FY 2019 Plans:*** Mature processing methods for fabricating materials required for expendable hypersonic applications. Continue to validate, and develop and refine unique experimental techniques to assess mechanical properties and time-dependent behavior. Continue to validate and demonstrate material properties and performance to meet design needs for control surfaces, leading edges and acreage. Continue to develop computational models to assess environmental degradation of materials in a hypersonic environment. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** FY 2019 increased compared to FY 2018 by $0.276 million. Justification for this increase is described in the plans above.	4.644	4.506	4.782
Accomplishments/Planned Programs Subtotals	46.485	45.059	47.375

	FY 2017	FY 2018
Congressional Add: Program increase - Structures, propulsion, subsystems ***FY 2017 Accomplishments:*** Conducted congressionally directed effort.	4.916	-
Congressional Add: Program increase - Certification of advanced materials ***FY 2017 Accomplishments:*** Conducted congressionally directed effort.	5.899	-
Congressional Adds Subtotals	10.815	-

Exhibit R-2A, RDT&E Project Justification: PB 2019 Air Force		Date: February 2018
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602102F / *Materials*	**Project (Number/Name)** 624347 / *Materials for Structures, Propulsion, and Subsystems*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A.

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 2019 Air Force			Date: February 2018
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 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
624348: *Materials for Electronics, Optics, and Survivability*	-	50.353	31.523	32.475	0.000	32.475	36.066	36.839	38.358	36.401	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 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 2017	FY 2018	FY 2019
Title: Infrared Detector and Electromagnetic Device Materials	10.846	10.403	10.792
Description: Develop infrared (IR) detector and Electro-magnetic device materials and processes technologies for performance, affordability, and operational capability of surveillance, tracking, targeting, and situational awareness systems. ***FY 2018 Plans:*** Develop and demonstrate materials and processes for control and detection of electromagnetic radiation for ISR technologies. Develop and demonstrate materials for use in high resolution imaging by electromagnetic radiation. Demonstrate nanoscale materials, meta materials, and models for use in producing detectors. Utilize computational materials science to improve performance prediction and reliability models. Demonstrate quantum materials for aerospace applications. Develop and demonstrate Short wave infrared (SWIR) detector materials and hyper-spectral Long wave infrared (LWIR) materials. Validate materials and processes for integration of radio frequency and optical signals as well as concepts for novel optical devices and components. Validate and continue development of photonics for air vehicle applications. Demonstrate nanostructured materials for components to enable agile radio frequency capability. ***FY 2019 Plans:*** Continue to develop and demonstrate materials and processes for control and detection of electromagnetic radiation for ISR technologies. Continue to develop and demonstrate materials for use in high resolution imaging by electromagnetic radiation.			

Exhibit R-2A, RDT&E Project Justification: PB 2019 Air Force		Date: February 2018
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 2017	FY 2018	FY 2019
Continue to demonstrate nanoscale materials, meta materials, and models for use in producing detectors. Continue to utilize computational materials science to improve performance prediction and reliability models. Continue to analyze quantum materials for aerospace applications. Continue to develop and demonstrate Short wave infrared (SWIR) detector materials and hyper-spectral Long wave infrared (LWIR) materials. Continue to validate materials and processes for integration of radio frequency and optical signals as well as concepts for novel optical devices and components. Validate and continue development of photonics for air vehicle applications. Continue to demonstrate nanostructured materials for components to enable agile radio frequency capability. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** FY 2019 increase compared to FY 2018 by $0.389 million. Justification for the increase is described in the plans above.			
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 2018 Plans:*** Validate and demonstrate a plethora of materials and technologies to protect against directed energy threats. Demonstrate advanced optical limiter materials for damage protection, enhanced hybrid materials 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. ***FY 2019 Plans:*** Analyze and validate a plethora of materials and technologies to protect against directed energy threats. Develop, validate, and demonstrate advanced optical limiter materials for damage protection, enhanced hybrid materials for advanced applications in airborne, space, and personnel systems. Continue to assess response of new materials for high-energy laser interactions. Continue to develop approaches for integration of multi-modal hardening into structures and devices. Continue to validate repeatability and continue to utilize computational materials science to enhance multi-scale modeling for design of robust, reliable integrated protection. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** FY 2019 increased compared to FY 2018 by $0.220 million. Justification for the increase is described in the plans above.	12.279	11.979	12.199
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).	1.315	1.261	1.308

Exhibit R-2A, RDT&E Project Justification: PB 2019 Air Force		Date: February 2018
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 2017	FY 2018	FY 2019
FY 2018 Plans: Validate materials and process technologies to control and generate directed electromagnetic energy for survivability and other applications. Demonstrate and model materials processes for controlling laser beam direction and focus with optical components. Demonstrate materials for frequency conversion, optical coatings, mirrors and high power microwave sources for directed energy sources. ***FY 2019 Plans:*** Validate materials and process technologies to control and generate directed electromagnetic energy for survivability and other applications. Continue to demonstrate and model materials processes for controlling laser beam direction and focus with optical components. Continue to develop materials for frequency conversion, high power optical isolators, Mid Wave Infrared (MWIR) Laser Sources and high power microwave sources for directed energy sources. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** FY 2019 increased compared to FY 2018 by $0.047 million. Justification for the increase is described in the plans above.			
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 2018 Plans:*** Validate engineering, scientific and processing methods for nano and biological materials to address unique requirements for Air Force man-machine integration, and electronic components. Explore biotechnology to assess the impact of microbes and fungi on Air Force systems. Study reliable materials and processes to optimize components for compact, flexible, stretchable multi-functional devices. Validate materials and process for functional additive manufacturing of electronic components. Demonstrate methods to assess reliability of nano and bio materials and processes. Continue to support Flexible Hybrid Electronics Institute for Manufacturing Innovation and the NanoBio Manufacturing Consortium. ***FY 2019 Plans:*** Continue to validate engineering, scientific and processing methods for nano and biological materials to address unique requirements for Air Force man-machine integration, and electronic components. Continue to explore biotechnology to assess the impact of microbes and fungi on Air Force systems. Continue to study reliable materials and processes to optimize components for compact, flexible, stretchable multi-functional devices. Continue to validate materials and process for functional additive manufacturing of electronic components. Continue to demonstrate methods to assess reliability of nano and bio materials and	8.216	7.880	8.176

Exhibit R-2A, RDT&E Project Justification: PB 2019 Air Force		Date: February 2018
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 2017	FY 2018	FY 2019
processes. Continue to support Flexible Hybrid Electronics Institute for Manufacturing Innovation and the NanoBio Manufacturing Consortium. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** FY 2019 increased compared to FY 2018 by $0.296 million. Justification for the increase is described in the plans above.			
Accomplishments/Planned Programs Subtotals	32.656	31.523	32.475

	FY 2017	FY 2018
Congressional Add: Program increase - Electronics, optics, and survivability ***FY 2017 Accomplishments:*** Conducted congressionally directed effort.	7.865	-
Congressional Add: Program Increase - Air Force Education and Outreach program ***FY 2017 Accomplishments:*** Conducted congressionally directed effort.	9.832	-
Congressional Adds Subtotals	17.697	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A.

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 2019 Air Force			Date: February 2018
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 2017	FY 2018	FY 2019 Base	FY 2019 OCO	FY 2019 Total	FY 2020	FY 2021	FY 2022	FY 2023	Cost To Complete	Total Cost
624349: *Materials Technology for Sustainment*	-	50.590	47.682	45.523	0.000	45.523	48.921	49.690	51.009	48.407	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 2017	FY 2018	FY 2019
Title: Material State Awareness	16.395	16.689	15.309
Description: Develop Materials State Awareness technologies to identify and characterize materials and/or damage regardless of scale for managing the health of aging structures, propulsion systems, and low-observable materials/structures, plus enabling advanced materials qualification. Effort changed from "Sensing Technologies" ***FY 2018 Plans:*** Validate and continue to demonstrate non-destructive evaluation modeling capabilities and use these competencies to drive improvements in capability to detect and characterize damage in realistic aerospace structures and engine components. Develop approaches to address the variability inherent in aerospace systems and materials and begin to quantify the impact of that variability on non-destructive 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. Validate and continue development of advanced methods to monitor and evaluate material state awareness. ***FY 2019 Plans:*** Continue to validate and demonstrate non-destructive evaluation modeling capabilities and use these competencies to drive improvements in capability to detect and characterize damage in realistic aerospace structures and engine components. Continue			

Exhibit R-2A, RDT&E Project Justification: PB 2019 Air Force		Date: February 2018
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 2017	FY 2018	FY 2019
to analyze approaches to address the variability inherent in aerospace systems and materials and begin to quantify the impact of that variability on non-destructive inspection capability and reliability. Validate 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. Validate and continue development of advanced methods to monitor and evaluate material state awareness. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** FY 2019 decreased compared to FY 2018 by $1.380 million. Justification for the decrease is decreased emphasis in material state awareness.			
Title: Production and Repair Technologies	12.179	12.397	11.685
Description: Develop support capabilities, information, and processes to resolve problems with materials in the production and repair of systems components and structures. ***FY 2018 Plans:*** Substantiate repeatability and demonstrate advanced materials and processes technology to repair and extend the life of Air Force legacy systems. Further refine through demonstration the understanding of failure limits for emerging Air Force systems. Advance the analysis and development of improved lifecycle prediction test methods and techniques to understand effects of service environments, corrosion, residual stresses, and material processes on structural and functional materials. Improve the continued assessment of advanced materials, processes and designs for improved repair and maintainability and life cycle cost of outer-moldline coatings, access panel treatments, and multifunctional systems. Further advance low observable affordability technologies and processes to reduce maintenance costs of these materials. ***FY 2019 Plans:*** Continue to substantiate repeatability and demonstrate advanced materials and processes technology to repair and extend the life of Air Force systems. Continue to further refine through demonstration the understanding of material durability and repair limits for emerging Air Force systems. Continue to advance the analysis and development of improved lifecycle prediction test methods and techniques to understand effects of service environments, corrosion, residual stresses, and material processes on structural and functional materials. Improve the service life of advanced materials, processes and designs for improved repair and maintainability and life cycle cost of outer-moldline coatings, access panel treatments, and multifunctional systems. Continue to further advance specialty material affordability technologies and processes to reduce maintenance costs of these materials. ***FY 2018 to FY 2019 Increase/Decrease Statement:***			

Exhibit R-2A, RDT&E Project Justification: PB 2019 Air Force		Date: February 2018
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 2017	FY 2018	FY 2019
FY 2019 decreased compared to FY 2018 by $0.712 million. Justification for the decrease is described in the plans above.			
Title: Failure Analysis Technologies	18.083	18.596	18.529
Description: Develop support capabilities, information, and processes to resolve materials problems and provide electronic and structural failure analysis of components. ***FY 2018 Plans:*** Perform and increase efficiency of quick response failure analyses and materials investigations. Continue to develop and investigate improved analysis techniques to determine root cause materials failure/degradation. Develop and provide advanced materials solutions to ensure warfighter system availability and safety of flight. Develop functional materials failure analysis capabilities. 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. Research and develop to provide advanced materials to improve systems sustainment. ***FY 2019 Plans:*** Continue to perform and increase efficiency of quick response failure analyses and materials investigations. Continue to develop and investigate improved analysis techniques to determine and prevent root cause materials failure/degradation. Continue to develop and provide advanced materials and processing solutions to ensure warfighter system availability and safety of flight. Refine development of functional materials failure analysis capabilities. Continue to analyze and validate advanced electrostatic discharge protection technologies and procedures for emerging avionics subsystems. Continue to transition advanced test and characterization 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, development and characterization of advanced materials. ***FY 2018 to FY 2019 Increase/Decrease Statement:*** FY 2019 decreased compared to FY 2018 by $0.067 million. Justification for the decrease is described in the plans above.			
Accomplishments/Planned Programs Subtotals	46.657	47.682	45.523

	FY 2017	FY 2018
Congressional Add: Program increase - Coatings Technology ***FY 2017 Accomplishments:*** Conducted congressionally directed effort.	3.933	-
Congressional Adds Subtotals	3.933	-

Exhibit R-2A, RDT&E Project Justification: PB 2019 Air Force		Date: February 2018
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602102F / *Materials*	**Project (Number/Name)** 624349 / *Materials Technology for Sustainment*

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.