Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force											Date: March 2024	
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 2023**	**FY 2024**	**FY 2025 Base**	**FY 2025 OCO**	**FY 2025 Total**	**FY 2026**	**FY 2027**	**FY 2028**	**FY 2029**	**Cost To Complete**	**Total Cost**
Total Program Element	-	266.944	142.325	142.336	0.000	142.336	140.195	143.747	155.328	158.451	Continuing	Continuing
624347: *Materials for Structures, Propulsion, and Subsystems*	-	167.690	54.318	54.816	0.000	54.816	56.169	57.478	62.529	63.780	Continuing	Continuing
624348: *Materials for Electronics, Optics, and Survivability*	-	53.307	39.593	39.561	0.000	39.561	40.423	41.306	43.989	44.884	Continuing	Continuing
624349: *Materials Technology for Sustainment*	-	45.947	48.414	47.959	0.000	47.959	43.603	44.963	48.810	49.787	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 Department of the 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.

Funds in this PE may be used to investigate specified technology advancements in air, space and/or cyber domains.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver science and technology capabilities. The use of program funds in this PE would be in addition to the civilian pay expenses budgeted in program elements 0601102F, 0602020F, 0602201F, 0602202F, 0602203F, 0602204F, 0602602F, 0602605F, 0602788F, 1206601SF, and 0602298F.

This program element may include necessary expenses to support the operation and maintenance of facilities to manage, execute, and deliver science and technology capabilities.

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 2025 Air Force	Date: March 2024
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 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Previous President's Budget	275.945	142.325	141.219	0.000	141.219
Current President's Budget	266.944	142.325	142.336	0.000	142.336
Total Adjustments	-9.001	0.000	1.117	0.000	1.117
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	-10.010	0.000			
• SBIR/STTR Transfer	-3.745	0.000			
• Other Adjustments	4.754	0.000	1.117	0.000	1.117

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2023	FY 2024
Project: 624347: *Materials for Structures, Propulsion, and Subsystems*		
Congressional Add: *Program increase - born qualified additive manufacturing*	9.864	0.000
Congressional Add: *Program increase - high and ultra-high temperature ceramic-matrix composites for hypersonics*	9.864	0.000
Congressional Add: *Program increase - additive manufacturing of alloys*	9.864	0.000
Congressional Add: *Program increase - high energy synchotron x-ray research*	8.878	0.000
Congressional Add: *Program increase - maturation of carbon-carbon thermal protection systems*	4.932	0.000
Congressional Add: *Program increase - additive manufactured ceramic matrix composites*	4.932	0.000
Congressional Add: *Program increase - catalytic architectures for ASCENT satellite maneuverability*	5.918	0.000
Congressional Add: *Program increase - computationally-driven next generation carbon composite material development*	4.932	0.000
Congressional Add: *Program increase - materials for high-energy fuels*	9.864	0.000
Congressional Add: *Program increase - modeling ultra high temperature materials for hypersonics*	9.864	0.000
Congressional Add: *Program increase - scanning and additive manufacturing*	1.479	0.000
Congressional Add: *Program increase - accelerated material development for high mach capabilities*	9.864	0.000
Congressional Add: *Program increase - disruptive alloy metals development*	9.864	0.000
Congressional Add: *Program Increase - Deployable passive cooling*	4.932	0.000
Congressional Add Subtotals for Project: 624347	105.051	0.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Air Force	Date: March 2024
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 2023	FY 2024
Project: 624348: *Materials for Electronics, Optics, and Survivability*		
Congressional Add: *Program increase - small satellite technology*	19.729	0.000
Congressional Add Subtotals for Project: 624348	19.729	0.000
Project: 624349: *Materials Technology for Sustainment*		
Congressional Add: *Program increase - transparency repair program*	4.587	0.000
Congressional Add: *Program increase - flexible conductive materials*	4.932	0.000
Congressional Add: *Program increase - electromagnetic protected advanced lightweight multifunctional materials*	4.932	0.000
Congressional Add Subtotals for Project: 624349	14.451	0.000
Congressional Add Totals for all Projects	139.231	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force			Date: March 2024
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 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
624347: *Materials for Structures, Propulsion, and Subsystems*	-	167.690	54.318	54.816	0.000	54.816	56.169	57.478	62.529	63.780	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 Department of the 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 improve turbine engine thrust-to-weight ratio, specific fuel consumption and affordability. 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 fielded operational systems. The project concurrently develops advanced processing methods to enable adaptive processing of aerospace materials.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Title: Ceramics and Composites	35.357	27.263	27.002
Description: Develop ceramic, polymer, polymer and ceramic matrix composites, and hybrid materials technologies for performance and supportability improvement in propulsion systems and high temperature aerospace structures.			
FY 2024 Plans: Continue validating, demonstrating, and maturing new advanced processing methods, coating technologies, and behavioral life prediction concepts for current and future higher capability polymer and ceramic matrix composites. Continue in-depth analyses and assessment of severe environment durability of advanced composite systems via mechanical testing. Continue validating, developing, and testing the new ceramic and polymer matrix composite materials and processes with higher temperature capability for next generation propulsion systems and aerospace structures. Continue advancing and integrating the computational material science infrastructure for composite materials in tools to model, characterize, and accelerate the development and certification of advanced composite materials. Continue verifying and validating damage progression models on increasingly complex polymer matrix composite structural applications. Continue developing and validating newer testing and assessment methods on composite damage progression models for application in an engineering environment. Continue developing and validating advanced materials to meet evolving requirements for structural hardening. Continue development and refinement modeling tools to link processing to performance of organic/polymer matrix composites and expand damage mechanics models to increasingly complex composite materials.			
FY 2025 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
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 2023	FY 2024	FY 2025
- Continue validating, demonstrating, and maturing new advanced processing methods, coating technologies, and behavioral life prediction concepts for current and future higher capability polymer and ceramic matrix composites. - Continue in-depth analyses and assessment of severe environment durability of advanced composite systems via mechanical testing. - Continue validating, developing, and testing the new ceramic and polymer matrix composite materials and processes with higher temperature capability for next generation propulsion systems and aerospace structures. - Continue advancing and integrating the computational material science infrastructure for composite materials in tools to model, characterize, and accelerate the development and certification of advanced composite materials. - Continue verifying and validating damage progression models on increasingly complex polymer matrix composite structural applications. - Continue developing and validating newer testing and assessment methods on composite damage progression models for application in an engineering environment. - Continue developing and validating advanced materials to meet evolving requirements for structural hardening. - Continue development and refinement modeling tools to link processing to performance of organic/polymer matrix composites and expand damage mechanics models to increasingly complex composite materials. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** FY 2025 funding increased compared to FY 2024 by $0.261 million. Funding increase as described in the above plans.			
Title: Metals ***Description:*** Develop lightweight and high temperature metallics, life prediction technologies, and metals processing technologies for increased affordability, durability, and reliability of Department of the Air Force systems. ***FY 2024 Plans:*** Continue validating, demonstrating, and implementing advanced computation methods to support faster material development and characterization modeling. Continue analyzing relationships between microstructure, processing, properties, and performance of affordable metallic and high performance gradient metallic materials. Continue validating integrated material/manufacturing and component analysis for life management and development of affordable structural metals and low cost processes. Continue advancing reliable affordable metallic structural components through computational methods. Continue validating the value of integrated analytical tools in the optimization of design and certification of additively manufactured metallic components. Continue development of novel capabilities via metallic additive manufacturing to be used as an alternative process when applicable. Continue developing and refining processing methods and affordable metals for low cost, attritable propulsion systems. Continue	18.576	18.490	18.313

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
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 2023	FY 2024	FY 2025
research on application of advanced data science, artificial intelligence and machine learning on materials science problems. Complete research on engine life prediction. ***FY 2025 Plans:*** - Continue validating, demonstrating, and implementing advanced computation methods to support faster material development and characterization modeling. - Continue analyzing relationships between microstructure, processing, properties, and performance of affordable metallic and high performance gradient metallic materials. - Continue validating integrated material/manufacturing and component analysis for life management and development of affordable structural metals and low-cost processes. - Continue advancing reliable affordable metallic structural components through computational methods. - Continue validating the value of integrated analytical tools in the optimization of design and certification of additively manufactured metallic components. - Continue development of novel capabilities via metallic additive manufacturing to be used as an alternative process when applicable. - Continue developing and refining processing methods and affordable metals for low cost, attritable propulsion systems. - Continue research on application of advanced data science, artificial intelligence and machine learning on materials science problems. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** FY 2025 funding decreased compared to FY 2024 by $0.177 million. Funding decrease is described in the above plans.			
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 2024 Plans:*** Continue validating and maturing processing methods for fabricating materials required for expendable hypersonic applications. Continue validating, developing, and refining unique experimental techniques to assess mechanical properties and time-dependent behavior. Continue validating and demonstrating material properties and performance to meet design needs for control surfaces, leading edges, aeroshells, and apertures. Continue development of computational models to assess environmental degradation of materials in a hypersonic environment. ***FY 2025 Plans:*** - Continue validating and maturing processing methods for fabricating materials required for expendable hypersonic applications.	5.594	5.453	5.401

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
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 2023	FY 2024	FY 2025
- Continue validating, developing, and refining unique experimental techniques to assess mechanical properties and time-dependent behavior. - Continue validating and demonstrating material properties and performance to meet design needs for control surfaces, leading edges, aeroshells, and apertures. - Continue development of computational models to assess environmental degradation of materials in a hypersonic environment. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** FY 2025 funding increased compared to FY 2024 by $0.053 million. Funding increase is due to increased emphasis in high temperature materials and processes.			
Title: Pervasive and Affordable Metals Technologies ***Description:*** Develop and demonstrate affordable, novel high temperature powder processing materials/structures and additive metals technology concepts to enable future defense capabilities, air vehicle propulsion, and computational prediction models. ***FY 2024 Plans:*** Continue demonstration of affordable metallic turbine engine disks made via powder processing technologies through high temperature, aggressive environment testing. Continue development of low cost, complex shape metallic components made through additive manufacturing for advanced weapon system component prototypes. Continue development of computational methodologies that incorporate impact of surface residual stress on the ability to extend life and lower life cycle cost of air vehicle propulsion system components. ***FY 2025 Plans:*** - Continue demonstration of affordable metallic turbine engine disks made via powder processing technologies through high temperature, aggressive environment testing. - Continue development of low cost, complex shape metallic components made through additive manufacturing for advanced weapon system component prototypes. - Continue development of computational methodologies that incorporate impact of surface residual stress on the ability to extend life and lower life cycle cost of air vehicle propulsion system components. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** FY 2025 funding increased compared to FY 2024 by $0.988 million. Funding increase is due to increased emphasis in affordable metals.	3.112	3.112	4.100
Accomplishments/Planned Programs Subtotals	62.639	54.318	54.816

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
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 2023	FY 2024
Congressional Add: Program increase - born qualified additive manufacturing ***FY 2023 Accomplishments:*** Conducted Congressionally directed efforts. ***FY 2024 Plans:*** Not applicable	9.864	0.000
Congressional Add: Program increase - high and ultra-high temperature ceramic-matrix composites for hypersonics ***FY 2023 Accomplishments:*** Conducted Congressionally directed efforts. ***FY 2024 Plans:*** Not applicable	9.864	0.000
Congressional Add: Program increase - additive manufacturing of alloys ***FY 2023 Accomplishments:*** Conducted Congressionally directed efforts. ***FY 2024 Plans:*** Not applicable	9.864	0.000
Congressional Add: Program increase - high energy synchotron x-ray research ***FY 2023 Accomplishments:*** Conducted Congressionally directed efforts. ***FY 2024 Plans:*** Not applicable	8.878	0.000
Congressional Add: Program increase - maturation of carbon-carbon thermal protection systems ***FY 2023 Accomplishments:*** Conducted Congressionally directed efforts. ***FY 2024 Plans:*** Not applicable	4.932	0.000
Congressional Add: Program increase - additive manufactured ceramic matrix composites ***FY 2023 Accomplishments:*** Conducted Congressionally directed efforts. ***FY 2024 Plans:*** Not applicable	4.932	0.000
Congressional Add: Program increase - catalytic architectures for ASCENT satellite maneuverability ***FY 2023 Accomplishments:*** Conducted Congressionally directed efforts. ***FY 2024 Plans:*** Not applicable	5.918	0.000
Congressional Add: Program increase - computationally-driven next generation carbon composite material development	4.932	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
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 2023	FY 2024
FY 2023 Accomplishments: Conduct Congressionally directed efforts. ***FY 2024 Plans:*** Not applicable		
Congressional Add: Program increase - materials for high-energy fuels ***FY 2023 Accomplishments:*** Conducted Congressionally directed efforts. ***FY 2024 Plans:*** Not applicable	9.864	0.000
Congressional Add: Program increase - modeling ultra high temperature materials for hypersonics ***FY 2023 Accomplishments:*** Conducted Congressionally directed efforts. ***FY 2024 Plans:*** Not applicable	9.864	0.000
Congressional Add: Program increase - scanning and additive manufacturing ***FY 2023 Accomplishments:*** Conducted Congressionally directed efforts. ***FY 2024 Plans:*** Not applicable	1.479	0.000
Congressional Add: Program increase - accelerated material development for high mach capabilities ***FY 2023 Accomplishments:*** Conducted Congressionally directed efforts. ***FY 2024 Plans:*** Not applicable	9.864	0.000
Congressional Add: Program increase - disruptive alloy metals development ***FY 2023 Accomplishments:*** Conducted Congressionally directed efforts. ***FY 2024 Plans:*** Not applicable	9.864	0.000
Congressional Add: Program Increase - Deployable passive cooling ***FY 2023 Accomplishments:*** Conducted Congressionally directed efforts. ***FY 2024 Plans:*** Not applicable	4.932	0.000
Congressional Adds Subtotals	105.051	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602102F / *Materials*	**Project (Number/Name)** 624347 / *Materials for Structures, Propulsion, and Subsystems*

D. Acquisition Strategy

N/A.

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force			Date: March 2024
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 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
624348: *Materials for Electronics, Optics, and Survivability*	-	53.307	39.593	39.561	0.000	39.561	40.423	41.306	43.989	44.884	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project develops materials technologies for the Department of the Air Force's Intelligence, Surveillance, and Reconnaissance (ISR), situational awareness, and specialty coatings for aerospace platforms and munitions. This includes sensors for microwave, short, mid, and long-wave infrared (SWIR, MWIR, LWIR) detection and countermeasures devices used for targeting, electronic warfare, and active aircraft protection. 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. This project develops materials for protection of aircrews, sensors, and aerospace structures from directed energy threats without impairing mission effectiveness. Nanostructured and biological materials are being developed for aerospace structures, munitions, aerospace vehicle subsystems, and personnel.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Title: Infrared Detector and Electromagnetic Device Materials	10.557	12.274	12.264
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 for the Department of the Air Force.			
FY 2024 Plans: Continue advanced development, demonstration and validation of materials and processes for control and detection of electromagnetic radiation for Intelligence, Surveillance and Reconnaissance (ISR) technologies. Further the development, testing, and assessment of materials for use in high resolution imaging by electromagnetic radiation. Continue advanced demonstration of nanoscale materials, metamaterials, and models for use in producing detectors. Continue utilizing all aspects of computational materials science to improve performance prediction and reliability models, as well as analyzing quantum materials for aerospace applications. Continue specific development and demonstration of short wave infrared detector and hyper-spectral long wave infrared materials. Continue verifying and validating materials and processes for integration of radio frequency and optical signals as well as concepts for novel optical devices and components. Continue development of photonics for aerospace applications, and demonstrate nanostructured materials for components to enable agile radio frequency capability. Continue development of techniques using quantum materials and processes. Continue development of software defined imaging receivers.			
FY 2025 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
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 2023	FY 2024	FY 2025
- Continue advanced development, demonstration and validation of materials and processes for control and detection of electromagnetic radiation for Intelligence, Surveillance and Reconnaissance (ISR) technologies. - Further the development, testing, and assessment of materials for use in high resolution imaging by electromagnetic radiation. - Continue advanced demonstration of nanoscale materials, metamaterials, and models for use in producing detectors. - Continue utilizing all aspects of computational materials science to improve performance prediction and reliability models, as well as analyzing quantum materials for aerospace applications. - Continue specific development and demonstration of short wave infrared detector and hyper-spectral long wave infrared materials. - Continue verifying and validating materials and processes for integration of radio frequency and optical signals as well as concepts for novel optical devices and components. - Continue development of photonics for aerospace applications, and demonstrate nanostructured materials for components to enable agile radio frequency capability. - Continue development of techniques using quantum materials and processes. - Continue development of software defined imaging receivers. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** FY 2025 funding decreased compared to FY 2024 by $0.010 million. Funding decrease is described in the above plans.			
Title: Directed Energy Hardened Materials ***Description:*** Develop and demonstrate technologies to enhance the safety, survivability, and mission effectiveness of personnel, sensors, viewing systems, and related Department of the Air Force assets. ***FY 2024 Plans:*** Continue analyzing, validating, and demonstrating the comprehensive generated data of materials and technologies to protect against directed energy threats. Continue developing and demonstrating advanced optical limiter materials for damage protection, enhanced hybrid materials for advanced applications, and continue to assess the response of new materials for high-energy laser interactions. Continue developing novel approaches for integration of multimodal hardening into structures and devices. Continue assessing data, validating repeatability, and utilizing computational materials science to enhance multi-scale modeling for design of robust, reliable integrated protection. Continue development of proven selected advanced materials technologies to protect against nuclear flash blindness. ***FY 2025 Plans:*** - Continue analyzing, validating, and demonstrating the comprehensive generated data of materials and technologies to protect against directed energy threats.	10.184	11.878	11.868

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
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 2023	FY 2024	FY 2025
- Continue developing and demonstrating advanced optical limiter materials for damage protection, enhanced hybrid materials for advanced applications, and continue to assess the response of new materials for high-energy laser interactions. - Continue developing novel approaches for integration of multimodal hardening into structures and devices. - Continue assessing data, validating repeatability, and utilizing computational materials science to enhance multi-scale modeling for design of robust, reliable integrated protection. - Complete development of proven selected advanced materials technologies to protect against nuclear flash blindness. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** FY 2025 funding decreased compared to FY 2024 by $0.010 million. Funding decrease described in the above plans.			
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 2024 Plans:*** Continue demonstrating and validating materials and process technologies to control and generate directed electromagnetic energy for survivability and other applications. Further demonstrate and model materials processes for controlling laser beam direction and focus with optical components and materials for frequency conversion, high power optical isolators, and mid-wave infrared laser sources for directed energy sources. ***FY 2025 Plans:*** - Continue demonstrating and validating 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 and materials for frequency conversion, high power optical isolators, and mid-wave infrared laser sources for directed energy sources. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** FY2025 funding decreased compared to FY 2024 by $0.002 million. Funding decrease is due to the above plans.	1.491	1.584	1.582
Title: Nanostructured and Biological Materials ***Description:*** Develop enabling and foundational biotechnologies for guidance and control, resilient basing, bio-integrated electronics and sensing for the Department of the Air Force applications. ***FY 2024 Plans:***	11.346	13.857	13.847

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
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 2023	FY 2024	FY 2025
Continue validating and verifying engineering, scientific, and processing methods for nano and biological materials to address unique requirements for the Department of the Air Force human-machine integration and electronic components. Continue exploring biotechnology to assess the impact of microbes and fungi on Department of the Air Force systems. Continue studying more robust and reliable materials and processes to optimize components for compact, flexible, stretchable multi-functional devices, and validate materials and processes for functional additive manufacturing of electronic components. Continue demonstrating methods to assess reliability and field resiliency of nano and biological materials and processes. Continue supporting the Flexible Hybrid Electronics Institutes for Manufacturing Innovation and the NanoBio Manufacturing Consortium for collaborative teaming. Continue development of agile materials for basing, infrastructure and expeditionary operations. ***FY 2025 Plans:*** - Continue validating and verifying engineering, scientific, and processing methods for nano and biological materials to address unique requirements for the Department of the Air Force human-machine integration and electronic components. - Continue studying more robust and reliable materials and processes to optimize components for compact, flexible, stretchable multi-functional devices, and validate materials and processes for functional additive manufacturing of electronic components. - Continue demonstrating methods to assess reliability and field resiliency of nano and biological materials and processes. - Continue supporting the Flexible Hybrid Electronics Institutes for Manufacturing Innovation and the NanoBio Manufacturing Consortium for collaborative teaming. - Continue development of agile materials for basing, infrastructure and expeditionary operations. - Completed exploring biotechnology to assess the impact of microbes and fungi on Department of the Air Force systems. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** FY 2025 funding decreased compared to FY 2024 by $0.010 million. Funding decrease as described in the above plans.			
Accomplishments/Planned Programs Subtotals	33.578	39.593	39.561

	FY 2023	FY 2024
Congressional Add: Program increase - small satellite technology	19.729	0.000
FY 2023 Accomplishments: Conducted Congressionally directed efforts.		
FY 2024 Plans: Not applicable		
Congressional Adds Subtotals	19.729	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602102F / *Materials*	**Project (Number/Name)** 624348 / *Materials for Electronics, Optics, and Survivability*

C. Other Program Funding Summary ($ in Millions)

Remarks

D. Acquisition Strategy

N/A.

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force			Date: March 2024
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 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
624349: *Materials Technology for Sustainment*	-	45.947	48.414	47.959	0.000	47.959	43.603	44.963	48.810	49.787	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project develops materials and processing technologies to support operational Department of the Air Force mission areas by providing the ability to inspect the quality of delivered systems, transition more reliable and maintainable materials, establish a capability to detect and characterize performance threatening defects, characterize materials processes and properties necessary for materials transition, and provide 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 2023	FY 2024	FY 2025
Title: Material State Awareness	11.172	16.945	16.786
Description: Develop Materials State Awareness technologies to identify and characterize materials and/or damage regardless of scale for managing the health of fielded structures, propulsion systems, and specialty materials, plus enabling advanced materials qualification for Department of the Air Force systems.			
FY 2024 Plans: Continue validating and demonstrating non-destructive evaluation modeling capabilities and use these competencies to drive improvements in capability to detect, characterize and quantify damage in realistic aerospace structures and engine components. Continue analyzing approaches to address the variability inherent in aerospace systems and materials to quantify the impact of that variability on nondestructive inspection capability and reliability. Continue validating advanced sensing technologies to detect and characterize changes in material properties, damage evolution, and other factors that detrimentally affect aerospace systems. Continue improving methods to acquire and analyze data to facilitate improved characterization, registration, and tracking of degradation and damage of specialty materials that enables/ensures more affordable coatings assessment. Continue validating tools to improve characterization and failure modes of specialty multilayer coatings. Continue developing automation and robotic technologies for visual inspections that will realize human-assisted inspection capabilities and begin to provide capabilities for automated multi-spectral characterization. Continued development of miniaturized nondestructive evaluation/inspection capabilities.			
FY 2025 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2025 Air Force		Date: March 2024
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 2023	FY 2024	FY 2025
- Continue validating and demonstrating non-destructive evaluation modeling capabilities and use these competencies to drive improvements in capability to detect, characterize and quantify damage in realistic aerospace structures and engine components. - Continue analyzing approaches to address the variability inherent in aerospace systems and materials to quantify the impact of that variability on nondestructive inspection capability and reliability. - Continue validating advanced sensing technologies to detect and characterize changes in material properties, damage evolution, and other factors that detrimentally affect aerospace systems. - Continue improving methods to acquire and analyze data to facilitate improved characterization, registration, and tracking of degradation and damage of specialty materials that enables/ensures more affordable coatings assessment. - Continue validating tools to improve characterization and failure modes of specialty multilayer coatings. - Continue developing automation and robotic technologies for visual inspections that will realize human-assisted inspection capabilities and begin to provide capabilities for automated multi-spectral characterization. - Continued development of miniaturized nondestructive evaluation/inspection capabilities. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** FY 2025 funding decreased compared to FY 2024 by $0.159 million. Funding decrease is due to decrease emphasis in research and development into sustainment of aging aircraft and engines.			
Title: Production and Repair Technologies	8.003	12.588	12.469
Description: Develop support capabilities, information, and processes to resolve problems with materials in the production and repair of systems components and structures for the Department of the Air Force. ***FY 2024 Plans:*** Continue developing and communicating to the field best practices to ensure repeatability of advanced materials and processes technology to repair and extend the life of Department of the Air Force systems. Further refine through demonstration the understanding of material durability and repair limits for emerging Department of the Air Force systems. Complete the advancement of the analysis and development of improved life cycle prediction test methods and techniques to understand effects of service environments, residual stresses, and material processes on structural and functional materials. Continue improving the service life of advanced materials, processes and designs for improved repair and maintainability and life cycle cost of outer mold line coatings, access panel treatments, and multifunctional systems. Continue to further advance specialty material affordability technologies and processes to reduce maintenance costs of specialty materials. ***FY 2025 Plans:*** - Continue developing and communicating to the field best practices to ensure repeatability of advanced materials and processes technology to repair and extend the life of Department of the Air Force systems. Further refine through demonstration the understanding of material durability and repair limits for emerging Department of the Air Force systems.			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
- Continue improving the service life of advanced materials, processes and designs for improved repair and maintainability and life cycle cost of outer mold line coatings, access panel treatments, and multifunctional systems. - Continue to further advance specialty material affordability technologies and processes to reduce maintenance costs of specialty materials. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** FY 2025 funding decreased compared to FY 2024 by $0.119 million. Funding decrease is due to reduce emphasis on research and development into sustainment of aging platforms.			
Title: Failure Analysis Technologies	12.321	18.881	18.704
Description: Develop support capabilities, information, and processes to resolve materials problems and provide electronic and structural failure analysis for the Department of the Air Force. ***FY 2024 Plans:*** Continue performing and increasing efficiency of quick response failure analyses and materials investigations. Further the development and investigate improved analysis techniques to determine and prevent root cause materials failure/degradation. Continue developing and providing advanced materials and processing solutions to ensure warfighter systems availability and safety of flight. Continue refining development of functional materials failure analysis capabilities. Continue analyzing and validating advanced electrostatic discharge protection technologies and procedures for emerging avionics subsystems. Continue transitioning advanced test and characterization methods for analyzing electrical and structural failures of emerging materials. Continue development of new, more durable materials and protection for high power wiring technologies, and advanced materials. ***FY 2025 Plans:*** - Continue performing and increasing efficiency of quick response failure analyses and materials investigations. - Further the development and investigate improved analysis techniques to determine and prevent root cause materials failure/degradation. - Continue developing and providing advanced materials and processing solutions to ensure warfighter systems availability and safety of flight. - Continue refining development of functional materials failure analysis capabilities. - Continue analyzing and validating advanced electrostatic discharge protection technologies and procedures for emerging avionics subsystems. - Continue transitioning advanced test and characterization methods for analyzing electrical and structural failures of emerging materials.			

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B. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
- Continue development of new, more durable materials and protection for high power wiring technologies, and advanced materials. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** FY 2025 funding decreased compared to FY 2024 by $0.177 million. Funding decrease is due to decreased emphasis on coatings qualifications for legacy platforms.			
Accomplishments/Planned Programs Subtotals	31.496	48.414	47.959

	FY 2023	FY 2024
Congressional Add: Program increase - transparency repair program ***FY 2023 Accomplishments:*** Conducted Congressionally directed efforts. ***FY 2024 Plans:*** Not applicable	4.587	0.000
Congressional Add: Program increase - flexible conductive materials ***FY 2023 Accomplishments:*** Conducted Congressionally directed efforts. ***FY 2024 Plans:*** Not applicable	4.932	0.000
Congressional Add: Program increase - electromagnetic protected advanced lightweight multifunctional materials ***FY 2023 Accomplishments:*** Conducted Congressionally directed efforts. ***FY 2024 Plans:*** Not applicable	4.932	0.000
Congressional Adds Subtotals	14.451	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not Applicable.