Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Air Force											Date: April 2022	
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 2: *Applied Research*					R-1 Program Element (Number/Name) PE 0602201F / *Aerospace Vehicle Technologies*							
COST ($ in Millions)	**Prior Years**	**FY 2021**	**FY 2022**	**FY 2023 Base**	**FY 2023 OCO**	**FY 2023 Total**	**FY 2024**	**FY 2025**	**FY 2026**	**FY 2027**	**Cost To Complete**	**Total Cost**
Total Program Element	-	148.576	183.032	159.453	0.000	159.453	163.842	166.249	169.389	173.108	Continuing	Continuing
622401: *Structures*	-	65.940	71.546	70.320	0.000	70.320	71.485	72.634	74.181	75.829	Continuing	Continuing
622403: *Flight Controls and Pilot-Vehicle Interface*	-	11.674	39.790	39.422	0.000	39.422	40.320	40.837	41.704	42.611	Continuing	Continuing
622404: *Aeromechanics and Integration*	-	7.451	29.941	9.745	0.000	9.745	9.947	10.156	10.374	10.592	Continuing	Continuing
622405: *High Speed Systems Technology*	-	35.457	38.103	36.432	0.000	36.432	38.474	38.943	39.771	40.642	Continuing	Continuing
622406: *Aerospace Power & Flight Control Technology*	-	25.130	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
623066: *Turbine Engine Technology*	-	2.924	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
625172: *NUCLEAR SYSTEM TECHNOLOGY*	-	0.000	3.652	3.534	0.000	3.534	3.616	3.679	3.359	3.434	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program investigates, develops, and analyzes aerospace vehicle technologies in the primary areas of high speed systems, flight control technologies, aeromechanics, structure systems and nuclear system technology. The effort has five current projects, each focusing on a technology area critical to the Department of the Air Force. The High Speed Systems Technology project develops component level vehicle technologies for expendable and reusable high speed/hypersonic aerospace systems. The Flight Controls and Pilot-Vehicle Interface project develops technologies that enable maximum affordable capability from manned, remotely-piloted and autonomous aerospace vehicles. The Aeromechanics and Integration project designs advanced aerodynamic vehicle configurations that are developed and analyzed through simulations, experiments, and multi-disciplinary analyses. It also develops design techniques, incorporating vehicle, inter-vehicle, and intra-vehicle control systems. The Structures project develops and exploits new materials, and fabrication processes. The Nuclear System Technology project provides science and technology to preserve nuclear deterrence for future generations.

Funds in this program element 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 & technology capabilities. The use of program funds in this program element would be in addition to the civilian pay expenses budgeted in program elements 0601102F, 0602020F, 0602102F, 0602203F,0602202F, 0602204F, 0602602F, 0602605F, 0602788F, 0602298F, and 1206601SF.

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Air Force	Date: April 2022
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602201F / *Aerospace Vehicle Technologies*

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 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	164.426	163.032	0.000	0.000	0.000
Current President's Budget	148.576	183.032	159.453	0.000	159.453
Total Adjustments	-15.850	20.000	159.453	0.000	159.453
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	20.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	-4.883	0.000			
• SBIR/STTR Transfer	-4.868	0.000			
• Other Adjustments	-6.099	0.000	159.453	0.000	159.453

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2021	FY 2022
Project: 622401: *Structures*		
Congressional Add: *Program increase - Educational partnership agreement for secure UAV technologies*	0.000	10.000
Congressional Add: *Program increase - Collaborative hypersonic demonstration*	0.000	10.000
Congressional Add Subtotals for Project: 622401	0.000	20.000
Project: 622405: *High Speed Systems Technology*		
Congressional Add: *Program increase - secure UAV technologies*	9.703	-
Congressional Add: *Program increase - modeling and testing of high temperature aero vehicle*	3.881	-
Congressional Add: *Program increase - hypersonic research and education*	2.340	-
Congressional Add Subtotals for Project: 622405	15.924	-
Congressional Add Totals for all Projects	15.924	20.000

Change Summary Explanation

Decrease in FY 2021 reflects reprogramming to support Research and Development Projects, 10 U.S.C. Section 2363, an amendment to PL 110-417, 10 U.S.C. Section 2358 and 10 U.S.C. 2805(d)(1)(B).

Exhibit R-2, RDT&E Budget Item Justification: PB 2023 Air Force	Date: April 2022
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602201F / *Aerospace Vehicle Technologies*

The FY 2022 President's Budget submittal did not reflect FY 2023 through FY 2026 funding. Therefore, an explanation of the change between the two budget positions for FY2023 cannot be made in a relevant manner.

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force			Date: April 2022
Appropriation/Budget Activity 3600 / 2	R-1 Program Element (Number/Name) PE 0602201F / *Aerospace Vehicle Technologies*	Project (Number/Name) 622401 / *Structures*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
622401: *Structures*	-	65.940	71.546	70.320	0.000	70.320	71.485	72.634	74.181	75.829	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project develops advanced structures concepts to exploit new materials and fabrication processes and investigates new concepts and design techniques. New structural concepts include low cost design and fabrication techniques, incorporating subsystem hardware items and adaptive mechanisms into the aerospace structures and/or skin of the platform.

In FY 2023, Next Generation Aerodynamic Technologies and Aircraft Integration Technologies efforts will transfer from Program 0602201F, Aerospace Vehicle Technologies, Project 622404, Aeromechanics and Integration, to this Project 622401, Structures, in order to effectively and efficiently align resources to Aerospace Systems Core Technical Competencies.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: Aircraft Service Life Technologies	23.825	18.615	1.996	0.000	1.996
Description: Develop an economic service life analysis capability comprised of analysis tools, methodologies, and structural health monitoring technologies. ***FY 2022 Plans:*** Continue lifing methods for durability and damage tolerance of aging structures on legacy fleet aircraft. Initiate digital engineering systems analysis on a low cost attritable unmanned aircraft system. ***FY 2023 Base Plans:*** Complete lifing methods for durability and damage tolerance of aging structures on legacy fleet aircraft. Complete digital engineering systems analysis on a low cost attritable unmanned aircraft system. ***FY 2023 OCO Plans:*** Not Applicable ***FY 2022 to FY 2023 Increase/Decrease Statement:*** FY2023 decreased compared to FY2022 by $16.619 million. Funding decrease due to reduced emphasis on aircraft-service-life enhancement technologies for legacy fleet aircraft.					
Title: Vehicle Design Technologies	21.664	16.937	18.137	0.000	18.137

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602201F / *Aerospace Vehicle Technologies*	**Project (Number/Name)** 622401 / *Structures*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Description: Develop methodologies to reduce the cost and time involved from design to full-scale testing of structural concepts and aerospace systems. ***FY 2022 Plans:*** Continue the development of advanced high fidelity aircraft design analysis tools. Continue the development of integrating cost, mission effectiveness, and affordable manufacturing methods into aircraft design analysis tools. Continue new design techniques to quantify and trade risk impacts against performance in aircraft designs. Continue the development of new design methods that link vehicle system requirements to mission operation performance. ***FY 2023 Base Plans:*** Continue the development of advanced high fidelity aircraft design analysis tools. Complete the development of integrating cost, mission effectiveness, and affordable manufacturing methods into aircraft design analysis tools. Complete new design techniques to quantify and trade risk impacts against performance in aircraft designs. Continue the development of new design methods that link vehicle system requirements to mission operation performance. Initiate the integration of model-based system engineering methodology with risk-aware aircraft design methods ***FY 2023 OCO Plans:*** Not Applicable ***FY 2022 to FY 2023 Increase/Decrease Statement:*** FY2023 increased compared to FY2022 by $1.2 million. Funding increase due to an increased emphasis on vehicle design Technologies for future platforms to include autonomous collaborative platforms.					
Title: Structural Concepts ***Description:*** Develop design methods, processes, and lightweight, adaptive, and multifunctional structural concepts to capitalize on new materials, multi-role considerations, and technology integration into aircraft systems. ***FY 2022 Plans:*** Continue development of innovative structural design methods to dramatically reduce weight and complexity of aircraft structures. Continue development of fail-safe technologies for bonded unitized composite structures applicable to Mobility aircraft. Continue validation of impact damage analysis and methods for advanced fail-safe	20.451	15.994	24.938	0.000	24.938

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602201F / *Aerospace Vehicle Technologies*	**Project (Number/Name)** 622401 / *Structures*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
composite structures applicable to Mobility aircraft. Initiate new low cost design and manufacturing structural concepts for attritable vehicles. ***FY 2023 Base Plans:*** Continue development of innovative structural design methods to dramatically reduce weight and complexity of aircraft structures. Complete development of fail-safe technologies for bonded unitized composite structures applicable to next generation aircraft. Continue validation of impact damage analysis and methods for advanced fail-safe composite structures applicable to next generation aircraft. Continue new low cost design and manufacturing structural concepts for attritable vehicles. Initiate development of low-cost agile manufacturing concepts for structures in support of the development of a next variant of a low cost unmanned aerospace system. ***FY 2023 OCO Plans:*** Not applicable ***FY 2022 to FY 2023 Increase/Decrease Statement:*** FY2023 increased compared to FY2022 by $8.944 million. Funding increase due to an increased emphasis on advanced structural concepts for future platforms to include autonomous collaborative platforms.					
Title: Next Generation Aerodynamic Technologies	-	0.000	8.075	0.000	8.075
Description: Develop and assess technologies for the next generation of multi-role large aircraft. ***FY 2022 Plans:*** In FY2022, this effort is performed in Program 0602201F, Aerospace Vehicle Technologies, Project 622404, Aeromechanics and Integration. ***FY 2023 Base Plans:*** Complete the design of a small, pod-mounted tactical air refueling boom for future Mobility applications. Continue the development of advanced high fidelity aerodynamic analysis tools for aircraft conceptual design. Continue assessment of innovative next generation vehicle concepts. ***FY 2023 OCO Plans:*** Not applicable ***FY 2022 to FY 2023 Increase/Decrease Statement:***					

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602201F / *Aerospace Vehicle Technologies*	**Project (Number/Name)** 622401 / *Structures*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
FY2023 increased compared to FY2022 by $8.075 million. Funding increase is due to transfer from Program 0602201F, Aerospace Vehicle Technologies, Project 622404, Aeromechanics and Integration and an increased emphasis on development of component technologies for next generation systems.					
Title: Aircraft Integration Technologies ***Description:*** Develop enabling technologies to allow efficient and effective integration of propulsion, weapons, and subsystems into current and future air vehicles. ***FY 2022 Plans:*** In FY2022, this effort is performed in Program 0602201F, Aerospace Vehicle Technologies, Project 622404, Aeromechanics and Integration. ***FY 2023 Base Plans:*** Complete development of advanced kinetic and directed energy weapons integration technologies for Air Superiority 2030. Continue integrated full flow path demonstration of a medium bypass embedded engine for next generation mobility. Complete the design and analysis methods to allow rapid certification of stores separation for new small weapons on tactical aircraft. Continue development of hybrid electric distributed propulsion vehicle integration designs for next generation vehicle concepts. Initiate development of novel kinetic weapons integration technologies for enhanced weapon payload in attritable platforms. ***FY 2023 OCO Plans:*** Not applicable ***FY 2022 to FY 2023 Increase/Decrease Statement:*** FY2023 increased compared to FY2022 by $17.174 million. Funding increase is due to transfer from Program 0602201F, Aerospace Vehicle Technologies, Project 622404, Aeromechanics and Integration and increased emphasis on weapon and propulsion integration technologies for next generation systems.	-	0.000	17.174	0.000	17.174
Accomplishments/Planned Programs Subtotals	65.940	51.546	70.320	0.000	70.320

	FY 2021	FY 2022
Congressional Add: Program increase - Educational partnership agreement for secure UAV technologies	0.000	10.000

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602201F / *Aerospace Vehicle Technologies*	**Project (Number/Name)** 622401 / *Structures*

	FY 2021	FY 2022
FY 2021 Accomplishments: Not applicable. ***FY 2022 Plans:*** Conduct Congressionally directed efforts.		
Congressional Add: Program increase - Collaborative hypersonic demonstration ***FY 2021 Accomplishments:*** Not applicable. ***FY 2022 Plans:*** Conduct Congressionally directed efforts. This effort will be executed in Program 0602201F, Aerospace Vehicle Technologies, Project 622405, High Speed Systems Technology.	0.000	10.000
Congressional Adds Subtotals	0.000	20.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable.

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force			Date: April 2022
Appropriation/Budget Activity 3600 / 2	R-1 Program Element (Number/Name) PE 0602201F / *Aerospace Vehicle Technologies*	Project (Number/Name) 622403 / *Flight Controls and Pilot-Vehicle Interface*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
622403: *Flight Controls and Pilot-Vehicle Interface*	-	11.674	39.790	39.422	0.000	39.422	40.320	40.837	41.704	42.611	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project develops technologies that enable maximum affordable capability from manned, remotely-piloted, and autonomous aerospace vehicles. Advanced control, automation, and autonomy technologies are developed for maximum vehicle performance throughout the flight envelope and simulated in full-scale, surrogate, and virtual environments. Resulting technologies contribute significantly towards the development of reliable autonomous or remotely piloted air vehicles, hypersonic aircraft, and extended-life legacy aircraft.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: Advanced Flight Controls Technologies	2.675	9.168	9.362	-	9.362
Description: Develop technologies for advanced control-enabled capabilities, including flight controls, components, integrated vehicle management systems, and software and system certification techniques for both manned/unmanned and remotely piloted aircraft. ***FY 2022 Plans:*** Continue the development of trusted autonomy approach, integrating certification processes and autonomy development. Continue the development, demonstration, and assessment of autonomy capabilities under adverse and contested environments. ***FY 2023 Base Plans:*** Continue the development of a trusted autonomy approach, integrating certification processes and autonomy development. Complete the development, demonstration, and assessment of autonomy capabilities under adverse and contested environments. Initiate the development, demonstration and assessment of autonomy capabilities for dynamic tasking in complex environments. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** FY2023 increased compared to FY2022 by $0.194 million. Funding increase due to increased emphasis on advanced flight controls technologies to enable future capabilities including autonomous collaboration.					
Title: Manned and Unmanned Teaming Technologies	6.952	23.569	22.858	-	22.858
Description: Develop technology for flight control systems that will permit safe interoperability between manned and remotely piloted aircraft and effective teaming in adverse and contested environments.					

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602201F / *Aerospace Vehicle Technologies*	**Project (Number/Name)** 622403 / *Flight Controls and Pilot-Vehicle Interface*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
FY 2022 Plans: Continue development, demonstration, and assessment of advanced control automation techniques. Continue the development of autonomous behaviors for safe, effective manned-unmanned teams. Continue the development of tactical autonomy for manned-unmanned teams in contested, dynamic mission environments. Initiate the development of mission management autonomy for manned-unmanned teams. ***FY 2023 Base Plans:*** Complete development, demonstration, and assessment of advanced control automation techniques. Complete the development of autonomous behaviors for safe, effective manned-unmanned teams. Continue the development of tactical autonomy for manned-unmanned teams in contested, dynamic mission environments. Continue the development of mission management autonomy for manned-unmanned teams. Initiate development, demonstration and assessment of autonomous behaviors to address mission capability gaps. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** FY2023 decreased compared to FY2022 by $0.711 million. Funding decrease due to a decreased emphasis in development of autonomous behaviors to address mission capability gaps.					
Title: Flight Controls Technologies Modeling and Simulation	2.047	7.053	7.202	-	7.202
Description: Develop tools and methods for capitalizing on simulation-based research and development of future aerospace vehicles. ***FY 2022 Plans:*** Continue modeling and simulation efforts to evaluate emerging autonomous and robust flight control technologies and concepts, as well as assess mission level performance of integrated aerospace systems. Continue analyses of manned-unmanned teams in adversarial mission environments. Continue trade studies of vehicle concepts for strike, mobility and reconnaissance. Continue manned-unmanned teaming evaluations including rapid development of new capabilities. Continue analyses of capability concepts for future advanced development programs. ***FY 2023 Base Plans:*** Complete modeling and simulation efforts to evaluate emerging autonomous and robust flight control technologies and concepts, as well as assess mission level performance of integrated aerospace systems. Complete analyses of manned-unmanned teams in adversarial mission environments. Continue trade studies of vehicle concepts for strike, mobility and reconnaissance. Continue manned-unmanned teaming evaluations					

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602201F / *Aerospace Vehicle Technologies*	**Project (Number/Name)** 622403 / *Flight Controls and Pilot-Vehicle Interface*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
including rapid development of new capabilities. Continue analyses of capability concepts for future advanced development programs. Initiate modeling and simulation efforts to assess emerging aerospace technologies and concepts in complex and dynamic battlespace environments. Initiate digital engineering efforts to create a continuum from military utility and cost effectiveness analysis to investment planning to technology development to technology transition. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** FY2023 increased compared to FY2022 by $0.149 million. Funding increase due to increased emphasis on modeling and simulation, digital engineering, and tool development to inform future Aerospace Systems Science and Technology (S&T) investments.					
Accomplishments/Planned Programs Subtotals	11.674	39.790	39.422	-	39.422

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable.

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force			Date: April 2022
Appropriation/Budget Activity 3600 / 2	R-1 Program Element (Number/Name) PE 0602201F / *Aerospace Vehicle Technologies*	Project (Number/Name) 622404 / *Aeromechanics and Integration*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
622404: *Aeromechanics and Integration*	-	7.451	29.941	9.745	0.000	9.745	9.947	10.156	10.374	10.592	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project develops aerodynamic configurations of a broad range of revolutionary, affordable aerospace vehicles. It matures and applies modeling and numerical simulation methods for fast and affordable aerodynamics prediction and integrates and demonstrates multi-disciplinary advances in airframe, propulsion, weapon, and air vehicle control integration.

In FY2023, Next Generation Aerodynamic Technologies and Aircraft Integration Technologies efforts will transfer to Program 0602201F, Aerospace Vehicle Technologies, Project 622401, Structures, in order to effectively and efficiently align resources to Aerospace Systems Core Technical Competencies.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: Aerodynamic Systems Technologies	1.669	6.740	9.745	-	9.745
Description: Develop aerodynamic assessment prediction methods centered on expanding the design capabilities of future air vehicles. ***FY 2022 Plans:*** Complete development and assessment of low cost attritable unmanned air vehicle concepts. Complete an assessment of design options to allow runway independence for low cost attritable unmanned air vehicle concepts. Continue design assessments of distributed propulsion concepts for next generation Mobility. Continue the assessment and development of incorporating active flow control techniques into advanced design to enable new aircraft configurations. ***FY 2023 Base Plans:*** Continue design assessments of distributed propulsion concepts for next generation aircraft. Continue the assessment and development of incorporating active flow control techniques into advanced design to enable new aircraft configurations. Initiate design assessments of long-endurance unmanned platforms. Initiate the development of prediction methods which include air vehicle stability and control requirements. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** FY2023 increased compared to FY2022 by $3.005 million. Funding increase due to an increased emphasis on air vehicle range enhancement and runway independence.					
Title: Next Generation Aerodynamic Technologies	1.847	7.445	0.000	-	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602201F / *Aerospace Vehicle Technologies*	**Project (Number/Name)** 622404 / *Aeromechanics and Integration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Description: Develop and assess technologies for the next generation of multi-role large aircraft. ***FY 2022 Plans:*** Complete next generation tanker maturation and assess promising configurations in high and low speed wind tunnels. Continue the design of a small, pod-mounted tactical air refueling boom for future Mobility applications. Continue the development of advanced high fidelity aerodynamic analysis tools for aircraft conceptual design. Initiate assessment of innovative next generation vehicle concepts. ***FY 2023 Base Plans:*** In FY2023, this effort will transfer to Program 0602201F, Aerospace Vehicle Technologies, Project 622401, Structures, in order to effectively and efficiently align resources to Aerospace Systems Core Technical Competencies. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** FY2023 decreased compared to FY2022 by $7.445 million. Funding decrease is due to transfer to Program 0602201F, Aerospace Vehicle Technologies, Project 622401, Structures.					
Title: Aircraft Integration Technologies ***Description:*** Develop enabling technologies to allow efficient and effective integration of propulsion, weapons, and subsystems into current and future air vehicles. ***FY 2022 Plans:*** Continue development of advanced kinetic and directed energy weapons integration technologies for Air Superiority 2030. Continue integrated full flow path demonstration of a medium bypass embedded engine for next generation mobility and completing the full flow path demonstration design. Continue design and analysis methods to allow rapid certification of stores separation for new small weapons on tactical aircraft. Initiate development of hybrid electric distributed propulsion vehicle integration designs for next generation vehicle concepts. ***FY 2023 Base Plans:*** In FY2023, this effort will transfer to Program 0602201F, Aerospace Vehicle Technologies, Project 622401, Structures, in order to effectively and efficiently align resources to Aerospace Systems Core Technical Competencies. ***FY 2022 to FY 2023 Increase/Decrease Statement:***	3.935	15.756	0.000	-	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602201F / *Aerospace Vehicle Technologies*	**Project (Number/Name)** 622404 / *Aeromechanics and Integration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
FY2023 decreased compared to FY2022 by $15.756 million. Funding decrease is due to transfer to Program 0602201F, Aerospace Vehicle Technologies, Project 622401, Structures.					
Accomplishments/Planned Programs Subtotals	7.451	29.941	9.745	-	9.745

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable.

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force			Date: April 2022
Appropriation/Budget Activity 3600 / 2	R-1 Program Element (Number/Name) PE 0602201F / *Aerospace Vehicle Technologies*	Project (Number/Name) 622405 / *High Speed Systems Technology*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
622405: *High Speed Systems Technology*	-	35.457	38.103	36.432	0.000	36.432	38.474	38.943	39.771	40.642	Continuing	Continuing

A. Mission Description and Budget Item Justification

This effort investigates, analyzes, and develops high speed/hypersonic aerospace vehicle technologies. Advanced high temperature structures concepts are explored and developed to exploit new materials, fabrication processes, and design techniques. Advanced aerodynamic vehicle configurations are developed and analyzed through simulations, experiments, and multi-disciplinary analyses. Advanced flight control technologies are developed and simulated for hypersonic vehicles. These technologies will enable future high speed weapons and platforms; intelligence, surveillance, and reconnaissance systems; and space access vehicles.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: High Speed Systems Technology	11.355	22.123	21.153	-	21.153
Description: Develop design analysis methods and technologies for high speed systems at extreme flight conditions. ***FY 2022 Plans:*** Continue to mature critical technologies for high speed/ hypersonic flight with primary emphasis on longer range flight and heavier payloads. Continue maturation of innovative structural concepts, analytical methods, service life predictions, airframe/engine integration, and thermal management techniques for structures. Complete development of design and analysis techniques and tools as well as experimental approaches to enable enhanced high-speed air induction system starting, operability, and performance for propulsion integration concepts over a wide range of flight conditions. Continue development of high speed system concepts that provide revolutionary capabilities including affordable expendable systems and robust reusable systems. Continue investigation of aeromechanic technologies to reduce drag and enable robust stability and control at all flight conditions. Continue efforts to characterize high-speed phenomena and develop and validate fundamental high-speed component technologies through ground and flight testing. Complete assessment of engagement, mission, and campaign-levels of effectiveness for promising high speed systems and refine concept designs to incorporate needed capabilities. ***FY 2023 Base Plans:*** Continue critical technology maturation for high speed/ hypersonic systems with primary emphasis on longer range flight and heavier payloads. Continue maturation of innovative aerospace structural concepts, analytical methods, service life predictions, airframe/engine integration, fluid/thermal/structural interactions and thermal					

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602201F / *Aerospace Vehicle Technologies*	**Project (Number/Name)** 622405 / *High Speed Systems Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
management techniques. Continue development of high speed system concepts, including flight research concepts, to provide revolutionary capabilities for affordable expendable systems and robust reusable systems. Complete investigation of aeromechanic technologies to reduce drag and enable robust stability and control at all flight conditions. Continue efforts to characterize high-speed structural phenomena, develop and validate fundamental high-speed component technologies through computational analysis, ground, and flight testing. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** FY2023 decreased compared to FY2022 by $0.970 million. Funding decrease due to decreased emphasis on high speed system structures.					
Title: High Speed Vehicle Aeromechanics and Integration	8.178	15.980	15.279	-	15.279
Description: Develop new and improved components, concepts, and designs for sustained flight of high-speed/ hypersonic expendable and re-useable vehicles. Conduct analyses of high speed/hypersonic vehicles to enable revolutionary capabilities. ***FY 2022 Plans:*** Continue to mature critical technologies for high speed/hypersonic flight with primary emphasis on longer range flight, heavier payloads, and high speed deployment. Continue development of design and analysis techniques and tools as well as experimental approaches to enhance high-speed engine inlet performance over a wide range of flight conditions. Continue development of high speed system concepts that provide revolutionary capabilities. Continue investigation of aeromechanic technologies to reduce drag, evaluate uncertainty, improve instrumentation accuracy, enable payload deployment, and achieve robust stability & control at all flight conditions. Continue efforts to characterize high-speed phenomena and develop and validate fundamental high-speed component technologies through ground and flight testing. Continue assessment of engagement, mission, and campaign level effectiveness for promising high speed system concepts and refine concept designs to incorporate needed capabilities. Complete assessment of campaign level benefits of preferred high speed weapon alternatives. ***FY 2023 Base Plans:*** Continue to mature critical technologies for high speed/hypersonic flight with primary emphasis on longer range and heavier payloads, with secondary emphasis on reusable systems. Continue development of multi-disciplinary design and analysis techniques and tools. Complete development of experimental approaches to enhance high-speed engine inlet performance over a wide range of flight conditions. Continue development of high speed system concepts that provide revolutionary capabilities through configuration research. Continue					

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602201F / *Aerospace Vehicle Technologies*	**Project (Number/Name)** 622405 / *High Speed Systems Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
investigation of aeromechanic technologies to reduce drag, evaluate uncertainty, improve instrumentation accuracy, include safe multi-body physics, and achieve robust stability & control at all flight conditions. Continue efforts to characterize high-speed aeromechanics phenomena and develop and validate fundamental high-speed component technologies through computational analysis, ground, and flight testing. Complete assessment of engagement, mission, and campaign level effectiveness for promising high speed system concepts and refine concept designs to incorporate needed capabilities. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** FY2023 decreased compared to FY2022 by $0.701 million. Funding decrease due to decreased emphasis on high speed vehicle technologies.					
Accomplishments/Planned Programs Subtotals	19.533	38.103	36.432	-	36.432

	FY 2021	FY 2022
Congressional Add: Program increase - secure UAV technologies ***FY 2021 Accomplishments:*** Conduct Congressionally directed efforts	9.703	-
Congressional Add: Program increase - modeling and testing of high temperature aero vehicle ***FY 2021 Accomplishments:*** Conduct Congressionally directed efforts.	3.881	-
Congressional Add: Program increase - hypersonic research and education ***FY 2021 Accomplishments:*** Conduct Congressionally directed efforts.	2.340	-
Congressional Adds Subtotals	15.924	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable.

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force			Date: April 2022
Appropriation/Budget Activity 3600 / 2	R-1 Program Element (Number/Name) PE 0602201F / *Aerospace Vehicle Technologies*	Project (Number/Name) 622406 / *Aerospace Power & Flight Control Technology*	

COST ($ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
622406: *Aerospace Power & Flight Control Technology*	-	25.130	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project develops integrated electrical and thermal management components, controls and systems for military aerospace applications. Power component technologies are developed to increase reliability, maintainability, commonality, affordability, and supportability of aircraft and flight line equipment. Research is conducted in energy storage and hybrid power system technologies to enable special purpose applications. Electrical power and thermal management technologies enable future military megawatt level power and thermal management needs. Controls and system integration technologies ensure the interoperability of aircraft, power, thermal, engine and other systems and subsystems. This project supports development of electrical power and thermal management components, controls and systems suitable for applications to legacy and future aircraft platforms including strike and mobility concepts. Lightweight power systems suitable for other aerospace applications are also developed. This project develops technologies that enable maximum affordable capability from manned, remotely-piloted and autonomous aerospace vehicles. Advanced control technologies are developed for maximum vehicle performance throughout the flight envelope and simulated in virtual environments. Resulting technologies contribute significantly towards the development of reliable autonomous or remotely piloted air vehicles, hypersonic aircraft, and extended-life legacy aircraft.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: High Power System Technologies ***Description:*** Develop integrated system architecture, controls, and component technologies to provide for the large amounts of electrical power needed, and concurrent thermal mitigation required, by current and future manned and unmanned systems. ***FY 2022 Plans:*** Not applicable. ***FY 2023 Base Plans:*** Not applicable. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Not applicable.	10.337	0.000	0.000	-	0.000
Title: Advanced Flight Control Technologies	3.391	0.000	0.000	-	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602201F / *Aerospace Vehicle Technologies*	**Project (Number/Name)** 622406 / *Aerospace Power & Flight Control Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Description: Develop technologies for advanced control-enabled capabilities, including flight controls, components, integrated vehicle management systems and software and system certification techniques for both manned/unmanned and remotely piloted aircraft. ***FY 2022 Plans:*** Not applicable ***FY 2023 Base Plans:*** Not applicable. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Not applicable.					
Title: Manned and Unmanned Teaming Technologies ***Description:*** Develop technology for flight control systems that will permit safe interoperability between manned and remotely piloted aircraft and effective teaming in adverse and contested environments. ***FY 2022 Plans:*** Not applicable. ***FY 2023 Base Plans:*** Not applicable. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** Not applicable.	8.809	0.000	0.000	-	0.000
Title: Flight Controls Technologies Modeling and Simulation ***Description:*** Develop tools and methods for capitalizing on simulation-based research and development of future aerospace vehicles. ***FY 2022 Plans:*** Not applicable. ***FY 2023 Base Plans:*** Not applicable. ***FY 2022 to FY 2023 Increase/Decrease Statement:***	2.593	0.000	0.000	-	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602201F / *Aerospace Vehicle Technologies*	**Project (Number/Name)** 622406 / *Aerospace Power & Flight Control Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Not applicable.					
Accomplishments/Planned Programs Subtotals	25.130	0.000	0.000	-	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable.

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force											Date: April 2022	
Appropriation/Budget Activity 3600 / 2					R-1 Program Element (Number/Name) PE 0602201F / *Aerospace Vehicle Technologies*				Project (Number/Name) 623066 / *Turbine Engine Technology*			
COST ($ in Millions)	**Prior Years**	**FY 2021**	**FY 2022**	**FY 2023 Base**	**FY 2023 OCO**	**FY 2023 Total**	**FY 2024**	**FY 2025**	**FY 2026**	**FY 2027**	**Cost To Complete**	**Total Cost**
623066: *Turbine Engine Technology*	-	2.924	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project develops technology to increase turbine engine operational reliability, durability, mission flexibility, and performance, while reducing weight, fuel consumption, and cost of ownership. Analytical and experimental areas of emphasis are fans and compressors, high temperature combustors, turbines, internal flow systems, controls, augmentor and exhaust systems, integrated power and thermal management systems, engine inlet integration, mechanical systems, adaptive cycle technologies, and structural design. The project investigates advanced propulsion, power, and thermal management system for subsonic, supersonic, or hypersonic vision systems for the 2025-2035 timeframe to: Develop and demonstrate propulsion technologies for subsonic expendable and attritable air platforms; develop and validate targeted life component design, materials, and modeling tools for all engine classes; develop advanced turbine engine technologies to enable significantly increased range and dash speed; investigate durability, efficiency, and specific power with reduced cost of ownership for reusable engines; develop pervasive, hydrocarbon fueled pressure gain propulsion technologies that offer increased efficiency, reduced propulsion system volume/weight, and truly disruptive vehicle performance to the warfighter; evaluate lubricants, mechanical systems, and combustion concepts for advanced turbine engines, pressure gain propulsion, and combined cycle engines; analysis for an adaptive cycle engine architecture that provides both optimized performance and fuel efficiency for widely varying mission needs.

This project supports joint Department of Defense, agency, and industry efforts to focus turbine propulsion technology on national needs. The project plan is relevant across capability areas for global responsive air superiority, strike, tactical and global mobility, responsive space lift, and persistent intelligence, surveillance, and reconnaissance (ISR).

B. Accomplishments/Planned Programs ($ in Millions)	**FY 2021**	**FY 2022**	**FY 2023 Base**	**FY 2023 OCO**	**FY 2023 Total**
Title: Turbofan/Turbojet Engine Technologies	1.287	0.000	0.000	-	0.000
Description: Develop core turbofan/turbojet engine components (i.e., fans, nozzles, compressors, combustors, and turbines and mechanical systems) for fighters, bombers, sustained supersonic/hypersonic cruise vehicles, and transports. ***FY 2022 Plans:*** Continue development of improved aerodynamic design tools and analysis methods to extend engine operability and efficiency. Continue developing physics-based bearing life model based on bearing alloy fatigue and microstructural investigations, including bearing life factors for advanced bearing materials. Continue incorporating fatigue life, fault evolution, and parametric heat generation of advanced material systems into the models. Continue development of oil-free bearing technology for Unmanned Air Systems. Continue the					

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602201F / *Aerospace Vehicle Technologies*	**Project (Number/Name)** 623066 / *Turbine Engine Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
development and demonstration of propulsion technologies for subsonic expendable and attritable air platforms, small and medium scale propulsion technologies, and evaluate lubricants, mechanical systems, bearing technology and combustion concepts for advanced turbine engines. Continue the development of fundamental knowledge of bearing material rolling contact fatigue failure mechanisms and lubricant interactions through microstructural investigations and failure analysis. ***FY 2023 Base Plans:*** Not applicable. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** No increase or decrease.					
Title: Turboshaft/Turboprop and Small Turbofan Engine Technologies ***Description:*** Develop components for turboshaft/turboprop and small turbofan engines for trainers, rotorcraft, special operations aircraft, and theater transports. ***FY 2022 Plans:*** Continue to demonstrate advanced component designs in rig testing. Continue to utilize validation data to develop improved test protocol for small engine augmentor designs. Continue development and validation of modeling and simulation tools for the design and analysis of turbine components with mission-tailored aero-performance and highly efficient cooling geometries. Continue the new innovative architectures, critical technologies, exploration of targeted life applications for small missile and remotely piloted aircraft applications; evaluate critical technologies that will increase range, performance, durability, electrical power and thermal capacity of these systems. Continue the exploration of new small engine technologies that can operate in high speed applications; Evaluate risk reduction technologies to increase usage time of systems. Continue demonstrating advanced component designs and modeling tools in rig and engine testing. Continue to utilize validation data to develop improved test protocol for small engine designs. Continue development and validation of modeling and simulation tools for the design and analysis of engine components with new manufacturing processes. Continue the exploration of advanced integrated engine controls with potential for synergistic airframe system level benefits. Continue exploration of new small and medium size engine technologies for increased fuel efficiency, propulsive capability, power and thermal management, and reduced life cycle cost. Continue identification of new architectures and critical technologies for integrated power and thermal systems. Continue identification of requirements and develop models for simulation of highly integrated systems. Continue exploring interactions and effects of compressor and turbine components on the combustor and combustor	0.234	0.000	0.000	-	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602201F / *Aerospace Vehicle Technologies*	**Project (Number/Name)** 623066 / *Turbine Engine Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
materials to reduce engine weight and increase efficiency. Continue using advanced diagnostics tools to develop high-quality datasets for use by academia and industry for model development and verification. Continue the determination of necessary reference performance and operability combustion systems and metrics to decrease the cost of certifying new and alternative fuels in weapon systems. Continue to support development of advanced computational fluid dynamics (CFD) models to reduce combustor and augmentor design costs. Continue development of computations, modeling and simulation, and research experimentation of advanced combustion concepts including pressure gain combustion components and system level architectures. Continue to explore advanced combustion and flameholding concepts working towards improved understanding at relevant operating conditions such as sub-atmospheric (less than 1 atmosphere) and high pressure (greater than 10 atmospheres); this includes fundamental combustion modeling and fluid-dynamic phenomena on high speed systems and rocket propulsion and advanced turbine engine applications, identifying modeling and simulation concepts/approaches to address combustion chemistry and physics and light/matter interactions, for high speed systems exploring turbulent combustion modeling in advanced configurations, exploring advanced combustion including pressure gain propulsion as it relates to new applications and architectures. Continue the development and demonstration of new tools and use of new designs and materials to improve efficiency, power under quiet operations. Continue investigation to identify and assess disruptive propulsion/power concepts and evaluate concepts. Continue development of new technologies for unmanned aircraft system propulsion/power systems for improved understanding at relevant operating conditions. ***FY 2023 Base Plans:*** Not applicable. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** No increase or decrease.					
Title: Diagnostic Technologies ***Description:*** Develop and demonstrate optical, electromechanical, and laser diagnostic tools and sensors for application to revolutionary propulsion technologies. ***FY 2022 Plans:*** Continue supporting computational fluid dynamics combustion modeling by providing, insights for interpreting experimental results using existing Modeling & Simulation methodologies and applying recently developed high-speed, spatially resolved laser diagnostics to our representative, single- element combustion experiments in order to demonstrate and deliver measurements of key combustion species and flow properties under high	0.000	0.000	0.000	-	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602201F / *Aerospace Vehicle Technologies*	**Project (Number/Name)** 623066 / *Turbine Engine Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
pressure conditions. Continue development of diagnostic tools/methods for robust measurement capability in engine test cells and full annular ground test environments including reacting and non-reacting spray experiments for liquid fuel spray model development and employment of Nonintrusive optical diagnostics that will be used to obtain accurate, spatially/temporally resolved data. This provides the local flow field data required for comparisons to results of numerical simulations. Continue the development of improved numerical methods and turbulent combustion models to guide design and development of experimental components and systems utilizing existing Modeling & Simulation methodologies. ***FY 2023 Base Plans:*** Not applicable ***FY 2022 to FY 2023 Increase/Decrease Statement:*** No increase or decrease.					
Title: Revolutionary Propulsion Technology ***Description:*** Develop, test, and evaluate revolutionary propulsion concepts for gas turbine, pressure gain propulsion, and combined cycle engines for missiles, manned and unmanned systems. ***FY 2022 Plans:*** Continue identification of control technology elements applicable to integrated propulsion/power/thermal solutions. Continue evaluation of power and thermal modeling of advanced architectures into aircraft system level multidisciplinary analysis and optimization tools: explore new control methods for integrated propulsion, power and thermal management; continue evaluation of integration of advanced augmentors and ramburners; continue exploration of new expendable and attritable architectures. Continue the development and evaluation of advanced, integrated propulsion technologies for supersonic expendable, attritable, and reusable strike and Intelligence, Surveillance, and Reconnaissance (ISR) systems. Continue studies for exploration of advanced propulsion technologies. Continue exploration and evaluation of innovative architectures for affordable & efficient air- launched propulsion capability from Mach 3 to Mach 5+, and turbine based combined cycle propulsion capability to Mach 5+. ***FY 2023 Base Plans:*** Not applicable. ***FY 2022 to FY 2023 Increase/Decrease Statement:***	0.789	0.000	0.000	-	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602201F / *Aerospace Vehicle Technologies*	**Project (Number/Name)** 623066 / *Turbine Engine Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
No increase or decrease.					
Title: Missile and Unmanned Aerial System (UAS) Engine Technologies ***Description:*** Develop limited life engine components for missile and Unmanned Aerial System (UAS) applications, including long-range subsonic, supersonic and hypersonic vehicles. ***FY 2022 Plans:*** Continue identification of control technology elements applicable to integrated propulsion/power/thermal solutions. Continue evaluation of power and thermal modeling of advanced architectures into aircraft system level multidisciplinary analysis and optimization tools: explore new control methods for integrated propulsion, power and thermal management; continue evaluation of integration of advanced augmentors and ramburners; continue exploration of new expendable and attritable architectures. Continue the development and evaluation of advanced, integrated propulsion technologies for supersonic expendable, attritable, and reusable strike and Intelligence, Surveillance, and Reconnaissance (ISR) systems. Continue exploration of new engine concepts for missile and unmanned systems. ***FY 2023 Base Plans:*** Not applicable. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** No increase or decrease.	0.614	0.000	0.000	-	0.000
Title: Lubricant Technologies ***Description:*** Develop, test, and qualify advanced turbine engine lubricants. Generate and maintain military specifications for aviation engine lubricants. ***FY 2022 Plans:*** Continue developing innovative fluids by; defining target requirements for new polyol ester oils, conducts Research & Development for new/enhanced turbine engine oils for legacy & emerging engines, qualifies new & updated engine oil products for legacy & emerging engines. Continue the development of lubricant modeling through characterization of heat generation, lubrication system cooling effectiveness, failure progression of bearing materials under relevant engine conditions, and overall system performance of advanced bearing concepts for model validation. Continue supporting the warfighter on field-related mechanical system issues. Continue performance validation study of advanced bearing designs/materials, lubricant & lubrication system components via full-scale high-fidelity laboratory parametric testing at representative engine operating	0.000	0.000	0.000	-	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602201F / *Aerospace Vehicle Technologies*	**Project (Number/Name)** 623066 / *Turbine Engine Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
conditions. Continue the generation of the fatigue life database & assess fatigue growth characteristics of state of the art baseline, emerging, & advanced engine rolling element bearing materials thru sub-scale experimental investigations. ***FY 2023 Base Plans:*** Not applicable. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** No increase or decrease.					
Accomplishments/Planned Programs Subtotals	2.924	0.000	0.000	-	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable.

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force											Date: April 2022	
Appropriation/Budget Activity 3600 / 2					R-1 Program Element (Number/Name) PE 0602201F / *Aerospace Vehicle Technologies*				Project (Number/Name) 625172 / *NUCLEAR SYSTEM TECHNOLOGY*			
COST ($ in Millions)	**Prior Years**	**FY 2021**	**FY 2022**	**FY 2023 Base**	**FY 2023 OCO**	**FY 2023 Total**	**FY 2024**	**FY 2025**	**FY 2026**	**FY 2027**	**Cost To Complete**	**Total Cost**
625172: *NUCLEAR SYSTEM TECHNOLOGY*	-	0.000	3.652	3.534	0.000	3.534	3.616	3.679	3.359	3.434	Continuing	Continuing

A. Mission Description and Budget Item Justification

This project provides sustaining S&T to preserve nuclear deterrence for future generations, develops complimentary projects to inform future systems, establishing inter-agency partnerships for Modeling & Simulation (M&S) and test platforms, and coordinates with existing programs for next generation strategic systems development and test platforms.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Title: Nuclear Technologies	0.000	3.652	3.534	-	3.534
Description: Develop nuclear-related technologies to support National requirements for nuclear deterrence operations including environmental modeling and simulation on re-entry systems. ***FY 2022 Plans:*** Continue to test new algorithms on high performance computing capabilities with special focus on automation of seismic event discrimination and characterization, improving earth structure models, and developing analysis methods for emerging detection technologies. Continue to exercise earth models in use in high-performance computing modeling and simulation codes for operational expert analysis of difficult-to-discriminate earthquakes and explosions. Continue to test specific algorithms for application of big data heuristics to more quickly characterize seismic events. Continue to further develop new statistical approaches to the behavior of discriminants for local and regional seismic events. Initiate refinement of distributed acoustic sensing methodology to provide a new detection solution for seismic explosion monitoring. ***FY 2023 Base Plans:*** Continue to develop and test new algorithms using high performance capabilities which focus on automation of seismic event discrimination and characterization. Continue to develop earth models and statistical approaches to advance the ground-based seismic nuclear monitoring mission through improving anomaly detection, attribution and protection. Continue to further develop new statistical approaches to the behavior of discriminants for local and regional seismic events. Initiate enhanced seismic monitoring with distributed acoustic sensing with machine learning data analysis approaches. Continue development of end-to-end modeling suite for re-entry systems by incorporating additional flight physics databases and solvers and adding more user/analysis tools. Continue aerothermal model validation and development through various testing					

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602201F / *Aerospace Vehicle Technologies*	**Project (Number/Name)** 625172 / *NUCLEAR SYSTEM TECHNOLOGY*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
mechanisms. Initiate analysis of strategic command, control, and communications to identify space-layer technologies of interest. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** FY 2023 decreased compared to FY 2022 by $0.118 million. Justification for this decrease is described in plans above.					
Accomplishments/Planned Programs Subtotals	0.000	3.652	3.534	-	3.534

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable