Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Air Force											Date: March 2023	
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 2022**	**FY 2023**	**FY 2024 Base**	**FY 2024 OCO**	**FY 2024 Total**	**FY 2025**	**FY 2026**	**FY 2027**	**FY 2028**	**Cost To Complete**	**Total Cost**
Total Program Element	-	173.628	199.453	161.268	0.000	161.268	157.425	160.803	164.169	190.877	Continuing	Continuing
622401: *Structures*	-	97.151	80.320	67.567	0.000	67.567	66.654	68.320	69.721	74.439	Continuing	Continuing
622403: *Flight Controls and Pilot-Vehicle Interface*	-	15.207	39.422	39.916	0.000	39.916	38.649	39.529	40.397	57.840	Continuing	Continuing
622404: *Aeromechanics*	-	16.731	9.745	10.135	0.000	10.135	9.115	9.312	9.507	11.111	Continuing	Continuing
622405: *High Speed Systems Technology*	-	38.685	66.432	40.026	0.000	40.026	39.307	40.251	41.083	43.901	Continuing	Continuing
625172: *NUCLEAR SYSTEM TECHNOLOGY*	-	5.854	3.534	3.624	0.000	3.624	3.700	3.391	3.461	3.586	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, autonomy and 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, digitize, and analyze 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.

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 2024 Air Force	Date: March 2023
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*

B. Program Change Summary ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Previous President's Budget	183.032	159.453	163.842	0.000	163.842
Current President's Budget	173.628	199.453	161.268	0.000	161.268
Total Adjustments	-9.404	40.000	-2.574	0.000	-2.574
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	40.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-9.404	0.000			
• Other Adjustments	0.000	0.000	-2.574	0.000	-2.574

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2022	FY 2023
Project: 622401: *Structures*		
Congressional Add: *Program increase - Educational partnership agreement for secure UAV technologies*	9.842	-
Congressional Add: *Program increase - Collaborative hypersonic demonstration*	9.842	-
Congressional Add: *Full scale determinant assembly for hypersonic airframe structures*	-	10.000
Congressional Add Subtotals for Project: 622401	19.684	10.000
Project: 622405: *High Speed Systems Technology*		
Congressional Add: *Program increase - educational agreement partnership for aerospace engineering security integration*	-	10.000
Congressional Add: *Program increase: educational partnership agreement for secure UAV technologies*	-	10.000
Congressional Add: *Program increase: collaborative hypersonic demonstration*	-	10.000
Congressional Add Subtotals for Project: 622405	-	30.000
Congressional Add Totals for all Projects	19.684	40.000

Change Summary Explanation

FY 2024 funding decreased in the FY 2024PB compared to the FY 2023PB by $2.574 million. The decrease is due to the completion of Aircraft Service Life technology efforts as well as funding for the University Affiliated Research Center for Tactical Autonomy transferring to a new PE, 0602022F.

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force			Date: March 2023
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 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
622401: *Structures*	-	97.151	80.320	67.567	0.000	67.567	66.654	68.320	69.721	74.439	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.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Aircraft Service Life Technologies	27.976	1.996	0.000
Description: Develop an economic service life analysis capability comprised of analysis tools, methodologies, and structural health monitoring technologies. ***FY 2023 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 2024 Plans:*** Not Applicable ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 decreased compared to FY 2023 by $1.996 million. Funding decreased due to completion of technology development for Aircraft Service Life.			
Title: Vehicle Design Technologies	25.454	18.137	18.137
Description: Develop methodologies to reduce the cost and time involved from design to full-scale testing of structural concepts and aerospace systems. ***FY 2023 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 2024 Plans:***			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force		Date: March 2023
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 2022	FY 2023	FY 2024
Continue the development of advanced high fidelity aircraft design tools. Continue the development of new design methods that link vehicle system requirements to mission operation performance. Continue the integration of model-based system engineering methodology with risk-aware aircraft design methods. Initiate the integration of cost, mission effectiveness and affordable manufacturing methods with uncertainty quantification across all performance variables to include risk. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Not Applicable			
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 2023 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 2024 Plans:*** Complete development of innovative structural design methods to dramatically reduce weight and complexity of aircraft structures. Complete the 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. Continue 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. Initiate systems engineering assessments for the development of airworthiness certification criteria for advanced airframe structures. Initiate the validation of innovative structural design methods to dramatically reduce weight and complexity of aircraft structures. Initiate the demonstration of the fatigue life of bonded unitized composite structures for the next generation of aircraft ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Not Applicable	24.037	24.938	24.938
Title: Next Generation Aerodynamic Technologies ***Description:*** Develop and assess technologies for the next generation of multi-role large aircraft.	0.000	8.075	7.318

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force		Date: March 2023
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 2022	FY 2023	FY 2024
FY 2023 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 2024 Plans:*** Continue the development of advanced high fidelity aerodynamic analysis tools for aircraft conceptual design. Continue assessment of innovative next generation vehicle concepts. Initiate modeling and simulation development for the assessment of fuel and energy use. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 decreased compared to FY 2023 by $0.757 million. Funding decreased due to the completion of tactical refueling boom design.			
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 2023 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 2024 Plans:*** Complete integrated full flow path demonstration of a medium bypass embedded engine for next generation mobility. Complete development of hybrid electric distributed propulsion vehicle integration designs for next generation vehicle concepts. Continue development of novel kinetic weapons integration technologies for enhanced weapon payload in attritable platforms. Initiate the development of a modeling and simulation approach to the design and integration of embedded propulsion systems. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Not Applicable	0.000	17.174	17.174
Accomplishments/Planned Programs Subtotals	77.467	70.320	67.567

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force		Date: March 2023
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602201F / *Aerospace Vehicle Technologies*	**Project (Number/Name)** 622401 / *Structures*

	FY 2022	FY 2023
Congressional Add: Program increase - Educational partnership agreement for secure UAV technologies ***FY 2022 Accomplishments:*** Conduct Congressionally directed efforts.	9.842	-
Congressional Add: Program increase - Collaborative hypersonic demonstration ***FY 2022 Accomplishments:*** Conduct Congressionally directed efforts. This effort will be executed in Program 0602201F, Aerospace Vehicle Technologies, Project 622405, High Speed Systems Technology.	9.842	-
Congressional Add: Full scale determinant assembly for hypersonic airframe structures ***FY 2023 Plans:*** Conduct Congressionally directed efforts. This effort will be executed in Program 0602201F, Aerospace Vehicle Technologies, Project 622401, Structures.	-	10.000
Congressional Adds Subtotals	19.684	10.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable.

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force			Date: March 2023
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 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
622403: *Flight Controls and Pilot-Vehicle Interface*	-	15.207	39.422	39.916	0.000	39.916	38.649	39.529	40.397	57.840	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 2022	FY 2023	FY 2024
Title: Advanced Flight Controls Technologies	3.504	9.362	9.478
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 2023 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 2024 Plans:*** Continue the development of a trusted autonomy approach, integrating certification processes and autonomy development. Continue the development, demonstration and assessment of autonomy capabilities for dynamic tasking in complex environments. Initiate the development of autonomy optimization and assurance in dynamic and uncertain environments. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 increased compared to FY 2023 by $0.116 million. Funding increase described in plans above.			
Title: Manned and Unmanned Teaming Technologies	9.007	22.858	23.144
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 2023 Plans:***			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force		Date: March 2023
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 2022	FY 2023	FY 2024
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 2024 Plans:*** 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. Continue the development, demonstration and assessment of autonomous behaviors to address mission capability gaps, such as operations of unmanned systems in terminal environments. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 increased compared to FY 2023 by $0.286 million. Funding increase described in plans above.			
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 2023 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 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 2024 Plans:*** Continue trade studies of vehicle concepts for strike, mobility and reconnaissance. Continue manned-unmanned teaming evaluations including rapid development of new integrated capabilities. Continue analyses of capability concepts for future advanced development programs. Continue modeling and simulation efforts to assess emerging aerospace technologies and	2.696	7.202	7.294

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force		Date: March 2023
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 2022	FY 2023	FY 2024
concepts in complex and dynamic battlespace environments. Continue digital engineering efforts to create a digital continuum of military utility and cost effectiveness analysis for investment planning to technology development to technology transition. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 increased compared to FY 2023 by $0.092 million. Funding increase described in plans above.			
Accomplishments/Planned Programs Subtotals	15.207	39.422	39.916

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable.

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force			Date: March 2023
Appropriation/Budget Activity 3600 / 2	R-1 Program Element (Number/Name) PE 0602201F / *Aerospace Vehicle Technologies*	Project (Number/Name) 622404 / *Aeromechanics*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
622404: *Aeromechanics*	-	16.731	9.745	10.135	0.000	10.135	9.115	9.312	9.507	11.111	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 2022	FY 2023	FY 2024
Title: Aerodynamic Systems Technologies	3.766	9.745	10.135
Description: Develop aerodynamic assessment prediction methods centered on expanding the design capabilities of future air vehicles.			
FY 2023 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 2024 Plans: Complete 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. Continue design assessments of long-endurance unmanned platforms. Continue the development of prediction methods which include air vehicle stability and control requirements.			
FY 2023 to FY 2024 Increase/Decrease Statement: FY 2024 increased compared to FY 2023 by $0.390 million. Increase described in plans above.			
Title: Next Generation Aerodynamic Technologies	4.160	0.000	0.000
Description: Develop and assess technologies for the next generation of multi-role large aircraft.			
FY 2023 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force		Date: March 2023
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602201F / *Aerospace Vehicle Technologies*	**Project (Number/Name)** 622404 / *Aeromechanics*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
In FY 2023, 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 2024 Plans:*** Not applicable ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Not applicable			
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 2023 Plans:*** In FY 2023, 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 2024 Plans:*** Not applicable ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Not applicable	8.805	0.000	0.000
Accomplishments/Planned Programs Subtotals	16.731	9.745	10.135

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable.

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force			Date: March 2023
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 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
622405: *High Speed Systems Technology*	-	38.685	66.432	40.026	0.000	40.026	39.307	40.251	41.083	43.901	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 subsystem, integration and analysis 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 2022	FY 2023	FY 2024
Title: High Speed Systems Technology	22.461	21.153	23.240
Description: Develop design analysis methods and technologies for high speed systems at extreme flight conditions.			
FY 2023 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 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 2024 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 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. Continue efforts to characterize high-speed vehicle system phenomena, develop and validate fundamental high-speed component technologies through computational analysis, ground, and flight testing.			
FY 2023 to FY 2024 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force		Date: March 2023
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 2022	FY 2023	FY 2024
FY 2024 increased compared to FY 2023 by $2.087 million. Funding increased to accelerate development of innovative reusable structural concepts for hypersonic platforms.			
Title: High Speed Vehicle Aeromechanics and Integration ***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 2023 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 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 2024 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. Continue development of high speed system concepts that provide revolutionary capabilities through configuration research. Continue investigation of aeromechanic technologies to evaluate uncertainty, improve instrumentation accuracy and safe multi-body physics; Complete initial investigation of aeromechanic technologies to reduce drag 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. Initiate investigation of advanced aeromechanic technologies to extend system range through improvement of system lift/drag ratio and maintain robust stability and control at all flight conditions. Initiate investigation of computational and ground based experimental approaches to improved air induction systems over a wide range of flight conditions. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 increased compared to FY 2023 by $1.507 million. Funding increased to accelerate development of Integrated vehicle designs with robust stability and control.	16.224	15.279	16.786
Accomplishments/Planned Programs Subtotals	38.685	36.432	40.026

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force		Date: March 2023
Appropriation/Budget Activity 3600 / 2	**R-1 Program Element (Number/Name)** PE 0602201F / *Aerospace Vehicle Technologies*	**Project (Number/Name)** 622405 / *High Speed Systems Technology*

	FY 2022	FY 2023
Congressional Add: Program increase - educational agreement partnership for aerospace engineering security integration ***FY 2023 Plans:*** Conduct Congressionally directed efforts. This effort will be executed in Program 0602201F, Aerospace Vehicle Technologies.	-	10.000
Congressional Add: Program increase: educational partnership agreement for secure UAV technologies ***FY 2023 Plans:*** Conduct Congressionally directed efforts. This effort will be executed in Program 0602201F, Aerospace Vehicle Technologies, Project 622405, High Speed Systems Technology.	-	10.000
Congressional Add: Program increase: collaborative hypersonic demonstration ***FY 2023 Plans:*** Conduct Congressionally directed efforts. This effort will be executed in Program 0602201F, Aerospace Vehicle Technologies, Project 622405, High Speed Systems Technology.	-	10.000
Congressional Adds Subtotals	-	30.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable.

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force			Date: March 2023
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 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
625172: *NUCLEAR SYSTEM TECHNOLOGY*	-	5.854	3.534	3.624	0.000	3.624	3.700	3.391	3.461	3.586	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 2022	FY 2023	FY 2024
Title: Nuclear Technologies	5.854	3.534	3.624

Description: Develop nuclear-related technologies to support National requirements for nuclear deterrence operations including environmental modeling and simulation on re-entry systems.

FY 2023 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 mechanisms. Initiate analysis of strategic command, control, and communications to identify space-layer technologies of interest.

FY 2024 Plans:

Initiate development of nuclear re-entry systems modeling and simulation coordinated with PE 0603273F. Continue development and testing of advanced numerical methods for implementation of dynamic techniques for improved event discrimination and characterization for local and regional seismic events. Continue developing earth models and statistical approaches to the behavior of discriminants for local and regional seismic events. Continue model and algorithm development and testing of detection techniques to advance the ground-based seismic nuclear monitoring mission through improved anomaly detection, attribution and protection. Continue enhanced seismic monitoring with distributed acoustic sensing with machine learning data analysis approach to analyze geometries for noise reduction. Initiate new advanced waveform tomography with 3D source simulations, linear wave propagation simulations and earth structure models to enhance prediction capabilities.

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force		Date: March 2023
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 2022	FY 2023	FY 2024
Continue aerothermal model validation and development through various testing mechanisms to include the development of integrated end-to-end physics based modeling suite to predict aerodynamic flow fields, signatures and material characterizations. Continue to improve modeling fidelity of plasma chemistry through machine learning models for product state distributions. Continue analysis of strategic command, control, and communications to identify space-layer technologies of interest. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 increased compared to FY 2023 by $0.090 Million. Justification for this increase is described in plans above.			
Accomplishments/Planned Programs Subtotals	5.854	3.534	3.624

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
• RDTE 03 0603273F: *Science & Technology for Nuclear Re-entry Systems*	0.000	39.431	70.162	-	70.162	87.945	118.933	155.791	161.244	Continuing	Continuing

Remarks

D. Acquisition Strategy

Not applicable