Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force												Date: May 2021
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 3: *Advanced Technology Development (ATD)*					R-1 Program Element (Number/Name) PE 0603211F / *Aerospace Technology Dev/Demo*							
COST ($ in Millions)	**Prior Years**	**FY 2020**	**FY 2021**	**FY 2022 Base**	**FY 2022 OCO**	**FY 2022 Total**	**FY 2023**	**FY 2024**	**FY 2025**	**FY 2026**	**Cost To Complete**	**Total Cost**
Total Program Element	-	95.730	62.117	70.486	0.000	70.486	-	-	-	-	-	-
634094: *Next Gen Platform Dev/ Demo*	-	0.000	0.000	17.288	0.000	17.288	-	-	-	-	-	-
634920: *Flight Vehicle Tech Integration*	-	40.860	62.117	36.788	0.000	36.788	-	-	-	-	-	-
634926: *High Speed Systems Integ & Demo*	-	32.849	0.000	11.058	0.000	11.058	-	-	-	-	-	-
634927: *Flight Systems Control*	-	22.021	0.000	5.352	0.000	5.352	-	-	-	-	-	-

A. Mission Description and Budget Item Justification

This program supports Department of Defense (DoD) priorities for demonstrations in hypersonics and manned/unmanned systems, respectively. This effort integrates and demonstrates advanced flight vehicle technologies that improve the performance and supportability of existing and future aerospace vehicles. System level integration brings together aerospace vehicle technologies along with avionics, propulsion, and weapon systems for demonstration in a near-realistic operational environment. Integration and technology demonstrations reduce the risk and time required to transition technologies into operational aircraft. Projects in this program have been coordinated through the DoD Science and Technology (S&T) Executive Committee process to harmonize efforts and eliminate duplication.

The Department of the Air Force technologies in this program are both enabling and enduring as we invest in maturing emerging technologies that address established mission gaps, and transformational technologies that address integrated enterprise capabilities intended to reshape the future force across air, space, and cyber warfighting domains. Development of transformational operational capabilities through advanced technology solutions focuses on five strategic capabilities: Global Persistent Awareness; Resilient Information Sharing; Rapid, Effective Decision-Making; Complexity, Unpredictability, and Mass; and Speed and Reach of Disruption and Lethality.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver science & technology capabilities. The use of program funds in this PE would be in addition to the civilian pay expenses budgeted in program elements 0601102F, 0602102F, 0602201F, 0602203F, 0602204F, 0602602F, 0602605F, 0602788F, 1206601SF, and 0602298F.

In FY 2022, the seismic technologies efforts of PE 1206616SF, Space Advanced Technology Development/Demo, were transferred to Appropriation 3600, Research, Development, Test & Evaluation, Air Force, PE 0603211F, Aerospace Technology Dev/Demo, Project 634928, Space and Missile Propulsion & Systems, from Appropriation 3620, Budget Activity (BA) 03 due to the creation of a new Appropriation for Space Force.

This program is in Budget Activity 3, Advanced Technology Development because this budget activity includes development of subsystems and components and efforts to integrate subsystems and components into system prototypes for field experiments and/or tests in a simulated environment.

Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Air Force	Date: May 2021
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603211F / *Aerospace Technology Dev/Demo*

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	127.949	0.000	0.000	0.000	0.000
Current President's Budget	95.730	62.117	70.486	0.000	70.486
Total Adjustments	-32.219	62.117	70.486	0.000	70.486
• Congressional General Reductions	0.000	-0.113			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	25.000	25.000			
• Congressional Directed Transfers	0.000	37.230			
• Reprogrammings	-24.121	0.000			
• SBIR/STTR Transfer	-4.495	0.000			
• Other Adjustments	-28.603	0.000	70.486	0.000	70.486

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2020	FY 2021
Project: 634920: *Flight Vehicle Tech Integration*		
Congressional Add: *Program Increase - Agility Prime*	25.000	25.000
Congressional Add Subtotals for Project: 634920	25.000	25.000
Congressional Add Totals for all Projects	25.000	25.000

Change Summary Explanation

Increase in FY 2022 of 70.486 million is due to the following:

1) Congressional reversal of Program Element restructure

2) Realignment of Project 63682J, Spacecraft Vehicles, from PE 0603401F, Advanced Spacecraft Technology to Project 634094, Next Gen Platform Dev/Demo to PE 0603211F, Aerospace Technology Dev/Demo.

3) Increased emphasis in low cost attritable aircraft technologies.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603211F / *Aerospace Technology Dev /Demo*	Project (Number/Name) 634094 / *Next Gen Platform Dev/Demo*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
634094: *Next Gen Platform Dev/ Demo*	-	0.000	0.000	17.288	0.000	17.288	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project develops next-generation solid state, radiation-hardened strategic advance inertial system components for hostile environments.

This Project and associated efforts will continue to be executed by the Air Force Research Laboratory Space Vehicles Technology Directorate located in Kirtland Air Force Base, New Mexico.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Inertial Sensor Navigation Technologies	0.000	0.000	17.288
Description: Develop next-generation solid state, radiation-hardened strategic advance inertial system components for hostile environment. ***FY 2021 Plans:*** In FY 2021, this work was performed under the Inertial Sensor Navigation Technologies effort in PE 0603401F, Advanced Spacecraft Technology, Project 63682J, Spacecraft Vehicles. ***FY 2022 Plans:*** Complete gravity gradiometer testbed design. Complete design and development of second gyroscope prototype and execute environment testing; initiate nesting work with prototype. Continue design of first inertial measurement unit engineering design unit and design of radiation hardened electronics module. Continue to mature modeling, simulation, and test/validation procedures for inertial sensor systems in relevant strategic environments. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 by $17.288 million. Funding increased due to the transfer and realignment of the work in the inertial sensor navigation technologies effort in PE 0603401F, Advanced Spacecraft Technology, Project 63682J, Spacecraft Vehicles to PE 0603211F, Aerospace Technology Dev/Demo, Project 634094, Next Gen Platform Dev/Demo due to the creation of a new Appropriation for Space Force.			
Accomplishments/Planned Programs Subtotals	0.000	0.000	17.288

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603211F / *Aerospace Technology Dev /Demo*	**Project (Number/Name)** 634094 / *Next Gen Platform Dev/Demo*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603211F / *Aerospace Technology Dev /Demo*	Project (Number/Name) 634920 / *Flight Vehicle Tech Integration*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
634920: *Flight Vehicle Tech Integration*	-	40.860	62.117	36.788	0.000	36.788	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project demonstrates advanced aerospace vehicle technologies. Aerospace Vehicle Technology Integration efforts are accomplished through integration of various technologies to include avionics, advanced propulsion, and weapon systems for demonstration in near-realistic operational environments. Advanced Aerospace Structures Technologies are demonstrated to enhance the capability of current and future aerospace vehicles.

This project includes the initiation and development of programs addressing DAF capability gaps and provides technologies for transformational future force capabilities. Transformational efforts will be identified through a competitive process and be responsive to DAF design priorities. Selected efforts will be designated as transformational, indicating enterprise-level priority.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Aerospace Vehicle Technology Integration	7.467	17.477	36.788
Description: Develop, simulate, and demonstrate integrated technologies to improve the performance of aerospace platform capabilities. ***FY 2021 Plans:*** Continue integrated full flow path demonstration of a medium bypass embedded engine for next generation mobility. Continue the flight demonstration of a low cost unmanned aerospace systems capable of interoperations with different unmanned aerospace systems assets; completing the next sensor extension variant in FY 2021 and initiate an off-board weapons station variant. Initiate next variant of a low cost unmanned aerospace system. Complete propulsion integration component validation tests for Air Superiority 2030 requirements. Complete flight demonstrations of practical laminar flow for swept wing aircraft designs. ***FY 2022 Plans:*** Complete the flight demonstration of a low cost unmanned aerospace systems capable of interoperations with different unmanned aerospace systems assets. Continue next variant of a low cost unmanned aerospace system. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 by $19.311 million. Funding increased due to increased emphasis in Aerospace Vehicle Technology Integration including low cost attritable aircraft technology.			
Title: Advanced Aerospace Structure Technologies	8.393	19.640	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603211F / *Aerospace Technology Dev /Demo*	**Project (Number/Name)** 634920 / *Flight Vehicle Tech Integration*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Description: Develop and demonstrate affordable, lightweight, adaptive, and multifunctional structural concepts integrated into aerospace systems. ***FY 2021 Plans:*** Complete low cost airframe design and manufacturing demonstrations. Continue fully automated manufacturing demonstrations of large airframe structures. Complete structural life extension demonstration of legacy fleet metallic structures. Continue validation tests of life extension and durability methods for legacy fleet composite structures in support of aircraft Service Life Extension programs. ***FY 2022 Plans:*** Not applicable. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 decreased compared to FY 2021 by $19.64 million. Funding decreased due to decreased emphasis in advanced aerospace structure technologies.			
Accomplishments/Planned Programs Subtotals	15.860	37.117	36.788

	FY 2020	FY 2021
Congressional Add: Program Increase - Agility Prime	25.000	25.000
FY 2020 Accomplishments: Conduct Congressionally directed efforts.		
FY 2021 Plans: Conduct Congressionally directed efforts. This effort will be executed in PE 0604858F, Tech Transition Program.		
Congressional Adds Subtotals	25.000	25.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603211F / *Aerospace Technology Dev /Demo*	Project (Number/Name) 634926 / *High Speed Systems Integ & Demo*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
634926: *High Speed Systems Integ & Demo*	-	32.849	0.000	11.058	0.000	11.058	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project develops, integrates and demonstrates, via simulations, ground, and flight tests, advanced flight vehicle technologies that improve the performance and supportability of future high speed/hypersonic vehicles. System level integration brings together air vehicle technologies with avionics, propulsion, warheads and other aerospace subsystems for demonstration in a near-realistic operational environment. Integration and technology demonstrations reduce the risk and time required to transition technologies into operational systems.

This project includes the initiation and development of programs addressing DAF capability gaps and provides technologies for transformational future force capabilities. Transformational efforts will be identified through a competitive process and be responsive to DAF design priorities. Selected efforts will be designated as transformational, indicating enterprise-level priority.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: High Speed/Hypersonic Vehicle Technologies	32.849	0.000	11.058
Description: Develop, simulate, and demonstrate integrated vehicle technologies to enable and improve the performance of future high-speed and hypersonic systems. ***FY 2021 Plans:*** Complete development and demonstration of tactically-relevant long-range high-speed strike technologies including ground and flight demonstrations needed. Complete some flight test activities for both Hypersonic Air-breathing Weapon Concept and Tactical Boost Glide. Initiate Advanced Airbreathing technology maturation activities to expand performance capabilities of high speed systems. ***FY 2022 Plans:*** Continue Multi-Mission Cruiser technology maturation activities to expand performance capabilities of high speed systems. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 by $11.058 million. Funding increase due to increased emphasis on high speed and hypersonic vehicle technologies.			
Accomplishments/Planned Programs Subtotals	32.849	0.000	11.058

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603211F / *Aerospace Technology Dev /Demo*	**Project (Number/Name)** 634926 / *High Speed Systems Integ & Demo*

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force			Date: May 2021
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603211F / *Aerospace Technology Dev /Demo*	Project (Number/Name) 634927 / *Flight Systems Control*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
634927: *Flight Systems Control*	-	22.021	0.000	5.352	0.000	5.352	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This program integrates and demonstrates advanced control technologies that improve the performance, reliability, safety, and survivability of existing and future, manned and unmanned, aerospace systems. Enhanced capabilities are enabled by control, automation, and system level integration of subsystems and systems such as propulsion, airframes, avionics, power & thermal management, weapons, communications, and operator interfaces. Modeling and simulation, integration, and technology demonstrations in a near-operational environment reduce the risk and time required to transition technologies into existing and future aerospace systems.

This project includes the initiation and development of programs addressing DAF capability gaps and provides technologies for transformational future force capabilities. Transformational efforts will be identified through a competitive process and be responsive to DAF design priorities. Selected efforts will be designated as transformational, indicating enterprise-level priority.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Autonomous Systems Control	22.021	0.000	5.352

Description: Develop, simulate, and demonstrate advanced automation and control-enabled capabilities for manned or unmanned aerospace platforms. Develop, simulate, and demonstrate autonomous flight controls for safe flight and cooperative operations between manned and remotely piloted air platforms.

FY 2021 Plans:

Continue development and demonstration of technologies for situational awareness, autonomous control, and survivability for unmanned systems and manned platforms. Continue to incorporate autonomous and safe airspace interoperability for manned and remotely piloted aircraft systems, airborne control of teams of unmanned aircraft, and unmanned sense-and-avoid technologies for ground and air operations to the autonomy spiral demonstrations. Continue development of technologies to reduce risk for transition of collision avoidance technologies to 4th and 5th-gen aircraft. Continue development of foundational autonomy for unmanned systems and spiral demonstrations of capability, including safe airspace interoperability and sense and avoid for air and ground operations. Continue spiral autonomy demonstration of manned-unmanned teaming capability incorporating the above technology transitions, including pilot-directed autonomous control.

FY 2022 Plans:

Continue development and demonstration of technologies for situational awareness, autonomous control, and survivability for unmanned systems and manned platforms. Continue research to incorporate autonomous and safe airspace interoperability for manned and remotely piloted aircraft systems, airborne control of teams of unmanned aircraft, and unmanned sense and avoid

Exhibit R-2A, RDT&E Project Justification: PB 2022 Air Force		Date: May 2021
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603211F / *Aerospace Technology Dev /Demo*	**Project (Number/Name)** 634927 / *Flight Systems Control*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
technologies for ground and air operations to the autonomy spiral demonstrations. Complete development of technologies to reduce risk for transition of collision avoidance technologies to 4th and 5th-gen aircraft. Complete development of foundational autonomy for unmanned systems and spiral demonstrations of capability, including safe airspace interoperability ***FY 2021 to FY 2022 Increase/Decrease Statement:*** FY 2022 increased compared to FY 2021 by $5.352 million. Funding increased due to increased emphasis on autonomous systems control.			
Accomplishments/Planned Programs Subtotals	22.021	0.000	5.352

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable.