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 3: *Advanced Technology Development (ATD)*					R-1 Program Element (Number/Name) PE 0603211F / *Aerospace Technology Dev/Demo*							
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	-	34.321	105.486	54.727	0.000	54.727	63.167	96.213	105.074	105.654	Continuing	Continuing
634094: *Next Gen Platform Dev/ Demo*	-	0.000	17.288	14.748	0.000	14.748	6.576	6.697	6.834	6.987	0.000	59.130
634920: *Flight Vehicle Tech Integration*	-	34.321	71.788	15.851	0.000	15.851	16.442	29.253	32.369	26.023	Continuing	Continuing
634926: *High Speed Systems Integ & Demo*	-	0.000	11.058	7.080	0.000	7.080	13.580	35.797	36.603	37.416	Continuing	Continuing
634927: *Flight Systems Control*	-	0.000	5.352	17.048	0.000	17.048	26.569	24.466	29.268	35.228	Continuing	Continuing

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. Additionally, this effort supports the nuclear enterprise and nuclear deterrence through advanced component and technology demonstrations. 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 program element would be in addition to the civilian pay expenses budgeted in program elements 0601102F, 0602020, 0602102F, 0602201F, 0602202F,0602203F, 0602204F, 0602602F, 0602605F, 0602788F, 0602298F, and 1206601SF.

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 2023 Air Force	Date: April 2022
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 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	62.117	70.486	0.000	0.000	0.000
Current President's Budget	34.321	105.486	54.727	0.000	54.727
Total Adjustments	-27.796	35.000	54.727	0.000	54.727
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	35.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	-24.138	0.000			
• SBIR/STTR Transfer	-2.169	0.000			
• Other Adjustments	-1.489	0.000	54.727	0.000	54.727

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2021	FY 2022
Project: 634920: *Flight Vehicle Tech Integration*		
Congressional Add: *Program increase - Heavy fuel engine hybrid electric ducted fan advanced propulsion*	0.000	15.000
Congressional Add: *Program increase - Small unit autonomous UAS resupply*	0.000	20.000
Congressional Add Subtotals for Project: 634920	0.000	35.000
Congressional Add Totals for all Projects	0.000	35.000

Change Summary Explanation

Decrease in FY 2021 reflects Cong Adds Realignment to appropriate program and 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).

The FY2022 President's Budget submittal did not reflect FY2023 through FY2026 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 / 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 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
634094: *Next Gen Platform Dev/ Demo*	-	0.000	17.288	14.748	0.000	14.748	6.576	6.697	6.834	6.987	0.000	59.130
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project demonstrates advanced nuclear-related components and technologies in support of the nuclear enterprise and nuclear deterrence operations missions. Next Gen Platform Development/Demonstration efforts are accomplished through development, integration, testing, and evaluation of various technologies to include fuzes, aeroshells, inertial guidance, and nuclear-specific communications for demonstration in near-realistic operational 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 2021	FY 2022	FY 2023
Title: Advanced Nuclear Components	0.000	17.288	14.748
Description: Develop next-generation solid state, radiation-hardened strategic advance inertial system components for hostile environment. ***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 2023 Plans:*** Continue iterative development of inertial measurement unit (IMU) prototypes, including nested sensor configuration of gyroscope and accelerometer technologies, and environmental testing. Continue development of radiation hardened electronics supporting nested sensor design. Continue to mature covariance analysis through test data inputs from sensor/system testing. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** FY 2023 decreased compared to FY 2022 by $2.540 million. Funding decreased due to completion of design and development of the second gyroscope prototype.			
Accomplishments/Planned Programs Subtotals	0.000	17.288	14.748

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force		Date: April 2022
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 2023 Air Force			Date: April 2022
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 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
634920: *Flight Vehicle Tech Integration*	-	34.321	71.788	15.851	0.000	15.851	16.442	29.253	32.369	26.023	Continuing	Continuing
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 2021	FY 2022	FY 2023
Title: Aerospace Vehicle Technology Integration	16.160	36.788	13.821
Description: Develop, simulate, and demonstrate integrated technologies to improve the performance of aerospace platform capabilities. ***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 2023 Plans:*** Continue development and initiate flight test of a next variant of a low cost unmanned aerospace system. Initiate the development of a forward weapons employment derivative of a low cost unmanned aerospace system. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** FY2023 decreased compared to FY22 by $22.967 million. Funding decreased due to higher AF priorities and shift in emphasis from S&T integration of legacy platforms to autonomous collaborative platforms.			
Title: Advanced Aerospace Structure Technologies	18.161	0.000	0.000
Description: Develop and demonstrate affordable, lightweight, adaptive, and multifunctional structural concepts integrated into aerospace systems.			

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force		Date: April 2022
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 2021	FY 2022	FY 2023
FY 2022 Plans: Not applicable. ***FY 2023 Plans:*** Not applicable.			
Title: Transformational Technology Development ***Description:*** Continually funded effort. This funding allocation will initiate new and continue existing Transformational Technology Development efforts. The Transformational Technology Development program will select new projects, in alignment with mission focused areas which include, but are not limited to: Intelligent Planning and Wargaming; Battlespace Awareness; Integrated Base Defense; and Hypersonic Multi-Mission Aircraft. Investments focus on technology development efforts including, but are not limited to technologies to enhance survivability, operability and performance of personnel, sensors, and structures in a threat environment through integration techniques for technologies including avionics, advanced propulsion, and weapon systems. This investment is overseen by senior representatives from Air and Space Forces who participate in the submission, initial review, and down-selection of Transformational Technology Development proposed efforts. Final selections will be reviewed by the Air Force Deputy Assistant Secretary for Science, Technology, and Engineering before a final recommendation for Congressional approval is made. ***FY 2022 Plans:*** This effort is starting in FY23. ***FY 2023 Plans:*** Continue to develop and demonstrate a capability for high speed delivery of area effects. Initiate projects selected from the annual WARTECH process that investigate Department of the Air Force prioritized topics. Continue to perform modeling, simulation, and analyses to establish the future force effect of candidate Transformational Component investments and continue the next cycle of WARTECH process. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** FY 2023 increased compared to FY 2022 by $2.03 million. Funding increased to scale investment toward the Department of the Air Force target outlined in the Air Force 2030 Science and Technology (S&T) Strategy.	0.000	0.000	2.030
Accomplishments/Planned Programs Subtotals	34.321	36.788	15.851

	FY 2021	FY 2022
Congressional Add: Program increase - Heavy fuel engine hybrid electric ducted fan advanced propulsion	0.000	15.000

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force		Date: April 2022
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*

	FY 2021	FY 2022
FY 2021 Accomplishments: Not applicable. ***FY 2022 Plans:*** Conduct Congressionally directed efforts.		
Congressional Add: Program increase - Small unit autonomous UAS resupply ***FY 2021 Accomplishments:*** Not applicable. ***FY 2022 Plans:*** Conduct Congressionally directed efforts.	0.000	20.000
Congressional Adds Subtotals	0.000	35.000

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 / 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 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
634926: *High Speed Systems Integ & Demo*	-	0.000	11.058	7.080	0.000	7.080	13.580	35.797	36.603	37.416	Continuing	Continuing
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.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2021	FY 2022	FY 2023
Title: High Speed/Hypersonic Vehicle Technologies	0.000	11.058	7.080
Description: Develop, simulate, and demonstrate integrated vehicle technologies to enable and improve the performance of future high-speed and hypersonic systems. ***FY 2022 Plans:*** Continue Multi-Mission Cruiser technology maturation activities to expand performance capabilities of high speed systems. ***FY 2023 Plans:*** Continue Multi-Mission Cruiser technology maturation activities to expand performance capabilities of high speed systems. Initiate robust digital engineering framework, model-based systems engineering, and multi-level modeling, simulation & analysis (MS&A) for accelerated, focused technology development. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** FY2023 decreased compared to FY2022 by $3.978 million. Funding decreased due to decreased emphasis on high speed vehicle technologies.			
Accomplishments/Planned Programs Subtotals	0.000	11.058	7.080

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force		Date: April 2022
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*

D. Acquisition Strategy

Not applicable.

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force			Date: April 2022
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 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
634927: *Flight Systems Control*	-	0.000	5.352	17.048	0.000	17.048	26.569	24.466	29.268	35.228	Continuing	Continuing
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 2021	FY 2022	FY 2023
Title: Autonomous Systems Control	0.000	5.352	6.626
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 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 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 2023 Plans: Complete 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 technologies for ground and air operations to the autonomy spiral demonstrations.			
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 / 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 2021	FY 2022	FY 2023
FY2023 increased compared to FY2022 by $1.274 million. Funding increased to enable autonomous collaboration capability, increased emphasis on autonomy development and demonstration for rapid transition.			
Title: Transformational Technology Development ***Description:*** Continually funded effort. This funding allocation will initiate new and continue existing Transformational Technology Development efforts. The Transformational Technology Development program will select new projects, in alignment with mission focused areas which include, but are not limited to: Intelligent Planning and Wargaming; Battlespace Awareness; Integrated Base Defense; and Hypersonic Multi-Mission Aircraft. Investments focus on technology development efforts including, but are not limited to technologies to enhance survivability, operability and performance of personnel, sensors, and structures in a threat environment through advanced control technologies to improve manned and unmanned aerospace systems, modeling and simulation, and integration. This investment is overseen by senior representatives from Air and Space Forces who participate in the submission, initial review, and down-selection of Transformational Technology Development proposed efforts. Final selections will be reviewed by the Air Force Deputy Assistant Secretary for Science, Technology, and Engineering before a final recommendation for Congressional approval is made. ***FY 2022 Plans:*** This effort is starting in FY23. ***FY 2023 Plans:*** Continue investments leveraging Artificial Intelligence and gaming technologies to accelerate Department of the Air Force capability to create theatre-scale operational plans within hours. Initiate projects selected from the annual WARTECH process that investigate Department of the Air Force prioritized topics. Continue to perform modeling, simulation, and analyses to establish the future force effect of candidate Transformational Component investments and continue the next cycle of WARTECH process. ***FY 2022 to FY 2023 Increase/Decrease Statement:*** FY 2023 increased compared to FY 2022 by $10.422 million. Due to database/systems issues, $8.507 million was erroneously moved from Program 0603216F, Aerospace Propulsion & Power Technology, Project 633035, Aerospace Power Technology under the High Power Aircraft Subsystem Technologies effort. The funding in this effort should have increased by $1.915 million in FY2023 compared to FY2022. Funding increased to scale investment toward the Department of the Air Force target outlined in the Air Force 2030 Science and Technology (S&T) Strategy. A technical adjustment will be submitted to correct this error.	0.000	0.000	10.422
Accomplishments/Planned Programs Subtotals	0.000	5.352	17.048

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2023 Air Force		Date: April 2022
Appropriation/Budget Activity 3600 / 3	**R-1 Program Element (Number/Name)** PE 0603211F / *Aerospace Technology Dev /Demo*	**Project (Number/Name)** 634927 / *Flight Systems Control*

C. Other Program Funding Summary ($ in Millions)

Remarks

D. Acquisition Strategy

Not applicable.