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Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Air Force **Date:** March 2023

Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force / BA 3: Advanced Technology Development (ATD)</i>	R-1 Program Element (Number/Name) PE 0603211F / <i>Aerospace Technology Dev/Demo</i>
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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	-	98.806	95.267	51.896	0.000	51.896	77.684	74.981	76.246	100.203	Continuing	Continuing
634094: <i>Next Gen Platform Dev/Demo</i>	-	15.964	14.740	6.591	0.000	6.591	6.736	6.900	7.042	7.298	Continuing	Continuing
634920: <i>Flight Vehicle Tech Integration</i>	-	71.941	26.399	13.008	0.000	13.008	26.119	12.291	12.543	34.616	Continuing	Continuing
634926: <i>High Speed Systems Integ & Demo</i>	-	5.281	37.080	13.611	0.000	13.611	32.038	36.959	37.714	39.080	Continuing	Continuing
634927: <i>Flight Systems Control</i>	-	5.620	17.048	18.686	0.000	18.686	12.791	18.831	18.947	19.209	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.

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 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 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.

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Appropriation/Budget Activity	R-1 Program Element (Number/Name)
3600: Research, Development, Test & Evaluation, Air Force I BA 3: Advanced Technology Development (ATD)	PE 0603211F I Aerospace Technology Dev/Demo

B. Program Change Summary (\$ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Previous President's Budget	105.486	54.727	63.167	0.000	63.167
Current President's Budget	98.806	95.267	51.896	0.000	51.896
Total Adjustments	-6.680	40.540	-11.271	0.000	-11.271
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	40.540			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-6.680	0.000			
• Other Adjustments	0.000	0.000	-11.271	0.000	-11.271

Congressional Add Details (\$ in Millions, and Includes General Reductions)

Project: 634920: Flight Vehicle Tech Integration

Congressional Add: Program increase - Heavy fuel engine hybrid electric ducted fan advanced propulsion

Congressional Add: Program increase - Small unit autonomous UAS resupply

Congressional Add: Unmanned adversary air platform

Congressional Add: Bonded unitized composites large scale structural demonstration

Congressional Add: Program increase - digital design studio

Congressional Add: Airborne missile defense beam Director development and Flight Environment Qualification

Congressional Add Subtotals for Project: 634920

Project: 634926: High Speed Systems Integ & Demo

Congressional Add: Hypersonic aircraft rapid prototyping

Congressional Add Subtotals for Project: 634926

Congressional Add Totals for all Projects

	FY 2022	FY 2023
	14.451	-
	19.268	-
	-	10.000
	-	10.000
	-	2.000
	-	1.000
	33.719	23.000
	-	30.000
	-	30.000
	33.719	53.000

Change Summary Explanation

FY 2024 funding decreased in the FY 2024PB compared to the FY 2023PB by \$11.271 million. The decrease is due to Transformational Technology work relocating PE 0603032F, Future AF Integrated Technology Demos, Project 630320, Air Force Vanguard.

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force										Date: March 2023		
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 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
634094: Next Gen Platform Dev/Demo	-	15.964	14.740	6.591	0.000	6.591	6.736	6.900	7.042	7.298	Continuing	Continuing
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 2022	FY 2023	FY 2024
Title: Advanced Nuclear Components	15.964	14.740	6.591
Description: Develop next-generation solid state, radiation-hardened strategic advance inertial system components for hostile environment.			
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 2024 Plans: Continue iterative development of inertial sensor systems, including gyroscope and accelerometer technologies for a nested sensor configuration insertion into an IMU, in coordination with PE 0603273 guidance technology development. Continue development of radiation hardened electronics/components supporting the nested sensor design. Continue laboratory and environmental testing of IMU components. Complicate concept design and testing of radiation hardened solid-state gyroscope technology. Continue covariance analysis improvement through sensor/system test data inputs to predict IMU performance.			
FY 2023 to FY 2024 Increase/Decrease Statement: FY 2024 decreased compared to FY 2023 by \$8.149 million due to maturation of accelerometer and gyroscope and inertial sensors, integration and testing funded and described in PE 0603273.			
Accomplishments/Planned Programs Subtotals	15.964	14.740	6.591

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force			Date: March 2023		
Appropriation/Budget Activity 3600 / 3		R-1 Program Element (Number/Name) PE 0603211F / <i>Aerospace Technology Dev /Demo</i>		Project (Number/Name) 634094 / <i>Next Gen Platform Dev/Demo</i>	

C. Other Program Funding Summary (\$ in Millions)

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

Remarks

D. Acquisition Strategy

Not applicable

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force										Date: March 2023		
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 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
634920: <i>Flight Vehicle Tech Integration</i>	-	71.941	26.399	13.008	0.000	13.008	26.119	12.291	12.543	34.616	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 2022	FY 2023	FY 2024
Title: Aerospace Vehicle Technology Integration	38.222	3.399	13.008
Description: Develop, simulate, and demonstrate integrated technologies to improve the performance of aerospace platform capabilities.			
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 2024 Plans: Complete the fabrication and continue flight test of a sensor variant of a low cost unmanned aerospace system. Continue the development of technology demonstrations for a forward weapons employment derivative of a low cost unmanned aerospace system. Initiate build of the affordable weapons platform for future flight experimentation.			
FY 2023 to FY 2024 Increase/Decrease Statement: FY 2024 increased compared to FY 2023 by \$9.609 million. Funding increased due to increased emphasis in Aerospace Vehicle Technology Integration and continued technology development and demonstrations for low-cost unmanned aerospace systems. Including weapons separation certification for the new class of air vehicles.			
Title: Transformational Technology Development	0.000	0.000	0.000

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force		Date: March 2023
Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603211F / <i>Aerospace Technology Dev /Demo</i>	Project (Number/Name) 634920 / <i>Flight Vehicle Tech Integration</i>

B. Accomplishments/Planned Programs (\$ in Millions)	FY 2022	FY 2023	FY 2024
<p>Description: This effort initiates and continues 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.</p> <p>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.</p> <p>FY 2024 Plans: In FY 2023 and beyond, this work is performed under PE 0603032F, Future AF Integrated Technology Demos, Project 630320, Air Force Vanguard.</p> <p>FY 2023 to FY 2024 Increase/Decrease Statement: N/A</p>			
Accomplishments/Planned Programs Subtotals	38.222	3.399	13.008

	FY 2022	FY 2023
Congressional Add: Program increase - Heavy fuel engine hybrid electric ducted fan advanced propulsion FY 2022 Accomplishments: Conduct Congressionally directed efforts.	14.451	-
Congressional Add: Program increase - Small unit autonomous UAS resupply FY 2022 Accomplishments: Conduct Congressionally directed efforts.	19.268	-
Congressional Add: Unmanned adversary air platform	-	10.000

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Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603211F / <i>Aerospace Technology Dev /Demo</i>	Project (Number/Name) 634920 / <i>Flight Vehicle Tech Integration</i>

	FY 2022	FY 2023
FY 2023 Plans: Conduct Congressionally directed efforts. This effort will be executed in Program 0603211F, Aerospace Technology Dev/Demo, Project 634920, Flight Vehicle Tech Integration.		
Congressional Add: Bonded unitized composites large scale structural demonstration	-	10.000
FY 2023 Plans: Conduct Congressionally directed efforts. This effort will be executed in Program 0603211F, Aerospace Technology Dev/Demo, Project 634920, Flight Vehicle Tech Integration.		
Congressional Add: Program increase - digital design studio	-	2.000
FY 2023 Plans: Conduct Congressionally directed efforts.		
Congressional Add: Airborne missile defense beam Director development and Flight Environment Qualification	-	1.000
FY 2023 Plans: Conduct Congressionally directed efforts. This effort will be executed in Program 0603211F, Aerospace Technology Dev/Demo, Project 634920, Flight Vehicle Tech Integration.		
Congressional Adds Subtotals	33.719	23.000

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable.

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Appropriation/Budget Activity 3600 / 3					R-1 Program Element (Number/Name) PE 0603211F / <i>Aerospace Technology Dev /Demo</i>				Project (Number/Name) 634926 / <i>High Speed Systems Integ & Demo</i>			
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
634926: <i>High Speed Systems Integ & Demo</i>	-	5.281	37.080	13.611	0.000	13.611	32.038	36.959	37.714	39.080	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 2022	FY 2023	FY 2024
Title: High Speed/Hypersonic Vehicle Technologies	5.281	7.080	13.611
Description: Develop, simulate, and demonstrate integrated vehicle technologies to enable and improve the performance of future high-speed and hypersonic 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 2024 Plans: Continue Multi-Mission Cruiser technology maturation activities to expand performance capabilities of high speed systems. Continue robust digital engineering framework, model-based systems engineering, and multi-level modeling, simulation & analysis (MS&A) for accelerated, focused technology development and demonstration. Initiating design work for expendable hypersonic multi-mission ISR and Strike demo.			
FY 2023 to FY 2024 Increase/Decrease Statement: FY 2024 increased compared to FY 2023 by \$6.531 million. Funding increase due to increased emphasis in engineering framework and technology maturation work in thermal structures; initiate design work for expendable hypersonic multi-mission ISR and Strike demo.			
Accomplishments/Planned Programs Subtotals	5.281	7.080	13.611

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	FY 2022	FY 2023
Congressional Add: Hypersonic aircraft rapid prototyping	-	30.000
FY 2023 Plans: Conduct Congressionally directed efforts. This effort will be executed in Program 0603211F, Aerospace Technology Dev/Demo, Project 634926, High Speed Systems Integ & Demo.		
Congressional Adds Subtotals	-	30.000

C. Other Program Funding Summary (\$ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable.

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Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force **Date:** March 2023

Appropriation/Budget Activity 3600 / 3	R-1 Program Element (Number/Name) PE 0603211F / Aerospace Technology Dev /Demo	Project (Number/Name) 634927 / Flight Systems Control
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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
634927: <i>Flight Systems Control</i>	-	5.620	17.048	18.686	0.000	18.686	12.791	18.831	18.947	19.209	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.

B. Accomplishments/Planned Programs (\$ in Millions)

	FY 2022	FY 2023	FY 2024
<p>Title: Autonomous Systems Control</p> <p>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.</p> <p>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.</p> <p>FY 2024 Plans: 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. Initiate development and autonomy spiral demonstrations of advanced autonomy to manage a heterogeneous team of attritable and expendable aircraft without human interaction in complex missions and challenging threat environments.</p> <p>FY 2023 to FY 2024 Increase/Decrease Statement: FY2024 increased compared to FY2023 by \$1.638 million. Funding increase due to increase emphasis on autonomy development and demonstration for rapid transition to enable autonomous collaboration capability.</p>	5.620	17.048	18.686
<p>Title: Transformational Technology Development</p> <p>Description: This effort 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</p>	0.000	0.000	0.000

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B. Accomplishments/Planned Programs (\$ in Millions)		FY 2022	FY 2023	FY 2024
<p>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.</p> <p>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.</p> <p>FY 2024 Plans: In FY 2023 this effort will be realigned under Program 0603032F Future AF Integrated Technology Demos, Project 630320, Air Force Vanguards, effort Vanguard Prospect - Fight Tonight and effort Future Transformational Capabilities.</p> <p>FY 2023 to FY 2024 Increase/Decrease Statement: N/A</p>				
Accomplishments/Planned Programs Subtotals		5.620	17.048	18.686
C. Other Program Funding Summary (\$ in Millions)				
N/A				
Remarks				
D. Acquisition Strategy				
Not applicable.				