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 3: *Advanced Technology Development (ATD)*					R-1 Program Element (Number/Name) PE 0603216F / *Aerospace Propulsion and Power 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**
Total Program Element	-	103.219	94.540	56.789	0.000	56.789	72.309	73.463	68.940	71.454	Continuing	Continuing
633035: *Aerospace Power Technology*	-	32.499	22.049	10.067	0.000	10.067	10.105	10.145	10.345	10.648	Continuing	Continuing
634093: *Missile Rocket Propulsion Integ & Demo*	-	18.657	13.192	6.045	0.000	6.045	6.067	5.681	5.797	6.006	Continuing	Continuing
634921: *Aircraft Propulsion Subsystems Int*	-	17.019	41.862	17.411	0.000	17.411	23.597	20.020	14.411	15.023	Continuing	Continuing
635098: *Advanced Aerospace Propulsion*	-	16.227	17.437	23.266	0.000	23.266	32.540	37.617	38.387	39.777	Continuing	Continuing
63681B: *Advanced Turbine Engine Gas Generator*	-	18.817	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program develops and demonstrates technologies to achieve enabling and revolutionary advances in turbine, advanced-cycle, rocket, and space propulsion as well as electrical power, thermal management, and fuels. The program has five current projects, each focusing on technologies with a high potential to enhance the performance of existing and future Air Force weapon systems. The Aerospace Power Technology project develops and demonstrates adaptive power and thermal management components, controls, and systems for high-power payloads and aircraft as part of energy-optimized aircraft development. The Aircraft Propulsion Subsystems Integration project develops demonstrator engines by integrating the engine cores demonstrated in the Advanced Turbine Engine Gas Generator project with low-pressure components. The Advanced Aerospace Propulsion project develops the scramjet propulsion cycle to a technology readiness level appropriate for in-flight demonstration and for full integration with other engine cycles (including turbine and rocket based). The Advanced Turbine Engine Gas Generator project develops and demonstrates core turbine engine technologies for current and future aircraft propulsion systems. The Missile Rocket Propulsion project develops and demonstrates innovative rocket propulsion technologies, propellants, and manufacturing techniques.

All transfers detailed below are administrative realignments due to the stand up of the United States Space Force, and not new starts. This work will continue to be executed by the Air Force Research Laboratory Aerospace Systems Technology Directorate located in Wright Patterson Air Force Base, OH, Edwards Air Force Base, CA, or Arnold Air Force Base, TN.

In FY2022, the work and funding associated with advanced space technology demonstrations in Program 0603216F, Aerospace Propulsion, Project 634922, Space & Missile Rocket Propulsion, are transferred to Appropriation 3620F, Research, Development, Test & Evaluation, Space Force, Program 1206616SF, Space Advanced Technology Development/Demo, Project 634922, Space & Missile Rocket Propulsion, due to the creation of a new Appropriation for Space Force.

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 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603216F / *Aerospace Propulsion and Power Technology*

In FY 2022, the work and funding associated with missile rocket propulsion technologies in Program 0603216F, Aerospace Propulsion, are transferred from Project 634922, Space & Missile Rocket Propulsion, to Project 634093, Missile Rocket Propulsion Integ & Demo due to the creation of a new Appropriation for Space Force.

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.

Projects in this program have been coordinated through the Department of Defense (DoD) Science and Technology (S&T) Executive Committee process to harmonize efforts and eliminate duplication.

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.

B. Program Change Summary ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Previous President's Budget	110.273	64.254	85.665	0.000	85.665
Current President's Budget	103.219	94.540	56.789	0.000	56.789
Total Adjustments	-7.054	30.286	-28.876	0.000	-28.876
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	30.286			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-7.047	0.000			
• Other Adjustments	-0.007	0.000	-28.876	0.000	-28.876

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2022	FY 2023
Project: 633035: *Aerospace Power Technology*		
Congressional Add: *Program increase - Silicon carbide research*	9.634	10.000
Congressional Add: *Program increase - Domestic manufacturing of solid state power controllers*	9.634	-

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 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603216F / *Aerospace Propulsion and Power Technology*

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2022	FY 2023
Congressional Add Subtotals for Project: 633035	19.268	10.000
Project: 634093: *Missile Rocket Propulsion Integ & Demo*		
Congressional Add: *Program increase - Hypersonic liquid rocket propulsion*	9.634	-
Congressional Add: *Program increase - Altitude chamber infrastructure upgrades*	4.817	5.000
Congressional Add: *Advanced hybrid engine rocket development*	-	5.000
Congressional Add Subtotals for Project: 634093	14.451	10.000
Project: 634921: *Aircraft Propulsion Subsystems Int*		
Congressional Add: *Low spool generator capabilities*	-	5.000
Congressional Add: *Program increase - turbo air cool HTPEM hydrogen fuel cell development*	-	12.330
Congressional Add Subtotals for Project: 634921	-	17.330
Congressional Add Totals for all Projects	33.719	37.330

Change Summary Explanation

FY 2024 funding decreased in the FY 2024PB compared to the FY 2023PB by $28.876 million. The decrease is due to Transformational Technology work relocating PE 0603032F, Future AF Integrated Technology Demos, Project 630320, Air Force Vanguards.

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 0603216F / *Aerospace Propulsion and Power Technology*	Project (Number/Name) 633035 / *Aerospace Power 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
633035: *Aerospace Power Technology*	-	32.499	22.049	10.067	0.000	10.067	10.105	10.145	10.345	10.648	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project develops and demonstrates system and subsystem integration to include adaptive architectures, controls, actuation, electrical power, thermal management, and distribution for aerospace applications. This project develops and demonstrates the components, controls and systems required to satisfy the operational needs of current and future aircraft and enables the use of future high-power payloads. This technology enhances reliability and survivability, and reduces vulnerability, weight, and life cycle costs of air platforms. The electrical power system components developed are projected to provide a two-fold to five-fold improvement in aircraft reliability and maintainability, and a reduction in power system weight. This project is integrated into energy optimized aircraft efforts and power and thermal programs.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: High Power Aircraft Subsystem Technologies	13.231	12.049	10.067
Description: Develop and demonstrate integrated architecture, controls and components for power generation, conditioning, and distribution; energy storage components; and thermal management and subsystem technologies for integration into high power aircraft. ***FY 2023 Plans:*** Complete development and demonstration of system and component electrical power, electro-mechanical, and thermal technologies for high-power aircraft. Complete the development of hybrid-cycle power and thermal management system. Complete development of advanced power generation and distribution system. Continue development and demonstration of integrated, adaptive megawatt- class tactical aircraft power and thermal capability. Continue development and demonstration of megawatt class architecture, controls and integration. Complete development and demonstration of robust electrical power systems for megawatt applications. Complete development and demonstration of thermal management systems for megawatt applications. ***FY 2024 Plans:*** Complete development and demonstration of integrated, adaptive megawatt- class tactical aircraft power and thermal capability. Complete development and demonstration of megawatt class architecture, controls and integration. Initiate development and demonstration of integrated power, thermal, and propulsion technologies for medium-scale systems. Initiate architecture and technology assessment and digital integration. ***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 / 3	**R-1 Program Element (Number/Name)** PE 0603216F / *Aerospace Propulsion and Power Technology*	**Project (Number/Name)** 633035 / *Aerospace Power Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
FY2024 decreased compared to FY2023 by $1.982 million. Funding decreased due to completion of development and demonstration of megawatt class architecture, controls, and integration.			
Title: Transformational Technology Development ***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 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 engine core and low spool component technologies. 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 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 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 - Area Effects Demonstration and effort Future Transformational Capabilities. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** N/A	0.000	0.000	0.000
Accomplishments/Planned Programs Subtotals	13.231	12.049	10.067

	FY 2022	FY 2023
Congressional Add: Program increase - Silicon carbide research ***FY 2022 Accomplishments:*** Conduct Congressionally directed efforts. ***FY 2023 Plans:*** Conduct Congressionally directed efforts. This effort will be executed in Program 0603216F, Aerospace Propulsion and Power Technology, Project 633035, Aerospace Power Technology.	9.634	10.000
Congressional Add: Program increase - Domestic manufacturing of solid state power controllers	9.634	-

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 0603216F / *Aerospace Propulsion and Power Technology*	**Project (Number/Name)** 633035 / *Aerospace Power Technology*

	FY 2022	FY 2023
FY 2022 Accomplishments: Conduct Congressionally directed efforts.		
Congressional Adds Subtotals	19.268	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 / 3	R-1 Program Element (Number/Name) PE 0603216F / *Aerospace Propulsion and Power Technology*	Project (Number/Name) 634093 / *Missile Rocket Propulsion Integ & 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
634093: *Missile Rocket Propulsion Integ & Demo*	-	18.657	13.192	6.045	0.000	6.045	6.067	5.681	5.797	6.006	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project develops technologies for the sustainment of strategic systems (including solid rocket motor boosters and missile propulsion, post boost control, and aging and surveillance efforts) and tactical rockets. Characteristics such as environmental acceptability, affordability, reliability, responsiveness, reduced weight, and reduced operation and launch costs are emphasized. Increased life and performance of propulsion systems are key goals. Technology areas investigated include ground demonstrations of compact, lightweight, advanced propulsion technologies and high-energy propellants. Aging and surveillance thrusts for solid rocket motors could reduce lifetime prediction uncertainties for individual motors by fifty percent, enabling motor replacement for cause. The efforts in this project contribute to the sustainment of the rocket propulsion industry, providing rocket propulsion technology for the entire Department of Defense (DoD). The efforts in this project are reviewed by a DoD level steering committee annually for relevance to DoD missions.

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: Ballistic Missile Technologies	4.206	3.192	6.045
Description: Develop and demonstrate missile propulsion and post-boost control systems technologies for ballistic missiles.			
FY 2023 Plans: Continue development and test of solid rocket motors relevant to defense needs such as large air-launched boosters for high speed weapon application. Continue to design and develop modeling and simulation tools that more fully describe the physical processes that occur during manufacture and/or operation, and that reduce predictive uncertainty in design and analysis. Continue development of advanced manufacturing processes for solid rocket motors including inert components, energetic components, fabrication systems and automated assembly operations.			
FY 2024 Plans: Continue development and test of solid rocket motors relevant to defense needs such as large air-launched boosters for high speed weapon application. Continue to design and develop modeling and simulation tools that more fully describe the physical processes that occur during manufacture and/or operation, and that reduce predictive uncertainty in design and analysis. Continue			

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 0603216F / *Aerospace Propulsion and Power Technology*	**Project (Number/Name)** 634093 / *Missile Rocket Propulsion Integ & Demo*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
development of advanced manufacturing processes for solid rocket motors including inert components, energetic components, fabrication systems and automated assembly operations. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 increased compared to FY 2023 by $2.853 million. Funding increased due to increased emphasis on hardware fabrication and testing operations after the design work in FY23.			
Title: Transformational Technology Development ***Description:*** 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 sustainment technologies for solid rocket motor boosters and post boost control. 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 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 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 - Area Effects Demonstration. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** N/A	0.000	0.000	0.000
Accomplishments/Planned Programs Subtotals	4.206	3.192	6.045

	FY 2022	FY 2023
Congressional Add: Program increase - Hypersonic liquid rocket propulsion	9.634	-

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 0603216F / *Aerospace Propulsion and Power Technology*	**Project (Number/Name)** 634093 / *Missile Rocket Propulsion Integ & Demo*

	FY 2022	FY 2023
FY 2022 Accomplishments: Conduct Congressionally directed efforts.		
Congressional Add: Program increase - Altitude chamber infrastructure upgrades ***FY 2022 Accomplishments:*** Conduct Congressionally directed efforts. ***FY 2023 Plans:*** Conduct Congressionally directed efforts. This effort will be executed in Program 0603216F, Aerospace Propulsion and Power Technology, Project 64093, Missile Rocket Propulsion Integ & Demo.	4.817	5.000
Congressional Add: Advanced hybrid engine rocket development ***FY 2023 Plans:*** Conduct Congressionally directed efforts. This effort will be executed in Program 0603216F, Aerospace Propulsion and Power Technology, Project 64093, Missile Rocket Propulsion Integ & Demo.	-	5.000
Congressional Adds Subtotals	14.451	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 / 3	R-1 Program Element (Number/Name) PE 0603216F / *Aerospace Propulsion and Power Technology*	Project (Number/Name) 634921 / *Aircraft Propulsion Subsystems Int*	

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
634921: *Aircraft Propulsion Subsystems Int*	-	17.019	41.862	17.411	0.000	17.411	23.597	20.020	14.411	15.023	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project develops and demonstrates technology to increase turbine engine operational reliability, durability, mission flexibility, and performance while reducing weight, fuel consumption, and cost of ownership. The Aircraft Propulsion Subsystems Integration (APSI) project includes demonstrator engines for manned systems and efficient small-scale propulsion for remotely piloted aircraft and cruise missile applications. The demonstrator engines integrate the core (high- pressure spool) technology developed under a joint multi-agency and aerospace industry project with the engine (low-pressure spool) technology such as fans, turbines, engine controls, mechanical systems, exhaust nozzles, and augmentors. Additionally, this project includes activities to improve propulsion safety and readiness. This project also focuses on integration of inlets, nozzles, engine-to-airframe compatibility, and power and thermal management subsystems technologies. The APSI project provides aircraft with potential for longer range and higher cruise speeds with lower specific fuel consumption, surge power for successful engagements, high sortie rates with reduced maintenance, reduced life cycle cost, and improved survivability, resulting in increased mission effectiveness. Technologies developed are applicable to sustained high-speed vehicles and responsive space launch. The Aircraft Propulsion Subsystems Integration project is focused on improving propulsion capabilities while at the same time reducing the cost of ownership. Anticipated technology advances include turbine engine improvements providing approximately twice the range for a sustained supersonic combat aircraft, doubling the time on station with ten times the power output for surveillance aircraft and propulsion for a high speed supersonic missile with double the range for time sensitive targets.

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.

In FY2023, Core Engine Technologies, High Pressure Ratio Core Engine Technologies, and Adaptive Turbine Engine Core Technology efforts transferred from Program 0603216F, Aerospace Propulsion & Power Technology, Project 63681B, Advanced Turbine Engine Gas Generator to Program 0603216F, Aerospace Propulsion and Power Technology, Project 634921, Aircraft Propulsion Subsystems Integration 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: Missile/Remotely Piloted Aircraft Engine Performance	10.082	11.010	13.961
Description: Design, fabricate, and test component technologies for limited-life engines to improve the performance, durability, and affordability of missile and remotely piloted aircraft engines.			

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 0603216F / *Aerospace Propulsion and Power Technology*	**Project (Number/Name)** 634921 / *Aircraft Propulsion Subsystems Int*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
FY 2023 Plans: Continue next innovative architecture, critical technologies and component designs for efficient small engines. Continue operational benefits analysis for missile and unmanned aerial vehicle (UAV) systems. Continue development of pervasive, hydrocarbon pressure gained propulsion fueled technologies. Initiate advanced development in rotating detonation engine technologies to advance powered munitions. ***FY 2024 Plans:*** Complete next innovative architecture, critical technologies and component designs for efficient small engines. Continue operational benefits analysis for missile and unmanned aerial vehicle (UAV) systems. Continue development of pervasive, hydrocarbon pressure gained propulsion fueled technologies. Continue advanced development in rotating detonation engine technologies to advance powered munitions. Initiate new engine technologies to deliver reduced takeoff length, increased range, loiter, combat maneuverability, and lower cost for attritable UAS in contested environments. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 increased compared to FY 2023 by $2.951 million. Funding increase due to increased emphasis in advancing rotating detonation engine technologies to advance powered munitions.			
Title: Adaptive Turbine Engine Technologies ***Description:*** Design, fabricate, and demonstrate performance, durability, and operability technologies to mature adaptive turbine engine technologies. ***FY 2023 Plans:*** Complete analysis and evaluation conceptual design of adaptive engine technology and complete technology rig tests to decrease risk in core technology testing. Complete maturation and integration of key technology through component and rig testing. Emphasis moving to Missile/Remotely Piloted Aircraft Engine Performance effort. ***FY 2024 Plans:*** Not Applicable ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 decreased compared to FY 2023 by $4.148 million. Funding decreased due to Adaptive Turbine Engine Technologies completion in FY2023.	6.937	4.148	0.000
Title: Core Engine Technologies ***Description:*** Design, fabricate, and demonstrate performance predictions in core engines, using innovative engine cycles and advanced materials for turbofan and for turbojet engines.	0.000	7.765	1.972

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 0603216F / *Aerospace Propulsion and Power Technology*	**Project (Number/Name)** 634921 / *Aircraft Propulsion Subsystems Int*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
FY 2023 Plans: Continue core tests for medium scale engines maturing key technologies. Continue risk reduction component tests for medium-scale engine advanced fan and core. Initiate advanced propulsion air frame integration experiments to enable embedded propulsion systems. ***FY 2024 Plans:*** Continue core tests for medium scale engines maturing key technologies. Continue risk reduction component tests for medium-scale engine advanced fan and core. Continue advanced propulsion air frame integration experiments to enable embedded propulsion systems. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 decreased compared to FY 2023 by $5.793 million. Funding decrease due to decreased emphasis to core tests for medium scale engines.			
Title: High Pressure Ratio Core Engine Technologies ***Description:*** Design, fabricate, and demonstrate high overall pressure ratio engine cores to provide increased durability and affordability with lower fuel consumption for turbofan and for turboshaft engines. ***FY 2023 Plans:*** Continue assessing innovative architecture, critical technologies and component designs for efficient, small engines. Continue assembly of advanced concept additive manufacturing heat exchanger for small core engines. Continue fabrication of recuperator for demonstration of increased core efficiency in small core engines. Continue to work and mature medium scale core technologies. ***FY 2024 Plans:*** Complete assembly of advanced concept additive manufacturing heat exchanger for small core engines. Complete fabrication of recuperator for demonstration of increased core efficiency in small core engines. Continue to work and mature medium scale core technologies. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Not Applicable	0.000	1.478	1.478
Title: Adaptive Turbine Engine Core Technologies ***Description:*** Design, fabricate, and demonstrate adaptive turbine engine cores to provide increased durability and affordability with lower fuel consumption for turbofan and for turboshaft engines.	0.000	0.131	0.000

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 0603216F / *Aerospace Propulsion and Power Technology*	**Project (Number/Name)** 634921 / *Aircraft Propulsion Subsystems Int*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
FY 2023 Plans: Complete component tests of advanced variable turbine and innovative compression rear block designed to accept flow variations caused by variable turbine operation. Emphasis moving to in Core Engine Technologies effort. ***FY 2024 Plans:*** Not Applicable ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 decreased compared to FY 2023 by $0.131 million. Funding decreased due to Adaptive Turbine Engine Core Technologies completion in FY2023 and emphasis move to Core Engine Technology.			
Title: Transformational Technology Development ***Description:*** 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 engine core and low spool component technologies. 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 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 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 - Area Effects Demonstration and effort Future Transformational Capabilities. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** N/A	0.000	0.000	0.000
Accomplishments/Planned Programs Subtotals	17.019	24.532	17.411

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 0603216F / *Aerospace Propulsion and Power Technology*	**Project (Number/Name)** 634921 / *Aircraft Propulsion Subsystems Int*

	FY 2022	FY 2023
Congressional Add: Low spool generator capabilities ***FY 2023 Plans:*** Conduct Congressionally directed efforts. This effort will be executed in Program 0603216F, Aerospace Propulsion and Power Technology.	-	5.000
Congressional Add: Program increase - turbo air cool HTPEM hydrogen fuel cell development ***FY 2023 Plans:*** Conduct Congressionally directed efforts. This effort will be executed in Program 0603216F, Aerospace Propulsion and Power Technology.	-	12.330
Congressional Adds Subtotals	-	17.330

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 / 3	R-1 Program Element (Number/Name) PE 0603216F / *Aerospace Propulsion and Power Technology*	Project (Number/Name) 635098 / *Advanced Aerospace Propulsion*	

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
635098: *Advanced Aerospace Propulsion*	-	16.227	17.437	23.266	0.000	23.266	32.540	37.617	38.387	39.777	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project develops and demonstrates, via ground and flight tests, the scramjet propulsion cycle to a technology readiness level appropriate for full integration with other engine cycles (including turbine and rocket-based) to provide the Air Force with transformational military capabilities. The primary focus is on the hydrocarbon-fueled, scramjet engine. Multi-cycle engines will provide the propulsion systems for possible application to support aircraft and weapon platforms. Efforts include: scramjet flow-path optimization to enable operation over the widest possible range of Mach numbers; active combustion control to assure continuous positive thrust (even during mode transition); robust flame-holding to maintain stability through flow distortions; and maximized volume-to-surface area to minimize the thermal load imposed by the high-speed engine. Thermal management plays a vital role in scramjet and combined cycle engines, including considerations for protecting low speed propulsion systems (e.g., turbine engines) during hypersonic flight.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Scramjet Technologies	16.227	17.437	23.266
Description: Develop and demonstrate technologies for a hydrocarbon-fueled scramjet with robust operation. ***FY 2023 Plans:*** Continue development and integration of larger scale scramjet component technologies to enhance operability including robust operation during maneuvers and extended operating time. Continue development and demonstration of tactically-relevant, high speed strike scramjet engine designs, technologies, and components including ground and flight demonstrations needed for potential follow-on acquisition program. Continue propulsion technology maturation activities for multi-mission cruiser concept to expand performance capabilities of high speed systems. ***FY 2024 Plans:*** Continue development and integration of larger scale scramjet component technologies to enhance operability including robust operation during maneuvers and extended operating time. Continue development and demonstration of tactically-relevant, scramjet engine designs, technologies, and components including ground and flight demonstrations needed for potential follow-on acquisition program. Continue propulsion technology maturation activities for multi-mission cruiser concept to expand performance capabilities of high speed systems. Initiate integration of scramjet components into expendable hypersonic multi-mission ISR and Strike demo design. ***FY 2023 to FY 2024 Increase/Decrease Statement:***			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force		Date: March 2023
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B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
FY 2024 increased compared to FY 2023 by $5.829 million. Funding increase due to increased emphasis on expanding high speed engine operability; initiate integration of scramjet components into expendable hypersonic multi-mission ISR and Strike demo design.			
Accomplishments/Planned Programs Subtotals	16.227	17.437	23.266

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 / 3	R-1 Program Element (Number/Name) PE 0603216F / *Aerospace Propulsion and Power Technology*	Project (Number/Name) 63681B / *Advanced Turbine Engine Gas Generator*	

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
63681B: *Advanced Turbine Engine Gas Generator*	-	18.817	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project develops and demonstrates technology to increase turbine engine operational reliability, durability, mission flexibility, and performance while reducing weight, fuel consumption, and cost of ownership. The objective is to provide continuous evolution of technologies into an advanced gas generator in which the performance, cost, durability, repairability, and maintainability can be assessed in a realistic engine environment. The gas generator, or core, is the basic building block of the engine and nominally consists of a compressor, a combustor, a high-pressure turbine, mechanical systems, and core subsystems. Experimental core engine demonstration validates engineering design tools and enhances rapid, low-risk transition of key engine technologies into engineering development, where they can be applied to derivative and/or new systems. These technologies are applicable to a wide range of military and commercial systems including aircraft, missiles, land combat vehicles, ships, and responsive space launch. Component technologies are demonstrated in a core (sub-engine). This project also assesses the impact of low spool components such as; inlet systems, fans, low pressure turbines, exhaust systems, and system level technologies such as; integrated power generators and thermal management systems on core engine performance, and durability in ground demonstrations of engine cores. The core performances of this project are validated on demonstrator engines in the Aircraft Propulsion Subsystem Integration Project of this program. A portion of this project supports the demonstration of adaptive cycle technologies, which develop component technology for an adaptive cycle engine architecture that provides optimized performance, fuel efficiency, and durability for widely varying mission needs.

In FY2023, Core Engine Technologies, High Pressure Ratio Core Engine Technologies, and Adaptive Turbine Engine Core Technologies efforts will transfer to Program 0603216F, Aerospace Propulsion and Power Technology, Project 634921, Aircraft Propulsion Subsystems Integration from Program 0603216F, Aerospace Propulsion & Power Technology, Project 63681B, Advanced Turbine Engine Gas Generator 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: Core Engine Technologies	7.920	0.000	0.000
Description: Design, fabricate, and demonstrate performance predictions in core engines, using innovative engine cycles and advanced materials for turbofan and for turbojet engines.			
FY 2023 Plans:			

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 0603216F / *Aerospace Propulsion and Power Technology*	**Project (Number/Name)** 63681B / *Advanced Turbine Engine Gas Generator*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
In FY2023, this effort will transfer to Program 0603216F, Aerospace Propulsion & Power Technology, Project 634921, Aircraft Propulsion Subsystems Integration 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: High Pressure Ratio Core Engine Technologies ***Description:*** Design, fabricate, and demonstrate high overall pressure ratio engine cores to provide increased durability and affordability with lower fuel consumption for turbofan and for turboshaft engines. ***FY 2023 Plans:*** In FY2023, this effort will transfer to Program 0603216F, Aerospace Propulsion & Power Technology, Project 634921, Aircraft Propulsion Subsystems Integration 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	2.979	0.000	0.000
Title: Adaptive Turbine Engine Core Technologies ***Description:*** Design, fabricate, and demonstrate adaptive turbine engine cores to provide increased durability and affordability with lower fuel consumption for turbofan and for turboshaft engines. ***FY 2023 Plans:*** In FY2023, this effort will transfer to Program 0603216F, Aerospace Propulsion & Power Technology, Project 634921, Aircraft Propulsion Subsystems Integration 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:***	7.918	0.000	0.000

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 0603216F / *Aerospace Propulsion and Power Technology*	**Project (Number/Name)** 63681B / *Advanced Turbine Engine Gas Generator*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Not Applicable			
Accomplishments/Planned Programs Subtotals	18.817	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Not applicable.