Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Air Force											Date: March 2023	
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force* / BA 3: *Advanced Technology Development (ATD)*					R-1 Program Element (Number/Name) PE 1206616SF / *Space Advanced Technology Development/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**
Total Program Element	-	227.481	167.423	110.033	0.000	110.033	103.000	105.404	107.322	111.238	Continuing	Continuing
633834: *Integrated Space Technology Demonstrations*	-	73.001	72.256	65.731	0.000	65.731	63.700	65.205	66.485	68.881	Continuing	Continuing
634868: *Maui Space Surveillance System*	-	18.997	15.921	10.667	0.000	10.667	10.983	11.245	11.290	11.746	Continuing	Continuing
634922: *Space & Missile Rocket Propulsion*	-	58.760	59.342	22.629	0.000	22.629	23.326	23.841	24.330	25.206	Continuing	Continuing
63682J: *Spacecraft Vehicles*	-	76.723	19.904	11.006	0.000	11.006	4.991	5.113	5.217	5.405	Continuing	Continuing

A. Mission Description and Budget Item Justification

This program focuses on four major areas. First, integrated space technology demonstrations, is a series of advanced technology demonstrations designed to address mission needs by applying emerging technologies from the Air Force Research Laboratory, other United States government laboratories, and industry. Second, the program focuses on ground-based optical space situational awareness technology development and demonstration at the Maui Space Surveillance System in Hawaii, as well as the operation and upgrade of the facility. Third, the program develops and demonstrates advanced and innovative low-cost high performance satellite propulsion technologies and components. The last major area, spacecraft vehicles, focuses on developing technologies for next-generation space communications terminals and equipment. Efforts in this program have been coordinated through the Department of Defense Science and Technology 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 such program funds would be in addition to civilian pay expenses budgeted in program element 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.

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 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 2024 Air Force	Date: March 2023
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 1206616SF *I Space Advanced Technology Development/Demo*

B. Program Change Summary ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Previous President's Budget	238.584	103.395	104.937	0.000	104.937
Current President's Budget	227.481	167.423	110.033	0.000	110.033
Total Adjustments	-11.103	64.028	5.096	0.000	5.096
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	64.028			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	-3.066	0.000			
• SBIR/STTR Transfer	-8.037	0.000			
• Other Adjustments	0.000	0.000	5.096	0.000	5.096

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2022	FY 2023
Project: 633834: *Integrated Space Technology Demonstrations*		
Congressional Add: *Congressional Add: Project increase - core manipulator joint*	1.608	-
Congressional Add: *Congressional Add: Program increase - accelerate cislunar flight experiment*	35.788	20.000
Congressional Add: *Congressional Add: Program increase - space research hub*	-	4.000
Congressional Add Subtotals for Project: 633834	37.396	24.000
Project: 634868: *Maui Space Surveillance System*		
Congressional Add: *Congressional Add: Program increase - accelerate cislunar flight experiment*	8.000	-
Congressional Add Subtotals for Project: 634868	8.000	-
Project: 634922: *Space & Missile Rocket Propulsion*		
Congressional Add: *Congressional Add: Program increase - tridyne multi-mode propulsion*	6.764	3.000
Congressional Add: *Congressional Add: Program increase - accelerate cislunar flight experiment*	15.461	-
Congressional Add: *Hall multi-mode propulsion Tech*	-	3.000
Congressional Add: *Additive Mfg of solid rocket propellant*	-	3.000
Congressional Add: *Commercial Space Access Improvements*	-	5.000
Congressional Add: *Congressional Add: Program increase - upper stage engine technology*	22.225	23.400

Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Air Force	Date: March 2023
Appropriation/Budget Activity 3620F: *Research, Development, Test & Evaluation, Space Force I* BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 1206616SF *I Space Advanced Technology Development/Demo*

Congressional Add Details ($ in Millions, and Includes General Reductions)	FY 2022	FY 2023
Congressional Add Subtotals for Project: 634922	44.450	37.400
Project: 63682J: *Spacecraft Vehicles*		
Congressional Add: *Congressional Add: Program increase - nuclear propulsion technologies for cislunar flight*	67.642	-
Congressional Add Subtotals for Project: 63682J	67.642	-
Congressional Add Totals for all Projects	157.488	61.400

Change Summary Explanation

FY 2024: The Department of Defense increased funding by $5.000M for initiating the Orbital Prime effort.

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force			Date: March 2023
Appropriation/Budget Activity 3620F / 3	R-1 Program Element (Number/Name) PE 1206616SF / *Space Advanced Technology Development/Demo*	Project (Number/Name) 633834 / *Integrated Space Technology Demonstrations*	

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
633834: *Integrated Space Technology Demonstrations*	-	73.001	72.256	65.731	0.000	65.731	63.700	65.205	66.485	68.881	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Additional FY24 funds of 2.831M for the Maui Space Surveillance System Civilian pay were inadvertently put into this BPAC. Funds will be realigned upon enactment.

A. Mission Description and Budget Item Justification

This project is a series of advanced technology demonstrations designed to address mission needs by applying emerging technologies from the Air Force Research Laboratory, other United States government laboratories, and industry. These technologies are integrated into system-level demonstrations that are used to test, evaluate, and validate the technologies in a relevant environment.

This project includes the initiation and development of programs addressing Department of the Air Force (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: Integrated Satellite Demonstrations	27.498	20.679	21.887
Description: Develop satellite technologies for integrated, robust, and flexible satellite demonstrations building on previous work and leveraging investments by other organizations.			
FY 2023 Plans: Continue mission-level military utility analyses of technology and associated architectures and employment concepts across multi-domain mission areas. Continue refining guidelines and checkpoints for concept maturation evaluations in context of emerging space technologies. Continue to evolve processes for applying model-based systems engineering into technology decision-making and flight experiment design. Continue design and build of satellite experiments demonstrating small satellite systems/ sub-systems to prove performance, military utility, and enabling capabilities in autonomy, cyber resiliency and integration of commercial and government space networks for command and control (C2) of a hybrid space architecture.			
FY 2024 Plans: Continue development of integrated satellite demonstrations of key space technologies across multi-domain mission areas. Continue design, build, and test of small satellite missions with a focus on capabilities in autonomy, cyber resiliency, and			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force		Date: March 2023
Appropriation/Budget Activity 3620F / 3	**R-1 Program Element (Number/Name)** PE 1206616SF / *Space Advanced Technology Development/Demo*	**Project (Number/Name)** 633834 / *Integrated Space Technology Demonstrations*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
integration of commercial, allied, and government space networks for command and control (C2) of a hybrid space architecture. Continue evolution of the space center of excellence to accelerate transition of space capabilities to the joint warfighter. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY24 increased to support continued development, design, build, and test of small satellite missions with a focus on capabilities in autonomy, cyber resiliency, and integration of commercial, allied, and government space networks for command and control (C2) of a hybrid space architecture. Continue evolution of the space center of excellence to accelerate transition of space capabilities to the joint warfighter.			
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, and other multi-domain operations capabilities. 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 space technology demonstrations for cislunar space situational awareness, autonomy demonstrations, and space logistics. These technologies advance autonomy in space to ensure that space services are available to the joint warfighter, countering adversary threats by getting inside adversary Observe, Orient, Decide, Act (OODA) loops, operating satellites in novel distant regimes, and performing complex robotic tasks on orbit. 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 experimentation to demonstrate logistics and situational awareness in orbits beyond Geosynchronous Earth Orbit. 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:*** Continue experiment demonstrating advanced space situational awareness and multi-agent satellite inspection with integration and test of payloads for rendezvous, proximity operations, and docking. Initiate integration of payloads for cislunar space	8.107	27.577	26.475

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force		Date: March 2023
Appropriation/Budget Activity 3620F / 3	**R-1 Program Element (Number/Name)** PE 1206616SF / *Space Advanced Technology Development/Demo*	**Project (Number/Name)** 633834 / *Integrated Space Technology Demonstrations*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
situational awareness (beyond Geosynchronous Orbit) experiment to satellite bus. Continue experiment demonstrating space logistics with ground testing of robotic payload software and end-to-end demonstration of propulsion module swap. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 decreased as compared to FY 2023 by 1.102M due to higher USSF priorities.			
Title: Modeling and Simulation Tools for Space Applications ***Description:*** Provide modeling, simulation, and analysis for technology evolution in space-based terrestrial surveillance systems, precision navigation and timing, space domain awareness, satellite communications, space environment monitoring, and space control payloads. ***FY 2023 Plans:*** In FY 2024 the Modeling and Simulation Tools for Space Applications thrust is transferred to Program Element (PE) 1206616SF/ Space Advanced Technology Development/Demo, Project 633834/Integrated Space Technology Demonstrations, to better align projects focused on the DAF Operational Imperative for Space Order of Battle, and in line with the USSF Space System Command's Program Executive Office's mission areas. The FY 2023 Plans for the Modeling and Simulation Tools for Space Applications thrust remain in PE 1206601SF/Space Technology, Project 624846/Spacecraft Payload Technologies. ***FY 2024 Plans:*** Continue mission-level military utility analyses of technology and associated architectures and employment concepts across multi-domain mission areas. Continue refining guidelines and checkpoints for concept maturation evaluations in context of emerging space technologies. Continue to evolve processes for applying model-based systems engineering into technology decision-making and flight experiment design. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 increased compared to FY 2023 by 8.852M due to realignment from a different Project. In FY 2024 the Modeling and Simulation Tools for Space Applications thrust is transferred to Program Element (PE) 1206616SF/Space Advanced Technology Development/Demo, Project 633834/Integrated Space Technology Demonstrations, to better align projects focused on the DAF Operational Imperatives, and in line with the USSF Space System Command's Program Executive Office's mission areas. The FY 2023 Plans for the Modeling and Simulation Tools for Space Applications thrust remain in PE 1206601SF/Space Technology, Project 624846/Spacecraft Payload Technologies.	-	0.000	8.852
Title: Agile Space Operations Technology ***Description:*** Develop, provide, and leverage agile software development platforms and pipelines that support pain point identification and rapid software application prototyping, operational evaluation, operator/Guardian effectiveness, and certification in support of USSF operators in collaboration with commercial partners.	-	0.000	3.517

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force		Date: March 2023
Appropriation/Budget Activity 3620F / 3	**R-1 Program Element (Number/Name)** PE 1206616SF / *Space Advanced Technology Development/Demo*	**Project (Number/Name)** 633834 / *Integrated Space Technology Demonstrations*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
FY 2023 Plans: In FY 2024 the Agile Space Operations Technology effort was separated as a stand alone thrust under PE 1206616SF/Space Advanced Technology Development/Demo, Project 633834/Integrated Space Technology Demonstrations, to better align projects focused on the DAF Operational Imperative for Space Order of Battle, and in line with the USSF Space System Command's Program Executive Office's mission areas. FY 2023 Plans were included in PE 1206601SF/Space Technology, Project 625018/ Spacecraft Protection Technology as part of the Space Control thrust. ***FY 2024 Plans:*** Continue to focus on tactical level exploratory development and transition of emerging technologies, refine an environment to perform agile software development and delivery through user focused collaboration and commercial partnerships, and to work with USSF Field Commands and SAF to develop and field a variety of software applications to the USSF Space Delta Units and improve Guardian performance. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 increased compared to FY 2023 by 3.517M due to realignment from a different Program Element. In FY 2024 the Agile Space Operations Technology effort was separated as a stand alone thrust under PE 1206616SF/Space Advanced Technology Development/Demo, Project 633834/Integrated Space Technology Demonstrations, to better align projects focused on the DAF Operational Imperatives and in line with the USSF Space System Command's Program Executive Office's mission areas. FY 2023 Plans were included in PE 1206601SF/Space Technology, Project 625018/Spacecraft Protection Technology as part of the Space Control thrust.			
Title: Orbital Prime	-	0.000	5.000
Description: SpaceWERX Orbital Prime will transition agile, affordable, and accelerated space capabilities, reducing risk to the global commons to rapidly field In-space Servicing, Assembly, Manufacturing (ISAM) capabilities. ***FY 2023 Plans:*** N/A ***FY 2024 Plans:*** Pair funding with capabilities being matured through the SpaceWERX Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) pipeline set aside for Orbital Prime, which includes Strategic Funding Increase (STARTFI) matching consideration, and to seed a Prize Challenge such as through the private sector X-Prize program. ***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 3620F / 3	**R-1 Program Element (Number/Name)** PE 1206616SF / *Space Advanced Technology Development/Demo*	**Project (Number/Name)** 633834 / *Integrated Space Technology Demonstrations*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Orbital Prime efforts are a new start for FY24.			
Accomplishments/Planned Programs Subtotals	35.605	48.256	65.731

	FY 2022	FY 2023
Congressional Add: Congressional Add: Project increase - core manipulator joint ***FY 2022 Accomplishments:*** Conduct Congressionally directed effort.	1.608	-
Congressional Add: Congressional Add: Program increase - accelerate cislunar flight experiment ***FY 2022 Accomplishments:*** Conduct Congressionally directed effort. ***FY 2023 Plans:*** Conduct Congressionally directed effort.	35.788	20.000
Congressional Add: Congressional Add: Program increase - space research hub ***FY 2023 Plans:*** Conduct Congressionally directed effort.	-	4.000
Congressional Adds Subtotals	37.396	24.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force			Date: March 2023
Appropriation/Budget Activity 3620F / 3	R-1 Program Element (Number/Name) PE 1206616SF / *Space Advanced Technology Development/Demo*	Project (Number/Name) 634868 / *Maui Space Surveillance System*	

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
634868: *Maui Space Surveillance System*	-	18.997	15.921	10.667	0.000	10.667	10.983	11.245	11.290	11.746	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This program funds ground-based optical space situational awareness technology development and demonstration at the Maui Space Surveillance System in Hawaii, as well as the operation and upgrade of the experimental equipment and required facilities. Efforts in this program have been coordinated through the Department of Defense Science and Technology Executive Committee process to harmonize efforts and eliminate duplication.

A civilian pay adjustment should have been applied to this Project in the previous cycle to correct a Project code such that the BPAC aligns to PE 1206616SF, Project 634868 under Budget Activity 03. This fix reverses a previous error that aligned this BPAC to Budget Activity (BA) 06 (RDT&E Management Support) resulting in the unintentional creation of Project C6601Z in PE 1206616SF under BA 06.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Operate and Upgrade Maui Space Surveillance System	10.997	15.921	10.667
Description: Operate, sustain, and upgrade the Maui Space Surveillance System to support development, demonstration, and integration of ground-based optical space domain awareness technologies for use in R&D, as well as for missions conducted by the Space Operations Command DELTA 2/15 Space Surveillance Squadron (SPOC/DEL2/15SPSS). ***FY 2023 Plans:*** Continued to maintain the Maui Space Surveillance System R&D facilities and experimental equipment in a mission-ready state, including needed upgrades and modernization to keep the R&D facilities and equipment in good working order to perform efficiently and reliably. Continued to operate Maui Space Surveillance System R&D facilities for development and demonstration of ground based space domain awareness capabilities in conjunction with customer programs and to contribute to the SPOC/DEL2/15SPSS's operational Space Domain Awareness mission. Continued to collect observations of satellites as requested by mission partners. As needed, operated the prototype regional wide-area-search of the geosynchronous belt in the Pacific AOR ahead of the fielding of the joint Space Systems Command + Australian Space Surveillance Telescope facility. Continued to host missions in the Pacific AOR for DoD components and other government agencies. ***FY 2024 Plans:*** Continue to maintain the Maui Space Surveillance System R&D facilities and experimental equipment in a mission-ready state, including needed upgrades and modernization to keep the R&D facilities and equipment in good working order to perform efficiently and reliably. Continue to operate Maui Space Surveillance System R&D facilities for development and demonstration			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force		Date: March 2023
Appropriation/Budget Activity 3620F / 3	**R-1 Program Element (Number/Name)** PE 1206616SF / *Space Advanced Technology Development/Demo*	**Project (Number/Name)** 634868 / *Maui Space Surveillance System*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
of ground-based space domain awareness capabilities in conjunction with customer programs and to contribute to the SPOC/ DEL2/15SPSS's operational Space Domain Awareness mission. Continue to collect observations of satellites as requested by mission partners. As needed, operate the prototype regional wide-area-search of the geosynchronous belt in the Pacific AOR ahead of the fielding of the joint Space Systems Command + Australian Space Surveillance Telescope facility. Begin construction of the new Air Force Maui Optical and Supercomputing (AMOS) facility funded under MILCON authority. Begin re-construction of the Small Telescope Advanced Research site. Continue to host missions in the Pacific AOR for DoD components and other government agencies. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY24 decreased from FY23 by $5.254M. Decrease was due to realignment of funds from PE 1206616SF, Project 634868 to PE 1206601SF, Project 624866. In addition, a civilian pay adjustment should have been applied to this Project in the previous cycle to correct this Project code to align PE 1206616SF, Project 634868 under Budget Activity 03. This adjustment would have reversed a previous error that aligned this BPAC to Budget Activity (BA) 06 (RDT&E Management Support) resulting in the unintentional creation of Project C6601Z in PE 1206616SF under BA 06. This correction has not been processed.			
Accomplishments/Planned Programs Subtotals	10.997	15.921	10.667

	FY 2022	FY 2023
Congressional Add: Congressional Add: Program increase - accelerate cislunar flight experiment	8.000	-
FY 2022 Accomplishments: Conduct Congressionally directed effort.		
Congressional Adds Subtotals	8.000	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force			Date: March 2023
Appropriation/Budget Activity 3620F / 3	R-1 Program Element (Number/Name) PE 1206616SF / *Space Advanced Technology Development/Demo*	Project (Number/Name) 634922 / *Space & Missile Rocket 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
634922: *Space & Missile Rocket Propulsion*	-	58.760	59.342	22.629	0.000	22.629	23.326	23.841	24.330	25.206	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project develops and demonstrates advanced and innovative low-cost rocket turbo-machinery and components, and low-cost space launch propulsion technologies. 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, higher efficiency energy conversion systems (derived from an improved understanding of combustion fundamentals), and high-energy propellants. Technological advances in this project could improve the performance of expendable payload capabilities by approximately twenty to fifty percent and reduce launch, operations, and support costs by approximately thirty percent. Responsiveness and operability of propulsion systems will be enhanced for reusable launch systems. 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) and National Aeronautics and Space Administration (NASA). The efforts in this project are reviewed by a DoD level steering committee annually for relevance to DoD missions, and the associated support costs.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Liquid Rocket Propulsion Technologies	8.161	9.530	9.828
Description: Develop liquid rocket propulsion technology for current and future space launch vehicles. Demonstrate technologies and concepts of operation supporting rapid launch capability.			
FY 2023 Plans: Continue modular engine feasibility to address scalability, applicability, testability, and life cycle cost for National Security Space applications. Continue development of disruptive engine concepts/cycles for liquid propellant engines, engine system components, and control for space launch system. Initiate evaluation of austere location launch capability with commercial partners and demonstration opportunities. Continue coordination of technology transition opportunities for space access to manage technology insertion and evaluate capabilities for rocket engine hardware and related systems.			
FY 2024 Plans: Continue modular engine feasibility to address scalability, applicability, testability, and life cycle cost for National Security Space applications. Continue development of disruptive engine concepts/cycles for liquid propellant engines, engine system components, and control for space launch system. Continue evaluation of austere location launch capability with commercial partners and demonstration opportunities, driving towards a sustainable rapid launch capability. Continue coordination of technology transition opportunities for space access to manage technology insertion and evaluate capabilities for rocket engine			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force		Date: March 2023
Appropriation/Budget Activity 3620F / 3	**R-1 Program Element (Number/Name)** PE 1206616SF / *Space Advanced Technology Development/Demo*	**Project (Number/Name)** 634922 / *Space & Missile Rocket Propulsion*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
hardware and related systems. Initiate a digital framework for space access planning, integration, modeling and logistical areas to facilitate rapid launch capabilities. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY2024 increased compared to FY2023 by $0.298 million. Funding increase due to increase in fuel costs for testing operations.			
Title: On-Orbit Propulsion Technologies ***Description:*** Develop solar electric, electric, and monopropellant propulsion technologies for existing and future satellites, upper stages, orbit transfer vehicles, and satellite maneuvering. ***FY 2023 Plans:*** Continue to develop and transition experimental, modeling and simulation, and theoretical efforts geared towards advanced thruster development with emphasis on understanding thrust scale-up. Continue analysis and development of multi-mode propulsion opportunities to combine high efficiency and high thrust capabilities on a common propellant. Continue thrust scale-up effort for advanced non-toxic propellant for use in monopropellant thrusters and electric propulsion thruster for a multi-mode propulsion capability. Initiate flight-weight design and development of multimode propulsion flight system combining capabilities of chemical thrusters and electric propulsion thrusters and utilizing a single common propellant for greater operational potentiality. ***FY 2024 Plans:*** Continue to develop and transition experimental, modeling and simulation, and theoretical efforts geared towards advanced thruster development with emphasis on understanding thrust scale-up. Continue analysis and development of multi-mode propulsion opportunities to combine high efficiency and high thrust capabilities on a common propellant. Continue thrust scale-up effort for advanced non-toxic propellant for use in monopropellant thrusters and electric propulsion thrusters for a multi-mode propulsion capability. Continue flight-weight design and development of multimode propulsion flight system combining capabilities of chemical thrusters and electric propulsion thrusters and utilizing a single common propellant for greater operational potentiality. Initiate design and development of high power electric propulsion thrusters for enhanced maneuver capability. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY2024 increased compared to FY2023 by $0.389 million. Funding increase due to hardware purchases for upcoming flight demonstration.	6.149	12.412	12.801
Accomplishments/Planned Programs Subtotals	14.310	21.942	22.629

	FY 2022	FY 2023
Congressional Add: Congressional Add: Program increase - tridyne multi-mode propulsion	6.764	3.000

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force		Date: March 2023
Appropriation/Budget Activity 3620F / 3	**R-1 Program Element (Number/Name)** PE 1206616SF / *Space Advanced Technology Development/Demo*	**Project (Number/Name)** 634922 / *Space & Missile Rocket Propulsion*

	FY 2022	FY 2023
FY 2022 Accomplishments: Conduct Congressionally directed effort. ***FY 2023 Plans:*** Conduct Congressionally directed effort.		
Congressional Add: Congressional Add: Program increase - accelerate cislunar flight experiment ***FY 2022 Accomplishments:*** Conduct Congressionally directed effort.	15.461	-
Congressional Add: Hall multi-mode propulsion Tech ***FY 2023 Plans:*** Conduct Congressionally directed effort.	-	3.000
Congressional Add: Additive Mfg of solid rocket propellant ***FY 2023 Plans:*** Conduct Congressionally directed effort.	-	3.000
Congressional Add: Commercial Space Access Improvements ***FY 2023 Plans:*** Commercial Space Access Improvements	-	5.000
Congressional Add: Congressional Add: Program increase - upper stage engine technology ***FY 2022 Accomplishments:*** Conduct Congressionally directed effort. ***FY 2023 Plans:*** Conduct Congressionally directed effort.	22.225	23.400
Congressional Adds Subtotals	44.450	37.400

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Air Force			Date: March 2023
Appropriation/Budget Activity 3620F / 3	R-1 Program Element (Number/Name) PE 1206616SF / *Space Advanced Technology Development/Demo*	Project (Number/Name) 63682J / *Spacecraft Vehicles*	

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
63682J: *Spacecraft Vehicles*	-	76.723	19.904	11.006	0.000	11.006	4.991	5.113	5.217	5.405	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project develops and demonstrates technologies critical to addressing documented military satellite communications capability gaps and top-ranked United States Space Force (USSF) and/or Space Systems Command (SSC) technology needs.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Space Communication Technologies	9.081	19.904	11.006
Description: Develop technologies for next-generation space communications terminals and equipment, along with methods/techniques to enable future space system operational command and control concepts. ***FY 2023 Plans:*** Continue support of W/V-band propagation flight experiment. Continue beacon ground terminal operations, maintenance, and redeployments. Continue collection and analysis of additional data to statistically characterize atmospheric propagation effects and correlate to meteorological parameters. Continue technology research and development work to address military space communications capability needs. Complete fabrication and space-qualification of V-band high power amplifiers. Complete development of W/V-band transponder flight experiment, coupled with cross-links. Initiate integration and testing of flight experiment engineering unit in preparation for launch and demonstration. Continue systems engineering and technology risk-reduction for W/V-band ground terminals. ***FY 2024 Plans:*** Initiate W/V-band transponder integration and testing activities. Prepare integrated payload for launch. Finish development of ground terminal capabilities to support transponder testing and experimentation. Continue on-orbit beacon experiment, including mission support, transmission of test signals, operation of ground receiver terminals, collection and archiving of data, monitoring of environmental conditions, and analysis of environmental impacts on W/V propagation. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** FY 2024 decreased compared to FY 2023 by 8.898M due to anticipated completion and delivery of W/V-band transponder unit.			
Accomplishments/Planned Programs Subtotals	9.081	19.904	11.006

	FY 2022	FY 2023
Congressional Add: Congressional Add: Program increase - nuclear propulsion technologies for cislunar flight	67.642	-

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	FY 2022	FY 2023
FY 2022 Accomplishments: Conduct congressionally directed effort.		
Congressional Adds Subtotals	67.642	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A