Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Defense Advanced Research Projects Agency	Date: March 2024
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603287E / *SPACE PROGRAMS AND TECHNOLOGY*

COST ($ in Millions)	Prior Years	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total	FY 2026	FY 2027	FY 2028	FY 2029	Cost To Complete	Total Cost
Total Program Element	-	76.900	134.809	225.457	-	225.457	257.490	289.776	306.373	317.280	-	-
SPC-01: *SPACE PROGRAMS AND TECHNOLOGY*	-	76.900	134.809	225.457	-	225.457	257.490	289.776	306.373	317.280	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The efforts described in this Program Element (PE) address the Advanced Technology Development associated with the Space Programs and Technology Program that addresses high payoff opportunities to dramatically reduce costs associated with advanced space systems and provides revolutionary new system capabilities for satisfying current and projected military missions.

A space force structure that is robust against attack represents a stabilizing deterrent against adversary attacks on space assets. This program element will examine concepts and architectures that move the U.S. away from a dependence on monolithic, ultra-capable, vulnerable, and unsustainably costly assets; replacing them with disaggregated assets that are agile, affordable, and easily replaced. Ready access to space requires the delivery of capabilities, replenishment of supplies into orbit, and rapid manufacturing of affordable space capabilities. In addition, developing space access and spacecraft servicing technologies will lead to reduced ownership costs of space systems and new opportunities for introducing technologies for the exploitation of space.

Systems development is also required to increase the interactivity and functionality of space systems, space-derived information, and services with terrestrial users. Studies under this program element include technologies and systems that will enable satellites and microsatellites to operate more effectively by increasing maneuverability, survivability, and situational awareness, and precision control of multi-payload systems. Studies will actively seek to take advantage of new commercial developments which may enable both rapid constitution/reconstitution of assets, and agility/functionality not previously available for military systems.

B. Program Change Summary ($ in Millions)	FY 2023	FY 2024	FY 2025 Base	FY 2025 OCO	FY 2025 Total
Previous President's Budget	74.388	134.809	227.314	-	227.314
Current President's Budget	76.900	134.809	225.457	-	225.457
Total Adjustments	2.512	0.000	-1.857	-	-1.857
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	5.197	0.000			
• SBIR/STTR Transfer	-2.685	0.000			
• TotalOtherAdjustments	-	-	-1.857	-	-1.857

Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Defense Advanced Research Projects Agency	Date: March 2024
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603287E / *SPACE PROGRAMS AND TECHNOLOGY*

Change Summary Explanation

FY 2023: Increase reflects SBIR/STTR transfer offset by reprogrammings.
FY 2024: N/A
FY 2025: Decrease reflects minor program repricing.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
Title: Demonstration Rocket for Agile Cislunar Operations (DRACO)	47.513	81.977	146.352

Description: Maintaining U.S. interests in cislunar space requires significant advances in propulsion technology. Current space propulsion includes electric (high efficiency but low thrust) and chemical (high thrust but low efficiency) systems. The Demonstration Rocket for Agile Cislunar Operations (DRACO) program will develop and demonstrate a High-Assay Low-Enriched Uranium (HALEU) nuclear thermal rocket (NTR) system on orbit by FY 2027. The NTR technology demonstrated by DRACO will achieve thrust similar to chemical rockets, but with 2-5 times the efficiency. The enhanced performance afforded by NTR will allow the U.S. to lead operations in the cislunar volume, in particular for missions that require moving heavy cargo across large distances in a timely manner.

FY 2024 Plans:
- Complete detailed design of the NTR engine (NTRE).
- Complete detailed design of experimental NTR vehicle (XNTRV).
- Continue fabrication of long lead components for the XNTRV.
- Complete build of primary non-nuclear NTRE components such as turbopump and valves.
- Complete assembly of engineering development unit of the NTRE for cold-flow test campaign.
- Conduct cold-flow test campaign for turbopump and the NTRE system.
- Begin making nuclear fuel into fuel elements to the specifications as determined by the detailed design of the NTRE.

FY 2025 Plans:
- Complete acquisition and machining of remaining major NTRE materials and components.
- Complete assembly of major XNTRV subsystems and begin preparations for space environment testing.
- Conduct space environment testing of major XNTRV subsystems.
- Manufacture reactor core fuel, reactor vessel, and beryllium for moderator and reflector.
- Begin assembly of fueled nuclear reactor.
- Complete assembly of cryogenic liquid hydrogen tank.
- Test Cryogenic liquid hydrogen tank to obtain propellant storage performance data.
- Begin full assembly of XNTRV.

FY 2024 to FY 2025 Increase/Decrease Statement:

Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Defense Advanced Research Projects Agency	Date: March 2024
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603287E / *SPACE PROGRAMS AND TECHNOLOGY*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
The FY 2025 increase is due to the assembly of the bus for the XNTRV, assembly of the tank, conducting cold flow testing of the NTRE, fuel manufacturing for the NTRE reactor core, and the completion of space qualification testing of major subsystems.			
Title: Robotic Servicing of Geosynchronous Satellites (RSGS) ***Description:*** A large number of national security and commercial space systems operate at geosynchronous earth orbit (GEO), providing persistence and enabling ground station antennas to point in a fixed direction. Technologies for servicing of GEO spacecraft would involve a mix of highly automated and remotely operated (from Earth) robotic systems. The Robotic Servicing of Geosynchronous Satellites (RSGS) program is establishing the capability to provide robotic services in GEO suitable for a variety of potential servicing tasks, in full collaboration and cooperation with existing satellite owners and national security space operators, and with sufficient propellant for several years of follow-on capability. Key RSGS challenges include robotic tool/end effector requirements, efficient orbital maneuvering of a servicing vehicle, robotic arm systems, automation of certain spacecraft operations, and development of the infrastructure for coordinated control between the servicer and client spacecraft operations teams. The transition agreement is with a commercial partner who will provide the satellite to carry the robotic payload and who will operate the robotic servicer. To support the development of a broadly accepted satellite servicing capability, DARPA is using the Consortium for Execution of Rendezvous and Servicing (CONFERS) operations approach to bring together experts from the private sector and Government to research, develop and publish nonbinding, consensus-based standards for safe operational approaches to on-orbit servicing. ***FY 2024 Plans:*** - Complete functional testing and space qualification of integrated robotic payload. - Deliver integrated and tested robotic payload. - Support combined testing of integrated robotic payload and spacecraft bus. - Develop partner training and detailed demonstration planning. ***FY 2025 Plans:*** - Conduct launch, on-orbit checkout, and calibration of integrated robotic payload. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** The FY 2025 increase reflects minor program repricing.	5.000	4.900	5.200
Title: Advanced Space Technology Concepts ***Description:*** Studies conducted under this program will examine and evaluate emerging technologies and concepts with the potential to provide substantial improvement in efficiency, effectiveness, and resilience of operations in space. This includes the degree and scope of potential impact and improvements to military operations, mission utility, and warfighter capability. Studies are also conducted to analyze emerging threats along with possible methods and technologies for countermeasures.	3.500	12.500	12.007

Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Defense Advanced Research Projects Agency	Date: March 2024
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603287E / *SPACE PROGRAMS AND TECHNOLOGY*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
The feasibility of achieving potential improvements, in terms of resources, schedule, and technological risk, is also evaluated. The results from these studies are used, in part, to formulate future programs or refocus ongoing work. Topics of consideration include applying artificial intelligence to low earth orbit (LEO) constellation operations to enable collaboration between space, air, maritime, and ground platforms in anti-access/area denial (A2/AD) theaters; robust architectures for precision navigation and timing; enabling operations in Cislunar space; novel approaches to space domain awareness; integration of commercial capabilities into military operations; and on-orbit software environments. ***FY 2024 Plans:*** - Initiate studies of new applications for military and commercial proliferated LEO (p-LEO) constellations. - Initiate studies of innovative approaches to enable dynamic space operations. - Perform laboratory demonstrations of novel technologies for early risk reduction and concept validation. ***FY 2025 Plans:*** - Explore updated and new architectures for space vehicle concepts. - Investigate novel approaches to defend joint forces operating in terrestrial environments. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** The FY 2025 decrease reflects minor program repricing.			
Title: Otter ***Description:*** The Otter program will develop and demonstrate air breathing propulsion technologies that enable operations in very low earth orbital domains that are currently inaccessible. Propulsion capabilities demonstrated will provide increased mission duration and ability to maneuver without regret. Key efforts include the development of new propulsion systems, improved ground test capabilities, and analysis tools to support system development. Otter will progress through development of analysis and test tools, design of candidate propulsion systems, ground testing, build of a demonstrator satellite, and culminate in a long duration (> 1 year) spaceflight demonstration. The anticipated transition partner is the U.S. Space Force. ***FY 2024 Plans:*** - Develop analysis tools to support system design. - Upgrade test facilities to support component testing. - Develop and mature propulsion system designs. ***FY 2025 Plans:*** - Refine measurement instrumentation of test facilities to support component testing. - Conduct component testing. - Continue development and maturation of propulsion system designs.	-	25.435	61.898

Exhibit R-2, RDT&E Budget Item Justification: PB 2025 Defense Advanced Research Projects Agency	Date: March 2024
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 0603287E / *SPACE PROGRAMS AND TECHNOLOGY*

C. Accomplishments/Planned Programs ($ in Millions)	FY 2023	FY 2024	FY 2025
- Conduct initial testing of air harvesting inlets. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** The FY 2025 increase reflects the shift from concept development and initial design to ground testing of preliminary inlet and thruster designs.			
Title: Blackjack ***Description:*** The Blackjack program is developing space technologies demonstrating a proliferated smallsat constellation capability in Low Earth Orbit (LEO). Capabilities demonstrated will provide constant custody of very large numbers of concurrent targets; target identification, tracking, and characterization; tactical communications; architectural resilience via massive proliferation; and rapid on-orbit technology refresh and experimentation. Blackjack is leveraging commercial industry plans to build constellations in LEO to provide global commercial broadband internet service. Key efforts include low size, weight, power, and cost (SWaP-C) multi-modality smallsat sensor payloads, algorithms for autonomous payload and architecture command and control, algorithms for satellite on-board processing and data fusion, and advanced manufacturing for military payload mass production. A Memorandum of Agreement (MOA) documents the partnership with U.S. Space Force and Air Force. The anticipated transition partners are the U.S. Space Force, Air Force and Space Development Agency. Blackjack will progress through design, build, and launch of four satellites with tactical communications and Intelligence, Surveillance, and Reconnaissance (ISR) payloads for the full Blackjack demonstration of a proliferated LEO constellation. ***FY 2024 Plans:*** - Conduct and complete on-orbit Blackjack constellation demonstration. ***FY 2024 to FY 2025 Increase/Decrease Statement:*** The FY 2025 decrease reflects program completion.	20.887	9.997	-
Accomplishments/Planned Programs Subtotals	76.900	134.809	225.457

D. Other Program Funding Summary ($ in Millions)

N/A

Remarks

E. Acquisition Strategy

N/A