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

Appropriation/Budget Activity 3620F: <i>Research, Development, Test & Evaluation, Space Force I BA 4: Advanced Component Development & Prototypes (ACD&P)</i>	R-1 Program Element (Number/Name) PE 1206438SF / <i>Space Control Technology</i>
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COST (\$ in Millions)	Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	FY 2024	FY 2025	FY 2026	FY 2027	Cost To Complete	Total Cost
Total Program Element	-	42.400	35.931	57.953	0.000	57.953	62.765	62.171	62.579	63.481	Continuing	Continuing
642611: <i>Technology Insertion Planning and Analysis</i>	-	42.400	35.931	57.953	0.000	57.953	62.765	62.171	62.579	63.481	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

This project supports a range of activities including systems engineering, technology planning, development, demonstrations and prototyping, and testing, as well as modeling, simulations and exercises to support development and maturation of tactics and procedures for a responsive and resilient Space Control mission area. This includes technology development and prototyping for Defensive Counterspace (DCS) and Offensive Counterspace (OCS) and the necessary systems engineering for the warfighter to effectively employ such systems.

Specifically supported are DCS and Space Domain Awareness (SDA) activities, which include developing threat warning payloads for monitoring, detecting, identifying, tracking, assessing, verifying, categorizing, and characterizing objects and events in space. Additionally, this activity supports the development of payload prototypes and space defense force packages for protecting U.S. space systems, resources, and operations from enemy attempts to negate, interfere, or destroy them.

Specific OCS activities include disruption, denial, or degradation (and associated Electronic Support) of adversary space systems that may be used for purposes hostile to U.S. national security interests. Rapid Reaction Capabilities in response to immediate warfighter needs in the Space Control mission area are developed within this program. Depending on the magnitude of Combatant Command Urgent Operational Needs (UON), this program may not include necessary funding for all contingency deployments. As required, necessary funding will be requested through established Joint Urgent Operational Need (JUON) and Overseas Contingency Operations (OCO) processes.

Joint Space Technology Integration leverages knowledge of the space environment and impacts on weapon systems to prototype, develop, test, and field joint multi-domain software and modeling solutions to fill Combatant Commander gaps. Decades of space environment science and technology advancements require significant maturity to integrate with joint force systems in all domains to address immediate and evolving threats to U.S. forces operating in harm's way. Rapid and agile demonstrations, exercises, and war games provide essential validation of delivered capabilities to increase commanders confidence when used operationally.

Space acquisition must respond with speed and agility to emerging adversary threats. Space Systems Command (SSC) has transformed the organization and implementation of space acquisition to an enterprise approach, to increase innovation and resiliency, leveraging international, commercial, and mission partnerships, and managing program/project priorities according to an integrated unclassified/classified enterprise space architecture. Expanding the appropriate acquisition authorities and contract mechanisms to deliver capability sooner, SSC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or repurpose existing capabilities.

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This program element may include necessary civilian pay expenses required to manage, execute, and deliver SCT weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392SF and 1206398SF. In CY 2021 \$0.160M was expended for civilian pay expenses in this program element.

This effort is in Budget Activity 4, Advanced Component Development and Prototypes (ACD&P), because efforts are necessary to evaluate integrated technologies, representative modes or prototype systems in a high fidelity and realistic operating environment.

B. Program Change Summary (\$ in Millions)	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total
Previous President's Budget	40.575	32.931	0.000	0.000	0.000
Current President's Budget	42.400	35.931	57.953	0.000	57.953
Total Adjustments	1.825	3.000	57.953	0.000	57.953
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	3.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	2.895	0.000			
• SBIR/STTR Transfer	-1.070	0.000			
• Other Adjustments	0.000	0.000	57.953	0.000	57.953

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

Project: 642611: *Technology Insertion Planning and Analysis*

Congressional Add: *NEXT-C Gridded Ion Thruster Development*

Congressional Add Subtotals for Project: 642611

Congressional Add Totals for all Projects

	FY 2021	FY 2022
	5.000	3.000
	5.000	3.000
	5.000	3.000

Change Summary Explanation

FY 2021: \$2.895M reprogramming for Space Safari effort and -\$1.070 decrease for SBIR.

FY 2022: \$3.000M increase for gridded ion thruster.

FY 2023: The FY 2022 President's Budget submittal did not reflect FY 2023 through FY 2026 funding. Therefore, an explanation of the change between the two budget positions for FY 2023 cannot be made in a relevant manner.

C. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
Title: Rapid Reaction Branch	20.064	19.490	18.934

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C. Accomplishments/Planned Programs (\$ in Millions)	FY 2021	FY 2022	FY 2023
<p>Description: Develops advanced capabilities for rapid prototyping and integration into space control programs of record and, if requested, to warfighter Urgent Operational Needs (UONs) and Joint Urgent Operational Needs (JUONs). Conducts prototype capability development, testing, training and rapid transition of technology and techniques to space control systems. Sustains deployed quick reaction capabilities until transition to program of record or mission completion.</p> <p>FY 2022 Plans: Develop, test, train, field, transition and sustain advanced rapid reaction capabilities in response to emergent requirements from multiple Combatant Commands. Conduct initial technical development and integration activities against relevant threat systems and technologies in preparation for operational requirements. Develop and test advanced prototypes in support of activities within the Space Control Technology portfolio. Based on technological advances relevant to the mission area, develop, integrate and evaluate next generation capabilities into Government Reference Architecture (GRA) Increment 5. Develop, test, train, deliver and sustain urgent/emergent operational needs using Increment 4 or Increment 5 GRA technologies as appropriate for urgent need timelines. Integrate information assurance constructs and controls into developmental platforms to expedite fielding. Execute field development & test activities, at all locations, to verify system performance in the operational environment. Enhance fielded rapid reaction capabilities in response to evolving threats and operator feedback.</p> <p>Additionally, FY 2022 funding will allow the program to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to: studies, technical analysis, risk reduction experiments and prototyping, integration and test of command and control (C2), resiliency measures and mission partner interfaces, space test/combat range events, and office support etc.</p> <p>FY 2023 Plans: Develop, test, train, field, transition and sustain advanced rapid reaction capabilities in response to emergent requirements from multiple Combatant Commands. Conduct initial technical development and integration activities against relevant threat systems and technologies in preparation for operational requirements. Develop and test advanced prototypes in support of activities within the Space Control Technology portfolio. Based on technological advances relevant to the mission area, develop, integrate and evaluate next generation capabilities into (GRA) Increment 5. Develop, test, train, deliver and sustain urgent/emergent operational needs using Increment 4 or Increment 5 GRA technologies as appropriate for urgent need time-lines, and start Increment 6. Integrate information assurance constructs and controls into developmental platforms to expedite fielding. Execute field development & test activities, at all locations, to verify system performance in the operational environment. Enhance fielded rapid reaction capabilities in response to evolving threats and operator feedback.</p> <p>Additionally, FY 2023 funding will allow the program to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to: studies, technical analysis, risk reduction</p>			

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
experiments and prototyping, integration and test of command and control (C2), resiliency measures and mission partner interfaces, space test/combat range events, and office support etc.				
FY 2022 to FY 2023 Increase/Decrease Statement: FY 2023 increased due to inflation.				
Title: Integration and Technology Futures, changed from Warfighting and Technology Futures		17.336	13.441	14.319
Description: In FY 2023, "Warfighting and Technology Futures" effort title was changed to "Integration and Technology Futures" to capture overall mission and activities. This is not a new start.				
Foundational architecture and prototype development will enable the integration, interoperability and compatibility of new Space Control Technology into space systems. Funds sensor and other capability technologies for transition into programs to meet space control mission requirements.				
FY 2022 Plans: Capture OCS and DCS enterprise capabilities in digital engineering models that represent the space enterprise assets, operations, and related key performance characteristics. Exercise the digital engineering models to analyze the performance, operational capabilities, and interdependencies of space systems at the enterprise level to inform the space control mission area. Define and perform various digital engineering functions, tools, procedures, and best practices to accelerate acquisition of successful and affordable space control systems. Conduct IRON JAR space experimentation activities with programs of record and mission partners to demonstrate and evaluate space technologies, mature space operations processes, conduct operator training, develop tactics, techniques, and procedures (TTPs), and validate digital engineering models. Identify and prioritize solution development of new space technologies. FY 2022 funding will allow the program to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to: studies, technical analysis, risk reduction experiments and prototyping, integration and test of command and control (C2), resiliency measures and mission partner interfaces, space test/ combat range events, and office support etc.				
FY 2023 Plans: Capture OCS and DCS enterprise capabilities in digital engineering models that represent the space enterprise assets, operations, related key performance characteristics, and threat response. Exercise the digital engineering models and establish secure networks for data sharing with mission partners to analyze the performance, operational capabilities, and interdependencies of space systems at the enterprise level to inform the counterspace mission areas. Define standards and perform various digital engineering functions, tools, procedures, and best practices to accelerate acquisition of successful and affordable counterspace systems.				

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2021	FY 2022	FY 2023
<p>Conduct IRON JAR space experimentation activities with programs of record and mission partners to demonstrate and evaluate space technologies, mature space operations processes, conduct operator training, develop tactics, techniques, and procedures (TTPs), and validate digital engineering models. Identify and prioritize solution development of new space technologies. FY 2023 funding will allow the program to rapidly respond to implement system resiliency and situational awareness necessary to operate in the contested space domain. Activities may include, but are not limited to: studies, technical analysis, risk reduction experiments and prototyping, integration and test of command and control (C2), resiliency measures and mission partner interfaces, space test/combat range events, and office support etc.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: FY 2023 increased due to inflation.</p>				
<p>Title: Military Application of the Space Environment (MASE)</p> <p>Description: MASE is not a new start as it was previously funded in Appropriation 3620, RDT&E, Space Force, PE 1206427S, Space Systems Prototype Transitions (SSPT).</p> <p>MASE provides commanders an operational risk assessment tool to improve air and maritime campaign mission effectiveness. Develops, tests, and delivers weapon system tailored visualizations/decision aids supporting operational level mission planning and tactical execution.</p> <p>FY 2022 Plans: N/A</p> <p>FY 2023 Plans: Research, develop and validate enhanced regional ionospheric and signal propagation models to predict (forecast) space domain impacts on weapon systems. Integrate model output into weapon system tailored visualizations to improve multi-domain mission planning and execution. Conduct demonstrations of new capabilities and validate results during campaign planning, exercises, and war games. Develop, test, and train new (or updated) tactics, techniques, and procedures for use by operational users. Integrate new traditional and non-traditional data sources into models to improve support to decision makers. Rapidly develop, test, and deploy new system features in response to Combatant Commander needs and a continuously evolving threat to U.S. forces.</p> <p>FY 2022 to FY 2023 Increase/Decrease Statement: FY 2023 increased due to increased efforts for MASE, which is a multi-phase prototype being turned into a program of record and was sustained by the Unfunded Requirements (UFR) process in FY 2022.</p>		-	0.000	24.700
Accomplishments/Planned Programs Subtotals		37.400	32.931	57.953

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	FY 2021	FY 2022
Congressional Add: NEXT-C Gridded Ion Thruster Development FY 2021 Accomplishments: N/A FY 2022 Plans: Project will partner with NASA to develop gridded ion thruster hardware based on the NASA Evolutionary Xenon Thruster - Commercial (NEXT-C) hardware development contract. The activity will include both in-house risk reduction tasks and contracted activities with industry through an existing contract mechanism. The objective for the project is to develop and test key components of a higher Thrust-to-Power (T/P) NEXT derivative for dual commercial and military applications. Development is planned to include the two key components of a propulsion system, including NEXT-C electric propulsion device and the associated higher power processing unit (PPU).	5.000	3.000
Congressional Adds Subtotals	5.000	3.000

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

N/A

Remarks

E. Acquisition Strategy

All contracts funded in this program element will be awarded using competitive procedures to the maximum extent possible.

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2023 Air Force **Date:** April 2022

Appropriation/Budget Activity 3620F / 4	R-1 Program Element (Number/Name) PE 1206438SF / <i>Space Control Technology</i>	Project (Number/Name) 642611 / <i>Technology Insertion Planning and Analysis</i>
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Product Development (\$ in Millions)				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
SCT Counterspace Technology Prototyping/ Rapid Reaction Development	Various	Various : Various	-	18.505	Oct 2020	17.443	Oct 2021	17.750	Oct 2022	-		17.750	Continuing	Continuing	-
SCT Integration and Technology Futures	C/Various	Various : Various	-	17.336	Dec 2020	12.701	Nov 2021	12.674	Nov 2022	-		12.674	Continuing	Continuing	-
NEXT-C Gridded Ion Thruster Development	TBD	TBD : TBD	-	5.000	Mar 2022	3.000	Sep 2022	-		-		-	Continuing	Continuing	-
MASE	Various	Various : Various	-	-		-		24.700	Oct 2022	-		24.700	Continuing	Continuing	-
Subtotal			-	40.841		33.144		55.124		-		55.124	Continuing	Continuing	N/A

Management Services (\$ in Millions)				FY 2021		FY 2022		FY 2023 Base		FY 2023 OCO		FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost	Award Date	Cost			
A&AS	Various	Various : Various	-	1.559	Jan 2021	2.787	Jan 2022	2.829	Jan 2023	-		2.829	Continuing	Continuing	-
Subtotal			-	1.559		2.787		2.829		-		2.829	Continuing	Continuing	N/A

			Prior Years	FY 2021	FY 2022	FY 2023 Base	FY 2023 OCO	FY 2023 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals			-	42.400	35.931	57.953	-	57.953	Continuing	Continuing	N/A

Remarks

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Exhibit R-4, RDT&E Schedule Profile: PB 2023 Air Force		Date: April 2022
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	FY 2021				FY 2022				FY 2023				FY 2024				FY 2025				FY 2026				FY 2027			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
RRB																												
Rapid Prototyping/Demo/Testing/Fielding & Transition of UON/JUON/JEON Weapon System Capabilities																												
Ongoing Capability Tests & DT Planning/ Execution																												
Signal Processing Lab GRA (dev) Increment 5																												
Signal Processing Lab GRA (dev) Increment 6																												
Signal Processing Lab GRA (dev) Increment 7																												
Integration and Technology Futures																												
Enterprise Systems Engineering																												
IRON JAR																												
Space Control Technology Development & Transition																												
Congressional Add																												
NEXT-C Gridded Ion Thruster Development																												
MASE																												
Development																												

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Exhibit R-4A, RDT&E Schedule Details: PB 2023 Air Force		Date: April 2022
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Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
RRB				
Rapid Prototyping/Demo/Testing/Fielding & Transition of UON/JUON/JEON Weapon System Capabilities	1	2021	4	2027
Ongoing Capability Tests & DT Planning/Execution	1	2021	4	2027
Signal Processing Lab GRA (dev) Increment 5	3	2021	2	2024
Signal Processing Lab GRA (dev) Increment 6	4	2023	4	2026
Signal Processing Lab GRA (dev) Increment 7	3	2026	4	2027
Integration and Technology Futures				
Enterprise Systems Engineering	1	2021	4	2027
IRON JAR	1	2021	4	2027
Space Control Technology Development & Transition	1	2021	4	2027
Congressional Add				
NEXT-C Gridded Ion Thruster Development	1	2021	4	2022
MASE				
Development	1	2023	4	2027