Exhibit R-2, RDT&E Budget Item Justification: PB 2022 Space Development Agency	Date: May 2021
Appropriation/Budget Activity 0400: *Research, Development, Test & Evaluation, Defense-Wide* / BA 3: *Advanced Technology Development (ATD)*	**R-1 Program Element (Number/Name)** PE 1206310SDA / *Space Science and Technology Research and Development*

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
Total Program Element	0.000	20.001	72.422	172.638	0.000	172.638	-	-	-	-	-	-
012: *Space Development Agency R&E*	0.000	0.000	72.422	172.638	0.000	172.638	-	-	-	-	-	-
032: *Proliferated Low Earth Orbit (pLEO) Sensor Technology*	0.000	16.533	0.000	0.000	0.000	0.000	-	-	-	-	-	-
197: *SDA Disruptive Development - SBIR*	0.000	3.040	0.000	0.000	0.000	0.000	-	-	-	-	-	-
198: *SDA Disruptive Investigation - STTR*	0.000	0.428	0.000	0.000	0.000	0.000	-	-	-	-	-	-

Note

Two new Projects (197 and 198) were created to house the Space Development Agency (SDA)'s Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) funding, respectively. Starting in FY 2021, the funds allocated for SBIR and STTR efforts will be in a new Program Element (PE), 0605502SDA.

In accordance with the William M. (Mac) Thornberry National Defense Authorization Act (NDAA) for FY 2021, effective on October 1, 2022, SDA will be an element of the U.S. Space Force (USSF), and report to Assistant Secretary of the Air Force (ASAF) for Space Acquisition and Integration (ASAF/SA&I) with respect to acquisition decisions and directly to the Chief of Space Operations with respect to requirements decisions, personnel decisions, and any other matter not covered by ASAF/SA&I. Funding in FY 2023 and out has been transferred to a new PE under the USSF, 1206310SF.

A. Mission Description and Budget Item Justification

SDA is developing and demonstrating next generation space capabilities for the joint warfighter enabled by proliferation of satellites and a new acquisition model utilizing rapid spiral development. SDA is developing capabilities to address a wide range of Department of Defense (DoD) space needs as stated in the National Defense Strategy and DoD Space Vision, including low-latency tactical communication, beyond-line-of-sight targeting, and advanced missile tracking. Specifically, SDA will demonstrate and field persistent, resilient capabilities needed to be responsive to emerging multi-domain threats against the U.S. national interest. SDA is responsible for the overall programmatic development and execution of a National Defense Space Architecture (NDSA). In coordination with other DoD Space stakeholders, SDA will drive the development of space capabilities to achieve the DoD Space Vision and reduce overlap and inefficiency. SDA will expand the DoD's space warfighting capability and foster growth in the U.S. space industrial base, by developing enhanced government-commercial relationships and international collaborations with key allies and partners.

While SDA is not responsible for building and fielding all capabilities within the NDSA, the Agency is responsible for orchestrating and architecting the NDSA and ensuring capability delivery to the warfighter following a spiral development approach. SDA is building and fielding the Transport Layer, a proliferated constellation of

satellites to provide low-latency, high-volume data to the warfighter. This transport layer will provide the space-based data transport backbone for the Combined Joint All-Domain Command and Control (C-JADC2).

The establishment of a proliferated data transport layer is essential to developing a new and responsive space architecture. SDA will integrate additional constellations with this transport layer to provide multiple warfighting capabilities, such as advanced missile warning, custody of time critical targets, and alternative position, navigation and timing (PNT).

This program element funds efforts to develop and demonstrate a prototype proliferated communications and data transport layer and other capability layers in support of the National Defense Strategy.

B. Program Change Summary ($ in Millions)	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total
Previous President's Budget	20.000	72.422	187.638	0.000	187.638
Current President's Budget	20.001	72.422	172.638	0.000	172.638
Total Adjustments	0.001	0.000	-15.000	0.000	-15.000
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Transfer to MDA PE 1206895C	-	-	-15.000	0.000	-15.000
• Program Adjustment	0.001	-	-	-	-

Change Summary Explanation

The $15.000 million reduction in FY 2022 reflects a transfer to fund the Hypersonic and Ballistic Tracking Space Sensor (HBTSS) program under the Missile Defense Agency (MDA) Program Element (PE) 1206895C. This transfer of funds impacts the Optical Intersatellite Link (OISL) interoperability testing and tracking demonstration plans increasing schedule and technical risk of the Transport and Tracking Tranche 0 effort.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Space Development Agency			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 1206310SDA / *Space Science and Technology Research and Development*	Project (Number/Name) 012 / *Space Development Agency R&E*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
012: *Space Development Agency R&E*	0.000	0.000	72.422	172.638	0.000	172.638	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

Funding for FY 2023 and future years has been transferred to a new Program Element (PE) under the U.S. Space Force (USSF), 1206310SF.

A. Mission Description and Budget Item Justification

The Space Development Agency (SDA) is developing and demonstrating next generation space capabilities for the joint warfighter enabled by proliferation of satellites and a new acquisition model utilizing rapid spiral development. SDA is developing capabilities to address a wide range of Department of Defense (DoD) space needs as stated in the National Defense Strategy and DoD Space Vision, including low-latency tactical communication, beyond line of sight targeting, and advanced missile tracking. SDA will orchestrate the rapid development and fielding of the National Defense Space Architecture (NDSA), a resilient military sensing and data transport capability via a proliferated space architecture in low-earth orbit.

This program element funds the research and development activity to deliver capabilities to U.S. joint warfighting forces in two-year tranches, beginning as early as FY 2022, including performing trade studies, technical analyses, or modeling and simulation; identifying and maturing enabling technologies; defining and conducting risk reduction demonstrations, prototyping hardware or software systems; and exploring novel concept for future warfighting capabilities.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Space Development Agency R&E	0.000	72.422	172.638
Description: Research and development activities to support development, demonstration, and fielding of a resilient military sensing and data transport capability via a proliferated space architecture in Low Earth Orbit (LEO). ***FY 2021 Plans:*** - Design, develop, and demonstrate space-to-space optical crosslink data exchange in LEO. - Design and begin development of a wide field-of-view sensor payload for advanced missile tracking experiment. - Conduct requirements review for multi-intelligence (multi-INT), multiple modalities of sensing data fusion algorithms. - In partnership with other DoD mission partners, begin design and development of operationally-relevant hosted payload candidates for demonstration and validation by SDA-developed tranches.			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Space Development Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 1206310SDA / *Space Science and Technology Research and Development*	**Project (Number/Name)** 012 / *Space Development Agency R&E*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
- Successful development of Tranche 1 of the NDSA will require advancement of multiple system and mission payload technologies, including high-speed on-orbit mesh networking, tactical data link terminals, optical intersatellite links, and space-based processors. ***FY 2022 Plans:*** - Demonstrate alternate position, navigation, and timing orbit and clock software. - Perform ground-based processing of missile tracking scene data collected in FY 2021. - Develop and conduct ground-based demonstration of multi-intelligence data fusion algorithms on flight-like systems and in flight-like environments. - Develop algorithms for integrated battle management, command, control, and communications (BMC3) applications. - Complete trade studies and technical analyses for Tranche 1 capabilities. ***FY 2021 to FY 2022 Increase/Decrease Statement:*** The increase in FY 2022 is required to invest in the development of an increasingly broad set of technologies (including alternative navigation solutions, advanced missile tracking, multi-INT fusion algorithms, and integrated battle management algorithms) that are critical to delivering a robust initial warfighting capability in the NDSA. Note that this project line includes a $15.000 million transfer to MDA, which will impact the Optical Intersatellite Link (OISL) interoperability testing and tracking demonstration plans increasing schedule and technical risk of the Transport and Tracking Tranche 0 effort.			
Accomplishments/Planned Programs Subtotals	0.000	72.422	172.638

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

N/A

D. Acquisition Strategy

Partners for these activities may include DoD research centers, small businesses, large defense contractors, commercial space providers, Federally Funded Research and Development Centers, University Affiliated Research Centers, Missile Defense Agency (MDA), Space and Missile Systems Center (SMC), and Defense Advanced Research Projects Agency (DARPA). SDA is also a transition partner for technology developers who want to conduct on-orbit demonstration and experimentation.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Space Development Agency			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 1206310SDA / *Space Science and Technology Research and Development*	Project (Number/Name) 032 / *Proliferated Low Earth Orbit (pLEO) Sensor Technology*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
032: *Proliferated Low Earth Orbit (pLEO) Sensor Technology*	0.000	16.533	0.000	0.000	0.000	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Proliferated Low Earth Orbit (pLEO) Sensor Technology effort will develop and demonstrate a prototype pLEO data transport layer and other capability layers to provide the eight capabilities outlined in the Department of Defense (DoD) Space Vision. The Space Development Agency (SDA) will rapidly develop and field the next generation space architecture that will enable the U.S. to deploy space capabilities that out-pace adversarial threats. This architecture is underpinned by a data transport layer, which will reside on a proliferated small satellite constellation in Low Earth Orbit (LEO). The Transport Layer will support the transfer of data between the space segment of the next generation space architecture, to include payloads co-hosted with the Transport Layer or other non-collocated space elements, and the ground, to include ground support infrastructure and very large numbers of users/subscribers. The Transport Layer will provide the "connective tissue" for the next generation space architecture.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: Proliferated Low Earth Orbit (pLEO) Sensor Technology	16.533	0.000	0.000
Description: Develop and demonstrate a resilient and unified military data transport layer, enabled by a pLEO architecture. This effort will demonstrate capability to provide very low-latency (low or high bandwidth) data between any two points on the globe to enable mission-agnostic battle management, command, control, and communications (BMC3). This effort will leverage technologies developed under the Defense Advanced Research Projects Agency (DARPA) Blackjack program and, wherever feasible, leverage commercial industry approaches to provide broadband internet access from space to form the foundation of the transport layer architecture. Some accomplishments with FY 2020 funding include the following efforts: - Demonstrating and characterizing space-to-space, space-to-air, and space-to-ground optical intersatellite link (OISL) performance with two spacecraft in LEO. The spacecraft are expected to launch in FY 2021. - Conducting a series of in-flight communications demonstrations with OISL. - Developing a spacecraft equipped with Link 16 transmit and receiving capabilities enabling beyond-line-of-sight Link 16 connectivity to various assets in theater. This is the first demonstration of a space-based Link 16 terminal and serves an important risk reduction role in preparing to proliferate tactical data link connectivity in the National Defense Space Architecture (NDSA).			
FY 2021 Plans: N/A			
FY 2022 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2022 Space Development Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 1206310SDA / *Space Science and Technology Research and Development*	**Project (Number/Name)** 032 / *Proliferated Low Earth Orbit (pLEO) Sensor Technology*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
N/A ***FY 2021 to FY 2022 Increase/Decrease Statement:*** N/A. Funding for this project ended in FY 2020.			
Accomplishments/Planned Programs Subtotals	16.533	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Partners for these activities included DoD research centers, commercial space providers, Federally Funded Research and Development Centers, and large defense contractors.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Space Development Agency			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 1206310SDA / *Space Science and Technology Research and Development*	Project (Number/Name) 197 / *SDA Disruptive Development - SBIR*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
197: *SDA Disruptive Development - SBIR*	0.000	3.040	0.000	0.000	0.000	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This is a new Project created to manage and execute the Space Development Agency (SDA)'s Small Business Innovation Research (SBIR) funding.

A. Mission Description and Budget Item Justification

With the emergence of many capable small businesses within the space industrial base, SDA leverages the SBIR program to invest in the development and demonstration of technologies supporting modernization of our national defense space capabilities. This program includes investments in such technologies as advanced space-based communications, sensing, data fusion, and battle management capabilities.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: SDA Disruptive Development - SBIR	3.040	0.000	0.000
Description: This project funds small business research and development activities providing analysis products and enabling technologies and capabilities for the National Defense Space Architecture (NDSA). In FY 2020, SDA made a SBIR award to further Optical Intersatellite Links (OISL) development, risk reduction and experimentation. FY 2021 SBIR topics include optical intersatellite links (OISLs); L-band Electronically Steered Array (ESA) antennas; Mesh Networking Technologies and Routers; Crypto Module; target recognition and acquisition in complex environments; and space-based environmental monitoring (SBEM) sensor. ***FY 2021 Plans:*** N/A ***FY 2022 Plans:*** N/A			
Accomplishments/Planned Programs Subtotals	3.040	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

Exhibit R-2A, RDT&E Project Justification: PB 2022 Space Development Agency		Date: May 2021
Appropriation/Budget Activity 0400 / 3	**R-1 Program Element (Number/Name)** PE 1206310SDA / *Space Science and Technology Research and Development*	**Project (Number/Name)** 197 / *SDA Disruptive Development - SBIR*

D. Acquisition Strategy

Partners for these activities include small businesses.

Exhibit R-2A, RDT&E Project Justification: PB 2022 Space Development Agency			Date: May 2021
Appropriation/Budget Activity 0400 / 3	R-1 Program Element (Number/Name) PE 1206310SDA / *Space Science and Technology Research and Development*	Project (Number/Name) 198 / *SDA Disruptive Investigation - STTR*	

COST ($ in Millions)	Prior Years	FY 2020	FY 2021	FY 2022 Base	FY 2022 OCO	FY 2022 Total	FY 2023	FY 2024	FY 2025	FY 2026	Cost To Complete	Total Cost
198: *SDA Disruptive Investigation - STTR*	0.000	0.428	0.000	0.000	0.000	0.000	-	-	-	-	-	-
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

Note

This is a new Project created to manage and execute the Space Development Agency (SDA)'s Small Business Technology Transfer (STTR) funding.

A. Mission Description and Budget Item Justification

SDA leverages STTR funds to support the collaborative development of defense space technologies by small businesses partnering with U.S. research institutions. By supporting such partnerships between emerging technology development companies and leading research organizations, SDA will help to foster the growth of a stronger, more integrated space industrial base while addressing our nation’s greatest technical challenges in space.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2020	FY 2021	FY 2022
Title: SDA Disruptive Investigation - STTR	0.428	0.000	0.000
Description: This project supports collaborative research and development activities by small businesses and research institutions providing enabling technologies and capabilities for the National Defense Space Architecture (NDSA). In FY 2021 STTR topics include Mesh Networking Technologies and Routers; Crypto Module; target recognition and acquisition in complex environments; and space-based environmental monitoring (SBEM) sensor. ***FY 2021 Plans:*** N/A ***FY 2022 Plans:*** N/A			
Accomplishments/Planned Programs Subtotals	0.428	0.000	0.000

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

Partners for these activities include small businesses teamed with a non-profit research institution.