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Exhibit R-2, RDT&E Budget Item Justification: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3600: <i>Research, Development, Test & Evaluation, Air Force I BA 7: Operational Systems Development</i>	R-1 Program Element (Number/Name) PE 1203110F / <i>Satellite Control Network (SPACE)</i>
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COST (\$ in Millions)	Prior Years	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total	FY 2022	FY 2023	FY 2024	FY 2025	Cost To Complete	Total Cost
Total Program Element	-	26.374	57.891	0.000	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
673276: <i>Satellite Control Network</i>	-	26.374	57.891	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

In FY2021, PE 1203110F, Satellite Control Network (SPACE) efforts were transferred to Appropriation 3620, Research, Development, Test & Evaluation, Space Force, PE 1203110SF Satellite Control Network (SPACE) from Appropriation 3600, Budget Activity 07 due to the creation of a new Appropriation for Space Force.

FY 2020 received a Congressional mark that reduces DCO-S by -\$5M for unjustified request. That reduction was not accounted for correctly in the database and reflected a -\$4M reduction. The correct total for AFSCN in FY 2020 is \$56.891M, not \$57.891M.

The Air Force Satellite Control Network (AFSCN) is a satellite ground terminal network comprised of two communication nodes (Schriever AFB & Vandenberg AFB) and 15 antenna systems. The antennas are distributed around the globe at seven locations -- Vandenberg Tracking Station (VTS), Diego Garcia Station (DGS), Guam Tracking Station (GTS), Hawaii Tracking Station (HTS), New Hampshire Tracking Station (NHS), Thule Tracking Station (TTS) and Telemetry and Commanding Station (TCS) at RAF Oakhanger, England -- to ensure global coverage for over 170 satellites in various orbits. The AFSCN conducts an average of 450 satellite contacts per day supporting Positioning, Navigation and Timing (PNT), Intelligence, Surveillance and Reconnaissance (ISR), Missile Warning, Communications, Weather, Launch Vehicle Support, and Research and Development (R&D) in support of Department of Defense (DoD), Intelligence Community (IC), and National Aeronautics and Space Administration (NASA) operations. While most of the 490 satellite contacts/day are routine command and control activities, the AFSCN is also used for satellite emergencies (e.g. tumbling satellite) because its high power antennas are often the only earthbound assets that can contact a non-responsive satellite to re-establish command & control. During FY 2019 the AFSCN supported 11 space vehicle emergencies resulting in the preservation of \$4.1B worth of satellites. In addition to routine and emergency satellite operations C2, the AFSCN provides support to launch vehicle and early orbit operations, ensuring worldwide antennas receive telemetry as the rocket travels through the atmosphere and transmit commands to a newly orbiting satellite to initiate early orbit checkout. In FY 2019, the AFSCN supported 19 launches delivering \$13.7B worth of satellites to their operational orbits. Finally, the AFSCN provides Factory Compatibility Testing (FCT) to ensure satellites and rockets can communicate via the AFSCN before the satellite is launched. These funds are used to develop next-generation tools to improve the AFSCN and ensure the capability is available to support DoD, Intelligence Community, and civil users. These efforts support cyber hardening, Defensive Cyberspace Operations (DCO-S) and and Systems Engineering & Integration (SE&I) activities for the space enterprise, as well as align with the evolving future space domain demands through Resilient Enterprise Ground (REG) to include transmit and receive, and data transport.

AFSCN Deficiency Resolution: Provides test, cyber security, requirements management, and system architecture support to the AFSCN.

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Resilient Enterprise Ground (REG): Provides the means to communicate with all future spacecraft through diverse communication networks. The program is pursuing more capable ground based antennas, space based communication links, augmenting the existing ASFCN with commercial and civil antennas, upgrading satellite scheduling to commercial standards, and developing infrastructure for long haul communications driven by increase in antennas, cyber security and resilience requirements.

In FY 2021, Defensive Cyber Operations Space (DCO-S) funds in PE 1203614F JSpOC Mission System moved to PE 1203110F Satellite Control Network to consolidate Air Force Space DCO-S development activities.

Space acquisition must respond with speed and agility to emerging adversary threats. Space & Missile Systems Center (SMC) is transforming the organization and implementation of space acquisition to an enterprise approach, maximizing 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, SMC will strategically execute experimentation, prototyping, risk reduction, and other efforts to develop new or re-purpose capabilities.

This program element may include necessary civilian pay expenses required to manage, execute, and deliver AFSCN weapon system capability. The use of such program funds would be in addition to the civilian pay expenses budgeted in program elements 1206392F and 1206398F.

Funding in this exhibit was previously budgeted in PE 0305110F Satellite Control Network.

This program is in Budget Activity 7, Operational System Development because this budget activity includes development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year.

B. Program Change Summary (\$ in Millions)	FY 2019	FY 2020	FY 2021 Base	FY 2021 OCO	FY 2021 Total
Previous President's Budget	26.440	61.891	16.167	0.000	16.167
Current President's Budget	26.374	57.891	0.000	0.000	0.000
Total Adjustments	-0.066	-4.000	-16.167	0.000	-16.167
• Congressional General Reductions	0.000	0.000			
• Congressional Directed Reductions	0.000	-5.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	-0.066	0.000			
• SBIR/STTR Transfer	0.000	0.000			
• Other Adjustments	0.000	1.000	-16.167	0.000	-16.167

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Change Summary Explanation FY 2020: -\$5M Congressional reduction for DCO-S unjustified growth FY 2021: Funds starting in FY 2021 were transferred from RDT&E, Air Force to RDT&E, Space Force				
C. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
Title: AFSCN Deficiency Resolution		0.211	2.752	-
Description: Provides test, cyber security, requirements management, and system architecture support to the AFSCN. Additionally, the Air Force is investigating multiple cyber defense tools for integration onto the AFSCN baseline.				
FY 2020 Plans: Address AFSCN deficiencies in the Remote Tracking Stations, Enhanced High Power Amplifiers, AFSCN Scheduling System and other infrastructure. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc.				
FY 2020 to FY 2021 Increase/Decrease Statement: N/A				
Title: Satellite Operations Transmit and Receive		22.177	10.196	-
Description: Provide enterprise transmit, receive and resource management solutions to enable continuous satellite operations (SATOPS) during contested, degraded and operationally denied environment.				
FY 2020 Plans: Continue risk reduction and technology maturation activities for phased array Multi-Band Multi-Mission antennas. Continue development of Commercial Augmentation Services (CAS) activities. Field AFSCN Scheduling Tool (AST) to replace Electronic Schedule Dissemination 2.7. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc.				
FY 2020 to FY 2021 Increase/Decrease Statement: N/A				
Title: Defensive Cyberspace Operations - Space (DCO-S)		0.000	42.000	-
Description: FY 2020 received a Congressional mark that reduces DCO-S by -\$5M for unjustified request. That reduction was not accounted for correctly in the database and reflected a -\$4M reduction. The correct total for DCO-S in FY 2020 is \$41M, not \$42M.				

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C. Accomplishments/Planned Programs (\$ in Millions)		FY 2019	FY 2020	FY 2021
<p>Funding supports cyber hardening and Defensive Cyberspace Operations for Space (DCO-S) activities for the space enterprise. Provides space enterprise defensive cyber solutions to counter advanced persistence cyber threats, through rapid fielding of operational prototypes using agile development methods.</p> <p>This effort implements a combined Development/Security/Operations (DEVSECOPS) framework which incorporates methodologies, technologies, and tools to deeply embed security best practices into the modern development workflow and tool-chain. This effort will institute four product lines: Manticore (detect), Pegasus (protect), Chimera (identify), and Kraken (respond). The DCO-S capabilities are developed and deployed as an agile program, leveraging a DEVSECOPS framework to facilitate rapid and timely fielding to operations.</p> <p>FY 2020 Plans: Enhance Defensive Cyber Operations for Space (DCO-S) enterprise-wide, through development and integration of Defensive Cyber Operations tools, including Manticore, Pegasus, Chimera, and Kraken product lines. Manticore will develop, integrate and field endpoint and network data collection, and data extraction and fusion analytic capabilities. Pegasus will address hardware and software supply chain risk management (HW/SW SCRMM), enterprise cryptography, and cyber hardening activities. Chimera will develop threat identification through system characterization, vulnerability mapping, and cyber/intelligence integration. Kraken will develop capability for incident management, forensics, and tailored response. Collectively these tool capabilities will fill cyber deficiencies across the space enterprise.</p> <p>Plan and deploy DCO-S product line capabilities to the following mission systems: AFSCN, Global Positioning System Operational Control Segment(GPS OCS), Advanced Extremely High Frequency (AEHF)satellite program, Enterprise Ground Services (EGS), REG, and Eastern/Western Ranges. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc.</p> <p>FY 2020 to FY 2021 Increase/Decrease Statement: N/A</p>				
<p>Title: Enterprise Systems Engineering and Integration</p> <p>Description: SE&I manages the government controlled system and subsystem level baseline requirements including analysis of future changes to the fielded baseline. SE&I provides "government as the integrator" engineering support to ensure multiple separate modernizations and the sustainment baselines are synchronized. SE&I will develop and recommend investment strategies to keep the AFSCN operating well beyond the Future Years Defense Plan.</p> <p>FY 2020 Plans:</p>		3.986	2.943	-

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C. Accomplishments/Planned Programs (\$ in Millions)	FY 2019	FY 2020	FY 2021
Continue Program Office support and independent SE&I efforts as required to integrate development and modernization across the AFSCN. Provide systems and subsystem level definition, baseline, architecture, integration planning and support for the AFSCN. Additionally, SE&I will provide support to Space & Missile Systems Center (SMC) initiatives supporting Resilient Enterprise Ground activities. Continue program office and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc.			
FY 2020 to FY 2021 Increase/Decrease Statement: N/A			
Accomplishments/Planned Programs Subtotals	26.374	57.891	-

D. Other Program Funding Summary (\$ in Millions)												
<u>Line Item</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u> <u>Base</u>	<u>FY 2021</u> <u>OCO</u>	<u>FY 2021</u> <u>Total</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>FY 2024</u>	<u>FY 2025</u>	<u>Cost To</u> <u>Complete</u>	<u>Total Cost</u>	
• SPAF 01 Line Item AFSCOM: <i>AF Satellite Comm System</i>	35.326	56.298	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing
• RDTE 07 1203182F: <i>Spacelift Range System (SPACE)</i>	20.168	20.837	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	Continuing	Continuing

Remarks
Procures the mission critical electronics and telecommunications equipment to upgrade the aging AFSCN Range and Network Operations segments.

E. Acquisition Strategy
RDT&E efforts focus on completing upgrades as well as future architectures and studies to ensure the best use of investment funding. The SE&I contractor maintains the DoD Architecture Framework (DoDAF) architecture and requirements baseline for Government approval and may perform studies to determine Government options. Limited RDT&E will be applied to the Consolidated AFSCN Modifications, Maintenance, and Operations (CAMMO) contract when sustaining engineering expertise is needed to finalize Government-approved architectures. Federally Funded Research and Development Corporation technical depth and breadth will be leveraged to ensure AFSCN modernization efforts are compatible with mission rules and do not pose a risk to safe and cost-effective satellite contacts.

Resilient Enterprise Ground (REG) activities will leverage existing prototypes and risk reduction activities. The Air Force plans to pursue the use of Other Transaction Authority for Resilient Enterprise Ground for Multi Band Multi Mission (MBMM) and Commercial Augmentation Segmentation (CAS).

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Exhibit R-3, RDT&E Project Cost Analysis: PB 2021 Air Force **Date:** February 2020

Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 1203110F / <i>Satellite Control Network (SPACE)</i>	Project (Number/Name) 673276 / <i>Satellite Control Network</i>
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Product Development (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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			
Product Development	C/CPAF	Not specified. : TBD	-	-		-		-		-		-	Continuing	Continuing	-
Resilient Enterprise Ground Scheduling	Various	Stottler-Henke : Colorado Springs, CO	-	5.155	Apr 2019	2.000	Jan 2020	-		-		-	Continuing	Continuing	-
AFSCN Deficiency Resolution	Various	Various : Colorado Springs, CO	-	0.211	Jul 2019	2.752	Jul 2020	-		-		-	Continuing	Continuing	-
Resilient Enterprise Ground Commercial Augmentation	MIPR	AFRL : Kirtland AFB, NM	-	10.000	Dec 2019	-		-		-		-	Continuing	Continuing	-
Resilient Enterprise Ground Multi-Band Multi-Mission	MIPR	DIU : Mountain View, CA	-	5.183	Nov 2019	5.057	Aug 2020	-		-		-	Continuing	Continuing	-
Defensive Cyberspace Operations - Space (DCO-S)	Various	TBD : Colorado Springs	-	-		42.000	Dec 2019	-		-		-	Continuing	Continuing	-
Enterprise Systems Engineering and Integration	C/CPIF	ENSCO : Colorado Springs, CO	-	3.986	Nov 2018	2.943	Nov 2019	-		-		-	Continuing	Continuing	-
Technical Mission Analysis	RO	Aerospace Corp : El Segundo, CA	-	0.570	Oct 2018	1.417	Oct 2019	-		-		-	Continuing	Continuing	-
Subtotal			-	25.105		56.169		-		-		-	Continuing	Continuing	N/A

Management Services (\$ in Millions)				FY 2019		FY 2020		FY 2021 Base		FY 2021 OCO		FY 2021 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			
Management Services	C/CPAF	Not specified. : TBD	-	-		-		-		-		-	Continuing	Continuing	-
FFRDC	Various	Aerospace Corp, : El Segundo, CA	-	0.847	Apr 2019	0.873	Apr 2020	-		-		-	Continuing	Continuing	-
A&AS	Various	Gartner : Colorado Springs, CO	-	0.422	Apr 2019	0.531	Apr 2020	-		-		-	Continuing	Continuing	-

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Exhibit R-4, RDT&E Schedule Profile: PB 2021 Air Force		Date: February 2020
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FY 2019				FY 2020				FY 2021				FY 2022				FY 2023				FY 2024				FY 2025			
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

AFSCN	
AFSCN Deficiency Resolution	████████████████████
REG Satellite Operations Transmits and Receive	████████████████████
REG Defensive Cyberspace Operations for Space (DCO-S)	████████████████████

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Exhibit R-4A, RDT&E Schedule Details: PB 2021 Air Force		Date: February 2020
Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 1203110F / <i>Satellite Control Network (SPACE)</i>	Project (Number/Name) 673276 / <i>Satellite Control Network</i>

Schedule Details

Events by Sub Project	Start		End	
	Quarter	Year	Quarter	Year
AFSCN				
AFSCN Deficiency Resolution	1	2019	4	2020
REG Satellite Operations Transmits and Receive	1	2019	4	2020
REG Defensive Cyberspace Operations for Space (DCO-S)	1	2020	4	2020