Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force											Date: February 2019	
Appropriation/Budget Activity 3600: *Research, Development, Test & Evaluation, Air Force* / BA 7: *Operational Systems Development*					R-1 Program Element (Number/Name) PE 1203110F / *Satellite Control Network (SPACE)*							
COST ($ in Millions)	**Prior Years**	**FY 2018**	**FY 2019**	**FY 2020 Base**	**FY 2020 OCO**	**FY 2020 Total**	**FY 2021**	**FY 2022**	**FY 2023**	**FY 2024**	**Cost To Complete**	**Total Cost**
Total Program Element	-	18.133	26.440	61.891	0.000	61.891	16.167	16.503	16.804	17.107	Continuing	Continuing
673276: *Satellite Control Network*	-	18.133	26.440	61.891	0.000	61.891	16.167	16.503	16.804	17.107	Continuing	Continuing
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

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 450 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 2018 the AFSCN supported 10 space vehicle emergencies resulting in the preservation of $3.6B 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 2018, 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.

Remote Tracking Station (RTS) Block Change (RBC) - Satellite Anomaly Recovery and Support Upgrade; Enhanced High-Power Amplifier (EHPA): The Air Force will complete development testing of the EHPA first article. The AFSCN is in jeopardy of losing the emergency high power satellite contact capability due to obsolete parts used in the legacy AFSCN system. The EHPA program will develop a new high power amplifier that resolves the obsolescence issue through the 2020s.

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

Resilient Enterprise Ground (REG): Provides the means to communicate with all future spacecraft through diverse antenna networks. The program is pursuing more capable ground based antennas, augmenting the existing ASFCN with commercial antennas, upgrading satellite scheduling to commercial standards, and cyber security.

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force	Date: February 2019
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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 repurpose 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.

As directed in the FY 2018 NDAA, Sec 825, amendment to PL 114-92 FY 2016 NDAA, Sec 828 Penalty for Cost Overruns, the FY 2018 Air Force penalty total is $14.373M. The calculated percentage reduction to each research, development, test and evaluation and procurement account will be allocated proportionally from all programs, projects, or activities under such account.

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 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	18.808	17.808	15.891	0.000	15.891
Current President's Budget	18.133	26.440	61.891	0.000	61.891
Total Adjustments	-0.675	8.632	46.000	0.000	46.000
• Congressional General Reductions	0.000	-1.368			
• Congressional Directed Reductions	0.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	10.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-0.675	0.000			
• Other Adjustments	0.000	0.000	46.000	0.000	46.000

Change Summary Explanation

FY19 Congressional add of $10M for Commercial Augmentation Services.

C. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: Remote Tracking Station (RTS) Block Change (RBC) - Satellite Anomaly Recovery and Support Upgrade; Enhanced High-Power Amplifier (EHPA):	1.191	0.000	0.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force	Date: February 2019
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C. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Description: RBC development replaces outdated, unique RTS equipment with standardized equipment and technology to reduce failures and enhance sustainability. Provides Advisory and Assistance Services (A&AS) to execute the RBC upgrade effort. Effort accomplished under Satellite Control Network Contract (SCNC). Developmental testing and fielding of first article occurred in FY 2018 to complete this effort. ***FY 2019 Plans:*** N/A ***FY 2020 Plans:*** N/A			
Title: AFSCN Deficiency Resolution ***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 2019 Plans:*** Address AFSCN deficiencies to the Remote Tracking Stations, Enhanced High Power Amplifiers, AFSCN Scheduling System and other infrastructure. ***FY 2020 Plans:*** Address AFSCN deficiencies in the Remote Tracking Stations, Enhanced High Power Amplifiers, AFSCN Scheduling System and other infrastructure. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2020 increased compared to FY 2019 by $0.342M. Justification for this increase is described in plans above.	0.642	0.453	0.795
Title: Satellite Operations Transmit and Receive ***Description:*** Provide enterprise transmit, receive and resource management solutions to enable continuous satellite operations (SATOPS) during contested, degraded and operationally denied environment. Not a new start, identified as Resilient Enterprise Ground major thrust in FY 2019. ***FY 2019 Plans:*** Begin risk reduction and technology maturation activities in pursuit of more capable ground infrastructure to include but not limited to ground based apertures, augmenting the existing AFSCN with commercial apertures and developing ground resource management tools. Award Commercial Augmentation Services integration contract (Congressional add). Fund Multi-Band Multi-	13.527	21.637	10.513

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force	Date: February 2019
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C. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Mission antenna prototyping to meet AFSCN and Launch and Test Range System (LTRS) requirements. Funds will also be contributed from the LTRS PE 1203182F. ***FY 2020 Plans:*** Award development contract for phased array Multi-Band Multi-Mission antennas. Complete Commercial Augmentation Services integration activities. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2020 decreased compared to FY 2019 by $11.124M. Justification for this decrease is described in plans above.			
Title: Defensive Cyberspace Operations - Space (DCO-S) ***Description:*** 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 DevSecOps methods. This is not a new start. This effort initially started under each of the AFSCN major thrusts has evolved into a space enterprise-wide effort and consequently is being broken out as a separate major thrust to provide additional efficiency and transparency. This effort implements a combined Development/Operations (DEVOPS) framework which incorporates methodologies, technologies, and tools to deeply embed security best practices into the modern development workflow and toolchain. 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 DEVOPS framework to facilitate rapid and timely fielding to operations. ***FY 2019 Plans:*** N/A ***FY 2020 Plans:*** Continue to 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 continue to develop, integrate and field endpoint and network data collection, and data extraction and fusion analytic capabilities. Pegasus will continue to address hardware and software supply chain risk management (HW/SW SCRM), enterprise crypography, and cyber hardening activities. Chimera will continue to develop threat identification through system characterization, vulnerability mapping, and cyber/intelligence integration. Kraken will continue to develop capability for incident management, forensics, and tailored response. Collectively these tool capabilities will fill cyber deficiencies access the space enterprise.	-	0.000	46.000

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force	Date: February 2019
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C. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Continue to plan and deploy DCO-S product line capabilities to the following mission systems: AFSCN, GPS (OCS), and AEHF, Enterprise Ground Services (EGS), REG, and Eastern/Western Ranges. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2020 increased compared to FY 2019 by $46M. Justification for this increase is described in plans above.			
Title: Enterprise Systems Engineering and Integration ***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 baseline are synchronized. SE&I will develop and recommend investment strategies to keep the AFSCN operating well beyond the FYDP. ***FY 2019 Plans:*** Continue Program Office support and independent SE&I efforts as required to integrate modernization and sustainment efforts into future sites. 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 such as logistics and sustainment planning for EGS. ***FY 2020 Plans:*** 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. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2020 increased compared to FY 2019 by $0.233M. Justification for this increase is described in plans above.	2.773	4.350	4.583
Accomplishments/Planned Programs Subtotals	18.133	26.440	61.891

D. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost
• SPAF 01 Line Item AFSCOM: *AF Satellite Comm System*	47.148	35.400	56.298	-	56.298	48.376	49.359	50.284	51.188	Continuing	Continuing
• RDTE 07 1203182F: *Spacelift Range System (SPACE)*	20.035	20.168	10.837	-	10.837	11.023	11.253	11.459	10.989	Continuing	Continuing

Exhibit R-2, RDT&E Budget Item Justification: PB 2020 Air Force	Date: February 2019
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D. Other Program Funding Summary ($ in Millions)

Line Item	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total	FY 2021	FY 2022	FY 2023	FY 2024	Cost To Complete	Total Cost

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 Air Force Satellite Control Network (AFSCN) Modifications, Maintenance, and Operations (CAMMO) contract when sustaining engineering expertise is needed to finalize Government-approved architectures. FFRDC 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 FY2016 National Defense Authorization Act section 804, Middle Tier Rapid Prototyping and section 815, Other Transaction Authority for Resilient Enterprise Ground.

F. Performance Metrics

Please refer to the Performance Base Budget Overview Book for information on how Air Force resources are applied and how those resources are contributing to Air Force performance goals and most importantly, how they contribute to our mission.

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force			Date: February 2019
Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 1203110F / *Satellite Control Network (SPACE)*	Project (Number/Name) 673276 / *Satellite Control Network*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Satellite Control Network Contract (SCNC)	Various	KBR Wylie : Colorado Springs, CO	-	1.191	Oct 2017	-		-		-		-	0.000	1.191	-
Resilient Enterprise Ground Scheduling	Various	Braxton, Stottler-Henke : Colorado Springs, CO	-	6.199		4.652		2.000		-		2.000	Continuing	Continuing	-
AFSCN Deficiency Resolution	Various	Various : Colorado Springs, CO	-	0.642		0.453		2.740		-		2.740	Continuing	Continuing	-
Resilient Enterprise Ground (REG) Commercial Augmentation	MIPR	AFRL : Kirtland AFB, NM	-	-		10.000	Apr 2019	-		-		-	Continuing	Continuing	-
Resilient Enterprise Ground Multi-Band Multi-Mission	MIPR	DIU : Mountain View, CA	-	5.000	Mar 2019	4.195		3.429		-		3.429	Continuing	Continuing	-
Defensive Cyberspace Operations - Space (DCO-S)	Various	TBD : Colorado Springs	-	-		-		46.000		-		46.000	Continuing	Continuing	-
Enterprise Systems Engineering and Integration	C/CPIF	ENSCO : Colorado Springs, CO	-	2.773	Nov 2017	4.350	Nov 2018	4.583	Nov 2019	-		4.583	Continuing	Continuing	-
Technical Mission Analysis	RO	Aerospace Corp : El Segundo, CA	-	1.336	Oct 2017	1.376	Oct 2018	1.417	Oct 2019	-		1.417	Continuing	Continuing	-
		Subtotal	-	17.141		25.026		60.169		-		60.169	Continuing	Continuing	N/A

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2018 Cost	FY 2018 Award Date	FY 2019 Cost	FY 2019 Award Date	FY 2020 Base Cost	FY 2020 Base Award Date	FY 2020 OCO Cost	FY 2020 OCO Award Date	FY 2020 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
FFRDC, A&AS	Various	Aerospace Corp, Gartner : El Segundo, CA	-	0.992		1.414		1.722		-		1.722	Continuing	Continuing	-
		Subtotal	-	0.992		1.414		1.722		-		1.722	Continuing	Continuing	N/A

Exhibit R-3, RDT&E Project Cost Analysis: PB 2020 Air Force			Date: February 2019
Appropriation/Budget Activity 3600 / 7	R-1 Program Element (Number/Name) PE 1203110F / *Satellite Control Network (SPACE)*	Project (Number/Name) 673276 / *Satellite Control Network*	

	Prior Years	FY 2018		FY 2019		FY 2020 Base		FY 2020 OCO		FY 2020 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	-	18.133		26.440		61.891		-		61.891	Continuing	Continuing	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force		Date: February 2019
Appropriation/Budget Activity 3600 / 7	**R-1 Program Element (Number/Name)** PE 1203110F / *Satellite Control Network (SPACE)*	**Project (Number/Name)** 673276 / *Satellite Control Network*

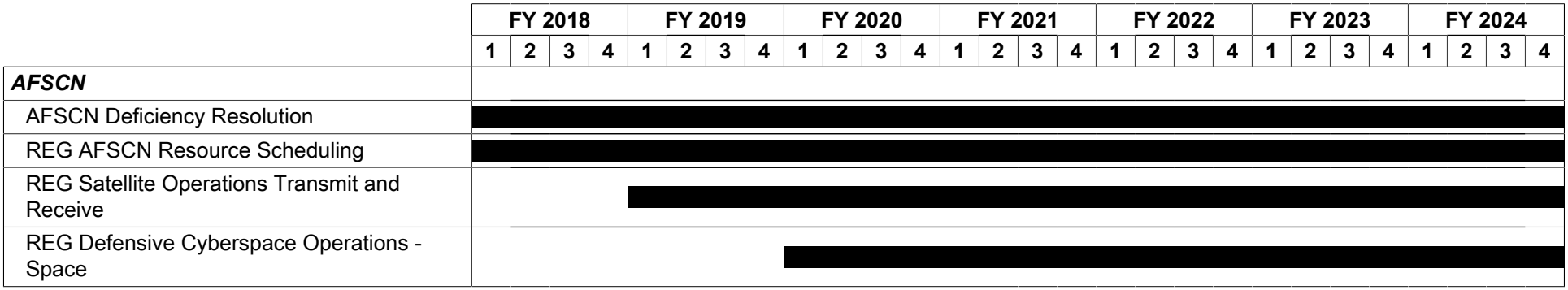

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force		Date: February 2019
Appropriation/Budget Activity 3600 / 7	**R-1 Program Element (Number/Name)** PE 1203110F / *Satellite Control Network (SPACE)*	**Project (Number/Name)** 673276 / *Satellite Control Network*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
AFSCN				
AFSCN Deficiency Resolution	1	2018	4	2024
REG AFSCN Resource Scheduling	1	2018	4	2024
REG Satellite Operations Transmit and Receive	1	2019	4	2024
REG Defensive Cyberspace Operations - Space	1	2020	4	2024