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 5: *System Development & Demonstration (SDD)*					R-1 Program Element (Number/Name) PE 1206433F / *Wideband Global SATCOM (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	-	6.535	3.970	1.920	0.000	1.920	0.000	0.000	0.000	2.973	0.000	15.398
657102: *Command & Control Sys-Consolidated (CCS-C)*	-	4.011	3.970	1.920	0.000	1.920	0.000	0.000	0.000	2.973	0.000	12.874
657107: *WGS Space Systems Resiliency Upgrade*	-	2.524	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.524

A. Mission Description and Budget Item Justification

The Military Satellite Communications (MILSATCOM) Command and Control System-Consolidated (CCS-C) system provides integrated launch and on-orbit command and control (C2) functionality at Schriever AFB and Vandenberg AFB for MILSATCOM satellites. Schriever AFB is used for primary operations and Vandenberg AFB is used for backup operations. CCS-C uses modified commercial off the shelf hardware/software to control emerging and legacy MILSATCOM systems including Milstar, Defense Satellite Communications System (DSCS), Wideband Global SATCOM (WGS) and Advanced Extremely High Frequency (AEHF) satellites.

The CCS-C project 657102 funds system architecture evolution to provide increased performance for additional satellites and to comply with DoD, Air Force, and Air Force Space Command (AFSPC)-directed standards for Information Assurance, Satellite Control Standardization, and Net-Readiness. This continuing effort was previously funded in the FY 2014 President's Budget and prior as an Acquisition Category II (ACAT II) program. With the 10 October 2013 Final Operational Capability (FOC) declaration, the program has transitioned to an ACAT III program, the CCS-C Assurance and Capability Enhancement (CACE), beginning FY 2014. FY 2020 will be the final year for the CACE effort. The newly enhanced CCS-C system will remain and continue to be funded with O&M funds. The WGS and AEHF procurement program elements fund the mission unique software and databases for the WGS Block II Follow-On satellites and the AEHF 4-6 satellites, respectively.

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 Wideband Global SATCOM (Space) 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 0605433F, Wideband Global SATCOM (SPACE).

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 5: *System Development & Demonstration (SDD)*	**R-1 Program Element (Number/Name)** PE 1206433F / *Wideband Global SATCOM (SPACE)*

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 5, System Development and Demonstration (SDD) because it has passed Milestone B approval and is conducting engineering and manufacturing development tasks aimed at meeting validated requirements prior to full rate production.

B. Program Change Summary ($ in Millions)	FY 2018	FY 2019	FY 2020 Base	FY 2020 OCO	FY 2020 Total
Previous President's Budget	14.263	3.970	1.920	0.000	1.920
Current President's Budget	6.535	3.970	1.920	0.000	1.920
Total Adjustments	-7.728	0.000	0.000	0.000	0.000
• Congressional General Reductions	-0.476	0.000			
• Congressional Directed Reductions	-7.000	0.000			
• Congressional Rescissions	0.000	0.000			
• Congressional Adds	0.000	0.000			
• Congressional Directed Transfers	0.000	0.000			
• Reprogrammings	0.000	0.000			
• SBIR/STTR Transfer	-0.252	0.000			
• Other Adjustments	0.000	0.000	0.000	0.000	0.000

Change Summary Explanation

FY2018: -$7.000M, Congressional Directed Reduction for "AoA duplication of effort."

Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force			Date: February 2019
Appropriation/Budget Activity 3600 / 5	R-1 Program Element (Number/Name) PE 1206433F / *Wideband Global SATCOM (SPACE)*	Project (Number/Name) 657102 / *Command & Control Sys-Consolidated (CCS-C)*	

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
657102: *Command & Control Sys-Consolidated (CCS-C)*	-	4.011	3.970	1.920	0.000	1.920	0.000	0.000	0.000	2.973	0.000	12.874
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Military Satellite Communications (MILSATCOM) Command and Control System-Consolidated (CCS-C) system provides integrated launch and on-orbit command and control (C2) functionality at Schriever AFB and Vandenberg AFB for MILSATCOM satellites. Schriever AFB is used for primary operations and Vandenberg AFB is used for backup operations. CCS-C uses modified commercial off the shelf hardware/software to control emerging and legacy MILSATCOM systems including Milstar, Defense Satellite Communications System (DSCS), Wideband Global SATCOM (WGS) and Advanced Extremely High Frequency (AEHF) satellites.

The CCS-C project 657102 funds system architecture evolution to provide increased performance for additional satellites and to comply with DoD, Air Force, and Air Force Space Command (AFSPC)-directed standards for Information Assurance, Satellite Control Standardization, and Net-Readiness. This continuing effort was previously funded in the FY 2014 President's Budget and prior as an Acquisition Category II (ACAT II) program. With the 10 October 2013 Final Operational Capability (FOC) declaration, the program has transitioned to an ACAT III program, the CCS-C Assurance and Capability Enhancement (CACE), beginning FY 2014. FY 2020 will be the final year for the CACE effort. The newly enhanced CCS-C system will remain and continue to be funded with O&M funds. The WGS and AEHF procurement program elements fund the mission unique software and databases for the WGS Block II Follow-On satellites and the AEHF 4-6 satellites, respectively.

Programs and projects in the space warfighting enterprise are evaluating ways to maximize innovation, resiliency, and our ability to rapidly respond to known and emerging threats. Space enterprise efforts aim to execute technology risk reduction efforts, integration of new or repurposed capabilities, enterprise decision-making tools, experimentation, and rapid prototyping and fielding via all appropriate acquisition authorities and contract mechanisms.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: CCS-C development	4.011	3.970	1.920
Description: Develop system architecture to provide enhanced C2 of MILSATCOM satellites. ***FY 2019 Plans:*** Continue to execute implementation, integration, and conduct test verification activities for all CCS-C modifications. Continue to execute Development Test and initiate Operational Test at Schriever AFB. Continue to manage the operational CCS-C & CACE baseline throughout testing activities. Continue program office support and other related support activities that may include, but are not limited to studies, technical analysis, prototyping, etc. ***FY 2020 Plans:***			

Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force		Date: February 2019
Appropriation/Budget Activity 3600 / 5	**R-1 Program Element (Number/Name)** PE 1206433F / *Wideband Global SATCOM (SPACE)*	**Project (Number/Name)** 657102 / *Command & Control Sys-Consolidated (CCS-C)*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Complete Operational Testing for CACE scheduled for 3rd Qtr FY 2020 at which time CACE transitions to Sustainment. 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 program office support, studies, technical analysis, prototyping, etc. ***FY 2019 to FY 2020 Increase/Decrease Statement:*** FY 2020 decreased compared to FY 2019 by $2.05M. Justification for this decrease is described in the plans above.			
Accomplishments/Planned Programs Subtotals	4.011	3.970	1.920

C. 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 MILSAT: *Milsatcom Space*	0.277	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	0.277
• SPAF 01 ADV555: *Advanced EHF*	3.244	0.000	0.000	-	0.000	0.000	0.000	0.000	0.000	0.000	3.244

Remarks

D. Acquisition Strategy

Competitive contract was awarded in November 2012 and began performance in January 2013. The CCS-C Production and Sustainment Contract (CPASC) includes effort to increase the capability of the CCS-C system to provide ongoing C2, launch readiness support, and anomaly resolution for MILSATCOM satellite families. The CCS-C project 657102 funds system architecture evolution to provide increased performance for additional satellites and to comply with DoD, Air Force, and AFSPC-directed standards for Information Assurance, Satellite Control Standardization, and Net-Readiness.

E. 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 / 5	**R-1 Program Element (Number/Name)** PE 1206433F / *Wideband Global SATCOM (SPACE)*	**Project (Number/Name)** 657102 / *Command & Control Sys-Consolidated (CCS-C)*

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
Production and Sustainment Contract	C/FPIF	Kratos : San Diego, CA	-	3.520	Oct 2017	3.189	Nov 2018	1.454	Nov 2019	-		1.454	0.000	8.163	0.000
Technical Mission Analysis	C/Various	Aerospace : El Segundo, CA	-	0.000	Oct 2017	0.277	Nov 2018	-		-		-	0.000	0.277	-
Enterprise SE&I	C/CPIF	LinQuest : Los Angeles, CA	-	0.142	Oct 2017	0.437	Nov 2018	0.346	Nov 2019	-		0.346	0.000	0.925	0.000
		Subtotal	-	3.662		3.903		1.800		-		1.800	0.000	9.365	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
A&AS	Various	Various : Various	-	0.349	Oct 2017	0.067	Nov 2018	0.115	Nov 2019	-		0.115	0.000	0.531	0.000
Other Support	Various	Various : Various	-	0.000	Oct 2017	0.000	Nov 2018	0.005	Nov 2019	-		0.005	0.000	0.005	-
		Subtotal	-	0.349		0.067		0.120		-		0.120	0.000	0.536	N/A

	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	-	4.011		3.970		1.920		-		1.920	0.000	9.901	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force		Date: February 2019
Appropriation/Budget Activity 3600 / 5	**R-1 Program Element (Number/Name)** PE 1206433F / *Wideband Global SATCOM (SPACE)*	**Project (Number/Name)** 657102 / *Command & Control Sys-Consolidated (CCS-C)*

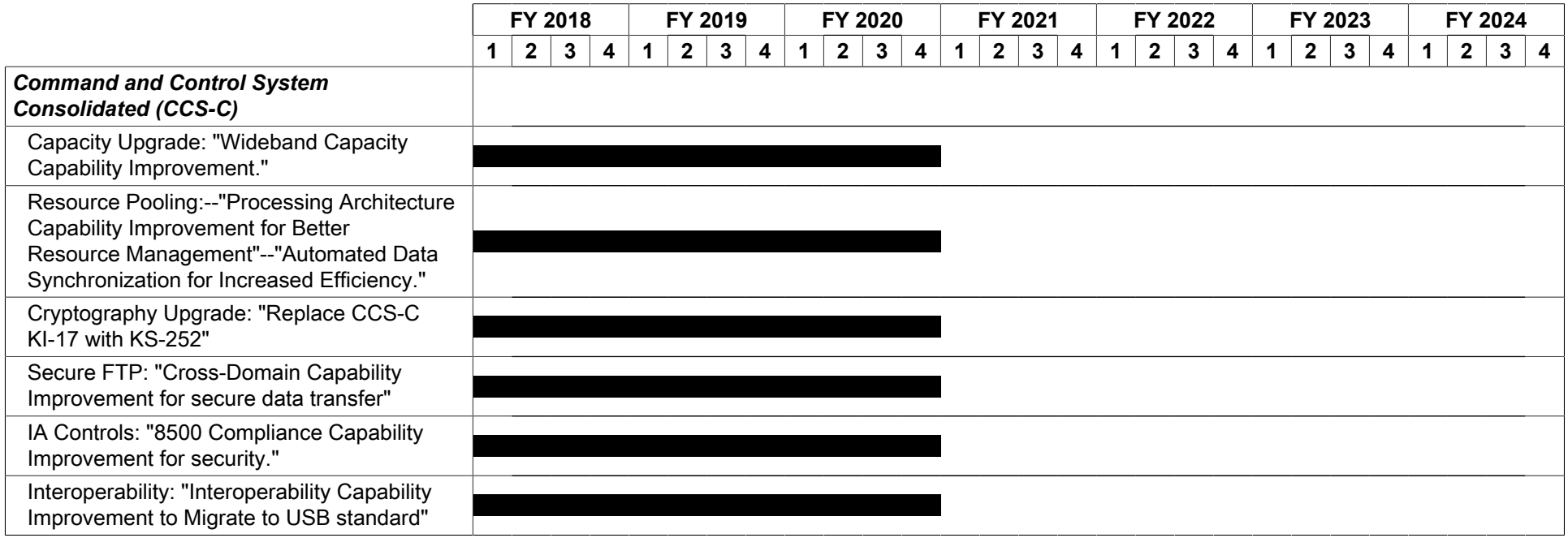

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force		Date: February 2019
Appropriation/Budget Activity 3600 / 5	**R-1 Program Element (Number/Name)** PE 1206433F / *Wideband Global SATCOM (SPACE)*	**Project (Number/Name)** 657102 / *Command & Control Sys-Consolidated (CCS-C)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Command and Control System Consolidated (CCS-C)				
Capacity Upgrade: "Wideband Capacity Capability Improvement."	1	2018	4	2020
Resource Pooling:--"Processing Architecture Capability Improvement for Better Resource Management"--"Automated Data Synchronization for Increased Efficiency."	1	2018	4	2020
Cryptography Upgrade: "Replace CCS-C KI-17 with KS-252"	1	2018	4	2020
Secure FTP: "Cross-Domain Capability Improvement for secure data transfer"	1	2018	4	2020
IA Controls: "8500 Compliance Capability Improvement for security."	1	2018	4	2020
Interoperability: "Interoperability Capability Improvement to Migrate to USB standard"	1	2018	4	2020

Note

CCS-C upgrade started in 1Q, FY 2015.

Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force			Date: February 2019
Appropriation/Budget Activity 3600 / 5	R-1 Program Element (Number/Name) PE 1206433F / *Wideband Global SATCOM (SPACE)*	Project (Number/Name) 657107 / *WGS Space Systems Resiliency Upgrade*	

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
657107: *WGS Space Systems Resiliency Upgrade*	-	2.524	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.524
Quantity of RDT&E Articles	-	-	-	-	-	-	-	-	-	-		

A. Mission Description and Budget Item Justification

The Wideband Global SATCOM (WGS) System provides the DoD with high data rate military satellite communications (MILSATCOM) services in accordance with the Joint Space Management Board-approved MILSATCOM architecture (August 1996), the Joint Requirements Oversight Council (JROC)-approved MILSATCOM Capstone Requirements Document (October 1997), and JROC-approved WGS Operational Requirements Document (May 2000). This program was originally conceived to augment the near-term "bandwidth gap" in warfighter communications needs. Dual-frequency WGS satellites augment, then replace the DoD's Defense Satellite Communications System X-band service and augment one-way Global Broadcast Service Ka-band capabilities. In addition, WGS provides a high capacity two-way Ka-band service.

All WGS Block I (Satellites 1-3), Block II (Satellites 4-6), and the first Block II Follow-on (Satellite 7) have been launched and are operational. Satellites 8-9 successfully launched on 7 December 2016 and 18 March 2017, respectively. With the operation of WGS-5, the constellation has global coverage and Full Operational Capability (FOC) was declared on 12 May 2014. Project 657107, WGS Space Systems Resiliency Upgrade, is an Acquisition Category III (ACAT III) effort. The WGS resiliency upgrade will enable the WGS system to both locate and neutralize ground-based jamming threats to the X-band.

The Commercial SATCOM (COMSATCOM) Pilot Program consists of three phases. Pilot Phase 1 was awarded in April 2017, Pilot Phase 2 was awarded in February 2018 and Pilot Phase 3 was awarded in July 2018. These efforts demonstrate the feasibility and utility of the DoD using order-of-magnitude SATCOM capability improvements advertised by commercial companies.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2018	FY 2019	FY 2020
Title: COMSATCOM Pilot Program	2.524	0.000	0.000
Description: The COMSATCOM Pilot Program will be conducted in three phases. Pilot Phase 1 studied future wideband SATCOM architecture. Pilot Phase 2 will develop and demonstrate a Flexible Modem Interface (FMI). Pilot Phase 3 will study order-of-magnitude improvements in SATCOM capability, affordability, and resiliency. ***FY 2019 Plans:*** N/A. ***FY 2020 Plans:*** N/A.			
Accomplishments/Planned Programs Subtotals	2.524	0.000	0.000

Exhibit R-2A, RDT&E Project Justification: PB 2020 Air Force		Date: February 2019
Appropriation/Budget Activity 3600 / 5	**R-1 Program Element (Number/Name)** PE 1206433F / *Wideband Global SATCOM (SPACE)*	**Project (Number/Name)** 657107 / *WGS Space Systems Resiliency Upgrade*

C. 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 GAP000: *Wideband Global System Procurement*	634.259	12.106	0.000	-	0.000	0.000	0.000	-	-	0.000	646.365

Remarks

D. Acquisition Strategy

The WGS Space Systems Resiliency Upgrade has been accomplished by modifying the WGS Block II Follow-On (B2FO) Firm Fixed Price (FFP) contract definitized in August 2010. The B2FO contract currently provides development, production, and deployment of WGS satellites 7-10. The COMSATCOM Pilot Program Phase 2 was awarded under Other Transaction Authority (OTA) to multiple vendors.

E. 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 / 5	R-1 Program Element (Number/Name) PE 1206433F / *Wideband Global SATCOM (SPACE)*	Project (Number/Name) 657107 / *WGS Space Systems Resiliency Upgrade*	

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
COMSATCOM Pilot Program, Phase 3	Various	Linquest : El Segundo, CA	-	0.733	Jul 2018	-		-		-		-	0.000	0.733	-
Lincoln Labs (COMSATCOM Pilot Program)	Various	Lincoln Labs : Lexington, MA	-	0.550	May 2018	-		-		-		-	0.000	0.550	-
		Subtotal	-	1.283		-		-		-		-	0.000	1.283	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
A&AS	Various	Various : Various	-	1.241	Dec 2017	-		-		-		-	0.000	1.241	1.200
		Subtotal	-	1.241		-		-		-		-	0.000	1.241	N/A

	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	-	2.524		0.000		-		-		-	0.000	2.524	N/A

Remarks

Exhibit R-4, RDT&E Schedule Profile: PB 2020 Air Force		Date: February 2019
Appropriation/Budget Activity 3600 / 5	**R-1 Program Element (Number/Name)** PE 1206433F / *Wideband Global SATCOM (SPACE)*	**Project (Number/Name)** 657107 / *WGS Space Systems Resiliency Upgrade*

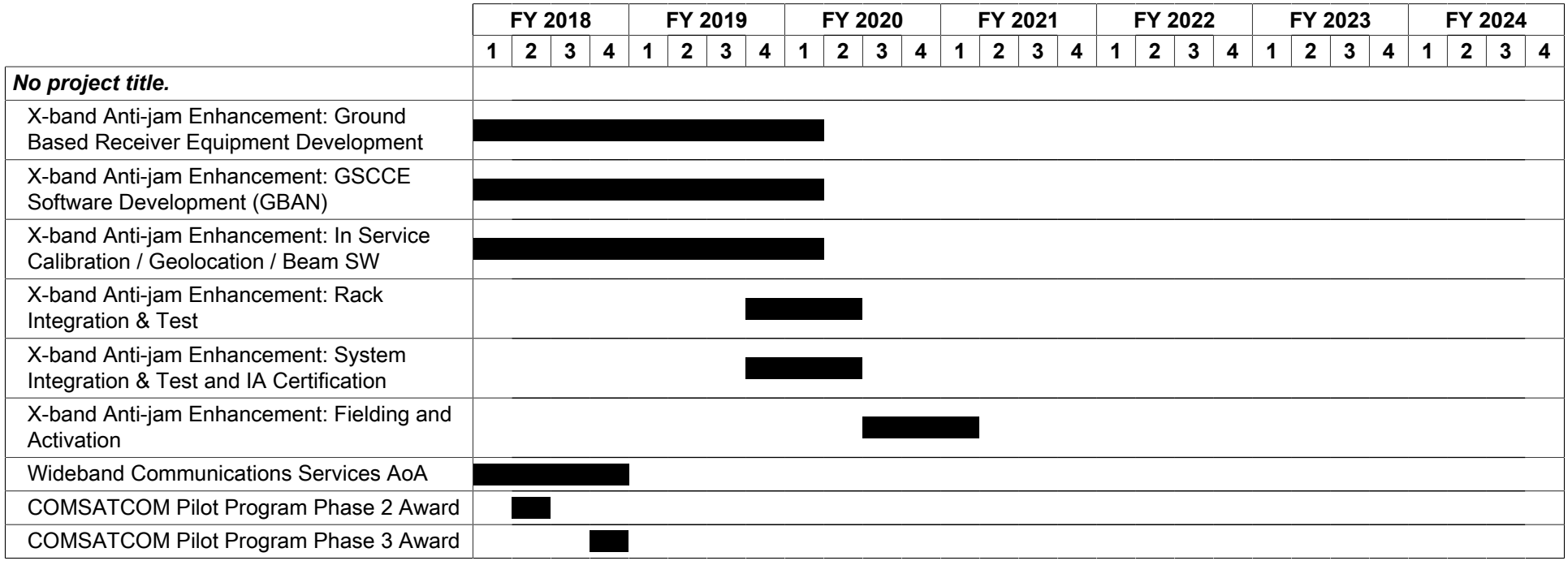

Exhibit R-4A, RDT&E Schedule Details: PB 2020 Air Force		Date: February 2019
Appropriation/Budget Activity 3600 / 5	**R-1 Program Element (Number/Name)** PE 1206433F / *Wideband Global SATCOM (SPACE)*	**Project (Number/Name)** 657107 / *WGS Space Systems Resiliency Upgrade*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
No project title.				
X-band Anti-jam Enhancement: Ground Based Receiver Equipment Development	1	2018	1	2020
X-band Anti-jam Enhancement: GSCCE Software Development (GBAN)	1	2018	1	2020
X-band Anti-jam Enhancement: In Service Calibration / Geolocation / Beam SW	1	2018	1	2020
X-band Anti-jam Enhancement: Rack Integration & Test	4	2019	2	2020
X-band Anti-jam Enhancement: System Integration & Test and IA Certification	4	2019	2	2020
X-band Anti-jam Enhancement: Fielding and Activation	3	2020	1	2021
Wideband Communications Services AoA	1	2018	4	2018
COMSATCOM Pilot Program Phase 2 Award	2	2018	2	2018
COMSATCOM Pilot Program Phase 3 Award	4	2018	4	2018