Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Navy											Date: May 2017	
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 7: *Operational Systems Development*					R-1 Program Element (Number/Name) PE 1203109N *I (U)Satellite Communications (SPACE)*							
COST ($ in Millions)	**Prior Years**	**FY 2016**	**FY 2017**	**FY 2018 Base**	**FY 2018 OCO**	**FY 2018 Total**	**FY 2019**	**FY 2020**	**FY 2021**	**FY 2022**	**Cost To Complete**	**Total Cost**
Total Program Element	0.000	0.000	0.000	37.836	-	37.836	35.724	48.023	49.800	55.015	Continuing	Continuing
0728: *EHF SATCOM Terminals*	0.000	0.000	0.000	22.361	-	22.361	19.144	33.051	34.509	40.709	Continuing	Continuing
2472: *Mobile User Objective Sys (MUOS)*	0.000	0.000	0.000	13.965	-	13.965	15.654	14.972	15.291	14.306	46.060	120.248
3398: *Enterprise SATCOM Gateway Modems (ESGMs)*	0.000	0.000	0.000	1.510	-	1.510	0.926	0.000	0.000	0.000	0.000	2.436
Program MDAP/MAIS Code: **Project MDAP/MAIS Code(s):** 290, 345												

A. Mission Description and Budget Item Justification

The Navy Multiband Terminal (NMT) Program is the required Navy component to the Advanced Extremely High Frequency (AEHF) program for enhancing protected and survivable satellite communications to Naval forces. The NMT system provides an increase in single service capability from 1.5 Megabits per second (Mbps) to 8 Mbps, increases the number of coverage areas and retains Anti-Jam/Low Probability of Intercept (AJ/LPI) protection characteristics. It is compatible with legacy Navy Low Data Rate/Medium Data Rate (LDR/MDR) terminals and will sustain the Military Satellite Communications (MILSATCOM) architecture by providing connectivity across the spectrum of mission areas, to include land, air and naval warfare, special operations, strategic nuclear operations, strategic defense, theater missile defense, and space operations and intelligence in support of A2AD initiatives. The NMT system replenishes and improves on Navy terminal capabilities of the Military Strategic, Tactical & Relay System (MILSTAR), Defense Satellite Communications System (DSCS), Wideband Global Satellite (WGS) and Global Broadcast Service (GBS). The new system equips the warfighters with the assured, jam resistant, secure communications as described in the joint AEHF satellite communications system and WGS Operational Requirements Documents (ORD). The NMT provides multiband Satellite Communications (SATCOM) capability for ship, submarine, and protected MILSATCOM for shore sites.

The Navy Global Broadcast Service (GBS) Program is the Navy component of the Joint Military Satellite Communications (MILSATCOM) ACAT IC program that delivers the continuous flow of high-speed, high-volume communication and information flow for deploying, deployed, on the move, and garrisoned forces. The Joint GBS system supports the Navy Strategic Plan and equips warfighters with counter Anti-Access/Area Denial (A2AD) communications in a denied Command, Control, Communications, Computers, and Intelligence (C4I) environment. The Enterprise SATCOM Gateway Modem (ESGM) is the DoD Chief Information Officer directed solution to satisfy the Transmission Security (TRANSEC) requirement in place of the Joint Internet. Testing and fielding of the ESGM is a joint venture, operationally directed by the Defense Information Systems Agency (DISA) and the Air Force as the lead service. GBS augments and interfaces with other communications systems, provides relief to overburdened communications systems already in place, and provides information to previously unsupported users. GBS provides bandwidth five times any other system, up to 45 Mbps of forward link data (shore to ship) per WGS satellite transponder.

The Mobile User Objective System (MUOS) program provides for the development of the next generation Department of Defense (DoD) advanced narrowband communications satellite constellation. MUOS is the only UHF satellite system replacing the aging UHF Follow-on (UFO) system, which is currently beyond its design

Exhibit R-2, RDT&E Budget Item Justification: FY 2018 Navy	Date: May 2017
Appropriation/Budget Activity 1319: *Research, Development, Test & Evaluation, Navy I* BA 7: *Operational Systems Development*	**R-1 Program Element (Number/Name)** PE 1203109N *I (U)Satellite Communications (SPACE)*

life. MUOS provides legacy UHF satellite communications as well as a Wideband Code Division Multiple Access (WCDMA) capability which significantly increases performance and capacity critical to support Combatant Command priorities.

Beginning in FY18, the Satellite Communications (Space) funding profiles have moved to PE 1203109N from PE 0303109N.

B. Program Change Summary ($ in Millions)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Previous President's Budget	0.000	0.000	0.000	-	0.000
Current President's Budget	0.000	0.000	37.836	-	37.836
Total Adjustments	0.000	0.000	37.836	-	37.836
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-	-			
• SBIR/STTR Transfer	-	-			
• Program Adjustments	0.000	0.000	37.478	-	37.478
• Rate/Misc Adjustments	0.000	0.000	0.358	-	0.358

Change Summary Explanation

Projects 0728, 2472 and 3398 were realigned from PE 0303109N FY2018-FY2022

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy			Date: May 2017
Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 1203109N / *(U)Satellite Communications (SPACE)*	Project (Number/Name) 0728 / *EHF SATCOM Terminals*	

COST ($ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
0728: *EHF SATCOM Terminals*	0.000	0.000	0.000	22.361	-	22.361	19.144	33.051	34.509	40.709	Continuing	Continuing
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Project MDAP/MAIS Code: 290

Note

NMT FY18-FY22 funding profile has moved from PE 0303109N to 1203109N.

A. Mission Description and Budget Item Justification

The Navy Multiband Terminal (NMT) Program is the required Navy component to the Advanced Extremely High Frequency (AEHF) Program for enhancing protected and survivable satellite communications to Naval forces. The NMT system provides an increase in single service capability from 1.5 Megabits per second (Mbps) to 8 Mbps, increases the number of coverage areas, and retains Anti-Jam/Low Probability of Intercept (AJ/LPI) protection characteristics. It is compatible with legacy Navy Low Data Rate/Medium Data Rate (LDR/MDR) terminals and will sustain the Military Satellite Communications (MILSATCOM) architecture by providing connectivity across the spectrum of mission areas, to include land, air and naval warfare, special operations, strategic nuclear operations, strategic defense, theater missile defense, and space operations and intelligence. The NMT system replenishes and improves on Navy Military Strategic, Tactical & Relay System (MILSTAR), Defense Satellite Communications System (DSCS), Wideband Global Satellite (WGS), and Global Broadcast Service (GBS) terminal capabilities. The new system equips the warfighters with assured, jam resistant, secure communications as described in both the joint AEHF Satellite Communications System and the WGS Operational Requirement Documents (ORD). Mission requirements specific to Navy operations, including threat levels and scenarios, are contained in the ORD. The NMT provides multiband Satellite Communications (SATCOM) capability for ship, submarine, and protected MILSATCOM for shore sites.

The Wideband Anti-Jam Modem Systems (WAMS) enhances communication capability of shipboard and submarine NMTs by providing wideband Anti-Jam (AJ) Satellite Communication throughput over Wideband Global SATCOM (WGS). The United States Air Force (USAF) Protected Tactical Enterprise Service (PTES) program will provide the ground hub component of the WAMS communication system. This PTES joint hub will serve as a DoD enterprise service ground solution for the use of the Protected Tactical Waveform (PTW) of SATCOM communications. WAMS enables space segment AJ diversity (EHF/AEHF and WGS), thus enabling NMT ships and submarines equipped with the modem to operate in wideband links closer to threat jammers. WAMS will also include a Mini-Hub component to be fielded on all Force Level platforms to provide operations in the event Shore Communications are eliminated. WAMS enables the use of WGS X and Ka-band resources to assure access to mission critical communications in the A2AD environment. The use of WAMS Protected Tactical Waveform (PTW) on WGS will augment AEHF extended data rate (XDR) services to provide the information throughput capacity necessary to support critical Command and Control capability.

Joint Aerial Layer Network-Maritime (JALN-M) is the Navy implementation of the JALN architecture which provides assured communications in any environment, especially in an Anti-Access Area Denial (A2AD) satellite denied environment. With disruption or loss of Space tier communications, JALN-M establishes and/or restores connectivity within the High Capacity Backbone (HCB) Common Data Link (CDL) tier, the Distribution Access Range Extension (DARE) tier, and the Transition tier in accordance with the JALN-M Initial Capabilities Document and the JALN Analysis of Alternatives (AoA) Final Report. JALN-M is a robust, assured communications capability providing joint connectivity via the HCB and Navy platform connectivity via a pseudo satellite DARE capability. JALN-M will use the Extended Data Rate (XDR) NMT waveform for intra-battle group DARE communications, a Common Data Link (CDL) waveform for the HCB cross-link capability, and intend to develop a pre-planned product improvement to leverage enhanced Ultra High Frequency/High Frequency (UHF/HF) waveforms for coalition connectivity. A critical component of A2AD

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 1203109N / *(U)Satellite Communications (SPACE)*	**Project (Number/Name)** 0728 / *EHF SATCOM Terminals*

is Adaptive Coding (AC) software development incorporation into the baseline NMT terminal including the Advanced Time Division Multiple Access (TDMA) Interface Processor (ATIP) in addition to supporting the JALN-M demonstration. This capability autonomously enhances maximum throughput and supports degraded conditions by adjusting End-to-End code rate to provide continuous, mission critical, and protected communications.

Technology Insertion, studies and implementation is necessary for military satellite communications systems development to support emerging technologies for Commercial Broadband Satellite Program (CBSP) and Global Broadcast Service (GBS) Terminals. Efforts will include evaluation of End-to-End performance testing of data rates associated with Broadband and Broadcast transmissions.

FY18 NMT activities will continue the development of WAMS technical baseline into NMT to include requirements and design changes to improve performance when operating with WAMS. Efforts will include integration strategies with DoD enterprise Protected Tactical Enterprise Service (PTES) ground solution architecture as well as WAMS specification documentation development. Efforts will continue Adaptive Coding (AC) software design development for Time of Day (TOD) encryption and begin software design development efforts to implement robust AC capability.

FY18 JALN-M efforts will focus on completion of integration and testing of NMT and ATIP pre-demonstration flights and testing with Aerial Extended Data Rate (AXDR) payload to support JALN-M demonstration flight tests. The demonstration will include Navy ship-to-ship/sub and ship/afloat-to-GIG communications via Airborne JALN-M Pod hosting AXDR, High Capacity Backbone (HCB), and Assured PNT (Positioning, Navigation, and Timing) payloads. Results of the demonstration seeks to inform DoD and Navy leadership on the JALN way ahead (technical and programmatic risks) and of the viability of JALN-M as a future capability.

FY18 Technology Insertion will support various testing efforts for Commercial Broadband Satellite Program (CBSP) to evaluate End to End Performance of data rates throughout the shipboard network.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Title: NMT Development	0.000	0.000	20.154	0.000	20.154
Articles:	-	-	-	-	-
Description: The NMT development efforts support Anti-Access/Area Denial A2AD capabilities. Those capabilities provide secure SATCOM access in contested/degraded environments by providing anti jam and improved bandwidth that supports increasing Fleet demands. WAMS will provide an anti-jamming capability that will counter various adversary threats and Adaptive Coding (AC) will autonomously maximize throughput in degraded or benign conditions. Efforts include NMT modifications to support new software and hardware development to enable these A2AD capabilities.					
FY 2016 Accomplishments: NMT Development FY16 funding profile resides in PE 0303109N.					
FY 2017 Plans: NMT Development FY17 funding profile resides in PE 0303109N.					
FY 2018 Base Plans:					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 1203109N / *(U)Satellite Communications (SPACE)*	**Project (Number/Name)** 0728 / *EHF SATCOM Terminals*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Begin major Time of Day (TOD) software design development efforts on the affected three different systems to include NMT, ATIP, and KIV-7M to implement the more robust AC capability. The multiple vendors for NMT, ATIP, and KIV-7M will work parallel Engineering Change Proposals (ECPs) to design and ensure interoperability on development efforts for Adaptive Coding software TOD encryption to enable a more robust, lower code rate when the link margin is degraded. This will ensure ADNS/ATIP interface data rates changes commensurate with code rate changes are optimized to ensure maximum user data throughput. The program will undertake NSA certification of AC TOD encryption. These modifications will allow the ATIP to support TOD for KIV-7M use to prevent crypto losing synchronization during degraded link environment. Start the development of integration and testing plans for the TOD encryption solution and perform technical and system risk reduction. NMT will be conducting Operational Test-E1 to evaluate the operational effectiveness and operational suitability of the Enhanced Polar System (EPS) modified NMT which utilizes the protected high frequency (EHF) satellite communications in the North Polar. In addition, NMT will support Air Force Lead Developmental Test Organization (LDTO) EPS events and EPS Multi-Service Operational Test and Evaluation (MOT&E). Continue development of the WAMS technical baseline for use in NMT and complete Systems Engineering Technical Review (SETR) activities. Develop requirements and NMT specification changes and commence NMT design changes to improve performance when operating with the WAMS. Develop design of the Modem Mission Management System (MMS) and Key Management System (KMS) as well as integration strategies for MMS/KMS operational compatibility with DoD enterprise Protected Tactical Enterprise Service (PTES) (which is the Air Force ground system for waveform operations over the Wideband Global SATCOM (WGS) ground solution architecture. Obtain and certify space assets and ground facilities to support testing and assessment of EDM modems. Develop test plans and procedures and begin Navy testing of USAF EDM modems. Testing will include analysis of three separate vendor EDM designs procured from the USAF Protected Tactical Field Service Demonstration (PTSFD) effort. The testing process will verify and validate the vendor designs ensuring that Navy unique performance (antenna handover) and environmental (shock, vibration, temperature, and humidity) requirements are addressed in the design. Further refinement of technical and pre-award acquisition documentation for the Modem and Mini-Hub contracts of the WAMS effort including RFP development and coordination as well as technical specifications. Initiate modem certification and coordination process through NSA. Documentation development will include the WAMS Specification, WAM Mini-Hub specification, Cyber strategy to support the Clinger Cohen Act and Information Support Plan (ISP). ***FY 2018 OCO Plans:***					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 1203109N / *(U)Satellite Communications (SPACE)*	**Project (Number/Name)** 0728 / *EHF SATCOM Terminals*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
N/A					
Title: Joint Aerial Layer Network Maritime (JALN-M) ***Articles:*** ***FY 2016 Accomplishments:*** NMT Development FY16 funding profile resides in PE 0303109N. ***FY 2017 Plans:*** NMT Development FY17 funding profile resides in PE 0303109N. ***FY 2018 Base Plans:*** Complete system of systems integration and testing of NMT and ATIP Adaptive Coding during pre-demonstration flights. This includes completion of design verification of JALN-M capabilities of NMT by testing with the Airborne XDR payload. Perform systems engineering, test support and document analytical data and findings. Complete installation of the JALN-M capabilities and execute shipboard/site verification by using the AEHF satellite for End-to-End SATCOM Adaptive Coding. ***FY 2018 OCO Plans:*** N/A	0.000 -	0.000 -	2.107 -	0.000 -	2.107 -
Title: Technology Insertion ***Articles:*** ***Description:*** Overall program efforts include technology insertion implementation and associated testing required to support satellite communications. ***FY 2016 Accomplishments:*** N/A ***FY 2017 Plans:*** Technology Insertion FY17 funding profile resides in PE 0303109N. ***FY 2018 Base Plans:*** Perform Development Test (DT), Operational Test (OT) and Operational Test Readiness Review (OTRR) of Commercial Broadband Satellite Program (CBSP) Force Level Variant (FLV) Capacity Key Performance Parameter (KPP) to evaluate End-to-End performance of data rates throughout the shipboard network. ***FY 2018 OCO Plans:***	0.000 -	0.000 -	0.100 -	0.000 -	0.100 -

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 1203109N / *(U)Satellite Communications (SPACE)*	**Project (Number/Name)** 0728 / *EHF SATCOM Terminals*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
N/A					
Accomplishments/Planned Programs Subtotals	0.000	0.000	22.361	0.000	22.361

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
• 1203109N/3216: *NAVY MULTIBAND TERMINAL (NMT)*	118.142	38.365	69.764	-	69.764	99.741	98.101	22.528	14.462	69.688	1,383.810

Remarks

D. The NMT Follow-On Full Deployment (FOFD) contract continues NMT production for Afloat platforms and Shore locations, in support of the Chief of Naval Operations and the Department of the Navy (DON), and allows the NMT Program to complete Full Operational Capability (FOC). The competitive contract awarded to COMTECH supports the development of Anti-Access Area Denial (A2AD).

D. Acquisition Strategy

The NMT Follow-On Full Deployment (FOFD) contract will continue NMT production for Afloat platforms and Shore locations, in support of the Chief of Naval Operations and the Department of the Navy (DON), and will allow the NMT Program to complete Full Operational Capability (FOC). The competitive contract awarded to COMTECH supports the development of Anti-Access Area Denial (A2AD).

E. Performance Metrics

The RDT&E goal for the NMT program is to create a military satellite communications system that consolidates capabilities of current and future satellite systems into a single terminal. SATCOM-related technology insertion, studies and associated testing will support the CBSP Program.

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 1203109N / *(U)Satellite Communications (SPACE)*	**Project (Number/Name)** 0728 / *EHF SATCOM Terminals*

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Software Development JALN-M	C/CPAF	RAYTHEON : Marlborough, MA	0.000	0.000		0.000		0.000	Dec 2017	-		0.000	0.000	0.000	-
Software Development Time of Day (TOD)	C/CPAF	RAYTHEON : Marlborough, MA	0.000	0.000		0.000		9.312	Dec 2017	-		9.312	Continuing	Continuing	Continuing
Software Development ATIP Adaptive Coding (AC) /Time of Day (TOD)	C/CPFF	COMTECH : Tempe, AZ	0.000	0.000		0.000		1.657	Dec 2017	-		1.657	Continuing	Continuing	Continuing
Systems Engineering	C/CPFF	NUWC : Newport, RI	0.000	0.000		0.000		3.857	Jan 2018	-		3.857	Continuing	Continuing	Continuing
Systems Engineering	WR	SSC PAC : San Diego, CA	0.000	0.000		0.000		1.381	Jan 2018	-		1.381	0.000	1.381	-
		Subtotal	0.000	0.000		0.000		16.207		-		16.207	-	-	-

Remarks

FY17 initiated studies for the Adaptive Coding Time of Day effort. FY18 NMT Product Development focuses on the complexity of software design development across systems and vendors to support Adaptive Coding Time of Day (TOD) Encryption. Additionally the program will be performing NMT testing with Enhanced Polar Systems (EPS) and will initiate testing of the PTSFD EDM modems. Funding moved from PE 0303109N to 1203109N starting in FY18.

Support ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Software Integration/ Government Oversight	WR	NUWC : Newport, RI	0.000	0.000		0.000		1.654	Nov 2017	-		1.654	Continuing	Continuing	Continuing
Software Integration Support	WR	SSC PAC : San Diego, CA	0.000	0.000		0.000		0.572	Nov 2017	-		0.572	Continuing	Continuing	Continuing
Software Engineering Support	C/CPFF	SYSTECH : San Diego, CA	0.000	0.000		0.000		0.673	Nov 2017	-		0.673	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		0.000		2.899		-		2.899	-	-	-

Remarks

Funding moved from PE 0303109N to 1203109N starting in FY18.

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy			Date: May 2017
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 1203109N / *(U)Satellite Communications (SPACE)*	**Project (Number/Name)** 0728 / *EHF SATCOM Terminals*	

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
EPS & JALN-M Development Test and Evaluation	WR	SSC PAC : San Diego, CA	0.000	0.000		0.000		1.632	Nov 2017	-		1.632	Continuing	Continuing	Continuing
Operational Test & Evaluation	WR	COMOPTEVFOR : Norfolk, VA	0.000	0.000		0.000		0.000		-		0.000	0.000	0.000	-
		Subtotal	0.000	0.000		0.000		1.632		-		1.632	-	-	-

Remarks

Funding moved from PE 0303109N to 1203109N starting in FY18.

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Contract Management	C/CPFF	BAH : San Diego, CA	0.000	0.000		0.000		0.204	Nov 2017	-		0.204	Continuing	Continuing	Continuing
Program Management	C/CPFF	BAH : San Diego, CA	0.000	0.000		0.000		1.369	Nov 2017	-		1.369	Continuing	Continuing	Continuing
Travel	Various	SPAWAR : Various	0.000	0.000		0.000		0.050	Nov 2017	-		0.050	Continuing	Continuing	Continuing
		Subtotal	0.000	0.000		0.000		1.623		-		1.623	-	-	-

Remarks

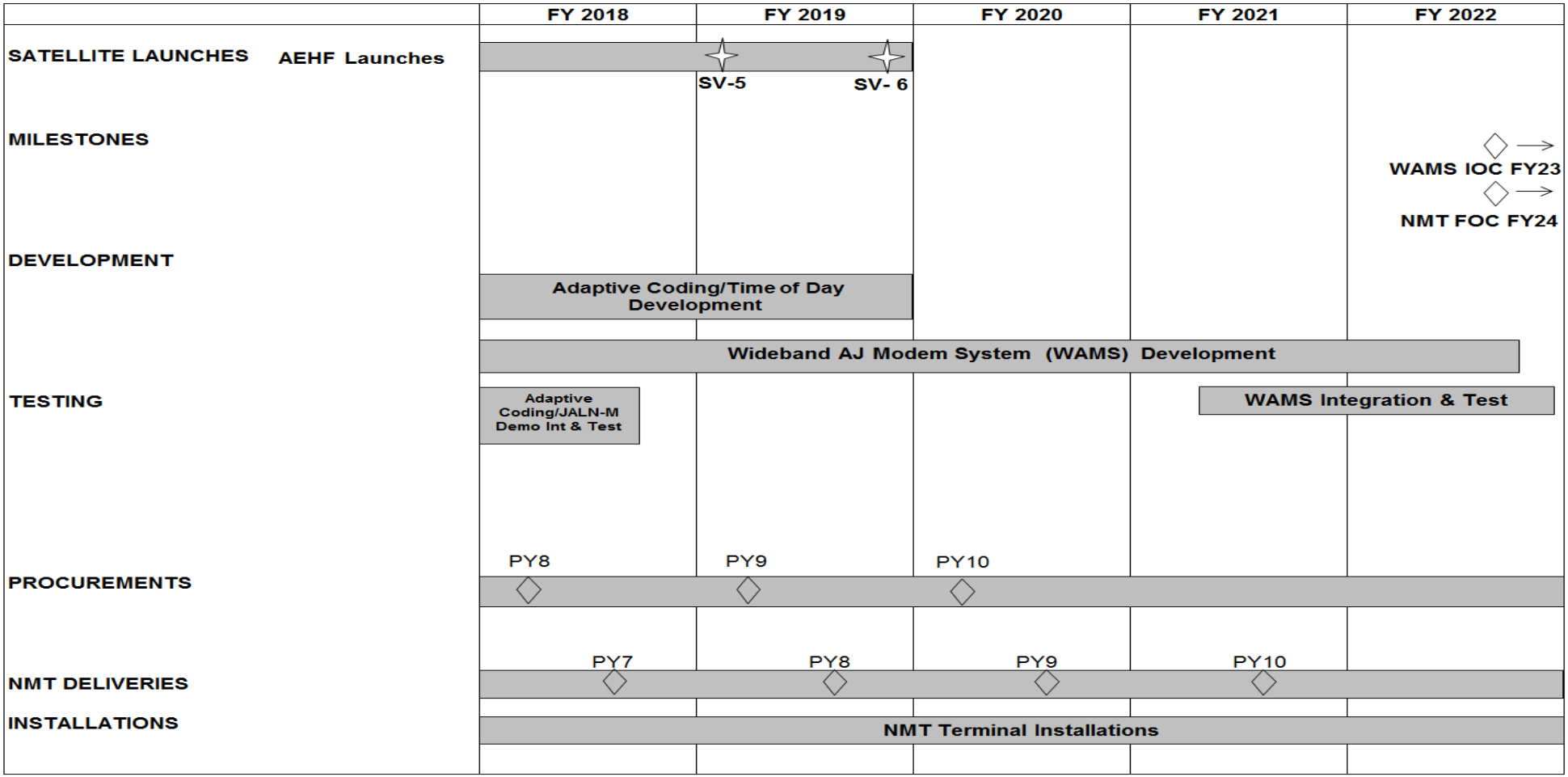
Funding moved from PE 0303109N to 1203109N starting in FY18.

	Prior Years	FY 2016		FY 2017		FY 2018 Base		FY 2018 OCO		FY 2018 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		0.000		22.361		-		22.361	-	-	-

Remarks

Funding moved from PE 0303109N to 1203109N starting in FY18.

Exhibit R-4, RDT&E Schedule Profile: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 1203109N / *(U)Satellite Communications (SPACE)*	**Project (Number/Name)** 0728 / *EHF SATCOM Terminals*



Note: FY16 and FY17 NMT funding profile resides in PE 0303109N.

Exhibit R-4A, RDT&E Schedule Details: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 1203109N / *(U)Satellite Communications (SPACE)*	**Project (Number/Name)** 0728 / *EHF SATCOM Terminals*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 0728				
AEHF Launch SV-5	1	2019	1	2019
A2AD Adaptive Coding & JALN-M Integration & Testing	1	2018	3	2018
A2AD Wideband AJ Modem Development	1	2018	3	2022
Procurement Year (PY8)	2	2018	2	2018
Procurement Year (PY9)	2	2019	2	2019
Procurement Year (PY10)	2	2020	2	2020
FRP PY7 Delivery	3	2018	3	2018
FRP PY8 Delivery	3	2019	3	2019
FRP PY9 Delivery	3	2020	3	2020
WAM Integration & Testing	2	2021	4	2022
FRP PY10 Delivery	3	2021	3	2021
AEHF Launch SV-6	4	2019	4	2019
A2AD Adaptive Coding/Time of Day	1	2018	4	2019

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy											Date: May 2017	
Appropriation/Budget Activity 1319 / 7					R-1 Program Element (Number/Name) PE 1203109N / *(U)Satellite Communications (SPACE)*				Project (Number/Name) 2472 / *Mobile User Objective Sys (MUOS)*			
COST ($ in Millions)	**Prior Years**	**FY 2016**	**FY 2017**	**FY 2018 Base**	**FY 2018 OCO**	**FY 2018 Total**	**FY 2019**	**FY 2020**	**FY 2021**	**FY 2022**	**Cost To Complete**	**Total Cost**
2472: *Mobile User Objective Sys (MUOS)*	0.000	0.000	0.000	13.965	-	13.965	15.654	14.972	15.291	14.306	46.060	120.248
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Project MDAP/MAIS Code: 345

Note

Project 2472 was realigned from PE 0303109N FY2018-FY2022

A. Mission Description and Budget Item Justification

The Mobile User Objective System (MUOS) provides a worldwide, multi-service population of mobile and fixed-site terminal users with Ultra-High Frequency (UHF), narrowband, beyond line of sight satellite communications (SATCOM). MUOS significantly increases performance and capacity in support of critical Combatant Command SATCOM priorities. MUOS is the replacement system for the UHF Follow-on (UFO) system, which is currently beyond its design life. MUOS consists of Space, Ground, and User Entry Segments. The Space Segment consists of 5 geosynchronous satellites, one which is an on-orbit spare, and provides both a legacy UHF payload, which is backward compatible with UFO, and a Wideband Code Division Multiple Access (WCDMA) payload, which provides 3G cellular-like capability. The Ground Segment consists of four world-wide Radio Access Facilities (RAFs) and two satellite control facilities. Each RAF includes three 60 ft. antennas, and numerous racks of equipment. The RAF in Hawaii includes a Network Management Facility (NMF). The RAFs in Hawaii and Virginia each include a Switching Facility (SF). The User Entry Segment consists of the MUOS waveform that is ultimately integrated into MUOS-capable terminals. The MUOS legacy capability has been in operational use since 2012, and the WCDMA capability transitioned to Early Combatant Command Use in July 2016.

In addition to providing UHF SATCOM for the Department of Defense (DoD), the Navy has the overall responsibility to deliver the End-to-End (E2E) MUOS capability to the warfighter. This responsibility involves systems engineering, integration, and test management of all MUOS system of system activities, to include the integration of the MUOS waveform into MUOS-capable terminals and the subsequent terminal certification testing.

In June 2016 based on the results of the Multi-Service Operational Test and Evaluation-2 (MOT&E-2), Director, Operational Test & Evaluation (DOT&E) assessed MUOS not operationally effective or suitable. As a result of the program addressing findings and preparing for MOT&E-2B in FY19, Full Operational Capability (FOC) has been moved to FY20.

The budget line in FY18 and out is dedicated to completion of the MOT&E-2B activities, system optimization to address the dynamic, worldwide electromagnetic and cybersecurity environment in which MUOS operates, and testing to support certification of MUOS-capable terminals.

Funding moved from PE 0303109N to 1203109N starting in FY18.

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 1203109N / *(U)Satellite Communications (SPACE)*	**Project (Number/Name)** 2472 / *Mobile User Objective Sys (MUOS)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Title: Mobile User Objective Sys (MUOS)	0.000	0.000	13.965	0.000	13.965
Articles:	-	-	-	-	-
FY 2016 Accomplishments: N/A					
FY 2017 Plans: N/A					
FY 2018 Base Plans: Support integration of the MUOS waveform into MUOS-capable terminals and execution of certification testing of MUOS-capable terminals in support of the U.S. Army Handheld, Manpack, and Small Form Fit (HMS) terminal program. Address operational test deficiencies and prepare for FY19 Multi-service Operational Test and Evaluation-2B (MOT&E-2B) activities, particularly addressing the capability to monitor system status and provide situational awareness for the system operators. Execute 5 developmental test assist events in preparation for FY19 MOT&E-2B. Address emerging cybersecurity requirements. Develop a modernized geolocation Ground Segment subsystem in order to meet baseline requirements. Address the dynamic, worldwide electronic magnetic environment through system optimization to ensure capacity is available to the end user.					
FY 2018 OCO Plans: N/A					
Accomplishments/Planned Programs Subtotals	0.000	0.000	13.965	0.000	13.965

C. Other Program Funding Summary ($ in Millions)

Line Item	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
• WPN/2433: *Fleet Satellite Comm Follow-On*	35.961	36.723	46.357	-	46.357	68.018	70.225	55.935	48.248	328.733	2,721.265

Remarks

D. Acquisition Strategy

Currently sustainment and engineering activities are procured via the baseline MUOS Risk Reduction and Design Development contract. The program is working to transition these activities to dedicated sustainment contracts for the Ground/User Entry and Space Segments. Integration of the MUOS waveform into MUOS-capable

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 1203109N / *(U)Satellite Communications (SPACE)*	**Project (Number/Name)** 2472 / *Mobile User Objective Sys (MUOS)*

terminals and execution of certification testing of MUOS-capable terminals are executed primarily by the Navy Working Capital Funded SPAWAR Systems Center Pacific.

E. Performance Metrics

MUOS Goal: Achieve Full Operational Capability in FY 2020.

Metric: Successfully complete 5 developmental test assist events in FY18, and Multi-Service Operational Test and Evaluation-2B FY19.

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy			Date: May 2017
Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 1203109N / *(U)Satellite Communications (SPACE)*	Project (Number/Name) 2472 / *Mobile User Objective Sys (MUOS)*	

Product Development ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Engineering Contract	C/CPAF	TBD : TBD	0.000	0.000		0.000		7.700	Oct 2017	-		7.700	0.000	7.700	-
		Subtotal	0.000	0.000		0.000		7.700		-		7.700	0.000	7.700	-

Remarks

Increase of ~$600K in Engineering Contract (RRDD AOS Contract) from FY17 to FY18 due to increased efforts to address Operational Test deficiencies.
Funding moved from PE 0303109N to 1203109N starting in FY18.

Test and Evaluation ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Developmental Test & Evaluation	WR	SSC PAC : San Diego, CA	0.000	0.000		0.000		1.515	Oct 2017	-		1.515	0.000	1.515	-
Operational Test & Evaluation	WR	COTF : Norfolk, VA	0.000	0.000		0.000		0.250	Oct 2017	-		0.250	0.000	0.250	-
		Subtotal	0.000	0.000		0.000		1.765		-		1.765	0.000	1.765	-

Remarks

Increase of $1.765M in Test and Evaluation efforts from FY17 to FY18 due to Test Assist Events in preparation for MOT&E-2B.
Funding moved from PE 0303109N to 1203109N starting in FY18.

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Contractor Engineering Support	Various	Various : Various	0.000	0.000		0.000		3.000	Oct 2017	-		3.000	0.000	3.000	-
Government Engineering	WR	SSC PAC : San Diego, CA	0.000	0.000		0.000		1.500	Oct 2017	-		1.500	0.000	1.500	-
		Subtotal	0.000	0.000		0.000		4.500		-		4.500	0.000	4.500	-

Exhibit R-3, RDT&E Project Cost Analysis: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 1203109N / *(U)Satellite Communications (SPACE)*	**Project (Number/Name)** 2472 / *Mobile User Objective Sys (MUOS)*

Management Services ($ in Millions)

Cost Category Item	Contract Method & Type	Performing Activity & Location	Prior Years	FY 2016 Cost	FY 2016 Award Date	FY 2017 Cost	FY 2017 Award Date	FY 2018 Base Cost	FY 2018 Base Award Date	FY 2018 OCO Cost	FY 2018 OCO Award Date	FY 2018 Total Cost	Cost To Complete	Total Cost	Target Value of Contract
Remarks															
Funding moved from PE 0303109N to 1203109N starting in FY18.															

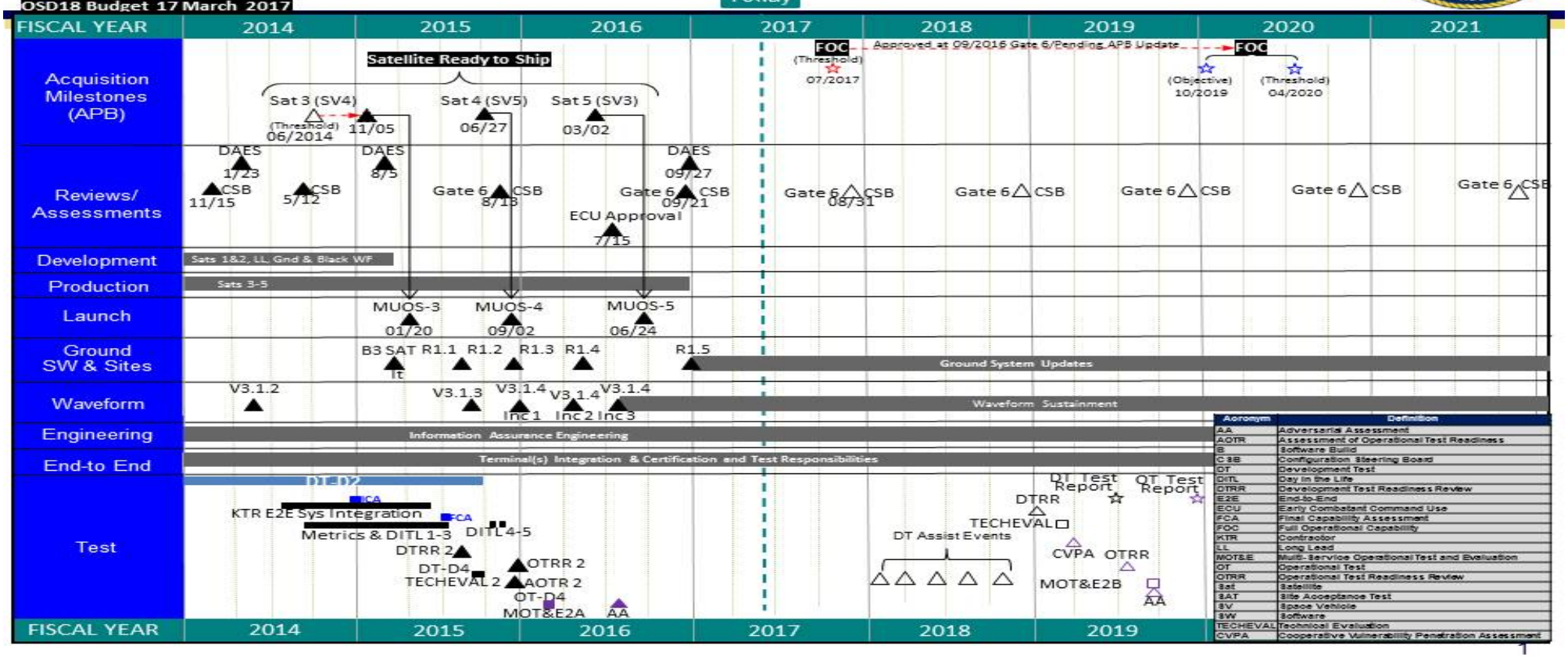
	Prior Years	FY 2016		FY 2017		FY 2018 Base		FY 2018 OCO		FY 2018 Total	Cost To Complete	Total Cost	Target Value of Contract
Project Cost Totals	0.000	0.000		0.000		13.965		-		13.965	0.000	13.965	-

Remarks

Funding moved from PE 0303109N to 1203109N starting in FY18.

Exhibit R-4, RDT&E Schedule Profile: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 1203109N / *(U)Satellite Communications (SPACE)*	**Project (Number/Name)** 2472 / *Mobile User Objective Sys (MUOS)*

MUOS Program Schedule



Acronym	Definition
AA	Adversarial Assessment
AOTR	Assessment of Operational Test Readiness
B	Software Build
CBB	Configuration Steering Board
DT	Developmental Test
DITL	Day in the Life
DTRR	Developmental Test Readiness Review
E2E	End-to-End
ECU	Early Combatant Command Use
FCA	Final Capability Assessment
FOC	Full Operational Capability
KTR	Contractor
LL	Long Lead
MOT&E	Multi-Service Operational Test and Evaluation
OT	Operational Test
OTRR	Operational Test Readiness Review
Sat	Satellite
SAT	Site Acceptance Test
SV	Space Vehicle
SW	Software
TECHEVAL	Technical Evaluation
CVPA	Cooperative Vulnerability Penetration Assessment

Exhibit R-4A, RDT&E Schedule Details: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 1203109N / *(U)Satellite Communications (SPACE)*	**Project (Number/Name)** 2472 / *Mobile User Objective Sys (MUOS)*

Schedule Details

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Proj 2472				
Information Assurance Engineering	1	2018	4	2021
Terminal Integration, Certification, and Test	1	2018	4	2021
Waveform Sustainment	1	2018	4	2021
Ground System Updates	1	2018	4	2021
Developmental Test Assist Event 1	1	2018	1	2018
Developmental Test Assist Event 2	2	2018	2	2018
Developmental Test Assist Event 3	2	2018	2	2018
Developmental Test Assist Event 4	3	2018	3	2018
Developmental Test Assist Event 5	4	2018	4	2018
Gate 6/CSB FY18	4	2018	4	2018
Developmental Test Readiness Review	1	2019	1	2019
Tech Eval	1	2019	1	2019
DT Test Report	2	2019	2	2019
OT Readiness Review	3	2019	3	2019
MOT&E2B	3	2019	3	2019
Adversarial Assessment	3	2019	3	2019
OT Test Report	4	2019	4	2019
Gate 6/CSB FY19	4	2019	4	2019
Full Operational Capability (FOC) Objective	1	2020	1	2020
Full Operational Capability (FOC) Threshold	3	2020	3	2020
Gate 6/CSB FY20	4	2020	4	2020

Exhibit R-4A, RDT&E Schedule Details: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 1203109N / *(U)Satellite Communications (SPACE)*	**Project (Number/Name)** 2472 / *Mobile User Objective Sys (MUOS)*

	Start		End	
Events by Sub Project	**Quarter**	**Year**	**Quarter**	**Year**
Gate 6/CSB FY21	4	2021	4	2021

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy			Date: May 2017
Appropriation/Budget Activity 1319 / 7	R-1 Program Element (Number/Name) PE 1203109N / *(U)Satellite Communications (SPACE)*	Project (Number/Name) 3398 / *Enterprise SATCOM Gateway Modems (ESGMs)*	

COST ($ in Millions)	Prior Years	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total	FY 2019	FY 2020	FY 2021	FY 2022	Cost To Complete	Total Cost
3398: *Enterprise SATCOM Gateway Modems (ESGMs)*	0.000	0.000	0.000	1.510	-	1.510	0.926	0.000	0.000	0.000	0.000	2.436
Quantity of RDT&E Articles		-	-	-	-	-	-	-	-	-		

Note

ESGM's FY18-FY19 funding profile has moved from PE 0303109N to 1203109N.

A. Mission Description and Budget Item Justification

The Navy Global Broadcast Service (GBS) Program is the Navy component of the Joint Military Satellite Communications (MILSATCOM) program that delivers the continuous flow of high-speed, high-volume communication and information flow for deploying, deployed, on the move, and garrisoned forces. The GBS system supports the Navy Strategic Plan and equips warfighters with counter Anti-Access/Area Denial (A2AD) communications in a denied Command, Control, Communications, Computers, and Intelligence (C4I) environment. GBS provides Satellite Communications (SATCOM) capability for forces afloat, ashore, and Naval Special Warfare Command.

The Enterprise SATCOM Gateway Modem (ESGM) is the DoD Chief Information Officer directed solution to satisfy the Transmission Security (TRANSEC) requirement. This modem will replace the existing modem in the GBS System. Testing and fielding of the ESGM is a joint venture, operationally directed by the Defense Information Systems Agency (DISA) and the Air Force as the lead service. Additionally, the ESGM will continue to enable GBS reception of the Digital Video Broadcast - Satellite 2nd Generation (DVB-S2).

FY18 GBS activities will complete integration and testing for the Enterprise Satellite Communications Gateway Modems (ESGM) technical baseline.

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
Title: Enterprise SATCOM Gateway Modems (ESGMs)	0.000	0.000	1.510	0.000	1.510
Articles:	-	-	-	-	-
FY 2016 Accomplishments: N/A					
FY 2017 Plans: Enterprise SATCOM Gateway Modems (ESGMs)FY17 funding profile has moved to PE 0303109N.					
FY 2018 Base Plans: Complete integration and testing necessary to support the Enterprise Satellite Communications Gateway Modems (ESGM) technical baseline. Complete test execution, qualification and reporting for Navy-specific					

Exhibit R-2A, RDT&E Project Justification: FY 2018 Navy		Date: May 2017
Appropriation/Budget Activity 1319 / 7	**R-1 Program Element (Number/Name)** PE 1203109N / *(U)Satellite Communications (SPACE)*	**Project (Number/Name)** 3398 / *Enterprise SATCOM Gateway Modems (ESGMs)*

B. Accomplishments/Planned Programs ($ in Millions, Article Quantities in Each)	FY 2016	FY 2017	FY 2018 Base	FY 2018 OCO	FY 2018 Total
requirements. GBS Joint ESGM DT and OT activities. Complete application integration testing and report on compliance with Navy C4I systems. ***FY 2018 OCO Plans:*** N/A					
Accomplishments/Planned Programs Subtotals	0.000	0.000	1.510	0.000	1.510

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

The GBS program reached a Full Rate Production Decision on 24 Oct 2008 and is in sustainment. The Enterprise Satellite Communications (SATCOM) Gateway Modem (ESGM), the Commercial Off-The-Shelf (COTS) Internet Protocol (IP) modem, provides Transmission Security functionality in support of DoD CIO direction to implement Information Assurance for all transmission media.

E. Performance Metrics

The RDT&E goal for the GBS program is to create a military satellite communications system that supports current and future requirements for Anti-Access/Area Denial and Information Assurance.