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## Selected Acquisition Report (SAR)

RCS: DD-A&T(Q&A)823-261



### Advanced Extremely High Frequency Satellite (AEHF)

As of FY 2019 President's Budget

Defense Acquisition Management  
Information Retrieval  
(DAMIR)

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## Sensitivity Originator

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## Common Acronyms and Abbreviations for MDAP Programs

Acq O&M - Acquisition-Related Operations and Maintenance  
ACAT - Acquisition Category  
ADM - Acquisition Decision Memorandum  
APB - Acquisition Program Baseline  
APPN - Appropriation  
APUC - Average Procurement Unit Cost  
\$B - Billions of Dollars  
BA - Budget Authority/Budget Activity  
Blk - Block  
BY - Base Year  
CAPE - Cost Assessment and Program Evaluation  
CARD - Cost Analysis Requirements Description  
CDD - Capability Development Document  
CLIN - Contract Line Item Number  
CPD - Capability Production Document  
CY - Calendar Year  
DAB - Defense Acquisition Board  
DAE - Defense Acquisition Executive  
DAMIR - Defense Acquisition Management Information Retrieval  
DoD - Department of Defense  
DSN - Defense Switched Network  
EMD - Engineering and Manufacturing Development  
EVM - Earned Value Management  
FOC - Full Operational Capability  
FMS - Foreign Military Sales  
FRP - Full Rate Production  
FY - Fiscal Year  
FYDP - Future Years Defense Program  
ICE - Independent Cost Estimate  
IOC - Initial Operational Capability  
Inc - Increment  
JROC - Joint Requirements Oversight Council  
\$K - Thousands of Dollars  
KPP - Key Performance Parameter  
LRIP - Low Rate Initial Production  
\$M - Millions of Dollars  
MDA - Milestone Decision Authority  
MDAP - Major Defense Acquisition Program  
MILCON - Military Construction  
N/A - Not Applicable  
O&M - Operations and Maintenance  
ORD - Operational Requirements Document  
OSD - Office of the Secretary of Defense  
O&S - Operating and Support  
PAUC - Program Acquisition Unit Cost

PB - President's Budget  
PE - Program Element  
PEO - Program Executive Officer  
PM - Program Manager  
POE - Program Office Estimate  
RDT&E - Research, Development, Test, and Evaluation  
SAR - Selected Acquisition Report  
SCP - Service Cost Position  
TBD - To Be Determined  
TY - Then Year  
UCR - Unit Cost Reporting  
U.S. - United States  
USD(AT&L) - Under Secretary of Defense (Acquisition, Technology and Logistics)

## Program Information

**Program Name**

Advanced Extremely High Frequency Satellite (AEHF)

**DoD Component**

Air Force

**Joint Participants**

Canada; The Netherlands; United Kingdom

## Responsible Office

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**Date Assigned:** February 10, 2014

## References

**SAR Baseline (Production Estimate)**

Defense Acquisition Executive (DAE) Approved Acquisition Program Baseline (APB) dated October 23, 2012

**Approved APB**

Defense Acquisition Executive (DAE) Approved Acquisition Program Baseline (APB) dated October 23, 2012

## Mission and Description

Advanced Extremely High Frequency Satellite (AEHF) is a joint service satellite communications system that provides global, survivable, secure, protected, and jam-resistant communications for high priority military ground, sea, and air assets. The system consists of four satellites in Geosynchronous Earth Orbit that provide 10 times the capacity of the 1990s-era Milstar Block II satellites. The system provides continuous 24-hour Extremely High Frequency Extended Data Rate coverage between 65 degrees north and 65 degrees south latitude. AEHF allows the National Security Council and Combatant Commanders to control their tactical and strategic forces at all levels of conflict up to and including general nuclear war, and it supports the attainment of information superiority.

The AEHF operational system is composed of three segments: space, terminals, and mission control. The space segment consists of a cross-linked constellation of satellites to provide worldwide coverage. The terminal segment includes fixed and mobile ground terminals, ship and submarine terminals, and airborne terminals. The mission control segment controls satellites on orbit, monitors satellite health, and provides communication system planning and monitoring. This segment is also survivable, with both fixed and mobile control stations.

International Cooperative Program – The three countries that have signed Memoranda of Understanding are as follows: Canada, November 16, 1999; the Netherlands, November 8, 2002; and the United Kingdom, September 9, 2003. These bilateral agreements allocate a portion of protected communication resources in exchange for financial participation in development. The Netherlands, Canada, and the United Kingdom signed Memoranda of Understanding in preparation for entering into a Foreign Military Sales case to purchase International Partnership variants of AEHF terminals.



## Executive Summary

### Program Highlights Since Last Report

AEHF 1/2/3 are fully integrated into the Milstar/AEHF constellation and performing well with AEHF-1 operating from 4 degrees East (covering Europe, the Middle East and Western Asia), AEHF-2 operating from 68 degrees West (covering Eastern United States and the Atlantic Ocean), and AEHF-3 operating from 152 degrees East (covering the Pacific Ocean).

There are many notable operational and programmatic achievements within the AEHF program throughout CY 2017. The AEHF-6 payload mated to the AEHF spacecraft in January 2017 and the AEHF-6 Lithium Ion batteries delivered in June 2017. The Ground Technology Refresh completed in October 2017 and is now operational. Air Force Space Command (AFSPC) awarded Operational Acceptance of the Mission Planning Element Increment 8.0 software on December 4, 2017. The AEHF 4 launch date is confirmed with United Launch Alliance (ULA) and the Cape Canaveral range for October 18, 2018. The program office Integrated Crew Exercises are scheduled for April and August 2018.

AEHF-5/6 production steadily progressed since contract definitization on October 31, 2013 with a value of \$2.2B. A program delay occurred when an on-contract Scaleable Power Regulator Unit (SPRU) requirement was not met. Thus, AEHF APB launch availability threshold date of December 2018 is now unachievable due to the SPRU delays and addition of Acoustic Testing. MDA approved a Program Deviation Report (PDR) in October 2017 which addressed these delays. Program progress slightly increased since the last SAR. AEHF-5 is now scheduled to complete all factory work and be ready for shipment to the launch base by January 2019, one month after the APB threshold date, breaching the APB threshold for schedule. The Lockheed Martin satellite buses for combined AEHF-5/6 effort are 88.6% complete and the Northrop Grumman payloads for the combined effort are 89.2% complete as of January 8, 2018.

Launch availability for AEHF-5 and AEHF-6 is currently CY 2019 and CY 2020 respectively.

There are no significant software-related issues with this program at this time.



**History of Significant Developments Since Program Initiation**

History of Significant Developments Since Program Initiation	
Date	Significant Development Description
May 1999	The DAE signed the Milestone I ADM approving entry into Phase I, System Definition.
August 1999	Two competitive System Definition contracts were awarded to Lockheed/TRW (now Northrop Grumman) and Hughes (now Boeing Satellite Systems) teams. Following the System Requirements Review and the Milstar flight 3 launch failure, the AEHF competition was re-established into a National Team consisting of all three contractors with Lockheed as the prime integration contractor. A "pathfinder" concept was put into effect to mitigate the loss of Milstar 3 capability. This concept included the acceleration of a Milstar II capable AEHF satellite followed by delivery of four additional fully capable AEHF satellites.
May 2000	An ADM was approved by USD(AT&L) that authorized a sole source Firm Fixed Price pathfinder concept award to a team of contractors.
May 2002	Due to fiscal constraints the program was initially broken into two production cycles. The first cycle consisted of AEHF-1 & -2 and the Mission Control Segment (MCS) development for an FY 2008 IOC. The second cycle included AEHF-3, -4, & -5 production for a FOC in FY 2012. After FY 2002 Congressional reductions and the initiation of the Transformational Communications Satellite (TSAT) program, the Deputy Secretary of Defense directed a change to the acquisition strategy in December 2002 removing AEHF-4 & -5 from the baseline.
December 2002	The contract launch dates for AEHF-1 & -2 were December 2006 and December 2007, and AEHF-3 was projected to be launched in April 2009. The definitized contract breached the APB IOC schedule threshold and overall program cost. An updated APB incorporating the new August 2009 IOC and revised strategy was signed in December 2002.
March 2005	A revised APB to include the launch slip and approval of AEHF-3 procurement was signed. Due to funding constraints, the FY 2004 PB introduced a one-year production gap between AEHF-2 and AEHF-3. In addition to the cost of delaying AEHF-3 production, other subsequent cost drivers, including payload hardware testing, information assurance product delivery delays and replacement of critical electronic parts, drove a one-year launch delay. A Nunn-McCurdy significant unit cost breach was sent to Congress on December 2, 2004.
May 2007	The AEHF-1 & -2 and MCS developments were well underway. The program successfully completed run-for-record intersegment tests for AEHF/Milstar compatibility and Lockheed Martin also successfully demonstrated the ability of the AEHF Satellite Mission Control Subsystem (ASMCS) to command and control the AEHF payload engineering model and the Interim Command and Control (C2) Terminal for Milstar.
September 2008	A Nunn-McCurdy critical unit cost breach notification occurred on September 5, 2008 due to the addition of AEHF-4 to the program and the AEHF-1 & -2 launch slips' cascading cost and schedule impacts on AEHF-3. The Government had concluded the production gap of four years for AEHF-4 would cause significant cost impacts to obsolescence issues such as Monolithic Microwave Integrated Circuits. The Nunn-McCurdy breach was caused by additional funding required for obsolescence, a seven month schedule delay due to AEHF-1 hardware issues, additional Thermal Vacuum tests, greater than expected AEHF-1 & -2 integration costs, and an overall IOC schedule slip. The USD (AT&L) signed an ADM on December 29, 2008 certifying the AEHF program to proceed with a fully-funded four-satellite baseline. The ADM established new launch dates of September 2010, 2011, 2012, and 2016.
June 2009	After the cancellation of the TSAT program, the DoD directed the procurement of additional AEHF satellites. The AEHF-4 contract was awarded for \$1.4B in December 2010, and the MDA approved the AEHF 1-4 APB in June 2011. In December 2011, the MDA approved the AEHF 5-6 Acquisition Strategy as a DoD Efficient Space Procurement, and the APB designating AEHF 5-6 as a sub-program was



	approved by MDA on October 23, 2012. On October 31, 2013 the Fixed Price Incentive Fee contract was definitized for the block buy of AEHF 5-6.
May 2010	The AEHF program office completed the C2 transition of the five-satellite Milstar constellation from a legacy C2 system to the new AEHF C2 system. In December 2011 an Interim Contractor Support contract was awarded to Lockheed Martin to provide sustainment of the space and ground segments until IOC is achieved.
August 2010	AEHF-1 was successfully launched from Cape Canaveral Air Force Station (CCAFS) on August 14, 2010. AEHF-1 experienced an anomaly that resulted in the failure of a Liquid Apogee Engine. Orbit raising was completed using the Reaction Engine Assemblies on October 24, 2011 after a 14-month effort. Satellite Control Authority (SCA) was transferred on March 12, 2012.
May 2012	AEHF-2 was successfully launched from CCAFS on May 4, 2012 and the space vehicle successfully completed on-orbit testing on September 24, 2012. SCA was transferred on November 7, 2012.
September 2013	AEHF-3 was successfully launched from CCAFS on September 18, 2013.
October 2013	AEHF 5-6 contract definitized with a value of \$2.2B on October 31, 2013.
January 2014	AEHF-3 space vehicle arrived on-orbit and successfully completed on-orbit testing on January 6, 2014.
March 2014	SCA was completed on March 21, 2014.
May 2014	U.S. Strategic Command declared early operational use of AEHF-1, 2, and 3 on May 12 2014. All three satellites fully integrated into the Milstar constellation.
October 2014	On October 16, 2014, the program received PEO certification for the systems (ground and space vehicle) to enter Air Force Operational Test and Evaluation Center System Dedicated Operational Test which began November 3, 2014 and ran through mid-January 2015.
January 2015	Multi-service Operational Test and Evaluation (MOT&E) completed on January 16, 2015 and AEHF-3 began repositioning from its interim MOT&E location of 155 degrees West on January 21, 2015.
March 2015	AEHF-3 arrived at its new operating location of 152 degrees East (covering the Western Pacific Ocean) on March 18, 2015.
July 2015	Air Force Space Command Commander declared AEHF IOC on July 28, 2015.
September 2015	USD(AT&L) redesignated AEHF as an ACAT IC on September 11, 2015.
October 2015	AEHF-2 arrived at its new operating location of 19 degrees East (covering Western Europe and Africa) on October 21, 2015.
January 2016	MCS Increment 7.6 software was operationally accepted.
July 2016	Completed a three week Operational Trial Period for the MCS Tech Refresh. Awarded the Mission Planning Element (MPE) Increment 8.1 development contract.
September 2016	Delivered and installed the AEHF-5 Configurable On-Board Router. Awarded the AEHF-5/6 contract modification to add acoustic testing.
October 2016	Delivered the AEHF-5 Lithium-Ion batteries and Battery Isolation Switch Unit (both new AEHF subsystems). Completed AEHF-5 Payload mate.
November 2016	Completed Critical Design Review for Operational Resiliency on AEHF-6 on November 10, 2016.
March 2017	Completed a two-week Operational Trial Period for the ASMCS portion of the Tech Refresh. The Military Satellite Communications program office accepted delivery of the MPE Increment 8.0 development software and delivered it to the 4th Space Operations Squadron.
June 2017	Air Force Space Command/Program Executive Officer directed Lockheed Martin to fix the AEHF-4/5/6 Scaleable Power Regulator Unit (SPRU) following an SMC Enterprise issue and investigation with the SPRU.
October 2017	The LM Ground Technology Refresh completed and is now operational.
October 2017	SAF/AQ approved the AEHF APB Program Deviation Report.

December 2017	AFSPC operationally accepted MPE Increment 8.0.
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# Threshold Breaches

APB Breaches			Explanation of Breach
Schedule		<input checked="" type="checkbox"/>	<p><i>The AEHF-5 APB threshold date of December 2018 is unachievable due to the addition of Acoustic Testing and Scaleable Power Regulator Unit (SPRU) delays. AEHF-5 scheduled to complete all factory work ready for shipment to the launch base in January 2019.</i></p>
Performance		<input type="checkbox"/>	
Cost	RDT&E	<input type="checkbox"/>	
	Procurement	<input type="checkbox"/>	
	MILCON	<input type="checkbox"/>	
	Acq O&M	<input type="checkbox"/>	
O&S Cost		<input type="checkbox"/>	
Unit Cost	PAUC	<input type="checkbox"/>	
	APUC	<input type="checkbox"/>	
Nunn-McCurdy Breaches			
Current UCR Baseline			
	PAUC	None	
	APUC	None	
Original UCR Baseline			
	PAUC	None	
	APUC	None	

## Schedule



Schedule Events					
Events	SAR Baseline Production Estimate	Current APB Production Objective/Threshold		Current Estimate	
AEHF SV 5-6 Production Decision	May 2012	May 2012	May 2012	May 2012	
Launch Availability AEHF SV-5	Jun 2018	Jun 2018	Dec 2018	<b>Jan 2019<sup>1</sup></b>	(Ch-1)
Launch Availability AEHF SV-6	Jun 2019	Jun 2019	Dec 2019	Sep 2019	(Ch-2)

<sup>1</sup> APB Breach

### Change Explanations

(Ch-1) Launch Availability AEHF SV-5 current estimate changed from August 2018 to January 2019 as a result of delays due to the addition of Acoustic Testing and Scaleable Power Regulator Unit (SPRU) hardware repair.

(Ch-2) Launch Availability AEHF SV-6 current estimate changed from February 2019 to September 2019, as a result of delays due to the addition of Acoustic Testing and SPRU hardware repair.



## Performance

Performance Characteristics				
SAR Baseline Production Estimate	Current APB Production Objective/Threshold	Demonstrated Performance	Current Estimate	
<b>Capacity</b>				
1.2 Gbps CMTW, 600 Mbps Strategic	1.2 Gbps CMTW, 600 Mbps Strategic	Support at least 500 Mbps for CMTW Scenario and at least 350 Mbps for Strategic Scenario	1.0 Gbps CMTW Scenario, 600 Mbps Strategic Scenario - verified required capability as part of system requirement sell-off prior to AEHF-1 launch.	1.2 Gbps CMTW, 600 Mbps Strategic
<b>Nuclear Protection</b>				
Provide assured communications to survivable nuclear forces exposed to the environment specified in NCGS-89-06, and for those critical networks that support the following critical functions: situation monitoring, decision making, force direction, force management, and planning	Provide assured communications to survivable nuclear forces exposed to the environment specified in NCGS-89-06, and for those critical networks that support the following critical functions: situation monitoring, decision making, force direction, force management, and planning	Provide assured communications to survivable nuclear forces exposed to the environment specified in NCGS-89-06, and for those critical networks that support the following critical functions: situation monitoring, decision making, force direction, force management, and planning	Verified required capability as part of system requirement sell-off prior to AEHF-2 launch.	Provide assured communications to survivable nuclear forces exposed to the environment specified in NCGS-89-06, and for those critical networks that support the following critical functions: situation monitoring, decision making, force direction, force management, and planning.
<b>Access and Control</b>				
Provide users ability to plan, control, & reconfigure their apportioned resources; critical functions such as situation monitoring, decision making, force direction, force management, & planning shall not be disrupted by communications configuration changes to noncritical functions	Provide users ability to plan, control, & reconfigure their apportioned resources; critical functions such as situation monitoring, decision making, force direction, force management, & planning shall not be disrupted by communications configuration changes to noncritical functions	Provide users ability to plan, control, & reconfigure their apportioned resources; critical functions such as situation monitoring, decision making, force direction, force management, & planning shall not be disrupted by communications configuration changes to noncritical functions	Verified required capability as part of system requirement sell-off prior to AEHF-2 launch. Demonstrated LDR operationally ready capability in AEHF-1 on-orbit test.	Provide users ability to plan, control, & reconfigure their apportioned resources; critical functions such as situation monitoring, decision making, force direction, force management, & planning shall not be disrupted by communications configuration changes to noncritical functions.



**AEHF Interoperability**

Support joint interoperable war-fighter communications among all military branches EHF terminals	Support joint interoperable war-fighter communications among all military branches EHF terminals	Support joint interoperable war-fighter communications among all military branches EHF terminals	Verified required capability as part of system requirement sell-off prior to AEHF-2 launch. Demonstrated operationally ready capability in AEHF-1 on-orbit test.	Support joint interoperable war-fighter communications among all military branches EHF terminals
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**Milstar Backward Compatible**

Operate with the Milstar system, at all LDR and MDR terminal supported data rates, throughout the Milstar transition to the AEHF system	Operate with the Milstar system, at all LDR and MDR terminal supported data rates, throughout the Milstar transition to the AEHF system	Operate with the Milstar system, at all LDR and MDR terminal supported data rates, throughout the Milstar transition to the AEHF system	Verified required capability as part of system requirement sell-off prior to AEHF-1 launch. Demonstrated operationally ready capability in AEHF-1 on-orbit test.	Operate with the Milstar system, at all LDR and MDR terminal supported data rates, throughout the Milstar transition to the AEHF system
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Classified Performance information is provided in the classified annex to this submission.

**Requirements Reference**

Operational Requirements Document (ORD), dated October 1, 2000

**Change Explanations**

None

**Acronyms and Abbreviations**

AFOTEC - Air Force Operational Test and Evaluation Center  
 CMTW - Combined Major Theater Warfare  
 EHF - Extremely High Frequency  
 Gbps - Giga bytes per second  
 LDR - Low Data Rate  
 Mbps - Mega bytes per second  
 MCS - Mission Control Segment  
 MDR - Medium Data Rate  
 Milstar - Military Strategic and Tactical Relay  
 NCGS - Nuclear Criteria Group Secretariat  
 OUE - Operational Utility Evaluation



## Track to Budget

### General Notes

In December 2014, the Office of Management and Budget directed the DoD to establish a new space procurement appropriation. Beginning in FY 2016, Air Force major procurement funding formerly under 3020F (Missile Procurement, Air Force) BA 05 will now be under 3021F (Space Procurement, Air Force) BA 01, a three-year procurement account.

### RDT&E

Appn	BA	PE	
Air Force	3600	04	0603430F
	Project	Name	
	644050	AEHF MILSATCOM (Space)	
	<b>Notes:</b> FY 2011 only		(Sunk)
	64A030	Evolved AEHF MILSATCOM (EAM)	
	<b>Notes:</b> FY 2013 only		(Sunk)
Air Force	3600	05	0605431F
	Project	Name	
	657104	Evolved AEHF MILSATCOM (EAM)	
	<b>Notes:</b> FY 2014 - 2015 only		(Sunk)

### Notes

Projects 64A030 and 657104 also fund the Military Satellite Communications (MILSATCOM) Space Modernization Initiative. AEHF RDT&E funding is for the AEHF SV 6 KI-54D cryptographic device. Project 644050 is FY 2011 only. Project 64A030 is FY 2013 only. Project 657104 is for FY 2014 - 2015 only.

### Procurement

Appn	BA	PE	
Air Force	3020	05	0303604F
	Line Item	Name	
	ADV555	Advanced EHF	
			(Sunk)
Air Force	3021	01	0303604F
	Line Item	Name	
	ADV555	Advanced EHF	
	<b>Notes:</b> Ends in FY 2017		(Sunk)
Air Force	3021	01	1203604F
	Line Item	Name	
	ADV555	Advanced EHF	
	<b>Notes:</b> FY 2018 - FY 2021		

### Notes

Due to the creation of a new appropriation for Space Procurement (3021), satellite vehicle (SV) quantities are accounted for under 3020 annual funding section.

## Cost and Funding

### Cost Summary

Total Acquisition Cost						
Appropriation	BY 2002 \$M			BY 2002 \$M	TY \$M	
	SAR Baseline Production Estimate	Current APB Production Objective/Threshold		Current Estimate	SAR Baseline Production Estimate	Current APB Production Objective
RDT&E	59.1	59.1	65.0	50.3	73.8	73.8
Procurement	2656.0	2656.0	2921.6	2029.7	3414.4	3414.4
Flyaway	--	--	--	2029.7	--	--
Recurring	--	--	--	2029.7	--	--
Non Recurring	--	--	--	0.0	--	--
Support	--	--	--	0.0	--	--
Other Support	--	--	--	0.0	--	--
Initial Spares	--	--	--	0.0	--	--
MILCON	0.0	0.0	--	0.0	0.0	0.0
Acq O&M	0.0	0.0	--	0.0	0.0	0.0
Total	2715.1	2715.1	N/A	2080.0	3488.2	3488.2

#### Cost Notes

In accordance with Section 842 of the National Defense Authorization Act for FY 2017, which amended title 10 U.S.C. § 2334, the Director of Cost Assessment and Program Evaluation, and the Secretary of the military department concerned or the head of the Defense Agency concerned, must issue guidance requiring a discussion of risk, the potential impacts of risk on program costs, and approaches to mitigate risk in cost estimates for MDAPs and major subprograms. The information required by the guidance is to be reported in each SAR. This guidance is not yet available; therefore, the information on cost risk is not contained in this SAR.

Total Quantity			
Quantity	SAR Baseline Production Estimate	Current APB Production	Current Estimate
RDT&E	0	0	0
Procurement	2	2	2
Total	2	2	2



## Cost and Funding

### Funding Summary

Appropriation Summary									
FY 2019 President's Budget / December 2017 SAR (TY\$ M)									
Appropriation	Prior	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	To Complete	Total
RDT&E	63.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	63.2
Procurement	2492.0	56.9	29.8	31.8	17.2	0.0	0.0	0.0	2627.7
MILCON	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Acq O&M	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PB 2019 Total	2555.2	56.9	29.8	31.8	17.2	0.0	0.0	0.0	2690.9
PB 2018 Total	2558.6	56.9	29.3	31.2	31.7	0.0	0.0	0.0	2707.7
Delta	-3.4	0.0	0.5	0.6	-14.5	0.0	0.0	0.0	-16.8

Quantity Summary										
FY 2019 President's Budget / December 2017 SAR (TY\$ M)										
Quantity	Undistributed	Prior	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	To Complete	Total
Development	0	0	0	0	0	0	0	0	0	0
Production	0	2	0	0	0	0	0	0	0	2
PB 2019 Total	0	2	0	0	0	0	0	0	0	2
PB 2018 Total	0	2	0	0	0	0	0	0	0	2
Delta	0	0	0	0	0	0	0	0	0	0

## Cost and Funding

### Annual Funding By Appropriation

Annual Funding							
3600   RDT&E   Research, Development, Test, and Evaluation, Air Force							
Fiscal Year	Quantity	TY \$M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2011	--	--	--	--	--	--	13.8
2012	--	--	--	--	--	--	--
2013	--	--	--	--	--	--	15.0
2014	--	--	--	--	--	--	14.4
2015	--	--	--	--	--	--	20.0
Subtotal	--	--	--	--	--	--	63.2

Annual Funding							
3600   RDT&E   Research, Development, Test, and Evaluation, Air Force							
Fiscal Year	Quantity	BY 2002 \$M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2011	--	--	--	--	--	--	11.4
2012	--	--	--	--	--	--	--
2013	--	--	--	--	--	--	12.0
2014	--	--	--	--	--	--	11.3
2015	--	--	--	--	--	--	15.6
Subtotal	--	--	--	--	--	--	50.3

Annual Funding 3020   Procurement   Missile Procurement, Air Force							
Fiscal Year	Quantity	TY \$M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2011	--	227.2	--	--	227.2	--	227.2
2012	2	524.1	--	--	524.1	--	524.1
2013	--	408.0	--	--	408.0	--	408.0
2014	--	268.4	--	--	268.4	--	268.4
2015	--	233.2	--	--	233.2	--	233.2
Subtotal	2	1660.9	--	--	1660.9	--	1660.9

Annual Funding							
3020   Procurement   Missile Procurement, Air Force							
Fiscal Year	Quantity	BY 2002 \$M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2011	--	185.6	--	--	185.6	--	185.6
2012	2	421.2	--	--	421.2	--	421.2
2013	--	320.6	--	--	320.6	--	320.6
2014	--	208.0	--	--	208.0	--	208.0
2015	--	178.8	--	--	178.8	--	178.8
Subtotal	2	1314.2	--	--	1314.2	--	1314.2



Cost Quantity Information		
3020   Procurement   Missile Procurement, Air Force		
Fiscal Year	Quantity	End Item Recurring Flyaway (Aligned With Quantity) BY 2002 \$M
2011	--	--
2012	2	1314.2
2013	--	--
2014	--	--
2015	--	--
Subtotal	2	1314.2

Annual Funding								
3021   Procurement   Space Procurement, Air Force								
Fiscal Year	Quantity	TY \$M						
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program	
2016	--	241.0	--	--	241.0	--	241.0	
2017	--	590.1	--	--	590.1	--	590.1	
2018	--	56.9	--	--	56.9	--	56.9	
2019	--	29.8	--	--	29.8	--	29.8	
2020	--	31.8	--	--	31.8	--	31.8	
2021	--	17.2	--	--	17.2	--	17.2	
Subtotal	--	966.8	--	--	966.8	--	966.8	

Annual Funding								
3021   Procurement   Space Procurement, Air Force								
Fiscal Year	Quantity	BY 2002 \$M						
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program	
2016	--	181.8	--	--	181.8	--	181.8	
2017	--	437.2	--	--	437.2	--	437.2	
2018	--	41.3	--	--	41.3	--	41.3	
2019	--	21.2	--	--	21.2	--	21.2	
2020	--	22.2	--	--	22.2	--	22.2	
2021	--	11.8	--	--	11.8	--	11.8	
Subtotal	--	715.5	--	--	715.5	--	715.5	

APPN 3021 is a continuation of our APPN 3020 funding that ended in 2015. There is no quantity to align with this funding due to the subprograms between AEHF 1-4 and AEHF5/6. The quantity is captured under APPN 3020 and in FY 2012. All funding is aligned to support quantities in FY 2012 for amounts in APPN 3020 and APPN 3021. Any future POM submittals need to align funding in similar manner and be posted under FY 2012.

## Low Rate Initial Production

There is no LRIP for this program.

## Foreign Military Sales

None

## Nuclear Costs

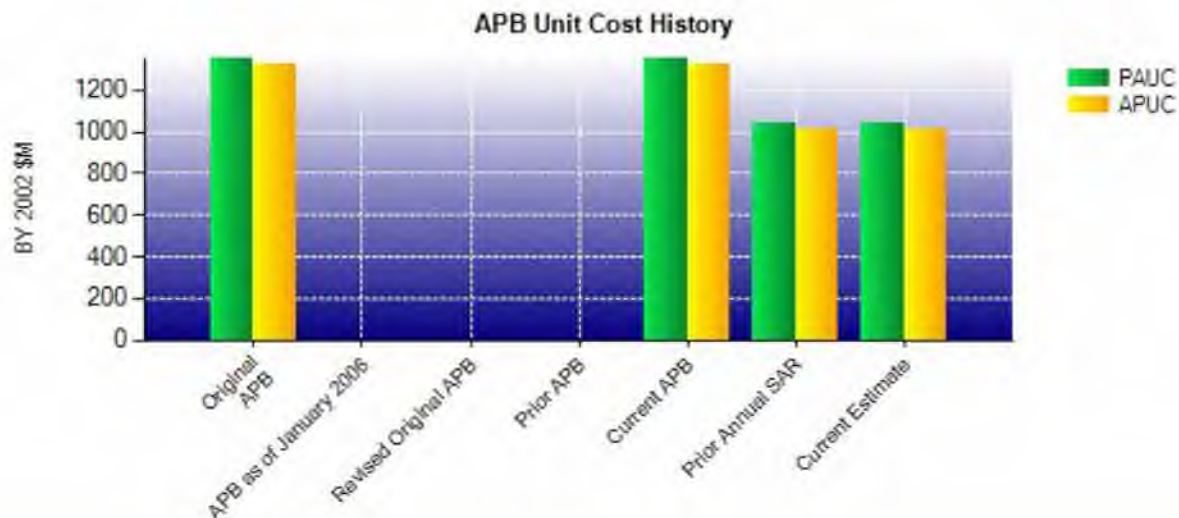
None

**Unit Cost**

Current UCR Baseline and Current Estimate (Base-Year Dollars)			
Item	BY 2002 \$M	BY 2002 \$M	% Change
	Current UCR Baseline (Oct 2012 APB)	Current Estimate (Dec 2017 SAR)	
Program Acquisition Unit Cost			
Cost	2715.1	2080.0	
Quantity	2	2	
Unit Cost	1357.550	1040.000	-23.39
Average Procurement Unit Cost			
Cost	2656.0	2029.7	
Quantity	2	2	
Unit Cost	1328.000	1014.850	-23.58

Original UCR Baseline and Current Estimate (Base-Year Dollars)			
Item	BY 2002 \$M	BY 2002 \$M	% Change
	Revised Original UCR Baseline (Oct 2012 APB)	Current Estimate (Dec 2017 SAR)	
Program Acquisition Unit Cost			
Cost	2715.1	2080.0	
Quantity	2	2	
Unit Cost	1357.550	1040.000	-23.39
Average Procurement Unit Cost			
Cost	2656.0	2029.7	
Quantity	2	2	
Unit Cost	1328.000	1014.850	-23.58





APB Unit Cost History					
Item	Date	BY 2002 \$M		TY \$M	
		PAUC	APUC	PAUC	APUC
Original APB	Mar 2014	1357.550	1328.000	1744.100	1707.200
APB as of January 2006	N/A	N/A	N/A	N/A	N/A
Revised Original APB	N/A	N/A	N/A	N/A	N/A
Prior APB	N/A	N/A	N/A	N/A	N/A
Current APB	Mar 2014	1357.550	1328.000	1744.100	1707.200
Prior Annual SAR	Dec 2016	1043.550	1018.400	1353.850	1322.250
Current Estimate	Dec 2017	1040.000	1014.850	1345.450	1313.850

### SAR Unit Cost History

Current SAR Baseline to Current Estimate (TY \$M)									
PAUC Production Estimate	Changes								PAUC Current Estimate
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
1744.100	25.800	0.000	0.000	0.000	-424.450	0.000	0.000	-398.650	1345.450

Current SAR Baseline to Current Estimate (TY \$M)									
Initial APUC Production Estimate	Changes								APUC Current Estimate
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
1707.200	25.450	0.000	0.000	0.000	-418.800	0.000	0.000	-393.350	1313.850



SAR Baseline History				
Item	SAR Planning Estimate	SAR Development Estimate	SAR Production Estimate	Current Estimate
Milestone A	N/A	N/A	N/A	N/A
Milestone B	N/A	N/A	N/A	N/A
Milestone C	N/A	N/A	N/A	N/A
IOC	N/A	N/A	N/A	N/A
Total Cost (TY \$M)	N/A	N/A	3488.2	2690.9
Total Quantity	N/A	N/A	2	2
PAUC	N/A	N/A	1744.100	1345.450

**Cost Variance**

Summary TY \$M				
Item	RDT&E	Procurement	MILCON	Total
SAR Baseline (Production Estimate)	73.8	3414.4	--	3488.2
Previous Changes				
Economic	+0.7	+57.0	--	+57.7
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	-11.3	-826.9	--	-838.2
Other	--	--	--	--
Support	--	--	--	--
Subtotal	-10.6	-769.9	--	-780.5
Current Changes				
Economic	--	-6.1	--	-6.1
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	--	-10.7	--	-10.7
Other	--	--	--	--
Support	--	--	--	--
Subtotal	--	-16.8	--	-16.8
Total Changes	-10.6	-786.7	--	-797.3
CE - Cost Variance	63.2	2627.7	--	2690.9
CE - Cost & Funding	63.2	2627.7	--	2690.9

Summary BY 2002 \$M				
Item	RDT&E	Procurement	MILCON	Total
SAR Baseline (Production Estimate)	59.1	2656.0	--	2715.1
Previous Changes				
Economic	--	--	--	--
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	-8.8	-619.2	--	-628.0
Other	--	--	--	--
Support	--	--	--	--
Subtotal	-8.8	-619.2	--	-628.0
Current Changes				
Economic	--	--	--	--
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	--	-7.1	--	-7.1
Other	--	--	--	--
Support	--	--	--	--
Subtotal	--	-7.1	--	-7.1
Total Changes	-8.8	-626.3	--	-635.1
CE - Cost Variance	50.3	2029.7	--	2080.0
CE - Cost & Funding	50.3	2029.7	--	2080.0

Previous Estimate: December 2016

Procurement		\$M	
Current Change Explanations		Base Year	Then Year
Revised escalation indices. (Economic)		N/A	-6.1
Adjustment for current and prior escalation. (Estimating)		+4.1	+5.6
Realignment of funds between AEHF subprogram SV 5-6 to AEHF subprogram SV 1-4, in support of SV 4 launch delay. (Estimating)		-11.2	-16.3
Procurement Subtotal		-7.1	-16.8



## Contracts

Contract Identification	
<b>Appropriation:</b>	Procurement
<b>Contract Name:</b>	AEHF 4 Production and Launch, 5/6 Long Lead, KI-54
<b>Contractor:</b>	Lockheed Martin Corp. (LM)
<b>Contractor Location:</b>	1111 Lockheed Martin Way Sunnyvale, CA 94089
<b>Contract Number:</b>	F04701-02-C-0002/2
<b>Contract Type:</b>	Cost Plus Incentive Fee (CPIF), Cost Plus Fixed Fee (CPFF)
<b>Award Date:</b>	December 15, 2010
<b>Definitization Date:</b>	December 15, 2010

Contract Price							
Initial Contract Price (\$M)			Current Contract Price (\$M)			Estimated Price At Completion (\$M)	
Target	Ceiling	Qty	Target	Ceiling	Qty	Contractor	Program Manager
1396.5	N/A	1	1752.9	N/A	2	1727.4	1727.4

Target Price Change Explanation
The difference between the Initial Contract Price Target and the Current Contract Price Target is due to contract modifications for AEHF 4 Launch Operations, AEHF 5-6 Long Lead, KI-54D cryptographic devices, X37 integration and analysis, Protected Key Management Architecture, and studies.

Contract Variance		
Item	Cost Variance	Schedule Variance
Cumulative Variances To Date (12/31/2017)	+70.6	-30.6
Previous Cumulative Variances	+92.1	-25.4
Net Change	-21.5	-5.2

Cost and Schedule Variance Explanations
The unfavorable net change in the cost variance is due to the cost overrun on CLIN 23 driven by required repairs to the Scaleable Power Regulator Unit (SPRU) and the resulting 10 month Initial Launch Capability (ILC) program extension.
The unfavorable net change in the schedule variance is due to LM performing behind schedule as a result of the SPRU repair delays relative to the baseline.

Notes
This contract includes AEHF 4 Production, AEHF 4 Launch Operations, AEHF 5/6 Long Lead, KI-54D, X37 and studies.

**Contract Identification**

**Appropriation:** Procurement  
**Contract Name:** AEHF 5-6 Production and Launch  
**Contractor:** Lockheed Martin  
**Contractor Location:** 1111 Lockheed Martin Way  
Sunnyvale, CA 94089  
**Contract Number:** FA8808-12-C-0010/1  
**Contract Type:** Fixed Price Incentive(Firm Target) (FPIF)  
**Award Date:** May 12, 2012  
**Definitization Date:** October 31, 2013

**Contract Price**

Initial Contract Price (\$M)			Current Contract Price (\$M)			Estimated Price At Completion (\$M)	
Target	Ceiling	Qty	Target	Ceiling	Qty	Contractor	Program Manager
1914.4	2001.6	2	2046.7	2136.1	2	2061.9	2040.5

**Target Price Change Explanation**

The difference between the Initial Contract Price Target and the Current Contract Price Target is due to the addition of the AEHF 5/6 acoustic test study (CLIN 4000) for \$2.22M, the AEHF-5 Lithium-Ion (Lilon) battery test study (CLIN 0410) for \$0.48M, the addition of the AEHF-6 Lilon battery test study (CLIN 0410) for \$0.38M, the addition of AEHF-5/6 acoustic testing for \$95.1M, the addition of the OR2/Atlas 551 contract for \$21.9M, and the non-adjudicated Request for Equitable Adjustment for Liquid Apogee Engine 4 corners testing of \$12.1M.

**Contract Variance**

Item	Cost Variance	Schedule Variance
Cumulative Variances To Date (12/31/2017)	+66.9	-18.5
Previous Cumulative Variances	+64.4	-21.8
Net Change	+2.5	+3.3

**Cost and Schedule Variance Explanations**

The favorable net change in the cost variance is due to LM performing slightly under budget after the incorporation of \$59M into the budget from Management Reserve to cover the SPRU delay costs.

The favorable net change in the schedule variance is due to LM performing slightly ahead of schedule with repairs to the SPRU that caused a delay to the original baseline schedule.



## Deliveries and Expenditures

Deliveries				
Delivered to Date	Planned to Date	Actual to Date	Total Quantity	Percent Delivered
Development	0	0	0	--
Production	0	0	2	0.00%
Total Program Quantity Delivered	0	0	2	0.00%

Expended and Appropriated (TY \$M)			
Total Acquisition Cost	2690.9	Years Appropriated	8
Expended to Date	1847.1	Percent Years Appropriated	72.73%
Percent Expended	68.64%	Appropriated to Date	2612.1
Total Funding Years	11	Percent Appropriated	97.07%

The above data is current as of February 12, 2018.

## Operating and Support Cost

### Cost Estimate Details

Date of Estimate:	February 14, 2018
Source of Estimate:	POE
Quantity to Sustain:	1
Unit of Measure:	System
Service Life per Unit:	14.00 Years
Fiscal Years in Service:	FY 2015 - FY 2030

Current estimate updated to reflect changes based on actual costs and content of the Combined Orbital Operations Logistics Sustainment (COOLS) contracts. The AEHF system being sustained consists of a six satellite (four operation satellites (AEHF 1-4) and two on-orbit spares (AEHF 5/6) constellation and associated ground segment.

### Sustainment Strategy

The O&S costs support a six satellite (four operational satellites (AEHF 1-4) and two on-orbit spares (AEHF5/6) constellation from FY 2015 through FY 2030. The estimates assume that AEHF and Milstar will be operated in parallel by the 4th Space Operations Squadron at Schriever Air Force Base (AFB). Due to the proprietary nature of the AEHF Space Satellite (on-orbit) Segment, this segment is not considered core and the Depot Source of Repair is Contractor Logistics Support for the life of the satellites. Sustainment of the AEHF Space Satellite (on-orbit) Segment transferred to the COOLS contract post-IOC. All other AEHF workloads are designated as core. Tobyhanna Army Depot is the candidate depot for hardware and Ogden Air Logistics Center (OO-ALC), Hill AFB UT for software. A Public Private Partnership is in place and will continue to ramp up the OO-ALC ground software capability over the life of the COOLS contract.

### Antecedent Information

The antecedent system for AEHF is Milstar which consists of a five satellite constellation and associated ground segment. The cost estimate is based on validated requirements in the Air Force Space Command Logistics Support Requirements Brochures built for the FY 2004 President's Budget. The Milstar O&S costs cover all operational activities for both the space and ground segment for FY 2009 - FY 2018. The antecedent Milstar program office estimate is from April 2003 finalized in Air Force Space Command's budget request to Headquarters Air Force.



Annual O&S Costs BY2002 \$M		
Cost Element	AEHF SV 5-6 Average Annual Cost Per System	Milstar (Antecedent) Average Annual Cost Per System
Unit-Level Manpower	17.627	16.900
Unit Operations	2.040	13.200
Maintenance	3.380	3.900
Sustaining Support	37.428	39.000
Continuing System Improvements	71.565	0.000
Indirect Support	5.786	7.200
Other	0.000	0.000
Total	137.826	80.200

AEHF Average Annual Cost Per System numbers above reflect costs for planning usage and monitoring health of the AEHF constellation.

Item	Total O&S Cost \$M			
	AEHF SV 5-6			Milstar (Antecedent)
	Current Production APB Objective/Threshold		Current Estimate	
Base Year	881.3	969.4	959.8	801.5
Then Year	1453.8	N/A	1421.1	N/A

#### Equation to Translate Annual Cost to Total Cost

$(\text{AEHF SV1-4 Total O\&S Cost} + \text{AEHF 5-6 Total O\&S Cost}) / 16 \text{ years} = \text{Average Annual O\&S cost}$   
 $(\$1,245.45\text{M} + \$959.8\text{M}) / 16 = \$137.8\text{M}$

The O&S estimate covers the 14 year design life of the AEHF system (4 active satellite constellation, two spares and associated ground segment) starting in FY 2017 and going through FY 2030. The 16 year divisor in the equation is based on the O&S start date in FY 2015 carrying through FY 2030. Sustainment of the system executed under the RDT&E Interim Contractor Support contract when the first AEHF satellite launched in FY 2010 and transitioned to O&S funding once IOC was declared on July 28, 2015.

O&S Cost Variance		
Category	BY 2002 \$M	Change Explanations
Prior SAR Total O&S Estimates - Dec 2016 SAR	942.8	
Programmatic/Planning Factors	0.0	
Cost Estimating Methodology	0.0	
Cost Data Update	17.0	Incorporated actual COOLS contract cost, Updated Inflation Indices
Labor Rate	0.0	

Energy Rate	0.0
Technical Input	0.0
Other	0.0
Total Changes	17.0
Current Estimate	959.8

**Disposal Estimate Details**

**Date of Estimate:** February 14, 2018  
**Source of Estimate:** POE  
**Disposal/Demilitarization Total Cost (BY 2002 \$M):** Total costs for disposal of all System are 0.7

Total costs for disposal of all System are \$0.7M.