Selected Acquisition Report (SAR)

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

AEHF

As of December 31, 2010

Defense Acquisition Management
Information Retrieval
(DAMIR)

Table of Contents

Program Information

Designation And Nomenclature (Popular Name)

Advanced Extremely High Frequency (AEHF) Satellite

DoD Component

Air Force

Joint Participants

Canada; Netherlands; United Kingdom

Responsible Office

Responsible Office

Mr. David W. Madden
SMC/MC
483 N. Aviation Blvd.
El Segundo, CA 90245-2802
david.madden@losangeles.af.mil

Phone 310-653-9001
Fax 310-653-9636
DSN Phone 633-9001
DSN Fax 633-9636
Date Assigned July 19, 2010

References

SAR Baseline (Production Estimate)

Under Secretary of the Air Force (USecAF) Approved Acquisition Program Baseline (APB) dated March 3, 2005

Mission and Description

Advanced Extremely High Frequency (AEHF) is a joint service satellite communications system that provides global, 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 (GEO) that provides 10 times the capacity of the 1990s-era Milstar Block II satellites. This constellation provides continuous 24-hour EHF Extended Data Rate (XDR) coverage between 65 degrees north and 65 degrees south latitude. Advanced EHF allows the National Security Council and Combatant Commanders to control their tactical and strategic forces at all levels of conflict through general nuclear war and supports the attainment of information superiority.

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

International Cooperative Program -- Canada, the Netherlands, and the United Kingdom signed Memoranda of Understanding (MOU) in preparation for entering into a Foreign Military Sales case to purchase International Partnership variants of AEHF terminals. Canada signed the MOU on November 16, 1999. The Netherlands signed the MOU on November 8, 2002. The United Kingdom signed the MOU on September 9, 2003. The International Partners (IP) have contributed $270.5M to the AEHF program.

Executive Summary

There have been several critical accomplishments for the AEHF program this year. In May 2010, the Program Office completed the command & control (C2) transition of the 5-satellite Milstar constellation from legacy C2 system to the new AEHF C2 system, which was the largest, most complex ground system transition in Air Force Space Command history and required Secretary of Defense approval to execute. The AEHF C2 system provides Milstar operations personnel with a first-ever capability for dual satellite commanding, multi-satellite ops and crypto rekey of all Defense Department C2 terminal types.

On August 14, 2010, the Program Office launched AEHF-1. On August 15, 2010, AEHF-1 experienced an anomaly with the bi-propellant propulsion subsystem during the initial Liquid Apogee Engine (LAE) burn that led to LAE low thrust, a roll disturbance at the end of the burn, high soakback temperatures and subsequent autonomous shutdown at 9.1 seconds. A follow-on 10 second burn was planned and executed on August 18, 2010. The LAE shut down after 2.4 seconds with roll disturbance during the entire burn period. No further burns were attempted.

An anomaly investigation team analyzed all aspects of AEHF-1 build from component delivery to launch and space vehicle operations. Root cause was determined to be manufacturing process escapes resulting in debris within the oxidizer line. During the Propellant Subsystem manufacturing process at Stennis (Lockheed-Martin facility in Mississippi), there is a high likelihood a polyester fabric used for debris control was left in the oxidizer feed line during rework. This fabric formed a plug which caused a restriction in oxidizer flow to the LAE, resulting in abnormal engine performance. Although we believe this was the primary cause of the anomaly, two additional contributors may have influenced the failure scenario. First, AEHF fuel loading procedures could lead to larger than expected Helium bubbles in the propellant line; and second, the thermal control requirements were not well controlled due to a design deficiency introduced as part of the vehicle close out procedures at Cape Canaveral. The overall result was that the engine was being operated outside of its qualified parameters and ultimately failed, as evidenced by the low LAE thrust, roll disturbance and high temperatures. This was verified by modeling and simulation, use of a high fidelity test propulsion feed simulator, and actual test engine firing.

AEHF-1 orbit raising following the propulsion system anomaly began August 20, 2010, with a series of chemical propulsion system burns using the 5.0 lb thrust Reaction Engine Assemblies (REAs) that raised the perigee of the orbit from ~230 km to ~4,680 km and reduced inclination from ~22 degrees to ~15 degrees. At the conclusion of the REA apogee burns, the solar arrays and Hall Current Thrusters (HCT) were deployed, conditioned for operations, and characterized for performance. Regular HCT operations started October 21, 2010, to continue raising perigee and reducing inclination. Low thrust HCT operations were performed for ~9-10 hours of each ~17-18 hour orbit periods. As of December 31, 2010, the Program Office had increased AEHF-1 perigee to ~9,729 km and reduced inclination to ~10.70 degrees. AEHF-1 orbit raising using HCTs will continue through late summer/early fall 2011 to allow for critical payload checkout prior to shipping AEHF-2 to Cape Canaveral for launch, while preserving the option of launching AEHF-2 in early 2012. After completing orbit raising and a successful payload checkout later in 2011, AEHF-1 will begin its service to the Nation providing assured, survivable and protected communications for the National Command Authority and Combatant Commanders, across the full spectrum of conflict.

After completing the production and development testing in December 2010, the Program Office put AEHF-2 into factory storage until its scheduled launch in spring 2012. The Program Office is also determining what (if any) work/analysis/testing is required to clear AEHF-2 for flight in response to the AEHF-1 propulsion system anomaly.

In December 2010, Lockheed Martin successfully completed AEHF-3 thermal vacuum (TVAC) testing, which is the satellite's final environmental test. The contractor finished AEHF-3's TVAC testing with 71% and 43% fewer flags than AEHF-1 and AEHF-2, respectively. In addition, the contractor finished one week early to plan, which further highlights the learning and performance improvements the program continues to make as it moves to a production mode.

In December 2010, the Program Office awarded a cost-plus-incentive-fee (CPIF) contract #F04701-02-C-0002 modification valued at approximately $1.4 billion to Lockheed Martin Space Systems Company, Sunnyvale, CA, for

production of AEHF-4. The production contract includes manufacturing, integration and test of AEHF-4. The satellite is contracted to be available for launch in 2017. In addition, the Program Office continued approximately $0.3 billion in AEHF-4 long lead and obsolescence parts development.

Evolutionary Acquisition for Space Efficiency (EASE), funded in the FY 2012 President's Budget, is an acquisition strategy that encompasses the following tenets: block buys of satellites, fixed price contracting, stable research and development investment, and a modified annual funding approach. The block buy approach will result in estimated savings that can be reinvested in research and development to further improve the performance and lower the cost of follow-on systems. In addition, the modified funding proposal stabilizes funding throughout satellite production to maintain affordability and avoid significant funding increasing in specific fiscal years.

The FY 2012 President’s Budget funds the Block Buy of SVs 5-6. The efficiencies garnered from the SVs 5-6 Block Buy will be applied to the RDT&E Capability and Affordability Insertion Program (CAIP) for AEHF Follow-on satellites.

The Nunn-McCurdy certification process was completed late 2008 and an Acquisition Decision Memorandum (ADM) was signed on December 29, 2008. An updated Acquisition Program Baseline (APB) is in process, however, it was deferred due to the termination of the Transformational Satellite in early 2009, and ongoing changes in the acquisition strategy for the AEHF program to include the EASE initiative contained in the FY12 PB submission. The APB is expected to be completed Third Quarter FY 2011 (3QFY11).

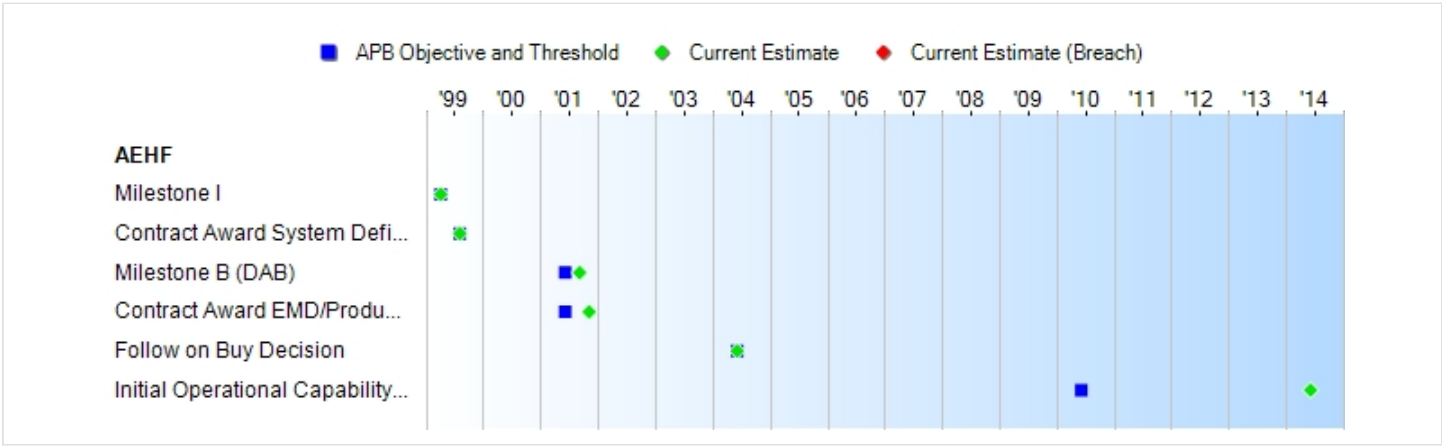
There are no significant software issues at this time.

Threshold Breaches

APB Breaches		
Schedule		☐
Performance		☐
Cost	RDT&E	☐
	Procurement	☐
	MILCON	☐
	Acq O&M	☐
Unit Cost	PAUC	☐
	APUC	☐

Nunn-McCurdy Breaches		
Current UCR Baseline		
	PAUC	None
	APUC	None
Original UCR Baseline		
	PAUC	None
	APUC	None

Schedule



Milestones	SAR Baseline Prod Est	Current APB Objective/Threshold		Current Estimate	
Milestone I	APR 1999	N/A	N/A	APR 1999	
Contract Award System Definition	AUG 1999	N/A	N/A	AUG 1999	
Milestone B (DAB)	JUN 2001	N/A	N/A	SEP 2001	
Contract Award EMD/Production	JUN 2001	N/A	N/A	NOV 2001	
Follow on Buy Decision	JUN 2004	N/A	N/A	JUN 2004	
Initial Operational Capability (IOC)	JUN 2010	N/A	N/A	JUN 2014	(Ch-1)

Acronyms And Abbreviations

DAB - Defense Acquisition Board
EMD - Engineering and Manufacturing Development

Change Explanations

(Ch-1) IOC has changed from June 2013 to June 2014 due to the delayed orbit raising of AEHF-1 and subsequent delays to the launch of AEHF-2.

Memo

IOC is met with two AEHF satellites operating at eXtended Data Rate (XDR), backward compatible to Milstar, and servicing the applicable strategic and tactical networks.

Performance

Characteristics	SAR Baseline Prod Est	Current APB Objective/Threshold		Demonstrated Performance	Current Estimate
Capacity	1.2 Gbps CMTW, 600 Mbps Strategic	N/A	N/A	TBD	1.2 Gbps CMTW, 600 Mbps Strategic
Nuclear Protection	Provide assured communicat-ions 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 direc tion, force manage-ment, and planning	N/A	N/A	TBD	Provide assured communicati ons 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 direc tion, force management , and planning
Access and Control	Provide users ability to plan, control, & reconfigure their apportioned resources; critical functions such as situation monitoring, decision making, force direct-	N/A	N/A	TBD	Provide users ability to plan, control, & reconfigure their apportioned resources; critical functions such as situation monitoring, decision making, force

	ion, force manage-ment, & planning shall not be disrupted by communicat-ions configuration changes to noncritical functions				direction, force management ,& planning shall not be disrupted by communicati ons configuration changes to noncritical functions
Interoperability					
AEHF Interopera-bility	Support joint interop-erable war-fighter communicat-ions among all military branches EHF terminals	N/A	N/A	TBD	Support joint interop-erable war-fighter communicati ons among all military branches EHF terminals
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	N/A	N/A	TBD	Operate with the Milstar system, at all LDR and MDR terminal supported data rates, throughout the Milstar transition to the AEHF system

Acronyms And Abbreviations

CMTW - Combined Major Theater Warfare
EHF - Extremely High Frequency
Gbps - Giga bytes per second
LDR - Low Data Rate
Mbps - Mega bytes per second
MDR - Medium Data Rate
NCGS - Nuclear Criteria Group Secretariat

Change Explanations

None

Classified Performance information is provided in the classified annex to this submission.

Track To Budget

General Memo

This report reflects Procurement funding associated with SV's 3-6 and Research Development and Test (RDT&E) funding associated with SV's 1-2, Mission Control Segment (MCS), and Interim Contractor Support (ICS). Funding associated with AEHF Follow-on satellites is not included in this report.

RDT&E

APPN 3600	BA 04	PE 0603430F	(Air Force)
	Project 4050	Advanced EHF	

Procurement

APPN 3020	BA 05	PE 0303604F	(Air Force)
	ICN ADV555	Advanced EHF	(Shared)

Cost and Funding

Cost Summary

Total Acquisition Cost and Quantity

	BY $M			BY2002 $M	TY $M		
Appropriation	SAR Baseline Prod Est	Current APB Objective/Threshold		Current Estimate	SAR Baseline Prod Est	Current APB Objective	Current Estimate
RDT&E	5223.7	--	--	6430.2	5468.4	--	7044.0
Procurement	577.0	--	--	5240.2	617.3	--	6470.0
Flyaway	--	--	--	5240.2	--	--	6470.0
Recurring	--	--	--	5240.2	--	--	6470.0
Non Recurring	--	--	--	0.0	--	--	0.0
Support	--	--	--	0.0	--	--	0.0
Other Support	--	--	--	0.0	--	--	0.0
Initial Spares	--	--	--	0.0	--	--	0.0
MILCON	0.0	--	--	0.0	0.0	--	0.0
Acq O&M	0.0	--	--	0.0	0.0	--	0.0
Total	5800.7	--	--	11670.4	6085.7	--	13514.0

Quantity	SAR Baseline Prod Est	Current APB	Current Estimate
RDT&E	2	0	2
Procurement	1	0	4
Total	3	0	6

Cost and Funding

Funding Summary

Appropriation and Quantity Summary
FY2012 President's Budget / December 2010 SAR (TY$ M)

Appropriation	Prior	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016	To Complete	Total
RDT&E	6150.1	351.8	279.5	160.3	64.4	37.9	0.0	0.0	7044.0
Procurement	2760.8	246.6	552.8	555.4	542.4	486.4	464.1	861.5	6470.0
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 2012 Total	8910.9	598.4	832.3	715.7	606.8	524.3	464.1	861.5	13514.0
PB 2011 Total	8925.9	598.4	1052.6	335.1	953.4	78.4	141.0	364.1	12448.9
Delta	-15.0	0.0	-220.3	380.6	-346.6	445.9	323.1	497.4	1065.1

This report reflects Procurement funding associated with SV's 3-6 and Research Development and Test (RDT&E) funding associated with SV's 1-2, Mission Control Segment (MCS), and Interim Contractor Support (ICS). Funding associated with AEHF Follow-on satellites is not included in this report.

Quantity	Undistributed	Prior	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016	To Complete	Total
Development	2	0	0	0	0	0	0	0	0	2
Production	0	2	0	2	0	0	0	0	0	4
PB 2012 Total	2	2	0	2	0	0	0	0	0	6
PB 2011 Total	2	2	0	1	0	1	0	0	0	6
Delta	0	0	0	1	0	-1	0	0	0	0

Cost and Funding

Annual Funding By Appropriation

Annual Funding TY$
3600 | RDT&E | Research, Development, Test, and Evaluation, Air Force

Fiscal Year	Quantity	End Item Recurring Flyaway TY $M	Non End Item Recurring Flyaway TY $M	Non Recurring Flyaway TY $M	Total Flyaway TY $M	Total Support TY $M	Total Program TY $M
1995	--	--	--	--	--	--	23.1
1996	--	--	--	--	--	--	31.0
1997	--	--	--	--	--	--	32.3
1998	--	--	--	--	--	--	34.2
1999	--	--	--	--	--	--	54.6
2000	--	--	--	--	--	--	89.8
2001	--	--	--	--	--	--	229.8
2002	--	--	--	--	--	--	494.8
2003	--	--	--	--	--	--	832.6
2004	--	--	--	--	--	--	872.7
2005	--	--	--	--	--	--	652.2
2006	--	--	--	--	--	--	647.7
2007	--	--	--	--	--	--	599.3
2008	--	--	--	--	--	--	659.1
2009	--	--	--	--	--	--	440.7
2010	--	--	--	--	--	--	456.2
2011	--	--	--	--	--	--	351.8
2012	--	--	--	--	--	--	279.5
2013	--	--	--	--	--	--	160.3
2014	--	--	--	--	--	--	64.4
2015	--	--	--	--	--	--	37.9
Subtotal	**2**	**--**	**--**	**--**	**--**	**--**	**7044.0**

Annual Funding BY$
3600 | RDT&E | Research, Development, Test, and Evaluation, Air Force

Fiscal Year	Quantity	End Item Recurring Flyaway BY 2002 $M	Non End Item Recurring Flyaway BY 2002 $M	Non Recurring Flyaway BY 2002 $M	Total Flyaway BY 2002 $M	Total Support BY 2002 $M	Total Program BY 2002 $M
1995	--	--	--	--	--	--	25.0
1996	--	--	--	--	--	--	33.0
1997	--	--	--	--	--	--	33.9
1998	--	--	--	--	--	--	35.7
1999	--	--	--	--	--	--	56.4
2000	--	--	--	--	--	--	91.4
2001	--	--	--	--	--	--	230.5
2002	--	--	--	--	--	--	491.1
2003	--	--	--	--	--	--	815.2
2004	--	--	--	--	--	--	833.7
2005	--	--	--	--	--	--	607.5
2006	--	--	--	--	--	--	585.7
2007	--	--	--	--	--	--	528.0
2008	--	--	--	--	--	--	569.4
2009	--	--	--	--	--	--	376.0
2010	--	--	--	--	--	--	385.2
2011	--	--	--	--	--	--	293.0
2012	--	--	--	--	--	--	229.4
2013	--	--	--	--	--	--	129.4
2014	--	--	--	--	--	--	51.1
2015	--	--	--	--	--	--	29.6
Subtotal	**2**	**--**	**--**	**--**	**--**	**--**	**6430.2**

The Research and Development (3600) Appropriation funding profile identified in this SAR differs from budget data in that it includes $270.5M in International Partners (IP) funding and does not include $119M (FY 2003 - FY2009) for Production and Qualification (P&Q) of Radiation Hardened Components.

The yearly breakout of the IP funding is as follows:

IP Funds ($M)	
FY 2002	35.2
FY 2003	44.0
FY 2004	91.0
FY 2005	67.0
FY 2006	28.5
FY 2007	3.0
FY 2008	1.8
Total	270.5

The yearly breakout of the P&Q of Radiation Hardened Components funding is as follows:

P&Q	($M)
FY 2003	19.0
FY 2004	19.0
FY 2005	21.0
FY 2006	20.0
FY 2007	21.0
FY 2009	19.0
Total	119.0

Annual Funding TY$
3020 | Procurement | Missile Procurement, Air Force

Fiscal Year	Quantity	End Item Recurring Flyaway TY $M	Non End Item Recurring Flyaway TY $M	Non Recurring Flyaway TY $M	Total Flyaway TY $M	Total Support TY $M	Total Program TY $M
2005	--	78.2	--	--	78.2	--	78.2
2006	1	521.9	--	--	521.9	--	521.9
2007	--	--	--	--	--	--	--
2008	--	141.4	--	--	141.4	--	141.4
2009	--	182.6	--	--	182.6	--	182.6
2010	1	1836.7	--	--	1836.7	--	1836.7
2011	--	246.6	--	--	246.6	--	246.6
2012	2	552.8	--	--	552.8	--	552.8
2013	--	555.4	--	--	555.4	--	555.4
2014	--	542.4	--	--	542.4	--	542.4
2015	--	486.4	--	--	486.4	--	486.4
2016	--	464.1	--	--	464.1	--	464.1
2017	--	773.3	--	--	773.3	--	773.3
2018	--	58.2	--	--	58.2	--	58.2
2019	--	30.0	--	--	30.0	--	30.0
Subtotal	**4**	**6470.0**	**--**	**--**	**6470.0**	**--**	**6470.0**

Annual Funding BY$
3020 | Procurement | Missile Procurement, Air Force

Fiscal Year	Quantity	End Item Recurring Flyaway BY 2002 $M	Non End Item Recurring Flyaway BY 2002 $M	Non Recurring Flyaway BY 2002 $M	Total Flyaway BY 2002 $M	Total Support BY 2002 $M	Total Program BY 2002 $M
2005	--	72.0	--	--	72.0	--	72.0
2006	1	467.4	--	--	467.4	--	467.4
2007	--	--	--	--	--	--	--
2008	--	121.4	--	--	121.4	--	121.4
2009	--	154.8	--	--	154.8	--	154.8
2010	1	1535.6	--	--	1535.6	--	1535.6
2011	--	203.2	--	--	203.2	--	203.2
2012	2	448.5	--	--	448.5	--	448.5
2013	--	443.2	--	--	443.2	--	443.2
2014	--	425.6	--	--	425.6	--	425.6
2015	--	375.3	--	--	375.3	--	375.3
2016	--	352.1	--	--	352.1	--	352.1
2017	--	576.8	--	--	576.8	--	576.8
2018	--	42.7	--	--	42.7	--	42.7
2019	--	21.6	--	--	21.6	--	21.6
Subtotal	**4**	**5240.2**	**--**	**--**	**5240.2**	**--**	**5240.2**

Cost Quantity Information
3020 | Procurement | Missile Procurement, Air Force

Fiscal Year	Quantity	End Item Recurring Flyaway (Aligned with Quantity) BY 2002 $M
2005	--	--
2006	1	859.0
2007	--	--
2008	--	--
2009	--	--
2010	1	1492.3
2011	--	--
2012	2	2888.9
2013	--	--
2014	--	--
2015	--	--
2016	--	--
2017	--	--
2018	--	--
2019	--	--
Subtotal	**4**	**5240.2**

Low Rate Initial Production

This program has no LRIP

Foreign Military Sales

International Cooperative Program – Canada, The Netherlands and the United Kingdom signed Research and Development (R&D) and Operations and Sustainment (O&S) Memorandums of Understanding (MOUs) for cooperation in the AEHF program. Canada signed the R&D MOU on November 19, 1999 and the O&S MOU on November 27, 2009. The Netherlands signed the R&D MOU on November 8, 2002 and are in final review of the O&S MOU. The United Kingdom signed the R&D MOU on September 9, 2003 and the O&S MOU on October 16, 2009. The International Partners have contributed $270.5M to the AEHF Program in R&D funds and will contribute $114.3M in O&S funds.

Canada, The Netherlands and The United Kingdom have Foreign Military Sales (FMS) cases with the Army and Navy for AEHF terminals.

Nuclear Cost

None

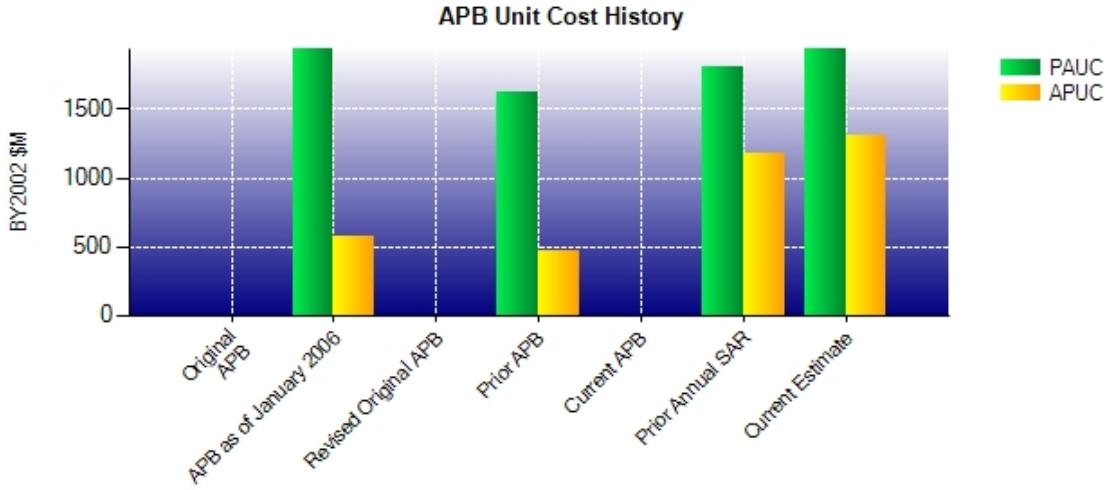
Unit Cost

Unit Cost Report

Unit Cost	BY2002 $M Current UCR Baseline	BY2002 $M Current Estimate (DEC 2010 SAR)	BY % Change
Program Acquisition Unit Cost (PAUC)			
Cost	--	11670.4	
Quantity	--	6	
Unit Cost	--	1945.067	--
Average Procurement Unit Cost (APUC)			
Cost	--	5240.2	
Quantity	--	4	
Unit Cost	--	1310.050	--

Unit Cost	BY2002 $M Original UCR Baseline	BY2002 $M Current Estimate (DEC 2010 SAR)	BY % Change
Program Acquisition Unit Cost (PAUC)			
Cost	--	11670.4	
Quantity	--	6	
Unit Cost	--	1945.067	--
Average Procurement Unit Cost (APUC)			
Cost	--	5240.2	
Quantity	--	4	
Unit Cost	--	1310.050	--

Unit Cost History



		BY2002 $M		TY $M	
	Date	PAUC	APUC	PAUC	APUC
Original APB	N/A	N/A	N/A	N/A	N/A
APB as of January 2006	MAR 2005	1933.567	577.000	2028.567	617.300
Revised Original APB	N/A	N/A	N/A	N/A	N/A
Prior APB	FEB 2003	1618.467	465.500	1699.700	506.000
Current APB	N/A	N/A	N/A	N/A	N/A
Prior Annual SAR	DEC 2009	1811.117	1171.925	2074.817	1429.075
Current Estimate	DEC 2010	1945.067	1310.050	2252.333	1617.500

SAR Unit Cost History

Initial SAR Baseline to Current SAR Baseline (TY $M)

Initial PAUC Dev Est	Changes								PAUC Prod Est
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
1129.060	3.625	276.440	528.550	17.225	524.475	0.000	-0.275	1350.040	2028.567

Current SAR Baseline to Current Estimate (TY $M)

PAUC Prod Est	Changes								PAUC Current Est
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
2028.567	17.817	-419.335	211.200	17.317	396.767	0.000	0.000	223.766	2252.333

Initial SAR Baseline to Current SAR Baseline (TY $M)

Initial APUC Dev Est	Changes								APUC Prod Est
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
460.133	6.550	218.417	88.600	0.000	816.550	0.000	-0.550	1129.567	617.300

Current SAR Baseline to Current Estimate (TY $M)

APUC Prod Est	Changes								APUC Current Est
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
617.300	-1.600	429.450	-15.450	0.000	587.800	0.000	0.000	1000.200	1617.500

SAR Baseline History

Item/Event	SAR Planning Estimate (PE)	SAR Development Estimate (DE)	SAR Production Estimate (PdE)	Current Estimate
Milestone I	APR 1999	APR 1999	APR 1999	APR 1999
Milestone B	FEB 2001	JUN 2001	JUN 2001	SEP 2001
Milestone C	FEB 2001	JUN 2004	JUN 2004	JUN 2004
IOC	NOV 2007	JUL 2008	JUN 2010	JUN 2014
Total Cost (TY $M)	2690.6	5645.3	6085.7	13514.0
Total Quantity	2	5	3	6
Prog. Acq. Unit Cost (PAUC)	1345.300	1129.060	2028.567	2252.333

Cost Variance

Cost Variance Summary

Summary Then Year $M				
	RDT&E	Proc	MILCON	Total
SAR Baseline (Prod Est)	5468.4	617.3	--	6085.7
Previous Changes				
Economic	+113.9	-12.4	--	+101.5
Quantity	--	+3569.7	--	+3569.7
Schedule	+1064.5	--	--	+1064.5
Engineering	+103.9	--	--	+103.9
Estimating	-18.1	+1541.7	--	+1523.6
Other	--	--	--	--
Support	--	--	--	--
Subtotal	+1264.2	+5099.0	--	+6363.2
Current Changes				
Economic	-0.6	+6.0	--	+5.4
Quantity	--	--	--	--
Schedule	+264.5	-61.8	--	+202.7
Engineering	--	--	--	--
Estimating	+47.5	+809.5	--	+857.0
Other	--	--	--	--
Support	--	--	--	--
Subtotal	+311.4	+753.7	--	+1065.1
Total Changes	+1575.6	+5852.7	--	+7428.3
CE - Cost Variance	7044.0	6470.0	--	13514.0
CE - Cost & Funding	7044.0	6470.0	--	13514.0

Summary Base Year 2002 $M				
	RDT&E	Proc	MILCON	Total
SAR Baseline (Prod Est)	5223.7	577.0	--	5800.7
Previous Changes				
Economic	--	--	--	--
Quantity	--	+2859.2	--	+2859.2
Schedule	+879.0	--	--	+879.0
Engineering	+88.7	--	--	+88.7
Estimating	-12.4	+1251.5	--	+1239.1
Other	--	--	--	--
Support	--	--	--	--
Subtotal	+955.3	+4110.7	--	+5066.0
Current Changes				
Economic	--	--	--	--
Quantity	--	--	--	--
Schedule	+212.3	--	--	+212.3
Engineering	--	--	--	--
Estimating	+38.9	+552.5	--	+591.4
Other	--	--	--	--
Support	--	--	--	--
Subtotal	+251.2	+552.5	--	+803.7
Total Changes	+1206.5	+4663.2	--	+5869.7
CE - Cost Variance	6430.2	5240.2	--	11670.4
CE - Cost & Funding	6430.2	5240.2	--	11670.4

Previous Estimate: December 2009

RDT&E	$M	
Current Change Explanations	**Base Year**	**Then Year**
Revised escalation indices. (Economic)	N/A	-0.6
Adjustment for current and prior escalation. (Estimating)	+0.3	+0.3
Adjustment for Congressional General Reduction (CGR) (Estimating)	-5.0	-5.9
Adjustment for SV-1 orbit raising delay, and SV-2 launch delay (Schedule)	+41.0	+50.0
Adjustment for cost of Interim Contract Support (ICS) (Estimating)	+43.6	+53.1
Adjustment for extension of Interim Contract Support (ICS) due to SV-1 launch delay (Schedule)	+171.3	+214.5
RDT&E Subtotal	+251.2	+311.4

Procurement	$M	
Current Change Explanations	**Base Year**	**Then Year**
Revised escalation indices. (Economic)	N/A	+6.0
Acceleration of procurement buy profile (Air Force). (Schedule)	0.0	-61.8
Adjustment for current and prior escalation. (Estimating)	-3.0	-3.6
Adjustment for Congressional General Reduction (CGR) and Secretary of the AF general reductions (Estimating)	-7.8	-9.1
Revised estimate for SVs 5/6 full funding strategy (Estimating)	+1292.9	+1620.7
Revised estimate due to acquisition strategy change from full funding to a block buy for SVs 5/6. (Estimating)	-729.6	-798.5
Procurement Subtotal	+552.5	+753.7

Change Explanations Memo

Contracts

General Contract Memo

The variance between the initial contract price and the current contract price is driven by several factors including numerous Engineering Change Proposal (ECPs), schedule delays, replan, and overrun.

Appropriation: RDT&E

Contract Name	**SDD Contract**
Contractor	Lockheed Martin
Contractor Location	Sunnyvale, CA 94089
Contract Number, Type	F04701-02-C-0002, CPAF
Award Date	November 16, 2001
Definitization Date	August 15, 2002

Initial Contract Price ($M)			Current Contract Price ($M)			Estimated Price At Completion ($M)	
Target	Ceiling	Qty	Target	Ceiling	Qty	Contractor	Program Manager
2839.0	N/A	2	5413.2	N/A	2	5413.2	5547.7

Variance	Cost Variance	Schedule Variance
Cumulative Variances To Date	+79.5	-4.8
Previous Cumulative Variances	+62.6	+16.4
Net Change	+16.9	-21.2

Cost And Schedule Variance Explanations

The SVs 1/2 contract experienced a net favorable cost variance of $16.9M, due to; an early launch of SV1 on August 14, 2010.

The SVs 1/2 contract experienced a net unfavorable schedule variance of $21.2M. The main cause for the unfavorable cost variance over the past year include: a delay in the SV2 launch schedule by 8 months due to the SV1 anomaly post-launch (orbit raising issue). Due to the SV1 anomaly, an Over Target Schedule has been placed on SV2.

The SVs 1/2 contract is currently more than 90% complete and will not be reported in the 2011 SAR.

Contract Comments

The estimated price at completion (EAC) is based on the contractor Most Likely latest revised estimate (LRE).

The variance between the initial contract price and the current contract price is driven by several factors including numerous Engineering Change Proposal (ECPs), schedule delays, replan, and overrun.

Appropriation: Procurement

Contract Name	**SDD Contract**
Contractor	Lockheed Martin
Contractor Location	Sunnyvale, CA 94089
Contract Number, Type	F04701-02-C-0002/2, CPAF
Award Date	November 16, 2001
Definitization Date	August 15, 2002

Initial Contract Price ($M)			Current Contract Price ($M)			Estimated Price At Completion ($M)	
Target	Ceiling	Qty	Target	Ceiling	Qty	Contractor	Program Manager
573.7	N/A	1	921.6	N/A	1	921.6	977.7

Variance	Cost Variance	Schedule Variance
Cumulative Variances To Date	+46.4	+2.1
Previous Cumulative Variances	+17.0	-1.1
Net Change	+29.4	+3.2

Cost And Schedule Variance Explanations

The SV 3 contract experienced a net favorable cost variance of $29.4M, due to; an early completion of SV 3s baseline integrated system test and an early delivery of the payload-to-test. In addition, forecasted rework in the SV 3 baseline was never realized.

The SV 3 contract experienced a net favorable schedule variance of $3.2M, due to; the cost efficiencies experienced in the contract carried over to favorable schedule variances due to early completion of test and unrealized rework in the SV 3 baseline.

Contract Comments

The estimated price at completion (EAC) is based on the contractor Most Likely latest revised estimate (LRE).

The variance between the initial contract price and the current contract price is driven by several factors including numerous Engineering Change Proposal (ECPs), schedule delays, replan, and overrun.

Appropriation: Procurement

Contract Name	**SDD Contract**
Contractor	Lockheed Martin
Contractor Location	Sunnyvale, CA 94089
Contract Number, Type	F04701-02-C-0002/3, CPAF
Award Date	November 16, 2001
Definitization Date	August 15, 2002

Initial Contract Price ($M)			Current Contract Price ($M)			Estimated Price At Completion ($M)	
Target	Ceiling	Qty	Target	Ceiling	Qty	Contractor	Program Manager
123.9	N/A	1	1711.8	N/A	1	1711.8	1801.3

Variance	Cost Variance	Schedule Variance
Cumulative Variances To Date	+3.2	-3.7
Previous Cumulative Variances	+3.1	-2.2
Net Change	+0.1	-1.5

Cost And Schedule Variance Explanations

The SV 4 LL contract experienced a net favorable cost variance of $0.1M, due to; under running the SV4/5 proposal/obsolescence studies.

The SV 4 LL contract experienced a net unfavorable schedule variance of $1.5M, due to; delays in the MMIC wafer development and the delay in the CDR schedule for Honeywell.

The contract for SV 4 was awarded in Dec 2010 and no production EV has been reported yet.

Contract Comments

No major contractual changes have been experienced thus far for SV 4 LL. The estimated price at completion (EAC) is based on the contractor Most Likely latest revised estimate (LRE).

The variance between the initial contract price and the current contract price is driven by additional CLINs that were added to the contract to support SV 4 LL.

Deliveries and Expenditures

Deliveries To Date	Plan To Date	Actual To Date	Total Quantity	Percent Delivered
Development	1	1	2	50.00%
Production	0	0	4	0.00%
Total Program Quantities Delivered	1	1	6	16.67%

Expenditures and Appropriations (TY $M)			
Total Acquisition Cost	13514.0	Years Appropriated	17
Expenditures To Date	6765.4	Percent Years Appropriated	68.00%
Percent Expended	50.06%	Appropriated to Date	9509.3
Total Funding Years	25	Percent Appropriated	70.37%

Operating and Support Cost

Assumptions And Ground Rules

The AEHF Operating and Support (O&S) cost cover all operational activities for both space segment (4 satellites) and the ground segment for FY 2015 through FY 2024 (IOC + 10 years). This O&S estimate is an update to the Program Office Estimate (POE) approved October 2001. The O&S cost estimate is reported in the proposed AEHF APB (currently in coordination) for a four satellite baseline. This estimate is based upon the AEHF O&S Cost Analysis Requirements Document (CARD) as of June 2010 and Source of Repair and Procurement Process (SORAP). The AEHF O&S estimate was finalized and approved by the AEHF Program manager January 2010.

Both AEHF and Milstar O&S costs are based on a full constellation. Many O&S costs are system-level cost instead of specific satellite costs. The estimate assume that AEHF and Milstar are operated in parallel by the 4th Space Operations Squadron at Schriever Air Force Base.

The antecedent system Milstar costs are based on validated requirements in the Air Force Space Command (AFSPC) Logistics Support Requirements Brochures built on the FY 2004 President's Budget Request. The Milstar O&S costs cover all operational activities for both the space segment (5 satellites) and ground segment for FY 2009 - FY 2018.

Costs BY2002 $M		
Cost Element	AEHF Annual Average Cost for Constellation	Milstar Annual Average for Constellation
Unit-Level Manpower	48.234	--
Unit Operations	0.056	--
Maintenance	22.650	--
Sustaining Support	0.134	--
Continuing System Improvements	42.963	--
Indirect Support	0.324	--
Other	0.000	--
Total Unitized Cost (Base Year 2002 $)	114.361	--

Total O&S Costs $M	AEHF	Milstar
Base Year	1143.6	801.5
Then Year	1593.6	899.8