



Selected Acquisition Report (SAR)

RCS: DD-A&T(Q&A)823-456



Next Generation Operational Control System (OCX)

As of FY 2016 President's Budget

Defense Acquisition Management
Information Retrieval
(DAMIR)

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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

Next Generation Operational Control System (OCX)

DoD Component

Air Force

Responsible Office

Col William Cooley
483 N. Aviation Blvd
El Segundo, CA 90245

william.cooley@us.af.mil

Phone: 310-653-3001
Fax: 310-653-3005
DSN Phone: 633-3001
DSN Fax: 633-3005
Date Assigned: June 13, 2013

References

SAR Baseline (Development Estimate)

Defense Acquisition Executive (DAE) Approved Acquisition Program Baseline (APB) dated November 19, 2012

Approved APB

Defense Acquisition Executive (DAE) Approved Acquisition Program Baseline (APB) dated November 19, 2012

Mission and Description

The Global Positioning System (GPS) is a space-based positioning, navigation, and timing distribution system, which operates through weather and electromagnetic environments (jamming, spoofing, etc.). GPS supports both civil and military users in air, space, sea, and land operations. GPS is a satellite-based radio navigation system that serves military and civil users worldwide. GPS users process satellite signals to determine accurate position, velocity, and time. GPS must comply with section 2281 of title 10, United States Code (USC), which requires that the Secretary of Defense ensures the continued sustainment and operation of GPS for military and civilian purposes and section 50112 of title 51, USC, which requires that GPS complies with certain standards and facilitates international cooperation.

The Next Generation Operational Control System (OCX) program develops and fields a modernized satellite command and control (C2) system which replaces the current ground control system for legacy and new GPS satellites. OCX implements a modern flexible architecture with built-in robust information assurance to address emerging cyber threats. The Air Force is taking a block approach to develop OCX with each block delivering upgrades as they become available.

The OCX program of record consists of two block deliverables: Block 1 and Block 2. OCX Block 0, a subset of Block 1, will allow OCX to support the launch and checkout of GPS III satellites. OCX Block 1 replaces the existing legacy GPS C2 system and fields the operational capability to control legacy satellites (GPS IIR, IIR-M, and IIF) and control existing signals (L1 C/A, L1P(Y), and L2P(Y)). OCX Block 1 also adds the operational capability to command and control the GPS III satellites and the modernized civil signals (L2C and L5). OCX Block 2 adds operational control of the new international open/civil L1C signal in compliance with 2004 European Union-United States agreement and adds control of the modernized Military Code (M-Code) signal.

Executive Summary

Since the June 2014 SAR, which reported a six month delay to program milestone estimates, the program has incorporated a new Air Force SCP into their estimate, resulting in changes to the cost and schedule.

A quarterly exception SAR, dated June 30, 2014, was submitted to report a breach of the Block 0, 1, and 2 schedule milestones, as a result of continuing technical and integration issues associated with OCX development. At that time, the program and contractor had just finalized an Over Target Baseline/Over Target Schedule (OTB/OTS) which pushed contract deliveries beyond the schedule milestone thresholds, but did not signal a cost breach.

Since the June 2014 SAR, the Air Force completed a comprehensive SCP cost estimate. As a result of the SCP, the program office is showing a breach to the O&S cost in the SAR. The Air Force has submitted a Program Deviation Report (PDR) for the cost breach in November 2014. The program office has also submitted an APB update incorporating these breaches in the 2nd Quarter FY 2015. These updates will include new delivery dates for Block 0 (February 2016), Block 1 (July 2019), and Block 2 (July 2020) along with new cost objectives for RDT&E and O&S.

During this period, Raytheon continued efforts with Block 0 (Iteration 1.5) software, including completion of segment integration and preparation for qualification testing in 2nd Quarter FY 2015. After completing coding and unit test, Raytheon encountered problems with software engineering and implementing information assurance requirements leading to a higher than expected number of Deficiency Reports (DRs) and difficulty in developing test procedures that adequately validated requirements. Raytheon completed all 126 test procedures of Block 0 Configuration Item Qualification Test (CIQT) test procedure development. In addition, Raytheon reduced the backlog of Block 0 DRs from 400 to 261. The Global Positioning System (GPS) Enterprise conducted an integrated launch and checkout exercise on October 4, 2014 that demonstrated OCX software could perform basic launch, checkout, command and control, and anomaly resolution of the GPS III satellites. However, Block 0 was delayed due to these technical challenges.

As part of the effort to finalize Block 1 and 2 systems engineering and close the 635 design disconnects discovered during OTB/OTS, the contractor completed solution identification to all design disconnects and segment/element design artifacts on October 17, 2014. The program office completed initial evaluation of Raytheon's solution to the 635 identified gaps on November 21, 2014. In the process of conducting this evaluation, the government team identified two additional gaps in the systems engineering baseline. Raytheon delivered configuration item level engineering on December 23, 2014. The Government conducted the Block 1 Segment Element Freeze Review on January 23, 2015 and the OCX Program Manager approved the restart of software engineering for Iteration 1.6 and continued systems engineering for the remaining Iterations 1.7 and 2.1. The program office identified 27 watch items to be tracked in the next phase of engineering and development.

To date, the program received \$7.6M in FY 2013 and \$5.0M in FY 2014 of civil funding from the Department of Transportation (DoT). As a result of the FY 2015 appropriation, the program anticipates receiving \$8.5M of the \$23M funding agreed to by DoT this year. Securing this funding is critical to the Air Force's ability to deliver OCX.

Threshold Breaches

APB Breaches		Explanation of Breach
Schedule	<input checked="" type="checkbox"/>	The schedule breach was previously reported in the June 2014 SAR. However, milestone schedule estimates have been further delayed as a result of the updated SCP that incorporates additional schedule analysis and refinement.
Performance	<input type="checkbox"/>	
Cost	RDT&E	The O&S cost breach against the November 2012 APB is due to additional costs associated with the addition of two years of O&S and methodology changes that incorporate the most current data from both OCX and Operational Control Segment (OCS).
	Procurement	
	MILCON	
	Acq O&M	
O&S Cost	<input checked="" type="checkbox"/>	
Unit Cost	PAUC	The Air Force submitted Program Deviation Reports (PDRs) for the schedule and cost breaches. The program has provided an APB update in the 2nd Quarter FY 2015.
	APUC	
Nunn-McCurdy Breaches		
Current UCR Baseline		
	PAUC	None
	APUC	None
Original UCR Baseline		
	PAUC	None
	APUC	None

Schedule



Schedule Events				
Events	SAR Baseline Development Estimate	Current APB Development Objective/Threshold		Current Estimate
Development Contract Award	Feb 2010	Feb 2010	Feb 2010	Feb 2010
Block 1 and 2 PDR	Aug 2011	Aug 2011	Aug 2011	Aug 2011
Milestone B	Nov 2012	Nov 2012	Nov 2012	Nov 2012
Block 0 (LCS Delivery)	Nov 2014	Nov 2014	May 2015	Feb 2016¹ (Ch-1)
Milestone C	Oct 2015	Oct 2015	Apr 2016	Jul 2018¹ (Ch-1)
Block 1 RTO	Oct 2016	Oct 2016	Oct 2017	Jul 2019¹ (Ch-1)
Block 2 RTO	Jun 2017	Jun 2017	Jun 2018	Jul 2020¹ (Ch-1)

¹ APB Breach

Change Explanations

(Ch-1) The Current Estimates for all milestones changed as a result of the Air Force SCP approved November 10, 2014, as well as additional schedule analysis and refinement. The changes are: Block 0 (LCS Delivery) changed from November 2015 to February 2016; Milestone C changes from January 2017 to July 2018; Block 1 RTO changed from November 2018 to July 2019; Block 2 RTO changed from November 2019 to July 2020.

Notes

RTO will be achieved when the Control Segment can support GPS III SV01-08 and operational Block II satellites, can monitor broadcast GPS navigation signals, and can support NAVWAR mission planning by JSpOC. At RTO, the system is turned over to the operational community.

Acronyms and Abbreviations

GPS - Global Positioning System

JSpOC - Joint Space Operations Center

LCS - Launch and Checkout System

NAVWAR - Navigation Warfare

PDR - Preliminary Design Review

RTO - Ready to Transition to Operations

SV - Space Vehicle

Performance

Performance Characteristics				
SAR Baseline Development Estimate	Current APB Development Objective/Threshold	Demonstrated Performance	Current Estimate	
Backward Compatibility				
All modifications made to the existing GPS Space Segment and Control Segment shall allow the continued operation of existing IS-GPS-200, IS-GPS-700, IS-GPS-705 and SS-GPS-001 compliant UE and continued operation of legacy receivers (to include Federal augmentation system receivers) IAW performance meeting the APB Precise Positioning Service Performance Standard and GPS Positioning Service Performance Standard, and Federal augmentation system specifications for the Local Area Augmentation System, Wide Area Augmentation System, Nationwide Differential GPS, and Maritime Differential GPS.	All modifications made to the existing GPS Space Segment and Control Segment shall allow the continued operation of existing IS-GPS-200, IS-GPS-700, IS-GPS-705 and SS-GPS-001 compliant UE and continued operation of legacy receivers (to include Federal augmentation system receivers) IAW performance meeting the APB Precise Positioning Service Performance Standard and GPS Positioning Service Performance Standard, and Federal augmentation system specifications for the Local Area Augmentation System, Wide Area Augmentation System, Nationwide Differential GPS, and Maritime Differential GPS.	All modifications made to the existing GPS Space Segment and Control Segment shall allow the continued operation of existing IS-GPS-200, IS-GPS-700, IS-GPS-705 and SS-GPS-001 compliant UE and continued operation of legacy receivers (to include Federal augmentation system receivers) IAW performance meeting the APB Precise Positioning Service Performance Standard and GPS Positioning Service Performance Standard, and Federal augmentation system specifications for the Local Area Augmentation System, Wide Area Augmentation System, Nationwide Differential GPS, and Maritime Differential GPS. [Threshold = Objective]	TBD	All modifications made to the existing GPS Space Segment and Control Segment shall allow the continued operation of existing IS-GPS-200, IS-GPS-700, IS-GPS-705 and SS-GPS-001 compliant UE and continued operation of legacy receivers (to include Federal augmentation system receivers) IAW performance meeting the APB Precise Positioning Service Performance Standard and GPS Positioning Service Performance Standard, and Federal augmentation system specifications for the Local Area Augmentation System, Wide Area Augmentation System, Nationwide Differential GPS, and Maritime Differential GPS.
Availability of Position Accuracy a. b. Horizontal c.d. Vertical				
UEE = 0.8 m rms a. 4.5 m (95%) @ 90% availability any lat/long b. 4.0 m (95%) @ 99.9% availability global average c. 7.0 m (95%) @ 90% availability any lat/long d. 7.0 m (95%) @ 99.9% availability global average UEE = 2.6 m rms a. 11.5 m	UEE = 0.8 m rms a. 4.5 m (95%) @ 90% availability any lat/long b. 4.0 m (95%) @ 99.9% availability global average c. 7.0 m (95%) @ 90% availability any lat/long d. 7.0 m (95%) @ 99.9% availability global average UEE = 2.6 m rms a. 11.5 m	a. 1.2 m (95%) @ 90% availability any lat/long b. 1.2 m (95%) @ 99.9% availability global average c. 1.9 m (95%) @ 90% availability any lat/long d. 1.9 m (95%) @ 99.9% availability global average Note: (a) and (c) values equal 1 m SEP Note:	TBD	UEE = 0.8 m rms a. 4.5 m (95%) @ 90% availability any lat/long b. 4.0 m (95%) @ 99.9% availability global average c. 7.0 m (95%) @ 90% availability any lat/long d. 7.0 m (95%) @ 99.9% availability global average UEE = 2.6 m rms a. 11.5 m

(95%) @ 90% availability any lat/long b. 11.5 m (95%) @ 99.9% availability global average c. 17.7 m (95%) @ 90% availability any lat/long d. 17.7 m (95%) @ 99.9% availability global average.	(95%) @ 90% availability any lat/long b. 11.5 m (95%) @ 99.9% availability global average c. 17.7 m (95%) @ 90% availability any lat/long d. 17.7 m (95%) @ 99.9% availability global average.	no UEE assumed for objective because requirement is stated in FCS ORD.		(95%) @ 90% availability any lat/long b. 11.5 m (95%) @ 99.9% availability global average c. 17.7 m (95%) @ 90% availability any lat/long d. 17.7 m (95%) @ 99.9% availability global average.
Position and Time Transfer Integrity				
GPS III SV01-08 shall not transmit MSI to the user with a probability greater than 0.0001 per hour.	GPS III SV01-08 shall not transmit MSI to the user with a probability greater than 0.0001 per hour.	GPS III SV01-08 shall not transmit MSI to the user with a probability greater than 0.0000001 per hour.	TBD	GPS III SV01-08 shall not transmit MSI to the user with a probability greater than 0.0001 per hour.
Availability of Dynamic Time Transfer Accuracy				
UEE = 0.8 m rms Any lat/long 15 nanoseconds (ns) (95%) @ 90% availability Global Average 15 ns (95%) @ 99.9% availability UEE = 2.6 m rms Any lat/long 40 ns (95%) @ 90% availability Global Average 50 ns (95%)	UEE = 0.8 m rms Any lat/long 15 ns (95%) @ 90% availability Global Average 15 ns (95%) @ 99.9% availability UEE = 2.6 m rms Any lat/long 40 ns (95%) @ 90% availability Global Average 50 ns (95%)	Any lat/long 4.5 ns (95%) @ 90% availability Global Average 4.5 ns (95%) @ 99.9% availability Note: no UEE assumed for objective because requirement is derived from the FCS ORD Objective SEP accuracy requirement	TBD	UEE = 0.8 m rms any lat/long 15 ns (95%) @ 90% availability Global Average 15 ns (95%) @ 99.9% availability UEE = 2.6 m rms any lat/long 40 ns (95%) @ 90% availability Global Average 50 ns (95%).
Availability of Static Time Transfer Accuracy				
3.0 ns (95%) @ > 99.9% availability	3.0 ns (95%) @ > 99.9% availability	1.0 ns (95%) @ > 99.9% availability	TBD	3.0 ns (95%) @ > 99.9% availability.
Net-Ready KPP				
The system must fully support execution of joint critical operational activities and information exchanges identified in the DoD Enterprise Architecture and solution architectures based on integrated DoD AF content, and must satisfy the technical requirements for transition to Net-Centric military operations to include: 1) Solution architecture products compliant with DoD Enterprise Architecture	The system must fully support execution of joint critical operational activities and information exchanges identified in the DoD Enterprise Architecture and solution architectures based on integrated DoD AF content, and must satisfy the technical requirements for transition to Net-Centric military operations to include: 1) Solution architecture products compliant with DoD	The system must fully support execution of all operational activities and information exchanges identified in DoD Enterprise Architecture and solution architectures based on integrated DoD AF content, and must satisfy the technical requirements for transition to Net-Centric military operations to include 1) Solution architecture products compliant with DoD Enterprise	TBD	The system must fully support execution of joint critical operational activities and information exchanges identified in the DoD Enterprise Architecture and solution architectures based on integrated DoD AF content, and must satisfy the technical requirements for transition to Net-Centric military operations to include: 1) Solution architecture products compliant with DoD

<p>based on integrated DoD AF content, including specified operationally effective information exchanges 2) Compliant with Net-Centric Data Strategy, and Net-centric Services Strategy and the principles and rules identified in the DoD IEA, excepting tactical and non-IP communications 3) Compliant with GIG Technical Guidance to include IT Standards identified in the TV-1 and implementation guidance of GESPs necessary to meet all operational requirements specified in the DoD Enterprise Architecture and solution architecture views 4) Information assurance requirements including availability, integrity, authentication, confidentiality, and non-repudiation, and issuance of an IATO or ATO by the DAA, and 5) Supportability requirements to include SAASM, Spectrum, and JTRS requirements.</p>	<p>Enterprise Architecture based on integrated DoD AF content, including specified operationally effective information exchanges 2) Compliant with Net-Centric Data Strategy, and Net-centric Services Strategy and the principles and rules identified in the DoD IEA, excepting tactical and non-IP communications 3) Compliant with GIG Technical Guidance to include IT Standards identified in the TV-1 and implementation guidance of GESPs necessary to meet all operational requirements specified in the DoD Enterprise Architecture and solution architecture views 4) Information assurance requirements including availability, integrity, authentication, confidentiality, and non-repudiation, and issuance of an IATO or ATO by the DAA, and 5) Supportability requirements to include SAASM, Spectrum, and JTRS requirements.</p>	<p>Architecture based on integrated DoD AF content, including specified operationally effective information exchanges 2) Compliant with Net-Centric Data Strategy, and Net-Centric Services Strategy, and the principles and rules identified in the DoD IEA, excepting tactical and non-IP communications 3) Compliant with GIG Technical Guidance to include IT Standards identified in the TV-1 and implementation guidance of GESPs, necessary to meet all operational requirements specified in the DoD Enterprise Architecture and solution architecture views 4) Information assurance requirements including availability, integrity, authentication, confidentiality, and non-repudiation, and issuance of an ATO by the DAA, and 5) Supportability requirements to include SAASM, Spectrum and JTRS requirements.</p>		<p>Enterprise Architecture based on integrated DoD AF content, including specified operationally effective information exchanges 2) Compliant with Net-Centric Data Strategy, and Net-centric Services Strategy and the principles and rules identified in the DoD IEA, excepting tactical and non-IP communications 3) Compliant with GIG Technical Guidance to include IT Standards identified in the TV-1 and implementation guidance of GESPs necessary to meet all operational requirements specified in the DoD Enterprise Architecture and solution architecture views 4) Information assurance requirements including availability, integrity, authentication, confidentiality, and non-repudiation, and issuance of an IATO or ATO by the DAA, and 5) Supportability requirements to include SAASM, Spectrum, and JTRS requirements.</p>
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Sustainment--Materiel Availability

<p>The achievement of the Availability of Position Accuracy KPP and Time Transfer Accuracy KPP Thresholds.</p>	<p>The achievement of the Availability of Position Accuracy KPP and Time Transfer Accuracy KPP Thresholds.</p>	<p>The achievement of the Availability of Position Accuracy KPP and Time Transfer Accuracy KPP Thresholds. [Threshold = Objective]</p>	<p>TBD</p>	<p>The achievement of the Availability of Position Accuracy KPP and Time Transfer Accuracy KPP Thresholds.</p>
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Requirements Reference

GPS III Capability Development Document (CDD) dated September 17, 2009

Change Explanations

None

Notes

This performance baseline is for OCX and was derived from the system-level CDD requirements. The GPS III program will track cost, schedule, and performance separately in its own APB.

Acronyms and Abbreviations

AF - Air Force
ATO - Authority To Operate
DAA - Designated Approval Authority
FCS - Future Combat System
GESP - GIG Enterprise Service Profiles
GIG - Global Information Grid
GPS - Global Positioning System
IATO - Interim Authority to Operate
IAW - In Accordance With
IEA - Information Enterprise Architecture
IP - Internet Protocol
IS - Interface Specifications
IT - Information Technology
JTRS - Joint Tactical Radio System
lat - Latitude
long - Longitude
m - meter
MSI - Misleading Signal in Space Information
ns - nanosecond
rms - root-mean-square
SAASM - Selective Availability/Anti-Spoofing Module
SEP - Spherical Error Probable
SS - System Specifications
SV - Space Vehicle
TV - Technical View
UE - User Equipment
UEE - User Equipment Error

Track to Budget

RDT&E			
Appn	BA	PE	
Air Force	3600	07	0603421F
	Project	Name	
	4993	GPS III	(Shared) (Sunk)
Air Force	3600	07	0603423F
	Project	Name	
	67A021	Global Positioning System III - Operational Control Segment (OCX)	
	67A025	GPS Enterprise Integrator	

Cost and Funding

Cost Summary

Total Acquisition Cost							
Appropriation	BY 2012 \$M			BY 2012 \$M	TY \$M		
	SAR Baseline Development Estimate	Current APB Development Objective/Threshold		Current Estimate	SAR Baseline Development Estimate	Current APB Development Objective	Current Estimate
RDT&E	3347.2	3347.2	3681.9	3521.0	3413.0	3413.0	3602.6
Procurement	0.0	0.0	--	0.0	0.0	0.0	0.0
Flyaway	--	--	--	0.0	--	--	0.0
Recurring	--	--	--	0.0	--	--	0.0
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	0.0	0.0
Acq O&M	0.0	0.0	--	0.0	0.0	0.0	0.0
Total	3347.2	3347.2	N/A	3521.0	3413.0	3413.0	3602.6

Confidence Level

Confidence Level of cost estimate for current APB: 60%

The Air Force Service Cost Position for the OCX Program is at the mean of the cost estimate distribution. It takes into consideration all relevant program risks, providing sufficient resources to execute the program under normal conditions encountering average levels of technical, schedule, and programmatic risk and external interference.

Total Quantity			
Quantity	SAR Baseline Development Estimate	Current APB Development	Current Estimate
RDT&E		1	1
Procurement		0	0
Total		1	1

Cost and Funding

Funding Summary

Appropriation Summary									
FY 2016 President's Budget / December 2014 SAR (TY\$ M)									
Appropriation	Prior	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	To Complete	Total
RDT&E	2367.5	299.1	350.2	222.3	136.5	139.0	88.0	0.0	3602.6
Procurement	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
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 2016 Total	2367.5	299.1	350.2	222.3	136.5	139.0	88.0	0.0	3602.6
PB 2015 Total	2379.2	299.8	282.1	212.4	118.3	120.6	0.0	0.0	3412.4
Delta	-11.7	-0.7	68.1	9.9	18.2	18.4	88.0	0.0	190.2

Funding Notes

The total funding requirement of the program is \$3.602B. Department of Transportation (DoT) currently has a commitment to provide \$32.4M in support of the program by FY 2017.

Quantity Summary										
FY 2016 President's Budget / December 2014 SAR (TY\$ M)										
Quantity	Undistributed	Prior	FY 2015	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	To Complete	Total
Development	1	0	0	0	0	0	0	0	0	1
Production	0	0	0	0	0	0	0	0	0	0
PB 2016 Total	1	0	0	0	0	0	0	0	0	1
PB 2015 Total	1	0	0	0	0	0	0	0	0	1
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
2007	--	--	--	--	--	--	168.4
2008	--	--	--	--	--	--	249.5
2009	--	--	--	--	--	--	289.6
2010	--	--	--	--	--	--	288.4
2011	--	--	--	--	--	--	353.6
2012	--	--	--	--	--	--	347.0
2013	--	--	--	--	--	--	309.6
2014	--	--	--	--	--	--	361.4
2015	--	--	--	--	--	--	299.1
2016	--	--	--	--	--	--	350.2
2017	--	--	--	--	--	--	222.3
2018	--	--	--	--	--	--	136.5
2019	--	--	--	--	--	--	139.0
2020	--	--	--	--	--	--	88.0
Subtotal	1	--	--	--	--	--	3602.6

Annual Funding							
3600 RDT&E Research, Development, Test, and Evaluation, Air Force							
Fiscal Year	Quantity	BY 2012 \$M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2007	--	--	--	--	--	--	181.0
2008	--	--	--	--	--	--	262.8
2009	--	--	--	--	--	--	301.1
2010	--	--	--	--	--	--	296.1
2011	--	--	--	--	--	--	356.3
2012	--	--	--	--	--	--	343.6
2013	--	--	--	--	--	--	301.4
2014	--	--	--	--	--	--	346.4
2015	--	--	--	--	--	--	283.1
2016	--	--	--	--	--	--	325.9
2017	--	--	--	--	--	--	203.1
2018	--	--	--	--	--	--	122.3
2019	--	--	--	--	--	--	122.1
2020	--	--	--	--	--	--	75.8
Subtotal	1	--	--	--	--	--	3521.0

Low Rate Initial Production

There is no LRIP for this program.

Foreign Military Sales

None

Nuclear Costs

None

Unit Cost

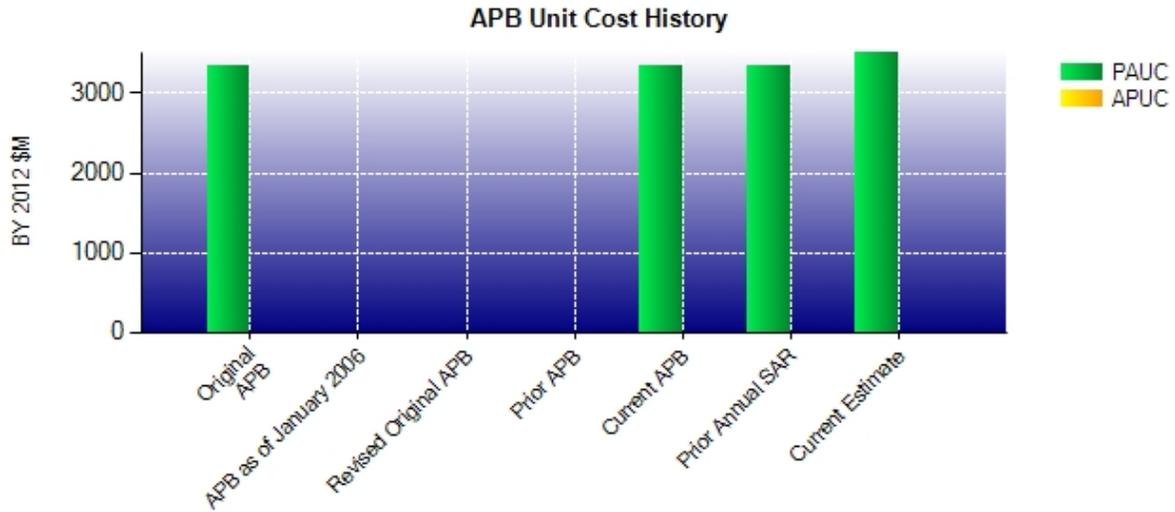
Unit Cost Report

Item	BY 2012 \$M	BY 2012 \$M	% Change
	Current UCR Baseline (Nov 2012 APB)	Current Estimate (Dec 2014 SAR)	
Program Acquisition Unit Cost			
Cost	3347.2	3521.0	
Quantity	1	1	
Item	3347.200	3521.000	+5.19
Average Procurement Unit Cost			
Cost	0.0	0.0	
Quantity	0	0	
Unit Cost	--	--	--

Item	BY 2012 \$M	BY 2012 \$M	% Change
	Original UCR Baseline (Nov 2012 APB)	Current Estimate (Dec 2014 SAR)	
Program Acquisition Unit Cost			
Cost	3347.2	3521.0	
Quantity	1	1	
Unit Cost	3347.200	3521.000	+5.19
Average Procurement Unit Cost			
Cost	0.0	0.0	
Quantity	0	0	
Unit Cost	--	--	--

PAUC is based on RDT&E costs and quantities only. There is no APUC for this program because there are no procurement funds or quantities.

Unit Cost History



Item	Date	BY 2012 \$M		TY \$M	
		PAUC	APUC	PAUC	APUC
Original APB	Nov 2012	3347.200	N/A	3413.000	N/A
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	Nov 2012	3347.200	N/A	3413.000	N/A
Prior Annual SAR	Dec 2013	3341.800	N/A	3412.400	N/A
Current Estimate	Dec 2014	3521.000	N/A	3602.600	N/A

SAR Unit Cost History

Current SAR Baseline to Current Estimate (TY \$M)									
Initial PAUC Development Estimate	Changes								PAUC Current Estimate
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
3413.000	-14.600	0.000	0.000	0.000	204.200	0.000	0.000	189.600	3602.600

Current SAR Baseline to Current Estimate (TY \$M)									
Initial APUC Development Estimate	Changes								APUC Current Estimate
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
0.000	--	--	--	--	--	--	--	--	0.000

An APUC Unit Cost History is not available, since no Initial APUC Estimate had been calculated due to a lack of defined quantities.

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	Nov 2012	N/A	Nov 2012
Milestone C	N/A	Oct 2015	N/A	Jul 2018
IOC	N/A	N/A	N/A	N/A
Total Cost (TY \$M)	N/A	3413.0	N/A	3602.6
Total Quantity	N/A	1	N/A	1
PAUC	N/A	3413.000	N/A	3602.600

Cost Variance

Summary TY \$M				
Item	RDT&E	Procurement	MILCON	Total
SAR Baseline (Development Estimate)	3413.0	--	--	3413.0
Previous Changes				
Economic	-3.2	--	--	-3.2
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	+2.6	--	--	+2.6
Other	--	--	--	--
Support	--	--	--	--
Subtotal	-0.6	--	--	-0.6
Current Changes				
Economic	-11.4	--	--	-11.4
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	+201.6	--	--	+201.6
Other	--	--	--	--
Support	--	--	--	--
Subtotal	+190.2	--	--	+190.2
Total Changes	+189.6	--	--	+189.6
CE - Cost Variance	3602.6	--	--	3602.6
CE - Cost & Funding	3602.6	--	--	3602.6

Summary BY 2012 \$M				
Item	RDT&E	Procurement	MILCON	Total
SAR Baseline (Development Estimate)	3347.2	--	--	3347.2
Previous Changes				
Economic	--	--	--	--
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	-5.4	--	--	-5.4
Other	--	--	--	--
Support	--	--	--	--
Subtotal	-5.4	--	--	-5.4
Current Changes				
Economic	--	--	--	--
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	+179.2	--	--	+179.2
Other	--	--	--	--
Support	--	--	--	--
Subtotal	+179.2	--	--	+179.2
Total Changes	+173.8	--	--	+173.8
CE - Cost Variance	3521.0	--	--	3521.0
CE - Cost & Funding	3521.0	--	--	3521.0

Previous Estimate: June 2014

RDT&E	\$M	
Current Change Explanations	Base Year	Then Year
Revised escalation indices. (Economic)	N/A	-11.4
Revised estimate due to realignment of funds to cover program delay overruns. (Estimating)	+37.9	+42.3
Increased funding for OCX transition to operations activities. (Estimating)	+9.6	+10.9
Increased funding for baseline extension in FY 2020. (Estimating)	+75.8	+88.0
Congressional reductions for Federally Funded Research and Development Centers for FY 2015. (Estimating)	-0.7	-0.7
Increased funding for Block 1 technical issues. (Estimating)	+64.6	+69.4
Revised estimate to reflect prior year actuals. (Estimating)	-11.3	-11.7
Adjustment for current and prior escalation. (Estimating)	+3.3	+3.4
RDT&E Subtotal	+179.2	+190.2

Contracts

Contract Identification

Appropriation: RDT&E
Contract Name: OCX Phase B Contract
Contractor: Raytheon (Intelligence and Information Systems)
Contractor Location: 16800 E Centre Tech Pkwy
 Aurora, CO 80011
Contract Number: FA8807-10-C-0001
Contract Type: Cost Plus Award Fee (CPAF)
Award Date: February 25, 2010
Definitization Date: February 25, 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
886.4	N/A	1	982.2	N/A	1	1730.7	1820.7

Target Price Change Explanation

The difference between the Initial Contract Price Target and the Current Contract Price Target is due to increased requirements of the OCX Technical Baseline, which include the addition of an interim Launch and Early Checkout System (LCS), Request for Equitable Adjustments (REAs), engineering studies, and Engineering Change Proposals (ECPs).

Contract Variance

Item	Cost Variance	Schedule Variance
Cumulative Variances To Date (1/25/2015)	-25.5	-15.6
Previous Cumulative Variances	-264.1	-12.9
Net Change	+238.6	-2.7

Cost and Schedule Variance Explanations

The favorable net change in the cost variance is due to a reset of the Program Management Baseline (PMB) resulting from the contractor's Over Target Baseline (OTB) and Over Target Schedule (OTS).

The unfavorable net change in the schedule variance is due to Raytheon's 14 week delay in completing Block 0's Launch and Early Checkout System (LCS) Configuration Item Qualification Test (CIQT) software integrity dry run and 15 weeks in completing Block 1 Segment Element Freeze Review (SEFR) campaign. In addition, further CIQT delays were due to additional software builds, greater amount of radio frequency Downconverter failure reports alongside problems with the Digital Sampling Circuit Card Assembly (CCA) test fixture, as well as the continued discovery of software deficiency reports.

General Contract Variance Explanation

Due to contractor's development issues, an OTB and an OTS were completed and authorized by the government in June 2014. The OTB incorporates a cost overrun of \$654.6M (which includes \$170M added to the PMB in Mar 2014) and the government authorized a single point adjustment to reset variances to zero.

Notes

For tracking purposes, initial contract price information is based on the initial monthly contractor's performance report ending March 28, 2010.

Deliveries and Expenditures

Deliveries				
Delivered to Date	Planned to Date	Actual to Date	Total Quantity	Percent Delivered
Development	0	0	1	0.00%
Production	0	0	0	--
Total Program Quantity Delivered	0	0	1	0.00%

Expended and Appropriated (TY \$M)			
Total Acquisition Cost	3602.6	Years Appropriated	9
Expended to Date	2153.4	Percent Years Appropriated	64.29%
Percent Expended	59.77%	Appropriated to Date	2666.6
Total Funding Years	14	Percent Appropriated	74.02%

The above data is current as of January 31, 2015.

The June 30, 2014 SAR incorrectly overstated the expenditures to date. The correct number should have been \$2003.1M (vice the \$2121.9M that was reported).

Operating and Support Cost

Cost Estimate Details

Date of Estimate:	November 10, 2014
Source of Estimate:	SCP
Quantity to Sustain:	1
Unit of Measure:	System
Service Life per Unit:	12.00 Years
Fiscal Years in Service:	FY 2019 - FY 2031

Estimated Costs are part of the Service Cost Estimate supported by the Air Force Cost Analysis Agency as part of the Acquisition Program Baseline SCP, completed November 2014. The current cost estimate was updated and signed by Deputy Assistant Secretary (Cost and Economics) on November 10, 2014.

O&S costs includes operating, maintaining, and supporting the dedicated Master Control Station (MCS) located at Schriever Air Force Base (AFB), CO and the Alternate MCS (AMCS) located at Vandenberg AFB, CA, both of which include connections to the ground antenna and monitoring stations which support the Global Positioning System III (GPS III) and GPS II legacy spacecraft. Also included are the costs of operating, maintaining, and supporting seventeen monitoring stations, six controlled by the 50th Space Wing and eleven co-located at National Geo-spatial Intelligence Agency (NGA) sites. Satellite operations at the MCS include mission planning, mission payload operations, and monitoring of satellite state of health. Monitor stations receive mission payload data and transfer this data to the MCS to ensure spacecraft are operating as desired.

The "system" to be supported will consist of the Master Control Station, Alternate Master Control Station, Launch and Checkout System, Transition Support Facility, Data Storage and Archive System, GPS System Simulator, Standard Space Trainer software, four ground antennae elements, and 17 remote sites.

O&S cost estimate assumes OCX Block 1 is Ready To Operate (RTO) in month end July 2019, a 12 year service life for this one system which starts on August 1, 2019. Manpower assumes a mixture of Air Force personnel performing organic work with assistance from contractor engineers. The estimate assumes organic depot hardware maintenance with 30% organic software maintenance and 70% contractor software maintenance. The increase of two years of reflects the scope of the 2014 SCP, which includes Software (SW) Iteration 2.2 and the O&S requirements to support GPS III Satellite Vehicle (SV) 09 and SV10.

Manpower, operations and maintenance is analogous to the currently operating GPS Operational Control System (OCS) with adjustments modeled to reflect the new OCX footprint.

Sustainment support is based on operator and non-operator training and sustainment engineering support is analogous to GPS OCS.

Continuing system improvements are factored in as hardware modifications and software maintenance and modifications. The OCX hardware and software maintenance cost are based on OCS historical data and adjusted proportionally for the larger hardware profile and Software Lines of Code (SLOC) and Information Assurance (IA) differences between OCS and OCX.

Contingency Operations cost is not included in the current OCX SCP O&S estimate. It is included in the GPSIII PE.

Sustainment Strategy

Hardware depot maintenance will be 100% supported by Tobyhanna Army Depot while the Organizational Level maintenance will be Contractor Logistics Support (in alignment with operational unit's maintenance structure).

Antecedent Information

GPS OCS is the current operating control system and is limited to operating GPS II satellites. GPS OCS costs are derived from actual cost collected from the last GPS OCS official Cost Data Summary Report submission in 2011.

Cost Element	Annual O&S Costs BY2012 \$M	
	OCX Average Annual Cost Per System	GPS Operational Control System (OCS) (Antecedent) Average Annual Cost Per System
Unit-Level Manpower	16.930	12.100
Unit Operations	9.610	51.400
Maintenance	46.650	5.400
Sustaining Support	2.980	4.400
Continuing System Improvements	52.050	31.500
Indirect Support	3.470	0.500
Other	1.400	0.000
Total	133.090	105.300

The estimated GPS OCX average annual cost is higher than the GPS OCS actuals mainly due to the following significant cost drivers; OCX has a significantly more lines-of code (57% larger) to maintain, a significantly more complex and robust Information Assurance (IA) construct, and higher costs for hardware maintenance due to a larger hardware profile (76% larger). Lastly, the Manpower Estimate Report (used estimate unit manning) has been updated with an addendum to more accurately reflect program requirements.

* **Other:** Costs under this category are linked to Depot Stand-Up. Specific to the Estimated Average Annual Costs Per System, please note for consistency purposes these costs were averaged over 12 years consistent with the cost estimate assumptions.

Item	Total O&S Cost \$M			
	OCX		GPS Operational Control System (OCS) (Antecedent)	
	Current Development APB Objective/Threshold	Current Estimate		
Base Year	1380.9	1518.2	1597.1¹	N/A
Then Year	1469.0	N/A	2065.7	N/A

¹ APB O&S Cost Breach

The O&S cost breach against the November 2012 APB is due to additional costs associated with the adding of two years of O&S and methodology changes that incorporate the most current data from both OCX and OCS.

Equation to Translate Annual Cost to Total Cost

Average Annual Cost per system = Total OCX O&S Cost / number of service years

\$133.09M= \$1,597.08M /12

O&S Cost Variance		
Category	BY 2012 \$M	Change Explanations
Prior SAR Total O&S Estimates - Jun 2014 SAR	1172.1	
Programmatic/Planning Factors	266.0	Increased service cost position period from 10 to 12 years. The additional 2 years of schedule were added to account for the Iteration 2.2 of the program and the addition of satellites 9 and 10.
Cost Estimating Methodology	0.0	
Cost Data Update	159.0	Methodology changes that incorporate the most current data from both OCX and OCS.
Labor Rate	0.0	
Energy Rate	0.0	
Technical Input	0.0	
Other	0.0	
Total Changes	425.0	
Current Estimate	1597.1	

Disposal Estimate Details

Date of Estimate:

Source of Estimate:

Disposal/Demilitarization Total Cost (BY 2012 \$M):

Costs associated with disposal of OCX will be captured in the follow-on control system development contract that would ultimately replace OCX. OCX disposal costs will be finalized in support of the 2018 Milestone C.