



Selected Acquisition Report (SAR)

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



Next Generation Operational Control System (GPS OCX)

As of FY 2015 President's Budget

Defense Acquisition Management
Information Retrieval
(DAMIR)

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Common Acronyms and Abbreviations

Acq O&M - Acquisition-Related Operations and Maintenance
APB - Acquisition Program Baseline
APPN - Appropriation
APUC - Average Procurement Unit Cost
BA - Budget Authority/Budget Activity
BY - Base Year
DAMIR - Defense Acquisition Management Information Retrieval
Dev Est - Development Estimate
DoD - Department of Defense
DSN - Defense Switched Network
Econ - Economic
Eng - Engineering
Est - Estimating
FMS - Foreign Military Sales
FY - Fiscal Year
IOC - Initial Operational Capability
\$K - Thousands of Dollars
LRIP - Low Rate Initial Production
\$M - Millions of Dollars
MILCON - Military Construction
N/A - Not Applicable
O&S - Operating and Support
Oth - Other
PAUC - Program Acquisition Unit Cost
PB - President's Budget
PE - Program Element
Proc - Procurement
Prod Est - Production Estimate
QR - Quantity Related
Qty - Quantity
RDT&E - Research, Development, Test, and Evaluation
SAR - Selected Acquisition Report
Sch - Schedule
Spt - Support
TBD - To Be Determined
TY - Then Year
UCR - Unit Cost Reporting

Program Information

Program Name

Next Generation Operational Control System (GPS OCX)

DoD Component

Air Force

Responsible Office

Responsible Office

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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 10 United States Code (USC) Section 2281 which requires that the Secretary of Defense ensures the continued sustainment and operation of GPS for military and civilian purposes and 51 USC Section 50112, which requires that GPS complies with certain standards and facilitates international cooperation.

The GPS Next Generation Operational Control System (OCX) program procures and fields a modernized satellite command and control (C2) system which replaces the current ground control system for all 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 2 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 all legacy satellites (GPS IIR, IIR-M, and IIF) and control existing signals (L1 C/A, L1P(Y), 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 approval of Milestone B in November 2012, the program has continued with design and development of OCX hardware and software. The prime contractor successfully completed the hardware Critical Design Reviews (CDRs) for the monitoring station and legacy ground antenna elements, as well as the CDR for the Global Positioning System (GPS) III Launch and Checkout System ((LCS), also known as Block 0). The prime contractor developed and completed the information assurance hardened software infrastructure to protect against emerging cyber threats. This software is the foundation upon which all remaining OCX software will be built. The remaining Block 0 software necessary to launch and check out GPS III satellites completed coding, is now in software integration, and remains on track for delivery by the APB threshold of May 2015.

OCX participated in two successful space-to-ground launch readiness exercises and a hardware compatibility test with GPS III. These exercises and test demonstrated that OCX software could perform basic launch, checkout, command and control, and anomaly resolution of the GPS III satellites.

The prime contractor completed multiple design reviews. In June 2013, the contractor conducted a CDR for LCS (Block 0). Overall, the design artifacts assessed by the Government team demonstrated that the contractor's design and software architecture were adequate and will meet requirements.

In addition, the contractor held a Hardware CDR for the OCX Monitor Station/Legacy Ground Antenna (MS/LGA). The design and hardware architecture showed an improvement in the performance and security of the program's continental United States and overseas hardware and software assets. This milestone is a gate for production readiness and supports production and 17 worldwide site installations that will begin next year. The GPS monitoring station receiver anti-tamper design was approved by the Government. This, in conjunction with the successful monitoring station CDR, enabled the start of manufacturing and installation for 17 worldwide monitor station sites.

In spite of these accomplishments, the prime contractor has struggled with software development, resulting in significant cost overruns and schedule delays to both the Block 0 LCS capability, as well as the Block 1 capability slated to replace the legacy GPS ground segment. Incomplete systems engineering resulted in significant rework during software coding. Information assurance implementation proved to be more difficult than anticipated. Additionally, the contractor experienced delays due to the complexity in configuring and maintaining the test/operational infrastructure. The cumulative effect of these issues resulted in four to six months delay to contractor forecasted delivery. The contractor has applied lessons learned and corrective actions to resolve these issues. Even with these schedule slips, the prime contractor forecasts delivery within the APB schedule thresholds. Due to the cost and schedule variances, the program team is implementing an Over Target Baseline (OTB) and Over Target Schedule (OTS), planned to complete in 2014. After the OTB is complete, the program office will be able to better evaluate and estimate any impact to the APB schedule.

In November 2012, in conjunction with the Milestone B decision, certification was made pursuant to section 2366b of title 10, United States Code. Based on program maturity, GPS OCX was deemed ready to enter the Engineering and Manufacturing phase. The Under Secretary of Defense for Acquisition, Technology and Logistics certified provisions (a)(1)(B) and (a)(1)(D) (with waivers) in accordance with subsection (d) on the basis that the program was not fully funded in the FY 2013 PB and the associated Future Years Defense Program. The certification requirement for these two provisions has not yet been met, and the Department will continue to review the GPS OCX program at least annually until the certification components are satisfied.

Overall, OCX has made significant progress in 2013, but has also experienced challenges in software development, resulting in cost and schedule overruns. Despite these overruns, the program remains on track to meet all APB

commitments.

Threshold Breaches

APB Breaches

Schedule ☐

Performance ☐

Cost ☐

RDT&E ☐

Procurement ☐

MILCON ☐

Acq O&M ☐

O&S Cost ☐

Unit Cost ☐

PAUC ☐

APUC ☐

Nunn-McCurdy Breaches

Current UCR Baseline

PAUC None

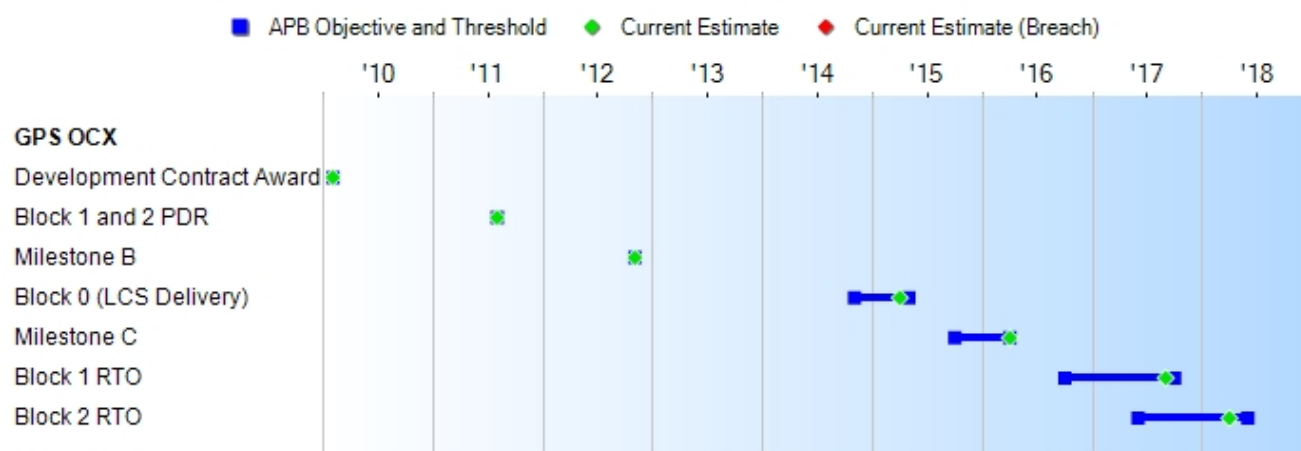
APUC None

Original UCR Baseline

PAUC None

APUC None

Schedule



Milestones	SAR Baseline Dev Est	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	APR 2015	(Ch-1)
Milestone C	OCT 2015	OCT 2015	APR 2016	APR 2016	(Ch-1)
Block 1 RTO	OCT 2016	OCT 2016	OCT 2017	SEP 2017	(Ch-1)
Block 2 RTO	JUN 2017	JUN 2017	JUN 2018	APR 2018	(Ch-1)

Change Explanations

(Ch-1) The current estimate of Block 0 (LCS Delivery) was delayed from November 2014 to April 2015; the current estimate of Milestone C was delayed from October 2015 to April 2016; the current estimate of Block 1 RTO was delayed from October 2016 to September 2017; and the current estimate of Block 2 RTO was delayed from June 2017 to April 2018 due to an increased level of unplanned work and rework. The contractor struggled with incomplete systems engineering during coding, information assurance being more difficult than expected, and challenges with configuration management of test/operational infrastructure. The cumulative effects resulted in changes to the Block 0, 1, 2 and Milestone C estimates.

Memo

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

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

Characteristics	SAR Baseline Dev Est	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	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	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	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.	augmentation system specifications for the Local Area Augmentation System, Wide Area Augmentation System, Nationwide Differential GPS, and Maritime Differential GPS.	augmentation system specifications for the Local Area Augmentation System, Wide Area Augmentation System, Nationwide Differential GPS, and Maritime Differential GPS. [Threshold = Objective]		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 (95%) @ 90% availability any lat/long b. 11.5 m (95%) @ 99.9% availability global	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	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: no UEE assumed for objective because requirement is stated in FCS ORD.	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.	average c. 17.7 m (95%) @ 90% availability any lat/long d. 17.7 m (95%) @ 99.9% availability global average.			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 SV 1-8 shall not transmit MSI to the user with a probability greater than 0.0001 per hour.	GPS III SV 1-8 shall not transmit MSI to the user with a probability greater than 0.0001 per hour.	GPS III SV 1-8 shall not transmit MSI to the user with a probability greater than 0.0000001 per hour.	TBD	GPS III SV 1-8 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	The system must fully support execution of joint critical	The system must fully support execution of all	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 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	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 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	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 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		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 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
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	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	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	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		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
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	to include SAASM, Spectrum, and JTRS requirements.	to include SAASM, Spectrum, and JTRS requirements.	SAASM, Spectrum and JTRS requirements.		SAASM, Spectrum, and JTRS requirements.
Sustainment--Materiel Availability	The achievement of the Availability of Position Accuracy KPP and Time Transfer Accuracy KPP Thresholds.	The achievement of the Availability of Position Accuracy KPP and Time Transfer Accuracy KPP Thresholds.	The achievement of the Availability of Position Accuracy KPP and Time Transfer Accuracy KPP Thresholds. [Threshold = Objective]	TBD	The achievement of the Availability of Position Accuracy KPP and Time Transfer Accuracy KPP Thresholds.

Requirements Source

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

Change Explanations

None

Memo

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

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
JTRS - Joint Tactical Radio System
KPP - Key Performance Parameter
lat - Latitude
long - Longitude
m - meter
MSI - Misleading SIS Information
ns - nanosecond
ORD - Operational Requirements Document
RMS - root-mean-square
SAASM - Selective Availability/Anti-Spoofing Module
SEP - Spherical Error Probable
SIS - Signal in Space
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 and Quantity

Appropriation	BY2012 \$M			BY2012 \$M	TY \$M		
	SAR Baseline Dev Est	Current APB Development Objective/Threshold		Current Estimate	SAR Baseline Dev Est	Current APB Development Objective	Current Estimate
RDT&E	3347.2	3347.2	3681.9	3341.8	3413.0	3413.0	3412.4
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	3341.8	3413.0	3413.0	3412.4

Confidence Level for Current APB Cost 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.

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

Cost and Funding

Funding Summary

Appropriation and Quantity Summary FY2015 President's Budget / December 2013 SAR (TY\$ M)

Appropriation	Prior	FY2014	FY2015	FY2016	FY2017	FY2018	FY2019	To Complete	Total
RDT&E	2006.1	373.1	299.8	282.1	212.4	118.3	120.6	0.0	3412.4
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 2015 Total	2006.1	373.1	299.8	282.1	212.4	118.3	120.6	0.0	3412.4
PB 2014 Total	2068.1	383.5	303.5	285.4	214.5	119.3	38.1	0.0	3412.4
Delta	-62.0	-10.4	-3.7	-3.3	-2.1	-1.0	82.5	0.0	0.0

In addition to above, the 2015 PB request includes \$41.5M of the Other Procurement Air Force funding. These funds are not a part of the approved OCX APB and will be transferred to Operations and Maintenance in a future budget cycle.

Quantity	Undistributed	Prior	FY2014	FY2015	FY2016	FY2017	FY2018	FY2019	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 2015 Total	1	0	0	0	0	0	0	0	0	1
PB 2014 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 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
2007	--	--	--	--	--	--	168.4
2008	--	--	--	--	--	--	249.5
2009	--	--	--	--	--	--	289.6
2010	--	--	--	--	--	--	288.4
2011	--	--	--	--	--	--	353.6
2012	--	--	--	--	--	--	347.0
2013	--	--	--	--	--	--	309.6
2014	--	--	--	--	--	--	373.1
2015	--	--	--	--	--	--	299.8
2016	--	--	--	--	--	--	282.1
2017	--	--	--	--	--	--	212.4
2018	--	--	--	--	--	--	118.3
2019	--	--	--	--	--	--	120.6
Subtotal	1	--	--	--	--	--	3412.4

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

Fiscal Year	Quantity	End Item Recurring Flyaway BY 2012 \$M	Non End Item Recurring Flyaway BY 2012 \$M	Non Recurring Flyaway BY 2012 \$M	Total Flyaway BY 2012 \$M	Total Support BY 2012 \$M	Total Program BY 2012 \$M
2007	--	--	--	--	--	--	181.0
2008	--	--	--	--	--	--	262.8
2009	--	--	--	--	--	--	301.1
2010	--	--	--	--	--	--	296.1
2011	--	--	--	--	--	--	356.3
2012	--	--	--	--	--	--	343.6
2013	--	--	--	--	--	--	301.1
2014	--	--	--	--	--	--	356.9
2015	--	--	--	--	--	--	281.6
2016	--	--	--	--	--	--	259.9
2017	--	--	--	--	--	--	191.9
2018	--	--	--	--	--	--	104.8
2019	--	--	--	--	--	--	104.7
Subtotal	1	--	--	--	--	--	3341.8

The total Research Development Test and Evaluation (RDT&E) costs listed in the table above does not include the contribution of \$82.3M (Then Year dollars (TY\$)) of civil funding to support OCX . The civil funding contribution in TY\$ is as follows:

FY 2011: \$13.2M

FY 2012: \$28.2M

FY 2013: \$27.8M

FY 2014: \$9.5M

FY 2015: \$2.8M

FY 2016: \$0.4M

FY 2017: \$0.4M

Low Rate Initial Production

There is no LRIP for this Program.

Foreign Military Sales

None

Nuclear Costs

None

Unit Cost

Unit Cost Report

	BY2012 \$M	BY2012 \$M	
Unit Cost	Current UCR Baseline (NOV 2012 APB)	Current Estimate (DEC 2013 SAR)	BY % Change

Program Acquisition Unit Cost (PAUC)

Cost	3347.2	3341.8	
Quantity	1	1	
Unit Cost	3347.200	3341.800	-0.16

Average Procurement Unit Cost (APUC)

Cost	0.0	0.0	
Quantity	0	0	
Unit Cost	--	--	--

	BY2012 \$M	BY2012 \$M	
Unit Cost	Original UCR Baseline (NOV 2012 APB)	Current Estimate (DEC 2013 SAR)	BY % Change

Program Acquisition Unit Cost (PAUC)

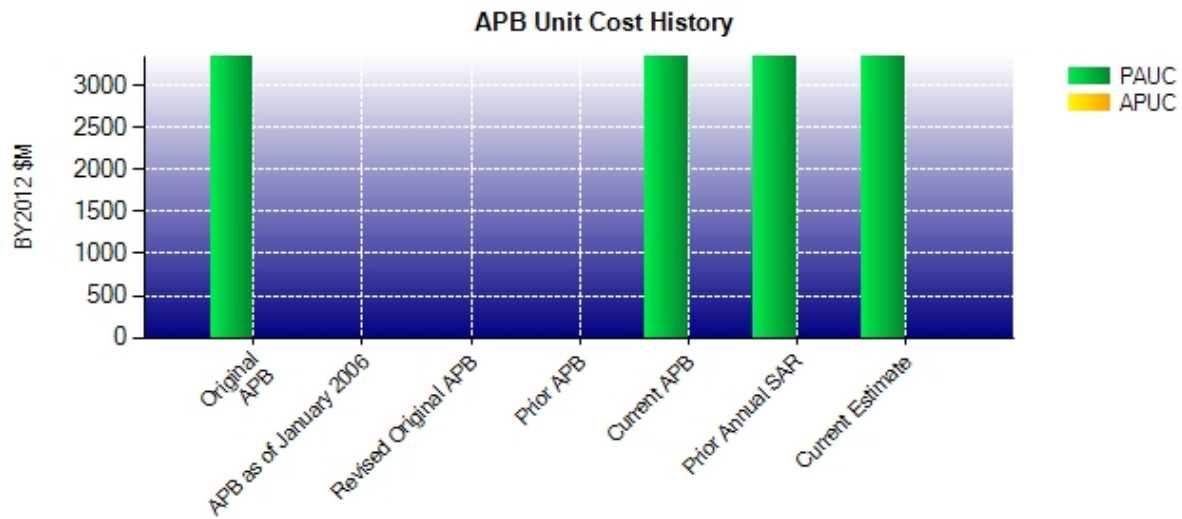
Cost	3347.2	3341.8	
Quantity	1	1	
Unit Cost	3347.200	3341.800	-0.16

Average Procurement Unit Cost (APUC)

Cost	0.0	0.0	
Quantity	0	0	
Unit Cost	--	--	--

PAUC is based on RDT&E costs and quantities only.

Unit Cost History



	Date	BY2012 \$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 2012	3335.700	N/A	3412.400	N/A
Current Estimate	DEC 2013	3341.800	N/A	3412.400	N/A

SAR Unit Cost History

Current SAR Baseline to Current Estimate (TY \$M)

Initial PAUC Dev Est	Changes								PAUC Current Est
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
3413.000	-3.200	0.000	0.000	0.000	2.600	0.000	0.000	-0.600	3412.400

Current SAR Baseline to Current Estimate (TY \$M)

Initial APUC Dev Est	Changes								APUC Current Est
	Econ	Qty	Sch	Eng	Est	Oth	Spt	Total	
0.000	--	--	--	--	--	--	--	--	0.000

APUC Unit Cost History is not available: No Initial APUC Estimate calculated due to lack of defined quantities.

SAR Baseline History

Item/Event	SAR Planning Estimate (PE)	SAR Development Estimate (DE)	SAR Production Estimate (PdE)	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	APR 2016
IOC	N/A	N/A	N/A	N/A
Total Cost (TY \$M)	N/A	3413.0	N/A	3412.4
Total Quantity	N/A	1	N/A	1
Prog. Acq. Unit Cost (PAUC)	N/A	3413.000	N/A	3412.400

Cost Variance

Summary Then Year \$M				
	RDT&E	Proc	MILCON	Total
SAR Baseline (Dev Est)	3413.0	--	--	3413.0
Previous Changes				
Economic	+11.9	--	--	+11.9
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	-12.5	--	--	-12.5
Other	--	--	--	--
Support	--	--	--	--
Subtotal	-0.6	--	--	-0.6
Current Changes				
Economic	-15.1	--	--	-15.1
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	+15.1	--	--	+15.1
Other	--	--	--	--
Support	--	--	--	--
Subtotal	--	--	--	--
Total Changes	-0.6	--	--	-0.6
CE - Cost Variance	3412.4	--	--	3412.4
CE - Cost & Funding	3412.4	--	--	3412.4

Summary Base Year 2012 \$M				
	RDT&E	Proc	MILCON	Total
SAR Baseline (Dev Est)	3347.2	--	--	3347.2
Previous Changes				
Economic	--	--	--	--
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	-11.5	--	--	-11.5
Other	--	--	--	--
Support	--	--	--	--
Subtotal	-11.5	--	--	-11.5
Current Changes				
Economic	--	--	--	--
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	+6.1	--	--	+6.1
Other	--	--	--	--
Support	--	--	--	--
Subtotal	+6.1	--	--	+6.1
Total Changes	-5.4	--	--	-5.4
CE - Cost Variance	3341.8	--	--	3341.8
CE - Cost & Funding	3341.8	--	--	3341.8

Previous Estimate: December 2012

RDT&E	\$M	
Current Change Explanations	Base Year	Then Year
Revised escalation indices. (Economic)	N/A	-15.1
Adjustment for current and prior escalation. (Estimating)	+6.1	+6.4
Increased costs for OCX development. (Estimating)	+72.4	+83.4
Sequestration reductions for FY 2013. (Estimating)	-28.1	-28.9
Congressional reductions for FY 2013. (Estimating)	-21.4	-22.0
Budgetary allocation for Small Business Innovative Research. (Estimating)	-10.8	-11.1
Non-pay inflation adjustment. (Estimating)	-2.2	-2.3
Congressional reductions for Federally Funded Research and Development Centers for FY 2014. (Estimating)	-0.4	-0.4
Additional Congressional reductions for FY 2014. (Estimating)	-9.5	-10.0
RDT&E Subtotal	+6.1	0.0

Contracts

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, Type	FA8807-10-C-0001, CPAF
Award Date	February 25, 2010
Definitization Date	February 25, 2010

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	972.1	N/A	1	1469.1	1440.1

Target Price Change Explanation

The difference between the Initial Contract Price Target and the Current Contract Price Target is due to increases in scope such as Technical Baseline efforts which include adding an interim Block 0 delivery, Request for Equitable Adjustments for GPS III system and satellite simulators, engineering studies, and Engineering Change Proposals offset by affordability efforts.

Variance	Cost Variance	Schedule Variance
Cumulative Variances To Date (1/26/2014)	-226.8	-39.6
Previous Cumulative Variances	-128.2	-17.8
Net Change	-98.6	-21.8

Cost and Schedule Variance Explanations

The unfavorable net change in the cost variance is due to an increased level of unplanned work and rework. The contractor struggled with incomplete systems engineering during coding, information assurance being more difficult than expected, and challenges with configuration and management of test/operational infrastructure.

The unfavorable net change in the schedule variance is due to an increased level of unplanned work and rework. The contractor struggled with incomplete systems engineering during coding, information assurance being more difficult than expected, and challenges with configuration and management of test/operational infrastructure.

Contract Comments

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

Deliveries and Expenditures

Delivered to Date	Plan 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	3412.4	Years Appropriated	8
Expended to Date	1955.1	Percent Years Appropriated	61.54%
Percent Expended	57.29%	Appropriated to Date	2379.2
Total Funding Years	13	Percent Appropriated	69.72%

The above data is current as of 2/28/2014.

Operating and Support Cost

GPS OCX

Assumptions and Ground Rules

Cost Estimate Reference:

Estimated Costs are part of the Service Cost Estimate supported by the Air Force Cost Analysis Agency as part of the Acquisition Program Baseline, dated November 19, 2012.

Sustainment Strategy:

O&S costs include all costs of operating, maintaining, and supporting the Global Positioning System III (GPS III) and GPS II legacy spacecraft from 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 the ground antenna and monitoring stations. 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.

O&S begins approximately eighteen months after Block 1 Ready to Transition to Operations (RTO) and assumes a ten year service life for this one system. 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.

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.

Antecedent Information:

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

Unitized O&S Costs BY2012 \$M		
Cost Element	GPS OCX Estimated Average Annual Costs Per System	GPS Operational Control System (OCS) (Antecedent) Actual Annual Costs from 2011 Per System
Unit-Level Manpower	13.700	12.100
Unit Operations	54.300	51.400
Maintenance	8.700	5.400
Sustaining Support	5.000	4.400
Continuing System Improvements	29.100	31.500
Indirect Support	4.600	0.500
Other	1.800	0.000
Total	117.200	105.300

Unitized Cost Comments:

The estimated GPS OCX average annual cost is slightly higher than the GPS OCS actuals due to higher lines-of-code size, included Commercial-Off-The-Shelf (COTS) refresh costs, slightly higher manpower estimates, and additional costs attributed to inflation uncertainty. Also, the GPS OCX estimate used estimating methodologies analogous to GPS OCS but were not based entirely on GPS OCS actuals.

The OCX cost estimate over ten years totals to \$1153.7M plus \$18.4M for Other costs (depot stand-up) equals \$1172.1M (BY 2012).

	Total O&S Cost \$M			
	Current Development APB Objective/Threshold		Current Estimate	
	GPS OCX		GPS OCX	GPS Operational Control System (OCS) (Antecedent)
Base Year	1380.9	1518.2	1172.1	N/A
Then Year	1469.0	N/A	1469.0	N/A

Total O&S Costs Comments:

The BY objective value estimate in the APB (\$1380.9M) was incorrectly calculated. After the correct application of the indices, the corrected BY objective value should reflect \$1172.1M. This is accurately reflected in the current estimate.

Disposal Costs:

There are no disposal costs. Disposal costs will be included in future ground segment estimates.