Selected Acquisition Report (SAR)

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

Next Generation Operational Control System (GPS OCX)

As of December 31, 2012

Defense Acquisition Management
Information Retrieval
(DAMIR)

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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

This is the initial submission for the Global Positioning System (GPS) Next Generation Operational Control System (OCX) program.

The OCX program received Milestone B approval in November 2012 and was authorized to begin Engineering Manufacturing Development. In addition, an Acquisition Decision Memorandum and an updated Acquisition Program Baseline were signed by the Milestone Decision Authority, Under Secretary of Defense for Acquisition, Technology and Logistics (USD(AT&L)). The program is on track for OCX Block 0 delivery to support launch and checkout of the first GPS III satellite in 2015.

In 2012, OCX completed development and testing of two software iterations, Iteration 1.3 in April 2012 and Iteration 1.4 in August 2012. With four of the seven software iterations planned for OCX Block 1 now coded and tested, approximately 72% of OCX Block 0 (a subset of OCX Block 1) and 50% of OCX Block 1 software development effort is complete. Development and coding is also underway for the final iteration required for OCX Block 0 (Iteration 1.5), which is scheduled to complete and enter formal qualification testing in 2013. The critical infrastructure for OCX's information assurance and cyber defense controls was developed in 2012 and is planned to be completed and begin formal testing and accreditation in 2013.

The OCX Block 0 hardware was configured and installed in June 2012. In August 2012, the OCX and GPS III teams utilized the OCX Block 0 hardware and Iteration 1.4 software to complete the first GPS III launch exercise. This launch exercise significantly reduced risk for both GPS III and OCX by demonstrating processing of satellite commands and telemetry between the GPS III satellite simulator and the OCX baseline.

OCX is a software intensive program and has experienced some significant development issues in 2012. The software development issues stemmed from lack of rigorous systems engineering for Iterations 1.4 and 1.5 prior to code development and challenges implementing the complete set of information assurance requirements for OCX Block 0 (LCS). Currently, the contractor is completing the systems engineering tasks and the necessary rework for Iteration 1.5 where required. The developer has implemented the first set of information assurance controls necessary to obtain an interim authority to test and is expected to complete the remaining controls for OCX Block 0 (LCS) in 2013. These development issues potentially delay OCX Block 0 (LCS) and Block 1 by 2-4 months. Corrective action plans are being put into place in 2013 to minimize likelihood of re-occurrence in future iterations.

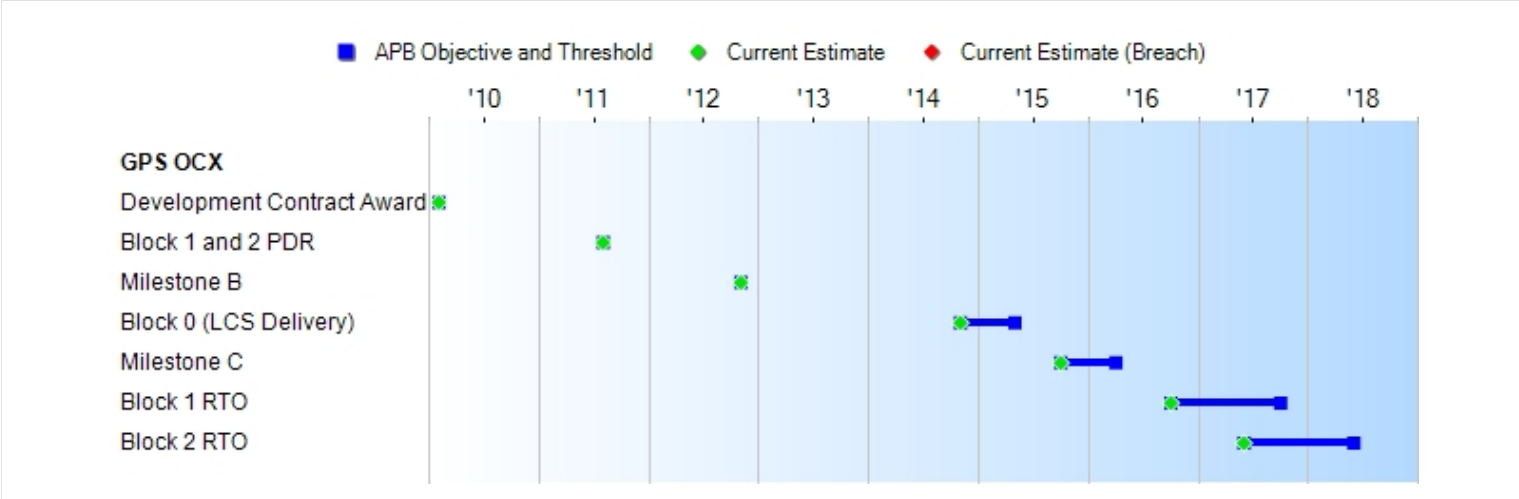
In November 2012, in conjunction with the Milestone B decision, certification was made pursuant to section 2366b of title 10, United States Code. Based on program maturity, GPS OCX was deemed ready to enter the Engineering and Manufacturing (EMD) phase. The USD(AT&L) certified (with waivers) the 2366b provisions (a)(1)(B) and (a)(1)(D) in accordance with subsection (d). The USD(AT&L) will continue periodic reviews, in accordance with subsection (d)(2)(B) until a determination can be made for any of the two waived provisions. For provisions (a)(1)(B) and (a)(1)(D), the Air Force has committed to work in the out-year budgeting process to realign program funding in accordance with the Service Cost Position (SCP).

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	NOV 2014
Milestone C	OCT 2015	OCT 2015	APR 2016	OCT 2015
Block 1 RTO	OCT 2016	OCT 2016	OCT 2017	OCT 2016
Block 2 RTO	JUN 2017	JUN 2017	JUN 2018	JUN 2017

Acronyms And Abbreviations

LCS - Launch and Checkout System
PDR - Preliminary Design Review
RTO - Ready to Transition to Operations

Change Explanations

None

Memo

RTO will be achieved when the Control Segment can support GPS III Space Vehicles 1-8 and operational Block II satellites, can monitor broadcast GPS navigation signals, and can support Navigation Warfare (NAVWAR) mission planning by Joint Space Operations Center (JSpOC). At RTO, the system is turned over to the operational community.

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 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%)	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 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%)
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	The system must fully support execution of	The system must fully support execution of	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	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	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 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		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 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	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	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		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.	to include SAASM, Spectrum, and JTRS requirements.	SAASM, Spectrum and JTRS requirements.		to include 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

Acronyms And Abbreviations

AF - Air Force
APB - Acquisition Program Baseline
ATO - Authorization To Operate
DAA - Designated Approval Authority
DoD - Department of Defense
FCS - Future Combat System
GESP - GIG Enterprise Service Profiles
GIG - Global Information Grid
GPS - Global Positioning System
IATO - Initial Approval 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
TBD - To Be Determined
TV - Technical View
UE - User Equipment
UEE - User Equipment Error

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.

Track To Budget

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

Cost and Funding

Cost Summary

Total Acquisition Cost and Quantity

	BY2012 $M			BY2012 $M	TY $M		
Appropriation	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	3335.7	3413.0	3413.0	3412.4
Procurement	0.0	0.0	--	0.0	0.0	0.0	0.0
Flyaway	0.0	--	--	0.0	0.0	--	0.0
Recurring	0.0	--	--	0.0	0.0	--	0.0
Non Recurring	0.0	--	--	0.0	0.0	--	0.0
Support	0.0	--	--	0.0	0.0	--	0.0
Other Support	0.0	--	--	0.0	0.0	--	0.0
Initial Spares	0.0	--	--	0.0	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	3335.7	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.

The table above includes costs for OCX Blocks 1 and 2 Ready to Transition to Operations (RTO). The total RDT&E costs listed in the table does not include a contribution of $82.3M (Then Year dollars) of civil funding to support OCX. Per Presidential Directive: "U.S. Space-Based Positioning, Navigation, and Timing Policy," dated December 15, 2004**,** the Secretary of Transportation shall provide resources to the Secretary of Defense for assessment, development, acquisition, implementation, operation, and sustainment of additional designated Global Positioning System civil capabilities contained in the current Global Positioning System program. Global Positioning System civil signal performance monitoring, augmentations, and other unique positioning, navigation, and timing capabilities will be funded by the agency or agencies requiring those services or capabilities, including out-year procurement and operations costs. Any new technical features proposed and funded by the civil agencies shall not degrade or displace existing or planned national security functions of the system. Therefore, the cost information identified above represents the total funding contribution from the Air Force. To satisfy both military and new civil capabilities (beyond the second and third military signals) there is also a civil funding contribution, which is not included in the table above. Funding requirements for new civil capabilities are documented in the 5-Year National Space-Based Positioning, Navigation, and Timing Plan and approved by the Deputy Secretaries of Defense and Transportation. Those costs will be booked against the

appropriate block.

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

Development delivery completion is expected in FY 2019, after the Block 2 Ready to Transition to Operations milestone is complete.

Cost and Funding

Funding Summary

Appropriation and Quantity Summary
FY2014 President's Budget / December 2012 SAR (TY$ M)

Appropriation	Prior	FY2013	FY2014	FY2015	FY2016	FY2017	FY2018	To Complete	Total
RDT&E	1696.5	371.6	383.5	303.5	285.4	214.5	119.3	38.1	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 2014 Total	1696.5	371.6	383.5	303.5	285.4	214.5	119.3	38.1	3412.4
	--	--	--	--	--	--	--	--	--

"To Complete" values reflect completion of OCX Block 1 and 2.

In addition to above, the Other Procurement Air Force funding (total of $27.2M) is included in the 2014 President's Budget Request, but is not part of the approved OCX program baseline: These funds will be transferred to Operations & Maintenance in a future budget cycle and are not recorded in the Procurement area of the SAR.

Program funding and production quantities listed in this SAR are consistent with the FY 2014 President's Budget (PB). The FY 2014 PB did not reflect the enacted DoD appropriation for FY 2013, nor sequestration; it reflected the President's requested amounts for FY 2013.

Quantity	Undistributed	Prior	FY2013	FY2014	FY2015	FY2016	FY2017	FY2018	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 2014 Total	1	0	0	0	0	0	0	0	0	1
	--	--	--	--	--	--	--	--	--	--

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	--	--	--	--	--	--	371.6
2014	--	--	--	--	--	--	383.5
2015	--	--	--	--	--	--	303.5
2016	--	--	--	--	--	--	285.4
2017	--	--	--	--	--	--	214.5
2018	--	--	--	--	--	--	119.3
2019	--	--	--	--	--	--	38.1
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	--	--	--	--	--	--	181.1
2008	--	--	--	--	--	--	263.1
2009	--	--	--	--	--	--	301.4
2010	--	--	--	--	--	--	296.3
2011	--	--	--	--	--	--	356.2
2012	--	--	--	--	--	--	342.6
2013	--	--	--	--	--	--	358.9
2014	--	--	--	--	--	--	363.4
2015	--	--	--	--	--	--	282.3
2016	--	--	--	--	--	--	260.5
2017	--	--	--	--	--	--	192.1
2018	--	--	--	--	--	--	104.9
2019	--	--	--	--	--	--	32.9
Subtotal	**1**	**--**	**--**	**--**	**--**	**--**	**3335.7**

The FY 2019 program baseline amount of $38.1M differs from the R-DOCs "To Complete" amount of $130.5M. This $92.4M difference is because the SAR covers only the OCX content through Block 2. The System Engineering and Integration (SE&I) efforts (which are required to ensure GPS Enterprise Integration between Ground, Space, and User Equipment) will be required past OCX Block 2.

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 Low Rate Initial Production (LRIP) for the GPS OCX program.

Foreign Military Sales

None

Nuclear Cost

None

Unit Cost

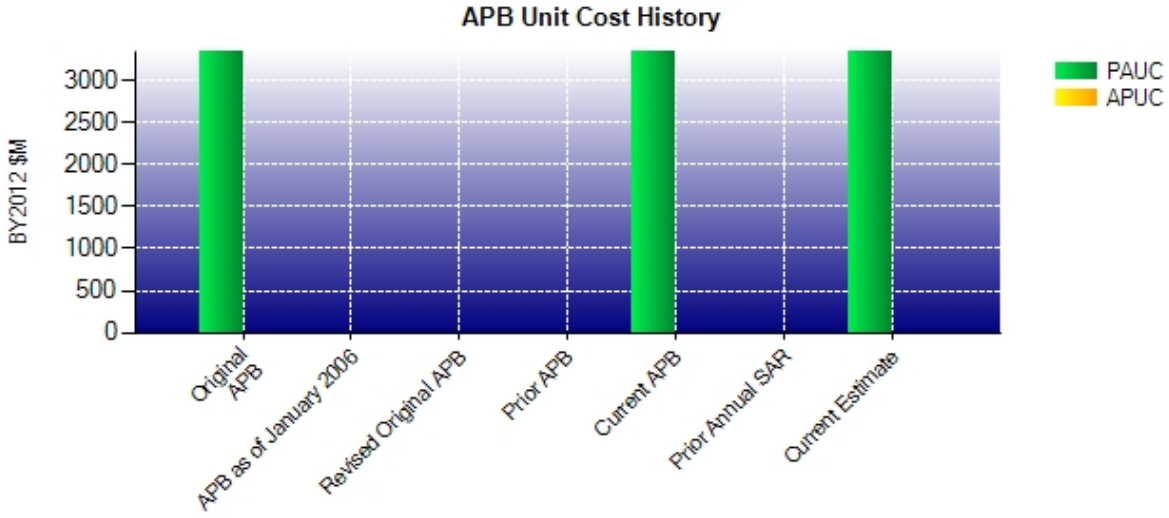
Unit Cost Report

Unit Cost	BY2012 $M Current UCR Baseline (NOV 2012 APB)	BY2012 $M Current Estimate (DEC 2012 SAR)	BY % Change
Program Acquisition Unit Cost (PAUC)			
Cost	3347.2	3335.7	
Quantity	1	1	
Unit Cost	3347.200	3335.700	-0.34
Average Procurement Unit Cost (APUC)			
Cost	0.0	0.0	
Quantity	0	0	
Unit Cost	--	--	--

Unit Cost	BY2012 $M Original UCR Baseline (NOV 2012 APB)	BY2012 $M Current Estimate (DEC 2012 SAR)	BY % Change
Program Acquisition Unit Cost (PAUC)			
Cost	3347.2	3335.7	
Quantity	1	1	
Unit Cost	3347.200	3335.700	-0.34
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



		BY2012 $M		TY $M	
	Date	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	N/A	N/A	N/A	N/A	N/A
Current Estimate	DEC 2012	3335.700	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	11.900	0.000	0.000	0.000	-12.500	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	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

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	OCT 2015
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	--	--	--	--
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	--	--	--	--
Other	--	--	--	--
Support	--	--	--	--
Subtotal	--	--	--	--
Current Changes				
Economic	+11.9	--	--	+11.9
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	-12.5	--	--	-12.5
Other	--	--	--	--
Support	--	--	--	--
Subtotal	-0.6	--	--	-0.6
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	--	--	--	--
Other	--	--	--	--
Support	--	--	--	--
Subtotal	--	--	--	--
Current Changes				
Economic	--	--	--	--
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	-11.5	--	--	-11.5
Other	--	--	--	--
Support	--	--	--	--
Subtotal	-11.5	--	--	-11.5
Total Changes	-11.5	--	--	-11.5
CE - Cost Variance	3335.7	--	--	3335.7
CE - Cost & Funding	3335.7	--	--	3335.7

Initial SAR - Above variances (if any) reflect changes since the SAR Baseline/APB.
SAR Baseline Reference: Defense Acquisition Executive (DAE) Approved Acquisition Program Baseline (APB) dated November 19, 2012

RDT&E	$M	
Current Change Explanations	**Base Year**	**Then Year**
Revised escalation indices. (Economic)	N/A	+11.9
Adjustment for current and prior escalation. (Estimating)	+7.9	+7.3
Revised estimate to reflect the application of new escalation indices (Estimating)	-17.9	-19.8
Adjustment to reflect OCX prior year allocation actuals (Estimating)	-1.5	0.0
RDT&E Subtotal	-11.5	-0.6

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	967.2	N/A	1	1150.5	1235.2

Variance	Cost Variance	Schedule Variance
Cumulative Variances To Date (3/31/2013)	-128.2	-17.8
Previous Cumulative Variances	--	--
Net Change	-128.2	-17.8

Cost And Schedule Variance Explanations

The unfavorable cumulative cost variance is due to more effort than planned to support System Design Review and Preliminary Design Review closure, software systems engineering and development for Iterations 1.2, 1.3, and 1.4, and information assurance coding and development.

The unfavorable cumulative schedule variance is due to more effort than planned for systems engineering and design of software Iteration 1.5.

Contract Comments

This is the first time this contract is being reported.

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.

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 To Date	Plan To Date	Actual To Date	Total Quantity	Percent Delivered
Development	0	0	1	0.00%
Production	0	0	0	--
Total Program Quantities Delivered	0	0	1	0.00%

Expenditures and Appropriations (TY $M)			
Total Acquisition Cost	3412.4	Years Appropriated	7
Expenditures To Date	1740.9	Percent Years Appropriated	53.85%
Percent Expended	51.02%	Appropriated to Date	2068.1
Total Funding Years	13	Percent Appropriated	60.61%

The above data is current as of 5/1/2013.

Operating and Support Cost

GPS OCX

Assumptions and Ground Rules

Cost Estimate Reference:

Estimated Annual 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:

Operating and Support (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.

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).

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	13.7	12.1
Unit Operations	54.3	51.4
Maintenance	8.7	5.4
Sustaining Support	5.0	4.4
Continuing System Improvements	29.1	31.5
Indirect Support	4.6	0.5
Other	1.8	0.0
Total	117.2	105.3

Unitized Cost Comments:
None

	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 Base Year (BY) estimate in the Acquisition Program Baseline ($1380.9M) was incorrectly calculated. The new BY of $1172.1M accurately reflects the correct BY conversion.

Disposal Costs

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