Selected Acquisition Report (SAR)

RCS: DD-A&T(Q&A)823-447

Military Global Positioning System (GPS) User Equipment Increment 1 (MGUE Inc 1)

As of FY 2020 President's Budget

Defense Acquisition Management
Information Retrieval
(DAMIR)

Table of Contents

Sensitivity Originator

No originator info Available at this time.

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)
USD(A&S) - Under Secretary of Defense (Acquisition and Sustainment)

Program Information

Program Name
Military Global Positioning System (GPS) User Equipment Increment 1 (MGUE Inc 1)

DoD Component
Air Force

Responsible Office

Col Steven Whitney
483 N. Aviation
El Segundo, CA 90245

steven.whitney.1@us.af.mil

Phone: 310-653-3001
Fax: 310-653-3005
DSN Phone: 633-3001
DSN Fax: 633-3005
Date Assigned: July 8, 2015

References

SAR Baseline (Development Estimate)

Defense Acquisition Executive (DAE) Approved Acquisition Program Baseline (APB) dated January 18, 2017

Approved APB

Defense Acquisition Executive (DAE) Approved Acquisition Program Baseline (APB) dated January 18, 2017

Mission and Description

The Global Positioning System (GPS) is a space based Positioning, Navigation, and Timing (PNT) 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 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 objective of the Military GPS User Equipment Increment 1 (MGUE Inc 1) program is to deliver affordable advanced GPS capabilities to military users as rapidly as possible to meet the PNT needs of a broad user base. The MGUE program is developing standard, modernized receiver form factors and will integrate them into the Service nominated lead platforms. This new family of modernized GPS receivers will deliver improved capabilities to counter current and emerging PNT threats and enable military operations in a Navigation Warfare environment.

Executive Summary

Program Highlights Since Last Report

Three contractors are producing MGUE Inc 1 Military Code (M-Code) receivers: L3 Technologies (L3T), Raytheon (RTN) and Collins Aerospace (formerly Rockwell Collins). All three contractors are producing a ground card, and RTN and Collins Aerospace are producing an aviation/maritime card. After lead platform Operational Test, the Services will procure and sustain MGUE Inc 1 receivers for their lead platforms and any other platforms they choose to equip. To assist the platforms, the GPS User Equipment Division will provide MGUE card-level Integration Guides for the integration of the MGUE GPS Receiver Application Module Standard Electronic Module (GRAM-S/M) and Ground Based GRAM Modernized (GB-GRAM-M) receiver cards.

The formal requirements sell-off plan for MGUE Inc 1 Integrated System Test 3-3 has gaps that are not directly testable by the Government and will require leveraging of contractor data to support verification activities. For requirements not tested by the Lead Developmental Test Organization (LDTO), the Program Office worked jointly with the LDTO and vendors to develop a requirement sell-off plan which uses vendor data. The requirements sell-off plan will be validated and proven with the first vendor, L3T, and then applied to each subsequent vendor to reduce risk going forward. The Program Office has received L3T's GB-GRAM-M test data which will be used for this purpose. The Consolidated Verification Review Board process will review test data from vendor and LDTO testing to verify requirements throughout the verification process to support the MGUE program APB milestone for the 1st vendor GB-GRAM-M. This issue will be closed when the requirements sell-off plan is successfully demonstrated in support of the GB-GRAM-M Technical Requirements Verification (TRV), which is scheduled to be complete at the end of March 2019. Additionally, the LDTO is conducting the final run for record test of the L3T GB-GRAM-M. Deficiencies with the GB-GRAM-M's implementation of functional and performance requirements include: Built-In-Test functionality, Time To First Fix, Radio Frequency Antenna and Auxiliary Power Detection, Time To Subsequent Fix and Integrity requirements. While some performance liens are expected with TRV, early test results indicate that they don't impact KPPs or key system attributes, and the program office intends to correct them prior to lead platform operational test.

There is a potential loss of Trusted Foundry for MGUE digital Application Specific Integrated Circuits (ASICs). To mitigate this issue, the program office has placed 14 nanometer (nm) ASIC early design work on contract through special studies and continue to work closely with the Defense Micro-Electronics Activity to achieve International Traffic in Arms Regulations (ITAR) and Trust compliance for GlobalFoundries 14nm ASIC design and manufacturing process. GlobalFoundries agreed to Cat 1B trust and DASD(SE), Defense Technology Security Administration, and the Department of State continue to lay out ITAR way forward. Contract modification is in progress to baseline effort to the Next-Gen ASIC Preliminary Design Review and to add obfuscation requirements to support the Commodities Jurisdictions request. This effort is planned to complete by September 2019.

Requirements have evolved since establishing the MGUE APB in January 2017. On March 28, 2017, the joint requirements community sent a legacy weapons initialization (also known as Hot Start) requirements clarification memorandum for Enterprise Hot Start (M-Code only). In July 2017, the Program Office released Request For Proposals to all 3 vendors for an Engineering Change Proposal-5 solution and received proposals in November 2017. The Program Office completed an impact analysis of the solution. Initial assessment indicates Enterprise Hot Start solution delivers past the current APB milestones. Should it be incorporated into the technical baseline, the additional cost of implementing it, inclusive of the lead platforms integration and test efforts, will exceed the ICE for MGUE Inc 1. The program office is validating performance via testing as part of the agreement with Headquarters Air Force Space Command to inform way ahead on Enterprise Hot Start implementation.

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

History of Significant Developments Since Program Initiation

History of Significant Developments Since Program Initiation	
Date	**Significant Development Description**
May 2003	The Global Positioning System (GPS) Directorate first issued Program Research and Development Announcement (PRDA) contracts in 2003 to achieve technology demonstration of early MGUE concepts.
May 2006	The GPS Program Office continued the work of the PRDA contracts via three competitively awarded Modernized User Equipment development contracts in 2006.
June 2006	The Secretary of the Air Force submitted an Analysis of Alternatives (AoA) providing Congress with a summary of the studies conducted to modernize GPS. The AoA found that developing new Military-Code signals as the most cost effective solution to mitigate growing denial of service and integrity threats to the warfighter.
April 2012	USD(AT&L) approved the Milestone A ADM and 2366a certifications were made for the MGUE Inc 1 program, initiating awarding technology development contracts. Materiel Development Decision approved for Inc 2 and MGUE Inc 2 designated as a pre-MDAP with the Air Force as lead.
September 2012	Competitively awarded three technology development contracts to Raytheon, L-3 Interstate Electronics Corporation, and Rockwell Collins Inc.
February 2014	USD(AT&L) signed an ADM to accelerate the MGUE Inc 1 effort via a combined Milestone B/C. This ADM added software risk reduction efforts and accelerated delivery of security certification and test material into the Technology Development phase of the MGUE Inc 1 program previously planned for the EMD phase.
June 2014	In response to the February 2014 ADM, the GPS Directorate awarded Engineering Change Proposals (ECPs) on all three MGUE Inc 1 development contracts to add software development risk reductions scope.
July 2014	JROC operational requirements approved. Four KPPs identified in the CDD: (1) Positioning, Navigation, and Timing (PNT) Determination, (2) PNT Accuracy, (3) Integrity and (4) Cryptography, Security Architecture, and Key Distribution.
September 2014	MGUE Inc 1 Preliminary Design Reviews were completed by all three MGUE vendors.
November 2014	Completed a MGUE Technology Readiness Assessment indicating all critical technologies were at a Technology Readiness Level of 6 or higher.
January 2015	In response to the February 2014 ADM, the GPS Directorate awarded ECPs on all three MGUE Inc 1 development contracts for additional test hardware deliveries.
April 2015	USD(AT&L) signed an updated Acquisition Strategy capturing accelerated approach.
June 2015	Existing contracts modified again adding resiliency and increasing software assurance.
October 2016	L3 Technologies (L3T) became the first MGUE contractor to receive security and compatibility certification.
January 2017	USD(AT&L) approved the MGUE Inc 1 2366B certifications and determinations, the Milestone B APB and ADM, and established MGUE Inc 1 as an ACAT ID MDAP. The ADM also relieved the program of Milestone C as production decisions will be made by the hosting platforms.
March 2017	PEO Ammunition conducted a Live Fire event at Yuma Proving Ground to assess the maturity of MGUE Inc 1 technology for Precision Guided Munitions (PGMs). Conducted a combination of 5 ballistic trajectory shots and 3 First-Ever M-Code Guide-to-Hit test shots for each of the two vendors using a U.S. government-designed 81mm Mortar PGM.
July 2017	Four B-2 Developmental flight tests to confirm B-2 Operational Flight Program compatibility using an

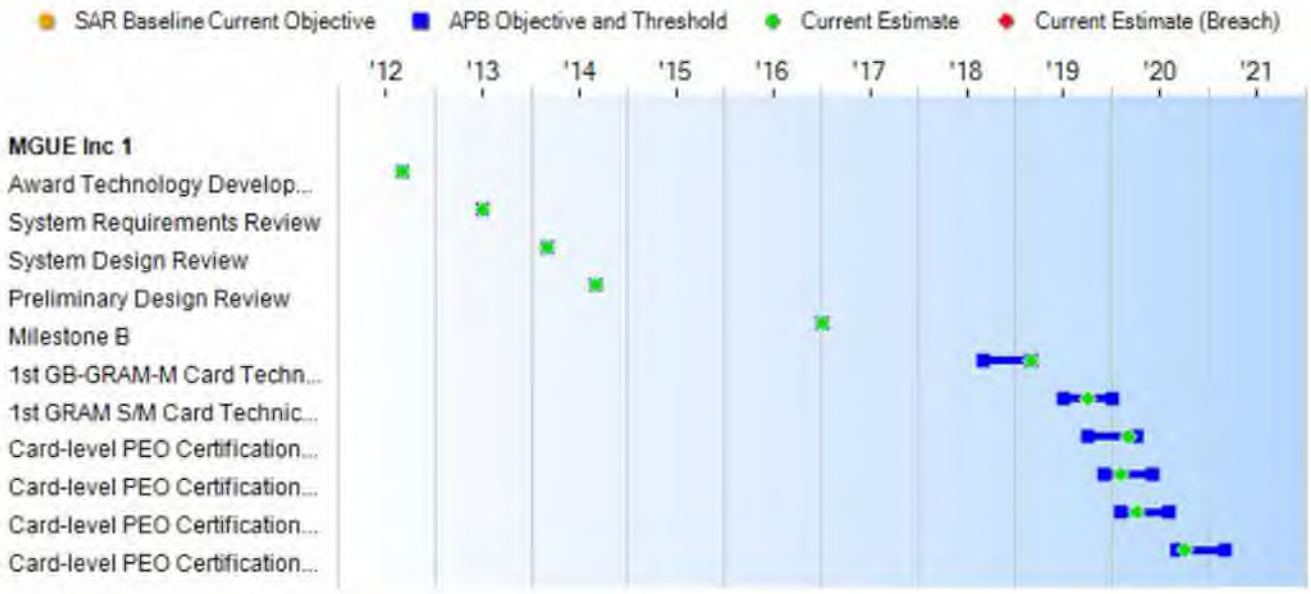
	MGUE-based prototype Miniature Airborne Global Positioning System Receiver 2000 M-Code completed on July 14, 2017.
November 2017	USD(AT&L) delegated the MDA to the Secretary of the Air Force as an ACAT IC.
December 2017	All three MGUE contracts updated with ECP 4 for Roving Channel Hot Start modification.
May 2018	Completed the 1st edition MGUE Integration Guides, fulfilling an MGUE Increment 1 APB Exit Criteria.
May 2018	US Navy Communications and Navigation GPS Program Office awarded a contract modification to support M-Code Integration efforts aligning the GPS-based PNT Service development effort with MGUE program objectives and delivery schedules with Roving Channel Hot Start capabilities.
June 2018	United States Marine Corps (USMC) Joint Light Tactical Vehicle (JLTV) Joint Program Office delivered the five JLTVs to be used for the upcoming USMC lead platform integration.
August 2018	L3T's Ground Based GPS Receiver Applications Module (GB-GRAM) Modernized (GB-GRAM-M) card successfully completed Electromagnetic Interference/Electromagnetic Compatibility, Environmental, and Reliability testing.
August 2018	L3T received GB-GRAM-M delta security certification.
September 2018	L3T received GB-GRAM-M delta security approval.
November 2018	Raytheon received GPS Receiver Application Module Standard Electronic Module (GRAM-S/M) initial security certification.

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



Schedule Events					
Events	**SAR Baseline Development Estimate**	**Current APB Development Objective/Threshold**		**Current Estimate**	
Award Technology Development Contract	Sep 2012	Sep 2012	Sep 2012	Sep 2012	
System Requirements Review	Jul 2013	Jul 2013	Jul 2013	Jul 2013	
System Design Review	Mar 2014	Mar 2014	Mar 2014	Mar 2014	
Preliminary Design Review	Sep 2014	Sep 2014	Sep 2014	Sep 2014	
Milestone B	Jan 2017	Jan 2017	Jan 2017	Jan 2017	
1st GB-GRAM-M Card Technical Requirements Verification	Sep 2018	Sep 2018	Mar 2019	Mar 2019	
1st GRAM S/M Card Technical Requirements Verification	Jul 2019	Jul 2019	Jan 2020	Oct 2019	(Ch-1)
Card-level PEO Certification for DDG	Oct 2019	Oct 2019	Apr 2020	Mar 2020	(Ch-2)
Card-level PEO Certification for JLTV	Dec 2019	Dec 2019	Jun 2020	Feb 2020	(Ch-3)
Card-level PEO Certification for B-2	Feb 2020	Feb 2020	Aug 2020	Apr 2020	(Ch-4)
Card-level PEO Certification for Stryker	Sep 2020	Sep 2020	Mar 2021	Oct 2020	(Ch-5)

Change Explanations

(Ch-1) The 1st GRAM-S/M Card Technical Requirements Verification changed from July 2019 to October 2019 due to increase in duration of testing.
(Ch-2) The card-level PEO Certification for DDG changed from January 2020 to March 2020 due to a delay in completing the software build necessary for testing.
(Ch-3) The card-level PEO Certification for JLTV changed from December 2019 to February 2020 due to an increased duration of completing software development related tasks.
(Ch-4) The card-level PEO Certification for B-2 changed from February 2020 to April 2020 due to increased fidelity in MAGR -2K-M test requirements and activities.
(Ch-5) The card-level PEO Certification for Stryker changed from September 2020 to October 2020 due to an increase in testing and integration activities.

Acronyms and Abbreviations

B-2 - US Air Force B-2 Bomber
DDG - Arleigh Burke Class Guided Missile Destroyer
GB-GRAM-M - Ground Based GRAM Modernized
GRAM - GPS Receiver Applications Module
GRAM S/M - GRAM Standard Electronic Module
JLTV - US Marine Corps Joint Light Tactical Vehicle

Performance

Performance Characteristics				
SAR Baseline Development Estimate	**Current APB Development Objective/Threshold**		**Demonstrated Performance**	**Current Estimate**
PNT Determination				
MGUE shall use M-Code, P(Y)-Code, and C/ACode; MGUE shall be capable of acquiring M-Code in the presence of J/S≤ 41 dB; MGUE shall use GPS signals needed to determine PNT in BFEA environments.	MGUE shall use M-Code, P(Y)-Code, and C/ACode; MGUE shall be capable of acquiring M-Code in the presence of J/S≤ 41 dB; MGUE shall use GPS signals needed to determine PNT in BFEA environments.	(T=O) MGUE shall use M-Code, P(Y)-Code, and C/ACode; MGUE shall be capable of acquiring M-Code in the presence of J/S≤ 41 dB; MGUE shall use GPS signals needed to determine PNT in BFEA environments.	TBD	MGUE shall use M-Code, P(Y)-Code, and C/ACode; MGUE shall be capable of acquiring M-Code in the presence of J/S≤ 41 dB; MGUE shall use GPS signals needed to determine PNT in BFEA environments.
PNT Accuracy				
Ground: 10.0 m H, 20.0 m V, 0.1 m/s (velocity, per axis) and 100 nsec; Aviation: 3.0 m H, 5.25 m V and 30 nsec; Maritime: 7.0 m H, 12.5 m V and 50 nsec.	Ground: 10.0 m H, 20.0 m V, 0.1 m/s (velocity, per axis) and 100 nsec; Aviation: 3.0 m H, 5.25 m V and 30 nsec; Maritime: 7.0 m H, 12.5 m V and 50 nsec.	(T=O) Ground: 10.0 m H, 20.0 m V, 0.1 m/s (velocity, per axis) and 100 nsec; Aviation: 3.0 m H, 5.25 m V and 30 nsec; Maritime: 7.0 m H, 12.5 m V and 50 nsec.	TBD	Ground: 10.0 m H, 20.0 m V, 0.1 m/s (velocity, per axis) and 100 nsec; Aviation: 3.0 m H, 5.25 m V and 30 nsec; Maritime: 7.0 m H, 12.5 m V and 50 nsec.
Integrity				
Ground: MGUE shall reject invalid GPS signals 99% of the time so they are not used in the PNT solution; MGUE shall detect and reject MSI provided from GPS satellites and reject that data from the PNT solution. Aviation: MGUE shall report when GPS should not be used for PNT. Maritime: MGUE shall report when GPS should not be used for PNT.	Ground: MGUE shall reject invalid GPS signals 99% of the time so they are not used in the PNT solution; MGUE shall detect and reject MSI provided from GPS satellites and reject that data from the PNT solution. Aviation: MGUE shall report when GPS should not be used for PNT. Maritime: MGUE shall report when GPS should not be used for PNT.	(T=O) Ground: MGUE shall reject invalid GPS signals 99% of the time so they are not used in the PNT solution; MGUE shall detect and reject MSI provided from GPS satellites and reject that data from the PNT solution. Aviation: MGUE shall report when GPS should not be used for PNT. Maritime: MGUE shall report when GPS should not be used for PNT.	TBD	Ground: MGUE shall reject invalid GPS signals 99% of the time so they are not used in the PNT solution; MGUE shall detect and reject MSI provided from GPS satellites and reject that data from the PNT solution. Aviation: MGUE shall report when GPS should not be used for PNT. Maritime: MGUE shall report when GPS should not be used for PNT.

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

Requirements Reference

CDD dated May 9, 2014 as approved and validated by JROC memorandum 077-14 dated July 24, 2014

Change Explanations

None

Acronyms and Abbreviations

BFEA - Blue Force Electronic Attack
C/A - Coarse Acquisition
dB - Decibel
GPS - Global Positioning System
H - Horizontal
J/S - Jamming-to-Signal Ratio
m - Meter
m/s - Meter(s) Per Second
M-Code - Military Code
MSI - Misleading Signal in Space Information
NSA - National Security Agency
nsec - Nanosecond
O - Objective
P(Y) - Encrypted Precision
PNT - Position, Navigation, and Timing
T - Threshold
V - Vertical

Track to Budget

RDT&E

Appn	BA	PE		
Air Force	3600	07	0301004F	
	Project	**Name**		
	677517	Resiliency and Software Assurance Modification		(Sunk)
Air Force	3600	04	0305164F	
	Project	**Name**		
	643833	Military Global Positioning System User Equip		(Sunk)
Air Force	3600	07	0305164F	
	Project	**Name**		
	673028	NAVSTAR Global Positioning System (User Equipment) (SPACE)		(Sunk)
Air Force	3600	04	1203164F	
	Project	**Name**		
	643833	Military Global Positioning System User Equip	(Shared)	
	Notes:	MGUE Inc 1 and Inc 2		

Cost and Funding

Cost Summary

Total Acquisition Cost							
Appropriation	BY 2017 $M			BY 2017 $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	1505.7	1505.7	1656.3	1419.5	1531.2	1531.2	1446.6
Procurement	0.0	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	0.0
Acq O&M	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	1505.7	1505.7	N/A	1419.5	1531.2	1531.2	1446.6

Current APB Cost Estimate Reference

MGUE Increment 1 ICE dated January 12, 2017

Cost Notes

No cost estimate for the program has been completed in the previous year.

The MGUE Inc 1 program includes $112.6M of external funding to support the MGUE Inc 1 Resiliency and Software Assurance Modification effort. Additionally, program includes $3.1M of external funding for a next generation Application Specific Integrated Circuit study. The $115.7M of RDT&E funds are included in the APB, but not included in the table above.

The MGUE Inc 1 program baseline does not include procurement or sustainment, however, maintenance of the MGUE technical baseline remains an enduring responsibility for the Global Positioning System program office throughout the acquisition and O&S phases.

This program does not have an antecedent system.

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

Cost and Funding

Funding Summary

Appropriation Summary FY 2020 President's Budget / December 2018 SAR (TY$ M)									
Appropriation	Prior	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	To Complete	Total
RDT&E	1036.3	180.5	142.6	76.3	10.9	0.0	0.0	0.0	1446.6
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 2020 Total	1036.3	180.5	142.6	76.3	10.9	0.0	0.0	0.0	1446.6
PB 2019 Total	1076.1	180.5	103.6	71.3	0.0	0.0	0.0	0.0	1431.5
Delta	-39.8	0.0	39.0	5.0	10.9	0.0	0.0	0.0	15.1

Funding Notes

The MGUE Inc 1 program includes $112.6M of external funding to support the MGUE Inc 1 Resiliency and Software Assurance Modification effort. Additionally, program includes $3.1M for external funding for a next generation Application Specific Integrated Circuit study. The $115.7M of RDT&E funds are included in the APB, but not included in the table above.

Quantity Summary FY 2020 President's Budget / December 2018 SAR (TY$ M)										
Quantity	Undistributed	Prior	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	To Complete	Total
Development	0	0	0	0	0	0	0	0	0	0
Production	0	0	0	0	0	0	0	0	0	0
PB 2020 Total	0	0	0	0	0	0	0	0	0	0
PB 2019 Total	0	0	0	0	0	0	0	0	0	0
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
2012	--	--	--	--	--	--	15.2
2013	--	--	--	--	--	--	63.7
2014	--	--	--	--	--	--	165.0
2015	--	--	--	--	--	--	152.1
2016	--	--	--	--	--	--	199.0
2017	--	--	--	--	--	--	231.9
2018	--	--	--	--	--	--	209.4
2019	--	--	--	--	--	--	180.5
2020	--	--	--	--	--	--	142.6
2021	--	--	--	--	--	--	76.3
2022	--	--	--	--	--	--	10.9
Subtotal	--	--	--	--	--	--	1446.6

Annual Funding 3600 | RDT&E | Research, Development, Test, and Evaluation, Air Force							
Fiscal Year	Quantity	BY 2017 $M					
		End Item Recurring Flyaway	Non End Item Recurring Flyaway	Non Recurring Flyaway	Total Flyaway	Total Support	Total Program
2012	--	--	--	--	--	--	16.1
2013	--	--	--	--	--	--	66.5
2014	--	--	--	--	--	--	169.9
2015	--	--	--	--	--	--	155.1
2016	--	--	--	--	--	--	199.9
2017	--	--	--	--	--	--	228.3
2018	--	--	--	--	--	--	201.9
2019	--	--	--	--	--	--	170.6
2020	--	--	--	--	--	--	132.2
2021	--	--	--	--	--	--	69.3
2022	--	--	--	--	--	--	9.7
Subtotal	--	--	--	--	--	--	1419.5

Low Rate Initial Production

There is no LRIP for this program.

Foreign Military Sales

None

Nuclear Costs

None

Unit Cost

Current UCR Baseline and Current Estimate (Base-Year Dollars)			
Item	BY 2017 $M Current UCR Baseline (Jan 2017 APB)	BY 2017 $M Current Estimate (Dec 2018 SAR)	% Change
Program Acquisition Unit Cost			
Cost	1505.7	1419.5	
Quantity	0	0	
Unit Cost	--	--	--
Average Procurement Unit Cost			
Cost	0.0	0.0	
Quantity	0	0	
Unit Cost	--	--	--

Original UCR Baseline and Current Estimate (Base-Year Dollars)			
Item	BY 2017 $M Original UCR Baseline (Jan 2017 APB)	BY 2017 $M Current Estimate (Dec 2018 SAR)	% Change
Program Acquisition Unit Cost			
Cost	1505.7	1419.5	
Quantity	0	0	
Unit Cost	--	--	--
Average Procurement Unit Cost			
Cost	0.0	0.0	
Quantity	0	0	
Unit Cost	--	--	--

APB Unit Cost History					
Item	Date	BY 2017 $M		TY $M	
		PAUC	APUC	PAUC	APUC
Original APB	Jan 2017	N/A	N/A	N/A	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	Jan 2017	N/A	N/A	N/A	N/A
Prior Annual SAR	Dec 2017	N/A	N/A	N/A	N/A
Current Estimate	Dec 2018	N/A	N/A	N/A	N/A

SAR Unit Cost History

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

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

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	Jan 2017	N/A	Jan 2017
Milestone C	N/A	N/A	N/A	N/A
IOC	N/A	N/A	N/A	N/A
Total Cost (TY $M)	N/A	1531.2	N/A	1446.6
Total Quantity	N/A	0	N/A	0
PAUC	N/A	N/A	N/A	N/A

Cost Variance

Summary TY $M				
Item	RDT&E	Procurement	MILCON	Total
SAR Baseline (Development Estimate)	1531.2	--	--	1531.2
Previous Changes				
Economic	+0.2	--	--	+0.2
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	-94.7	--	--	-94.7
Other	--	--	--	--
Support	--	--	--	--
Subtotal	-94.5	--	--	-94.5
Current Changes				
Economic	+6.3	--	--	+6.3
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	+3.6	--	--	+3.6
Other	--	--	--	--
Support	--	--	--	--
Subtotal	+9.9	--	--	+9.9
Total Changes	-84.6	--	--	-84.6
CE - Cost Variance	1446.6	--	--	1446.6
CE - Cost & Funding	1446.6	--	--	1446.6

Summary BY 2017 $M				
Item	RDT&E	Procurement	MILCON	Total
SAR Baseline (Development Estimate)	1505.7	--	--	1505.7
Previous Changes				
Economic	--	--	--	--
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	-86.8	--	--	-86.8
Other	--	--	--	--
Support	--	--	--	--
Subtotal	-86.8	--	--	-86.8
Current Changes				
Economic	--	--	--	--
Quantity	--	--	--	--
Schedule	--	--	--	--
Engineering	--	--	--	--
Estimating	+0.6	--	--	+0.6
Other	--	--	--	--
Support	--	--	--	--
Subtotal	+0.6	--	--	+0.6
Total Changes	-86.2	--	--	-86.2
CE - Cost Variance	1419.5	--	--	1419.5
CE - Cost & Funding	1419.5	--	--	1419.5

Previous Estimate: June 2018

RDT&E	$M	
Current Change Explanations	Base Year	Then Year
Revised escalation indices. (Economic)	N/A	+6.3
Additional funding received in FY 2020 - FY 2022 to align with CAPE ICE dated January 12, 2017. (Estimating)	+50.4	+54.9
Revised estimate for Below Threshold Reprogramming in FY 2018. (Estimating)	-9.1	-9.4
Revised estimate for reallocation of funds from MGUE Inc 1 to MGUE Inc 2 in FY 2018 to pay for Application-Specific Integrated Circuit obsolescence. (Estimating)	-11.2	-11.6
Revised estimate for Small Business Innovative Research. (Estimating)	-11.5	-12.0
Adjustment for current and prior escalation. (Estimating)	-4.3	-4.5
Revised estimate to reflect application of new outyear inflation. (Estimating)	-1.6	-1.8
Revised estimate due to higher Air Force priorities. (Estimating)	-12.1	-12.0
RDT&E Subtotal	+0.6	+9.9

Contracts

Contract Identification

Appropriation: RDT&E
Contract Name: Military GPS User Equipment (MGUE)
Contractor: L3 Technologies (L3T)
Contractor Location: 602 E. Vermont Ave
Anaheim, CA 92803
Contract Number: FA8807-12-C-0011
Contract Type: Cost Plus Incentive Fee (CPIF)
Award Date: September 28, 2012
Definitization Date: September 28, 2012

Contract Price							
Initial Contract Price ($M)			Current Contract Price ($M)			Estimated Price At Completion ($M)	
Target	Ceiling	Qty	Target	Ceiling	Qty	Contractor	Program Manager
27.5	N/A	N/A	81.9	N/A	N/A	91.7	94.1

Target Price Change Explanation

The difference between the Initial Contract Price Target and the Current Contract Price Target is due to additional scope associated with software and security certification, hardware, Resiliency, Software Assurance Modification, Roving Channel Hot Start (Engineering Change Proposal (ECP)-4), and Enterprise Hot Start (ECP-5).

Contract Variance		
Item	Cost Variance	Schedule Variance
Cumulative Variances To Date (1/25/2019)	-14.2	-0.1
Previous Cumulative Variances	-12.3	-0.1
Net Change	-1.9	+0.0

Cost and Schedule Variance Explanations

The unfavorable net change in the cost variance is due to to Anti-Spoof integration issues, Hot Start integration issues, and a higher number of System Trouble Reports than planned.

Notes

The PM's Estimated Price at Complete is based on SCP (September 2016) plus ECPs-4 and 5.

Contract Identification

Appropriation: RDT&E
Contract Name: Military GPS User Equipment (MGUE)
Contractor: Raytheon Space and Airborne Systems
Contractor Location: 2000 E. El Segundo Blvd
El Segundo, CA 90245
Contract Number: FA8807-12-C-0012
Contract Type: Cost Plus Incentive Fee (CPIF)
Award Date: September 28, 2012
Definitization Date: September 28, 2012

Contract Price							
Initial Contract Price ($M)			Current Contract Price ($M)			Estimated Price At Completion ($M)	
Target	Ceiling	Qty	Target	Ceiling	Qty	Contractor	Program Manager
25.2	N/A	N/A	138.1	N/A	N/A	187.3	189.2

Target Price Change Explanation

The difference between the Initial Contract Price Target and the Current Contract Price Target is due to additional scope associated with software and security certification, hardware, and for Resiliency, Software Assurance Modification, ECP-4, and ECP-5.

Contract Variance		
Item	Cost Variance	Schedule Variance
Cumulative Variances To Date (1/27/2019)	+0.2	-1.5
Previous Cumulative Variances	+0.5	-1.0
Net Change	-0.3	-0.5

Cost and Schedule Variance Explanations

The unfavorable net change in the cost variance is due to to additional effort needed for completion of the GPS Receiver Application Module Standard Electronic Module (GRAM-S/M) 5.0 software build.

The unfavorable net change in the schedule variance is due to to additional effort needed for completion of the GRAM-S/M 5.0 software build.

Notes

The PM's Estimated Price at Complete is based on SCP (September 2016) plus ECPs-4 and 5.

Contract Identification

Appropriation: RDT&E
Contract Name: MGUE Technology Development
Contractor: Collins Aerospace
Contractor Location: 400 Collins Road NE
Cedar Rapids, IA 52498
Contract Number: FA8807-12-C-0013
Contract Type: Cost Plus Incentive Fee (CPIF)
Award Date: September 28, 2012
Definitization Date: September 28, 2012

Contract Price							
Initial Contract Price ($M)			Current Contract Price ($M)			Estimated Price At Completion ($M)	
Target	Ceiling	Qty	Target	Ceiling	Qty	Contractor	Program Manager
27.7	N/A	N/A	101.6	N/A	N/A	139.8	187.9

Target Price Change Explanation

The difference between the Initial Contract Price Target and the Current Contract Price Target is due to additional scope associated with software and security certification, hardware, Resiliency, Software Assurance Modification, approval of Over Target Baseline/Over Target Schedule (August 1, 2017), ECP-4, and ECP-5.

Contract Variance		
Item	Cost Variance	Schedule Variance
Cumulative Variances To Date (1/25/2019)	+2.8	-1.5
Previous Cumulative Variances	+1.3	-0.8
Net Change	+1.5	-0.7

Cost and Schedule Variance Explanations

The favorable net change in the cost variance is due to continuing execution with lower headcount than planned.

The unfavorable net change in the schedule variance is due to Collins Aerospace experiencing software implementation and integration delays to the MGUE Legacy Weapons Initialization on latest incremental Build. Collins Aerospace is still on track to complete the effort on time.

Notes

The PM's Estimated Price at Complete is based on SCP (September 2016) plus ECPs-4 and 5.

While the contract is over 90% complete, the Program Office will continue to report this contract as there are estimated future ECPs which will add money to the contract.

Deliveries and Expenditures

Deliveries				
Delivered to Date	**Planned to Date**	**Actual to Date**	**Total Quantity**	**Percent Delivered**
Development	0	0	0	--
Production	0	0	0	--
Total Program Quantity Delivered	0	0	0	--

Expended and Appropriated (TY $M)			
Total Acquisition Cost	1446.6	Years Appropriated	8
Expended to Date	856.7	Percent Years Appropriated	72.73%
Percent Expended	59.22%	Appropriated to Date	1216.8
Total Funding Years	11	Percent Appropriated	84.11%

The above data is current as of March 11, 2019.

Operating and Support Cost

Cost Estimate Details

Date of Estimate:

Source of Estimate:

Quantity to Sustain:

Unit of Measure:

Service Life per Unit:

Fiscal Years in Service:

Sustainment Strategy

O&S requirements will be addressed by the DoD Services following completion of the MGUE development program.

Antecedent Information

No Antecedent

Annual O&S Costs BY2017 $M		
Cost Element	**MGUE Inc 1**	**Antecedent Item (Antecedent) YYYY**
Unit-Level Manpower	--	--
Unit Operations	--	--
Maintenance	--	--
Sustaining Support	--	--
Continuing System Improvements	--	--
Indirect Support	--	--
Other	--	--
Total	--	--

Item	Total O&S Cost $M			
	MGUE Inc 1			Antecedent Item (Antecedent)
	Current Development APB Objective/Threshold		Current Estimate	
Base Year	0.0	0.0	N/A	N/A
Then Year	0.0	N/A	N/A	0.0

O&S Cost Variance		
Category	**BY 2017 $M**	**Change Explanations**
Prior SAR Total O&S Estimates - Jun 2018 SAR	0.0	
Programmatic/Planning Factors	0.0	

Cost Estimating Methodology	0.0
Cost Data Update	0.0
Labor Rate	0.0
Energy Rate	0.0
Technical Input	0.0
Other	0.0
Total Changes	0.0
Current Estimate	0.0

Disposal Estimate Details

Date of Estimate:

Source of Estimate:

Disposal/Demilitarization Total Cost (BY 2017 $M):