



Global Positioning System Status and Modernization

12 September 2023

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GPS Modernization

SPACE SEGMENT (SATELLITES)

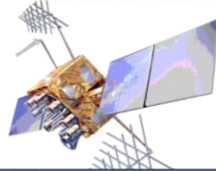
Legacy (GPS IIA/IIR)

- Basic GPS
- NUDET (Nuclear Detonation Detection System (NDS))



GPS IIR-M

- 2nd Civil Signal (L2C)
- New Military Signal
- Increased Anti-Jam Power



GPS IIF

- 3rd Civil Signal (L5)
- Longer Life
- Better Clocks



GPS III (SV01-10)

- Accuracy & Power
- Increased Anti-Jam Power
- Inherent Signal Integrity
- 4th Civil Signal (L1C)
- Longer Life
- Improved Clocks



GPS IIIIF (SV11-32)

- Unified S-Band Telemetry, Tracking, & Commanding
- Search & Rescue (SAR) Payload
- Laser Retroreflector Array
- Redesigned NDS Payload
- Regional Military Protect (RMP)

CONTROL SEGMENT (GROUND)

Legacy (OCS)

- Mainframe System
- Command & Control
- Signal Monitoring

Architecture Evolution Plan (AEP)

- Distributed Architecture
- Increased Signal Monitoring Coverage
- Security & Accuracy
- Launch And Disposal Operations



OCX Block 0

- GPS III Launch & Checkout

GPS III Contingency Ops (COps)

- GPS III Mission on AEP

M-Code Early Use (MCEU)

- Update OCS to operationalize Core M-Code on AEP

OCX Blocks 1 and 2

- Fly GPS IIR/IIR-M, GPS IIF, GPS III
- Modernize Cyber Architecture
- Operationalize Civil Signals (L1C, L2C, L5)
- Full M-Code

OCX Block 3F

- Incorporates GPS IIIIF Command & Control
- Integrates new capabilities



USER SEGMENT (RECEIVERS)

Legacy (PLGR/GAS-1/MAGR)

- First Generation System



Visit GPS.gov for more info

SAASM-era User Equipment

- Anti-Jam capability
- Electronic Protection



Military GPS User Equipment

- M-Code Receivers
- Common GPS Modules
- Increased Access Power w/ M-Code
- Increased Accuracy
- Increased Availability
- Increased Anti-Tamper Anti-Spoof
- Increased Acquisition in Jamming





GPS Constellation Status

38 Satellites • 31 Set Healthy
Baseline Constellation: 24 Satellites



Satellite Block	Quantity	Average Age (yrs.)	Oldest
GPS IIR	7 (5*)	21.7	26.1
GPS IIR-M	7 (1*)	15.9	17.9
GPS IIF	11 (1*)	9.6	13.3
GPS III	6	2.9	4.7

*Not set healthy

As of: 1 Aug 23

GPS Signal in Space (SIS) Performance

Average URE*	Best URE	Worst URE
47.4 cm	33.4 cm (23 Jun 23)	165.7 cm (25 Jan 23)

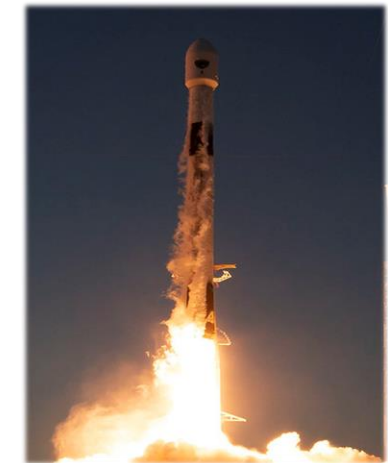
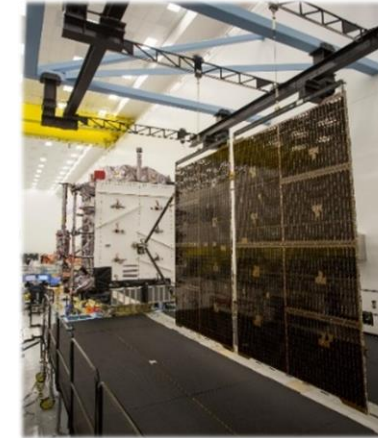
*All User Range Errors (UREs) are Root Mean Square values

As of: 1 Jul 23



GPS III Program (SV01-10)

- SV01- 06 Operational and available for use
 - Set healthy during April 2020 - February 2023
- SV07 Slated for launch in June 2024
 - Debuts on ULA's Vulcan Centaur
- SV08 AFL declared 10 Jun 21
 - Launch planned for 1Q FY25
- SV09 AFL declared 23 Aug 22
 - SV resides in long term storage
- SV10 AFL declared 8 Dec 22
 - SV resides in long term storage

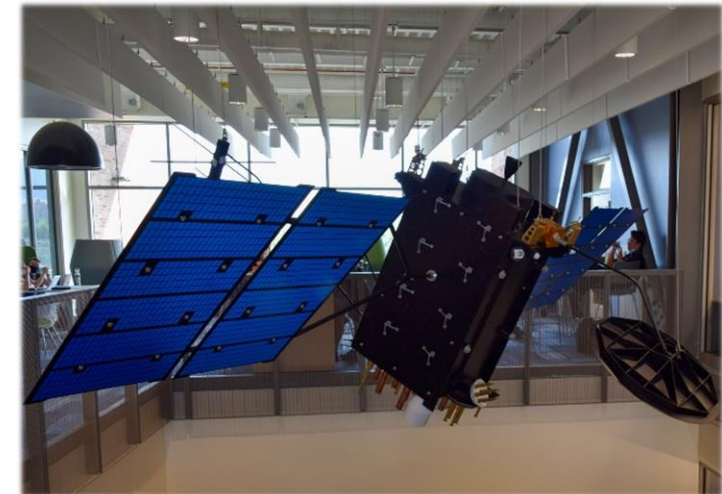


GPS III is delivering capability to the warfighter and the world!



GPS IIF Program (SV11-20)

- GPS IIF provides the next generation of on-orbit GPS capabilities
- Continues GPS III modernization efforts, provides backwards compatibility and includes:
 - Regional Military Protection (RMP) for boosted M-Code signal
 - M-Code power increased by 8x in localized area to give anti-jam capabilities in disadvantaged areas
 - Re-designed NUDET suite
 - Canadian-built search and rescue (SAR) payload
 - Up to 85% faster detect and locate of distress signals
 - Laser Retro reflector Array (LRA)
- Status: Purchased SVs 11 thru 20
 - GPS IIF Non-Flight Satellite Testbed (GNST+) build-up completed July 2023
 - GNST+ assembly complete 2QFY24
 - GPS IIF SV11 AFL planned for 2026





Next Generation Operational Control System (OCX)

- Next-generation command, control and cyber-defense for legacy and GPS III satellites
 - Enhanced command and control capability
 - Modernized architecture
 - Robust information assurance and cyber security
- Incremental Development
 - OCX Block 0: Launch and Checkout System (LCS) for GPS III
 - OCX Blocks 1 & 2: Operate and manage modernized GPS constellation, control and monitor modernized signals
- Current Status
 - OCX Block 0 LCS successfully supported GPS III SV01 through SV06 launch and checkout
 - OCX Block 1/2 Hewlett-Packard Formal Qualification Test (HP FQT) ongoing
 - Site Acceptance Test (SAT) ongoing
 - Delivery via DD250: May 2024
 - Ready to Transition to Operations: December 2024





Military GPS User Equipment (MGUE)

- Increment 1 involves 3 vendors developing modernized receiver cards (Ground & aviation/maritime form factors)
- Increment 2:
 - Addresses Inc 1 GPS receiver card obsolescence
 - Extends M-Code to space receivers
 - Provides Regional Mil Protection (RMP), Alternative Navigation (ALTNAV), & Multi-Global Navigation Satellite Sys (MGNSS)
 - Develops a Miniature Serial Interface (MSI) GPS receiver card for Precision-Guided Munitions & Handhelds
 - Generates a prototype GPS Handheld Receiver, which will be ready for immediate manufacturing
- Current Status:
 - Increment 1
 - Ground Card development is complete and available for procurement/fielding
 - Aviation/Maritime Card met Tech Rqmt Verification APB Milestone 17 Apr 23 & completed its Manufacturing Readiness Assessment (MRA) on 3 May 23
 - Undergoing integration and testing on lead platforms (B-2 Bomber & Arleigh Burke Destroyer)
 - Available for integration and testing on any DoD air and sea weapon systems
 - Increment 2
 - Acquisition Strategy approved in November 2018 as 2 Middle Tier of Acquisition (MTA) rapid prototyping efforts:
 - MSI receiver card w/ Next Generation Application-Specific Integrated Circuit (ASIC) has completed Preliminary Design Review (PDR) and is presently undergoing Critical Design Review (CDR) with 3 different prime Vendors
 - Joint Modernized Handheld Receiver prototype contract awarded on 28 Jul 23

MGUE core technologies prime market for 2M+ receivers



Questions

