



Status and Modernization of the US Global Positioning System

**Munich Satellite Navigation Summit 2012
Munich, Germany**

14 March 2012

**Colonel Bernie Gruber
Director**

Global Positioning Systems Directorate



Global Positioning System (GPS)

Mission:

Acquire, deliver and sustain reliable GPS capabilities to America's warfighters, our allies, and civil users.



Col Bernie Gruber



Deliver and Sustain Global Navigation and Timing Service

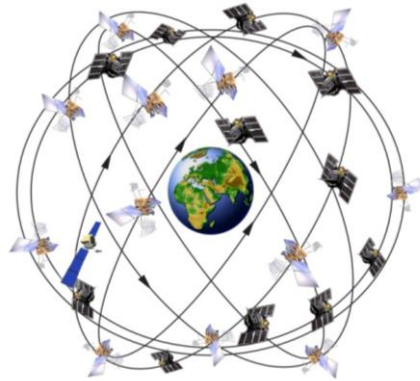


GPS Enterprise View



Civil Cooperation

- 1+ Billion civil & commercial users
- Search and Rescue
- Civil Signals
 - L2C (2nd Civil Signal)
 - L5 (Safety of Life)
 - L1C (International)



Department of Defense

- Services (Army, Navy, AF, USMC)
- Agencies (NGA, DISA, etc.)
- US Naval Observatory
- PNT EXCOMS, NPEF, etc...
- GPS Partnership Council

Maintenance/Security

- All Level I and Level II
 - Worldwide Infrastructure
- Develop & Publish ICDs Semi-Annually
 - ICWG: Worldwide Involvement
- Update GPS.gov Webpage

International Cooperation

- Deconflict PRN usage for 8 global PNT systems
 - 63 for US and 147 for other GNSS

- 25+ Years of Cooperation with 50+ Nations

GNSS

- China – COMPASS (BeiDou)
- Europe – Galileo/EGNOS
- India – IRNSS/GAGAN
- Japan – QZSS/MSAS
- Russia – GLONASS/SDCM

Spectrum

- World Radio Conference
- International Telecommunication Union
- Bilateral Agreements

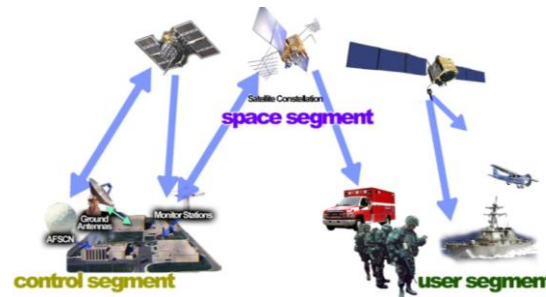


34 Satellites/ 31 Set Healthy

Baseline Constellation: 24 Satellites

Satellite	Quantity	Avg Life	Oldest
GPS IIA	10	18.0	21.3
GPS IIR	12	10.2	14.6
GPS IIR-M	7	4.6	6.4
GPS IIF	2	1.2	1.8
Constellation	31	10.9	21.3

AS OF 1 MAR 12



Department of Transportation

- Federal Aviation Administration

Department of Homeland Security

- U.S. Coast Guard

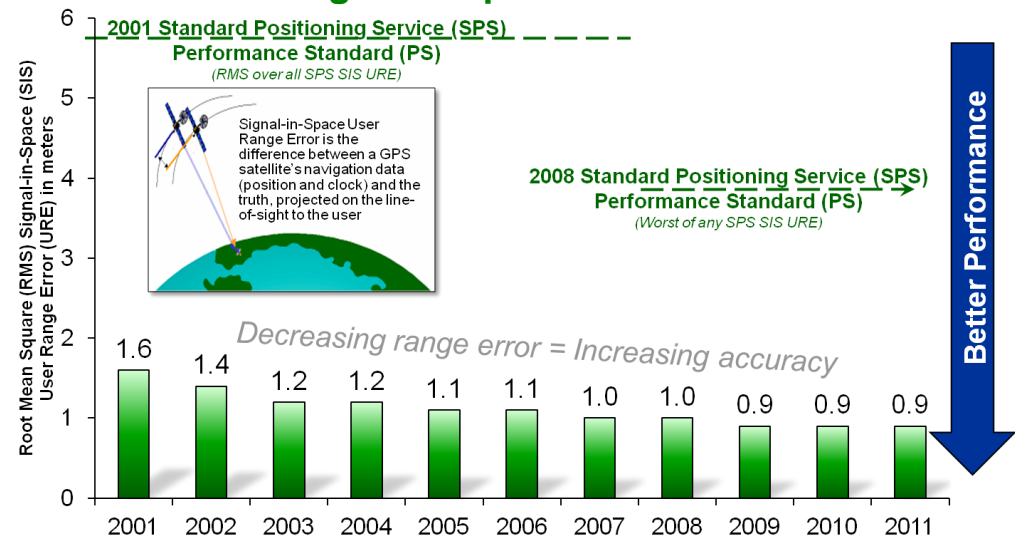


GPS Constellation

- **Very robust constellation**
 - 31 space vehicles (SVs) currently in operation
 - 10 GPS IIA
 - 12 GPS IIR
 - 7 GPS IIR-M
 - 2 GPS IIF
 - 3 additional satellites in residual status
- **Global GPS civil service performance commitment met continuously since Dec 1993**



Civil Signal in Space Performance





GPS IIF Status

- **Launched GPS IIF-2 on 16 Jul 11**
 - Satellite Vehicle Number 63, PRN 1
 - Set healthy 14 Oct 11
 - Second operational L5 signal
 - Increases the enhanced GPS clock performance coverage
- **2 total IIFs on orbit**
 - Best accuracies so far; 0.38 m RMS across family
- **10 more GPS IIFs in the pipeline**
 - SVs 3-4 in storage
 - SVs 5-8 are in assembly, integration and test
- **Next GPS IIF Launch scheduled for Sep 2012**





GPS III Status

- **Newest block of GPS satellites**
 - First GPS satellite to broadcast common L1C signal
 - Multiple civil and military signals; L1 C/A, L1 P(Y), L1M, L1C, L2C, L2 P(Y), L2M, L5
 - Three Rubidium clocks
- **Completed Critical Design Review for SVs 1-8**
- **Program granted Milestone C approval for SVs 1-8**
- **Prototype and engineering unit build/test underway**
 - Completed 57 of 59 Manufacturing Readiness Reviews
 - Completed 47 of 59 Test Readiness Reviews
- **GPS Nonflight Satellite Testbed (GNST) powered up 10 Jan 12**
 - Integration underway; full navigation panel turned on 7 Feb 12
- **Completed System Design Review for SVs 9+**





Ground Segment Status



Monitor Station



Master Control Stations at
Schriever AFB, Colorado



Ground Antenna

- **Current system Operational Control Segment (OCS)**
 - Currently flying GPS IIA/IIR/IIR-M/IIF constellation
 - Added the capability for anomaly resolution and disposal ops for IIF (LADO)
- **Next Generation Operational Control System (OCX) Phase B continues on track**
 - Preliminary Design Review completed Aug 2011
 - Completed first Hardware Critical Design Review 1 Mar 12
 - Delivered 2 of 7 software iterations
 - OCX Block I deployment planned for 2015



Recent International Participation

- **World Radio Conference (WRC-12) Jan-Feb 2012**

- GPS actively participated in coordinating international spectrum usage



- **International Astronautical Federation (IAF) Oct 2011**

- GPS honored with the IAF 60th Anniversary Award

- **Resolution 609 Consultation Meeting Sept 2011**

- Consulted with other GNSS providers to ensure protection of aeronautical receivers in L5 band



- **International Committee on GNSS (ICG-6) Sept 2011**

- Continued collaboration between GNSS providers to ensure compatibility and interoperability



President Obama's National Space Policy of 2010 states:

“Engage with foreign GNSS providers to encourage compatibility and interoperability, promote transparency in civil service provision...”





Summary

- GPS has continuously met its commitments to all users
- Modernization of all GPS Segments is on track
- Striving to continually improve navigation and timing services while maintaining backward compatibility with legacy equipment
- GPS is committed to open and transparent cooperation with the international GNSS community

The screenshot shows the GPS.gov website with a navigation menu including HOME, WHAT'S NEW, SYSTEMS, APPLICATIONS, POLICY & FUNDING, MULTIMEDIA, and SUPPORT. A central banner features the text "Bienvenidos Welcome أهلا وسهلا 歡迎光臨 Bienvenue" around a globe with stick figures. Below this, there are sections for "Multilingual Content" with links for Español, Français, 中文, and عربي. A sidebar on the right lists "GPS Cooperation with Other Nations" including Australia, China, Europe, India, Japan, Russia, and International Committee on GNSS. At the bottom, there is a section for "International GPS User Support" featuring the U.S. Coast Guard Navigation Center (NAVCEN) logo and text about providing support to international users.

Maintaining And Improving GPS Services For All Users Is Job #1

GLOBAL POSITIONING SYSTEMS DIRECTORATE

Questions?

