U.S. GPS Policy and Constellation Status

UN/Latvia Workshop on the Applications of Global Navigation Satellite Systems

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Overview

- U.S. National Space Policy
- International Cooperation Activities
- GPS Constellation Status Update
- GNSS Application Implementation: U.S. Wide Area Augmentation System (WAAS)

U.S. National Space Policy

Space-Based PNT Guideline: Maintain leadership in the service, provision, and use of GNSS

- Provide civil GPS services, **free of direct user charges**
  - Available on a continuous, worldwide basis
  - Maintain constellation consistent with published performance standards and interface specifications
  - Non-U.S. PNT services may be used to complement services from GPS
- **Encourage global compatibility and interoperability** with GPS
- Promote transparency in civil service provision
- Enable market access to industry
- Support international activities to detect and mitigate harmful interference

Planned GNSS

- Global Constellations
  - **GPS (24+)**
  - GLONASS (30)
  - Galileo (27+3)
  - Compass (27+3 IGSO + 5 GEO)
- Regional Constellations
  - QZSS (4+3)
  - IRNSS (7)
- Satellite-Based Augmentations
  - **WAAS (3)**
  - MSAS (2)
  - EGNOS (3)
  - GAGAN (2)
  - SDCM (2)

Recent International Activities

- **World Radio Conference (WRC-12) Jan-Feb 2012**
  - USG actively participated in coordinating international spectrum usage
- **International Astronautical Federation (IAF) Oct 2011**
  - GPS honored with the IAF 60th Anniversary Award
- **ITU 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…"

Bilateral Cooperation

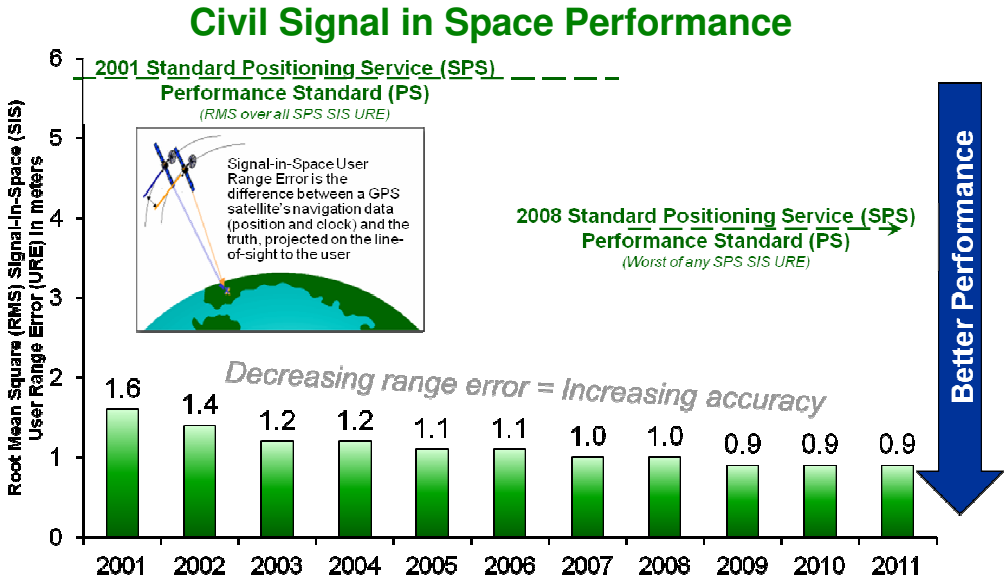
- **U.S.-Russia** Joint Statement issued Dec 2004
  - Working Groups: 1) compatibility/interoperability; 2) search/ rescue - latest meeting in U.S. Oct 2011
  - Reaffirmation of intent to cooperate signed Sep 2011
- **U.S.-China** operator-to-operator coordination under ITU auspices completed
  - Discussions on margins of international multilateral meetings
- **U.S.-India** Joint Statement on GNSS Cooperation 2007
  - ITU compatibility coordination and civil space talks pending
- **U.S.-EU** GPS-Galileo Cooperation Agreement signed in June 2004
  - Four working groups set up under the Agreement
  - Plenary meeting scheduled for June 2012 in Washington, D.C.
- **U.S.-Japan** Joint Statement on GPS Cooperation 1998
  - Last plenary meeting in Jan 2012 in Washington, D.C.
  - Bilateral agreements for QZSS monitoring stations in Hawaii and Guam

ICG-6 Plenary Meeting Outcomes

- The development of **Multi-GNSS monitoring** networks was a major topic of discussion
  - The Committee endorsed the IGS Multi-GNSS Experiment
  - A Subgroup of WG-A will be formed to collectively investigate international GNSS monitoring and assessment
- The Compatibility sub-group of WG-A, with participation from all interested system providers, will initiate discussions and **collaboration on Open Service GNSS performance parameters**, including definitions and calculation methods
- Templates describing the **geodetic and timing references for all systems** have been completed and will be available on the ICG website
- **Interference Detection and Mitigation (IDM) Workshop** was approved by the Committee

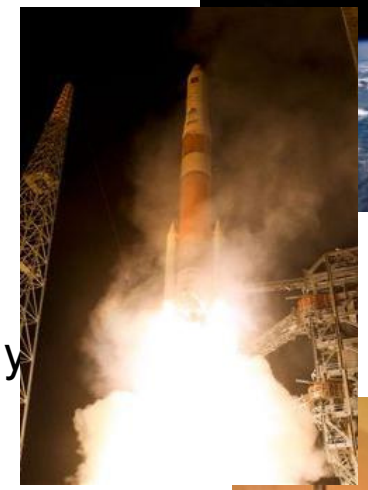
GPS Constellation Status

- **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**



GPS IIF Status

- Launched GPS IIF-2 on 16 Jul 2011
  - Satellite Vehicle Number 63, PRN 1
  - Set healthy 14 Oct 2011
  - Second operational L5 signal
  - Increases the enhanced GPS clock performance coverage
- Two 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 planned Sep 2012

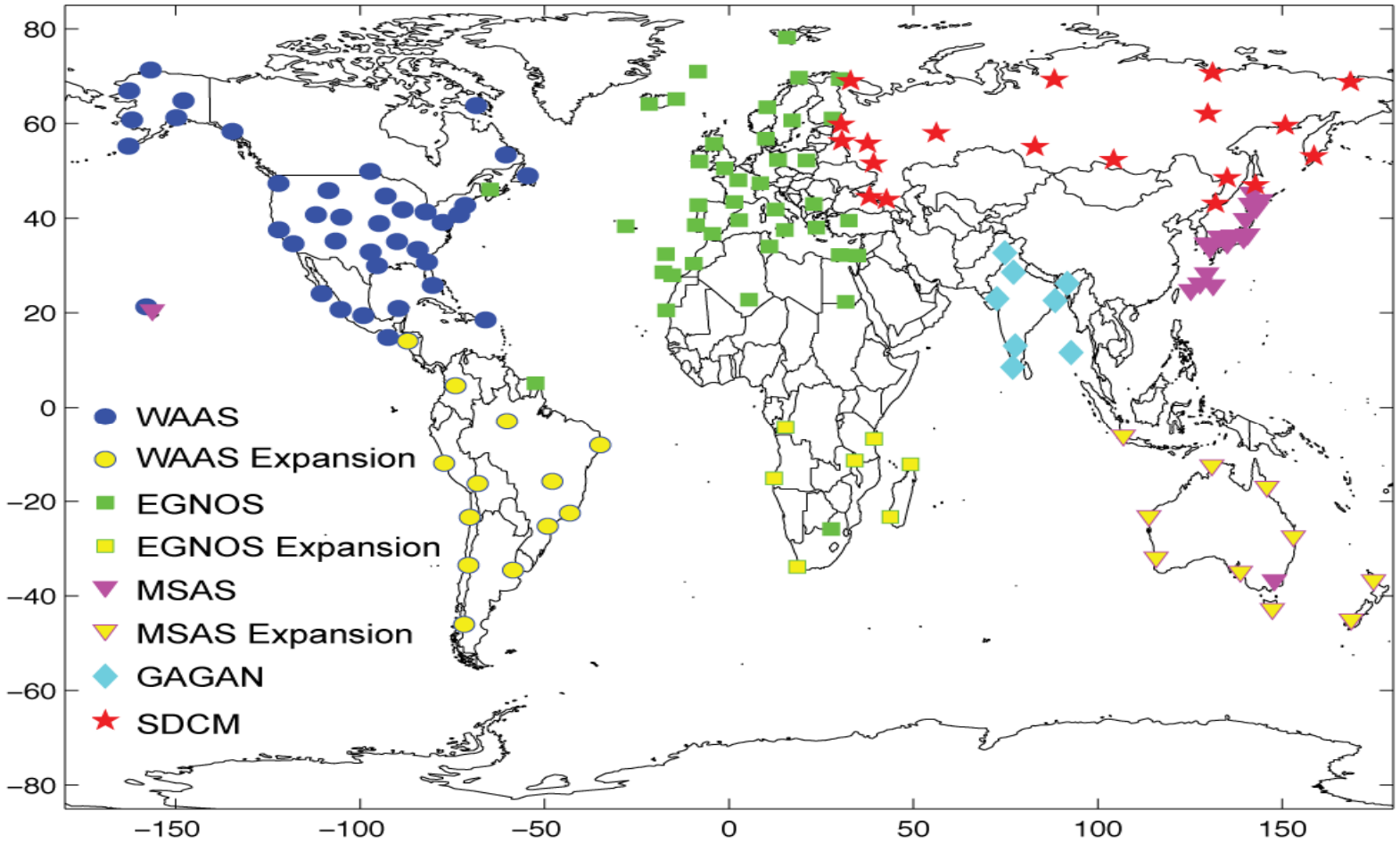


WAAS Aviation Benefits

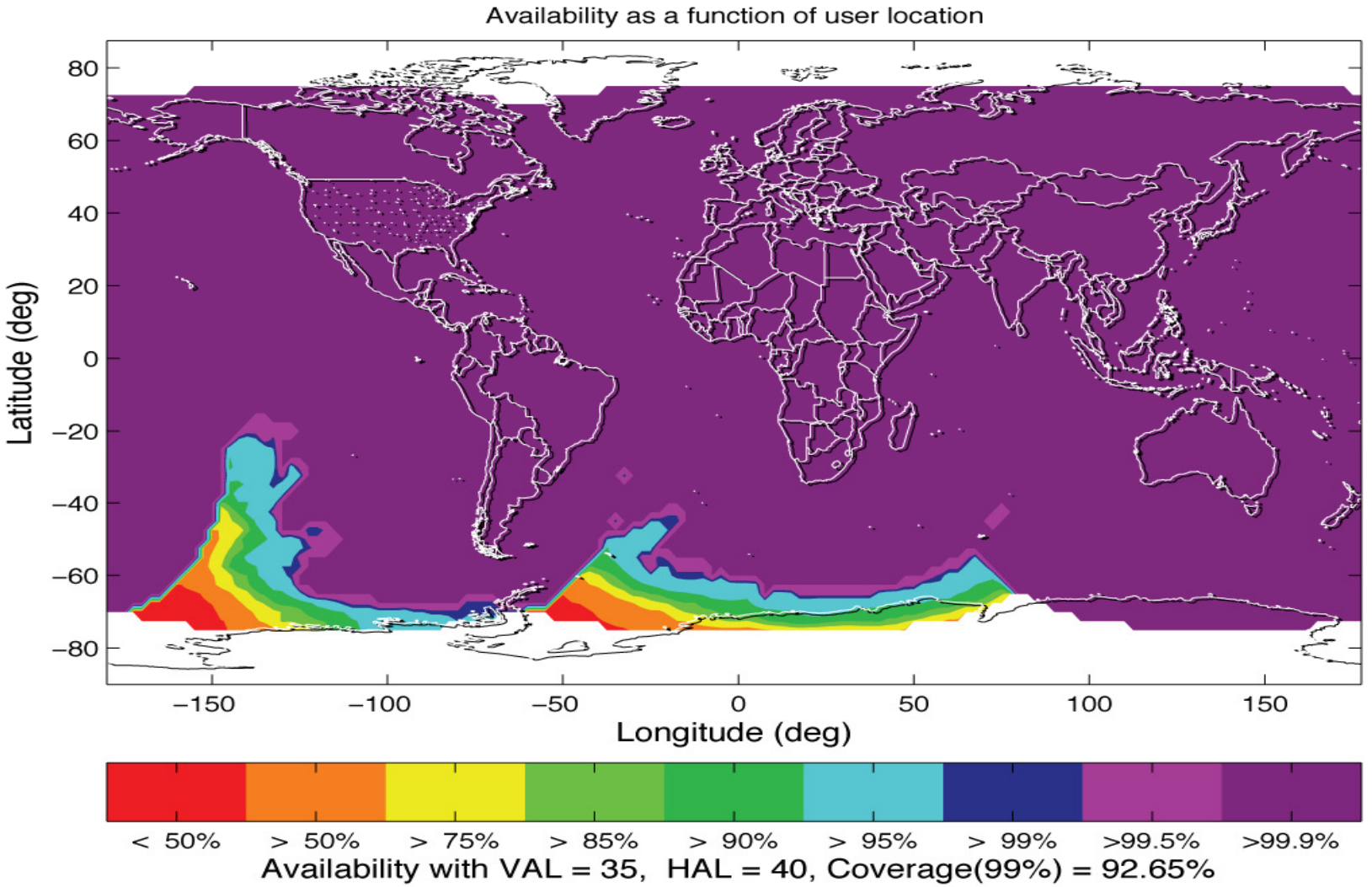
- **Most Significant Benefit Is Safety**
  - Provides Vertical Guidance At All Runway Ends
  - Improves Situational Awareness
  - Provides Integrity Down to Surface
- **WAAS Benefits All Users**
  - Improved Access for General Aviation to All Airports and Improved Navigational Capabilities
  - Allows for Significant Increase in Number of Available Airports to Support Commuter and Business Aviation
  - Provides Backup Approach Capability and Improved International Access to Air Carriers
- **Improves National Airspace System Efficiency and Capacity**
  - Complex Procedures Available to All Aircraft
  - Advanced Arrival and Departure Procedures
  - Promotes Airspace Redesign

- **Cost Savings By Decommissioning of Redundant Ground Based Navigation Aids**
  - WAAS Currently has over 3000 LPV/LP procedures
  - This is more than double the number of current ILS procedures
- **Low Cost/High Capability Avionics Available to All Users**
  - Provides State of the Art Performance at a Low Cost
  - Receivers currently available that provide both Enroute as well as Precision Approach Capability

Future Possible Expanded SBAS Networks



SBAS: Dual Frequency, Multi-Constellation, Expanded Network



LightSquared (LSQ)

LightSquared: Proposed 4G Broadband Network adjacent to GPS spectrum band

- U.S. FCC awarded LSQ a "Conditional Waiver Order" of the Ancillary Terrestrial Component (ATC) "integrated service" rule on Jan 26, 2011
- The Conditional Waiver Order required that LSQ must first "complete" the Interference Resolution Process, defined as the point at which "the Commission, after consultation with NTIA, concludes that the harmful interference concerns have been resolved and sends a letter to LightSquared stating that the process is complete."
- Feb 14, 2012 NTIA Letter to FCC : "We conclude at this time that there are no mitigation strategies that both solve the interference issues and provide LightSquared with an adequate commercial network deployment."
- Feb 15, 2012 FCC Public Notice seeking comment on actions proposed by the FCC International Bureau:
  - Vacatur of the Conditional Waiver Order
  - Modification of LightSquared's satellite license to suspend indefinitely LightSquared's underlying ATC authorization, first granted in 2004, to an extent consistent with the NTIA Letter
  -

Summary

- U.S. policy encourages worldwide use of civil GPS and augmentations
- U.S. pleased with progress in international GNSS cooperation
- GPS continues to meet or exceed U.S. performance commitments to worldwide users
- WAAS upgrades/system improvements occuring in phases, increasing accuracy and cost savings
- Use of multiple GNSS can significantly improve availability of civil signals worldwide