U.S. GNSS Policy

Civil GPS Service Interface Committee
U.S. States and Local Government Subcommittee

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Overview

• U.S. Space-Based PNT Policy

• GPS & Augmentation Programs Status

• International Cooperation Activities
Areas for Cooperation

Multi-modal

Maritime

Air
GOAL: Ensure the U.S. maintains space-based PNT services, augmentation, back-up, and service denial capabilities that...

- Provide uninterrupted availability of PNT services
- Meet growing national, homeland, economic security, and civil requirements, and scientific and commercial demands
- Remain the pre-eminent military space-based PNT service
- Continue to provide civil services that exceed or are competitive with foreign civil space-based PNT services and augmentation systems
- Remain essential components of internationally accepted PNT services
- Promote U.S. technological leadership in applications involving space-based PNT services
U.S. Space-Based PNT Organization Structure

WHITE HOUSE

NATIONAL EXECUTIVE COMMITTEE FOR SPACE-BASED PNT
   Executive Steering Group
     Co-Chairs: Defense, Transportation

NATIONAL COORDINATION OFFICE
   Host: Commerce

ADVISORY BOARD
   Sponsor: NASA

Defense
Transportation
State
Interior
Agriculture
Commerce
Homeland Security
Joint Chiefs of Staff
NASA

GPS International Working Group
   Chair: State

Engineering Forum
   Co-Chairs: Defense, Transportation

Ad Hoc Working Groups

NATIONAL COORDINATION OFFICE FOR SPACE-BASED POSITIONING, NAVIGATION & TIMING
U.S. Policy Promotes Global Use of GPS Technology

- No direct user fees for civil GPS services
  - Provided on a continuous, worldwide basis

- Open, public signal structures for all civil services
  - Promotes equal access for user equipment manufacturing, applications development, and value-added services
  - Encourages open, market-driven competition

- Global compatibility and interoperability with GPS

- Service improvements for civil, commercial, and scientific users worldwide

- Protection of radionavigation spectrum from disruption and interference
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GPS Constellation Status

30 Operational Satellites
(Baseline Constellation: 24)

• 11 Block IIA
• 12 Block IIR
• 7 Block IIR-M
  – Transmitting new second civil signal
  – 1 GPS IIR-M in on-orbit testing
• 3 additional satellites in residual status
• Next launch: IIF ~ June 2010
• Global GPS civil service performance commitment met continuously since December 1993
GPS Modernization Program

**Block IIA/IIR**
- Basic GPS
  - Standard Service
    - Single frequency (L1)
    - Coarse acquisition (C/A) code navigation
  - Precise Service
    - Y-Code (L1Y & L2Y)
    - Y-Code navigation

**Block IIR-M, IIF**
- IIR-M: IIA/IIR capabilities plus
  - 2nd civil signal (L2C)
  - M-Code (L1M & L2M)
- IIF: IIR-M capability plus
  - 3rd civil signal (L5)
  - Anti-jam flex power

**Block III**
- Backward compatibility
- 4th civil signal (L1C)
- Increased accuracy
- Increased anti-jam power
- Assured availability
- Navigation surety
- Controlled integrity
- Increased security
- System survivability
FAA GPS Augmentation Programs
WAAS Architecture

- 38 Reference Stations
- 3 Master Stations
- 4 Ground Earth Stations
- (2+1) Geostationary Satellite Links
- 2 Operational Control Centers
Global SBAS Coverage

WAAS 95% LPV and 99% RNP 0.3 SBAS Availability Contours

95% LPV Availability
99% RNP 0.3 Availability
LAAS/GBAS International Efforts

- Rio De Janeiro, Brazil
- Agana, Guam
- Malaga, Spain
- Sydney, Australia
- Frankfurt, Germany
- Bremen, Germany
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Planned GNSS

• Global Constellations
  – GPS (24+)
  – GLONASS (30)
  – Galileo (27+3)
  – Compass (30 global and 5 regional satellites)
  – GINS - Global Indian Navigation System (24)

• Regional Constellations
  – QZSS (3)
  – IRNSS (7)

• Satellite-Based Augmentations
  – WAAS (2+1)
  – MSAS (2)
  – EGNOS (3)
  – GAGAN (2)
  – SDCM (2)
U.S. Objectives in Working with Other GNSS Service Providers

- Ensure **compatibility** — ability of U.S. and non-U.S. space-based PNT services to be used separately or together without interfering with each individual service or signal
  - Radio frequency compatibility
  - Spectral separation between M-code and other signals

- Achieve **interoperability** — ability of civil U.S. and non-U.S. space-based PNT services to be used together to provide the user better capabilities than would be achieved by relying solely on one service or signal
  - Primary focus on the common L1C and L5 signals

- Ensure a level playing field in the global marketplace

**Pursue through Bi-lateral and Multi-lateral Cooperation**
U.S. - Europe Cooperation

• 2004 U.S.-EU agreement provides foundation for cooperation

• Four working groups were set up under the agreement:
  – Technical, trade, next generation systems and security working groups

• Improved new civil signal (MBOC) adopted in July 2007

• Second Plenary Meeting April 19-22, 2010 in Brussels
Additional Bilateral Cooperation

• U.S.-Japan Joint Statement on GPS Cooperation in 1998
  – Japan’s Quasi Zenith Satellite System (QZSS) designed to be fully compatible and highly interoperable with GPS
  – Bilateral agreements to set up QZSS monitoring stations in Hawaii and Guam. Guam station completed!

• U.S.-Russia Joint Statement issued in Dec. 2004
  – Negotiations for a U.S.-Russia Agreement on satellite navigation cooperation underway since late 2005
  – Working Groups on compatibility/interoperability, search and rescue

• U.S.-India Joint Statement on GNSS Coop. in 2007
  – Technical Meetings focused on GPS-India Regional Navigation Satellite System (IRNSS) compatibility and interoperability held in 2008 and 2009
International Committee on GNSS (ICG) & Providers Forum

- **ICG purpose:**
  - Promote the use of GNSS and its integration into infrastructures, particularly in developing countries
  - Encourage compatibility and interoperability among global and regional systems

- **Members include:** GNSS providers (U.S., EU, Russia, China, India, Japan), international organizations, and international associations

- **U.S. hosted ICG-3 at NASA JPL/Cal Tech in Pasadena, Dec. 8-12, 2008**

- **Russia hosted ICG-4 at St. Petersburg, Sep. 14-18, 2009**

- **Associated Providers Forum enables focused discussions on compatibility and interoperability, encouraging development of systems complimenting GPS**

- **ICG-5 to be held in October 2010 in Turin, Italy**
APEC
GNSS Implementation Team (GIT)

• Promote implementation of regional GNSS augmentation systems to enhance inter-modal transportation and recommend actions to be considered in the Asia Pacific Region

• Reports to Transportation Working Group (TPT-WG) through the Inter-modal Experts Group (IEG)

• Terms of Reference:
  
  – Facilitate GNSS applications to support seamless intermodal transportation to enhance safety, security, and sustainability.
  
  – Identify actions to facilitate and collaborate on implementation of GNSS applications for transportation in the APEC region, complementing the work of international organizations.
  
  – Provide a public/industry forum to address GNSS technologies related to transportation issues that will benefit the APEC region.
• US to host 14th Meeting of the GNSS Team
  June 21-24, 2010 in Seattle, Washington

• Need for greater involvement of U.S. agencies and U.S. industry in APEC deliberations concerning GNSS technologies and implementation

• Need to identify areas where GNSS could enhance the drive for greater GNSS interoperability and compatibility in the transport sector

• Anticipate an industry round table as part of the Meeting; also welcoming non-government organizations, such as IGS, FIG and IAG

• Seeking opportunities to use GNSS technology to increase energy efficiency, reduce congestion and enhance infrastructure
Summary

• GPS performance is better than ever and will continue to improve
  – Augmentations enable even higher performance
  – New civil GPS signal available now
  – Many additional upgrades scheduled

• U.S. policy encourages worldwide use of civil GPS and augmentations

• International cooperation is a priority
  – Compatibility and interoperability very important
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