SPACE-BASED POSITIONING
NAVIGATION & TIMING
NATIONAL EXECUTIVE COMMITTEE

U.S. GNSS Policy

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

Charleston, West Virginia
April 14, 2010

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National Space Based PNT Coordination Office

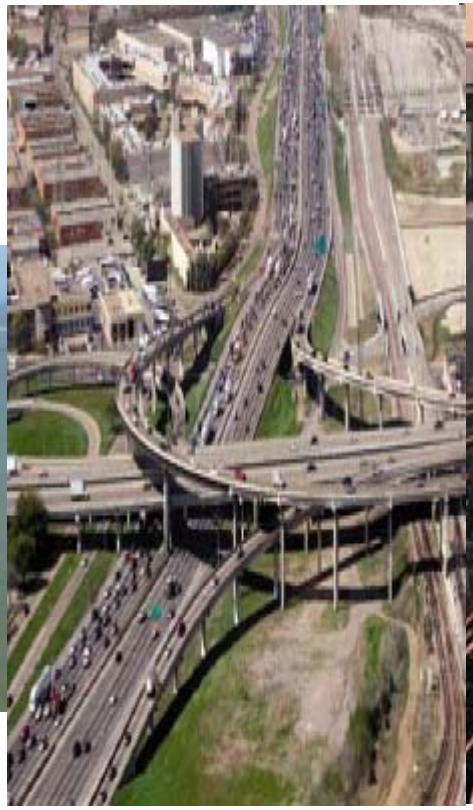
Overview

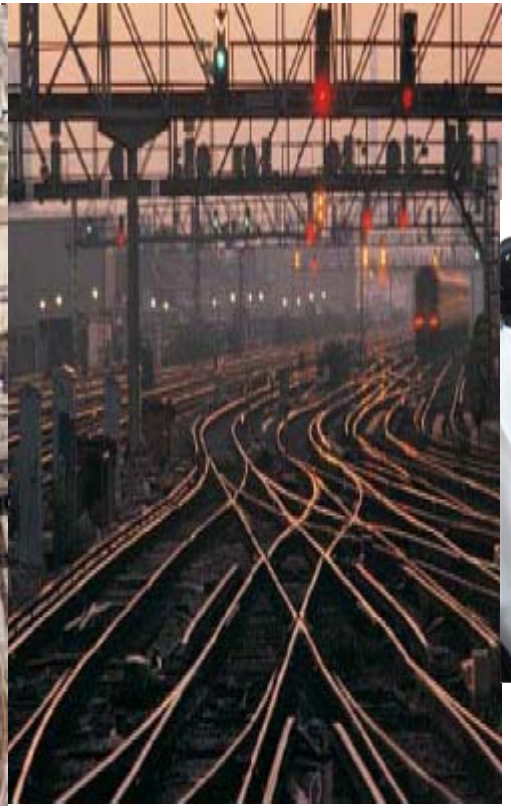
- **U.S. Space-Based PNT Policy**
- **GPS & Augmentation Programs Status**
- **International Cooperation Activities**

Areas for Cooperation

Multi-modal

Maritime





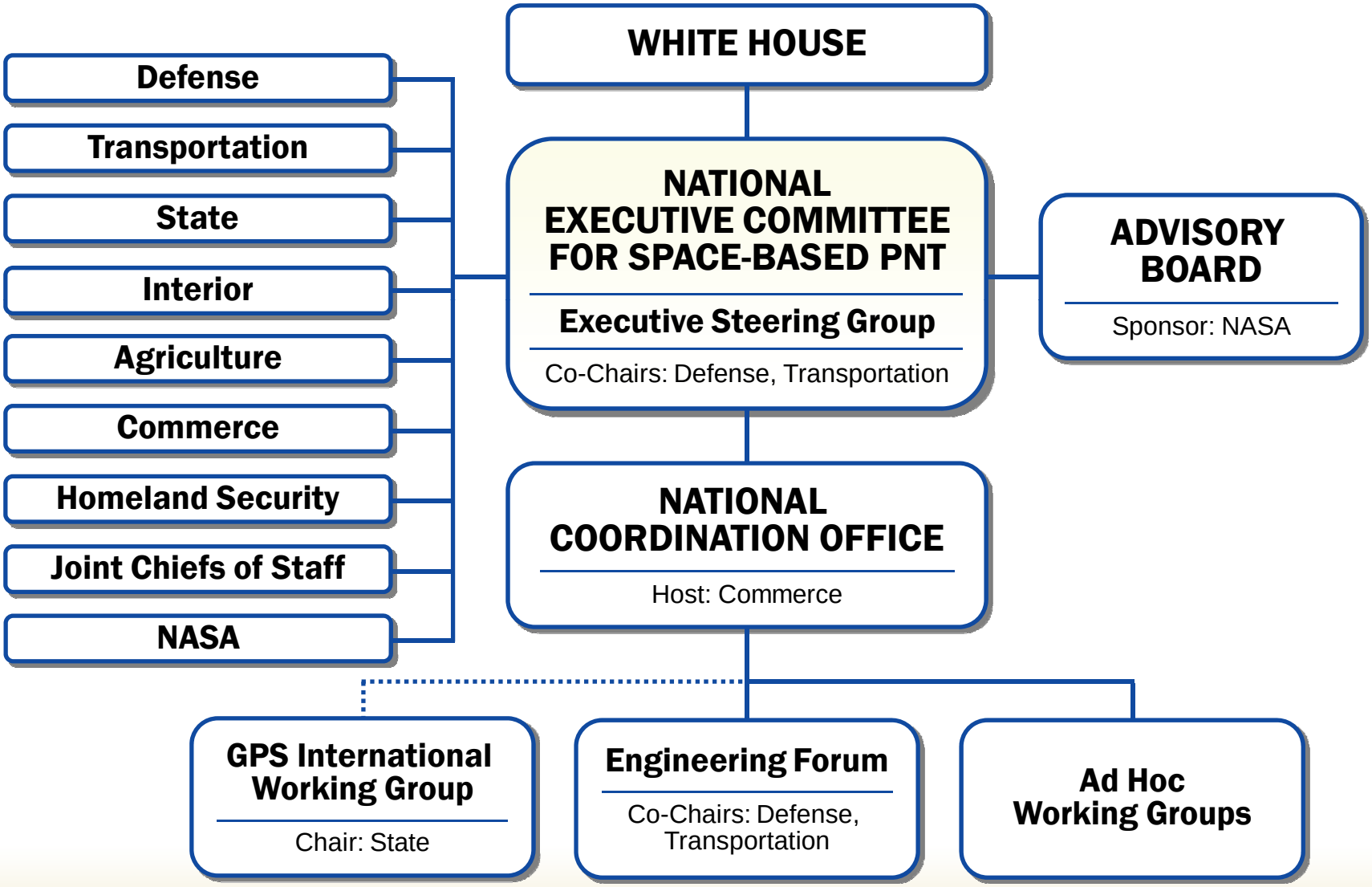
Air

U.S. Space-Based PNT Policy

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



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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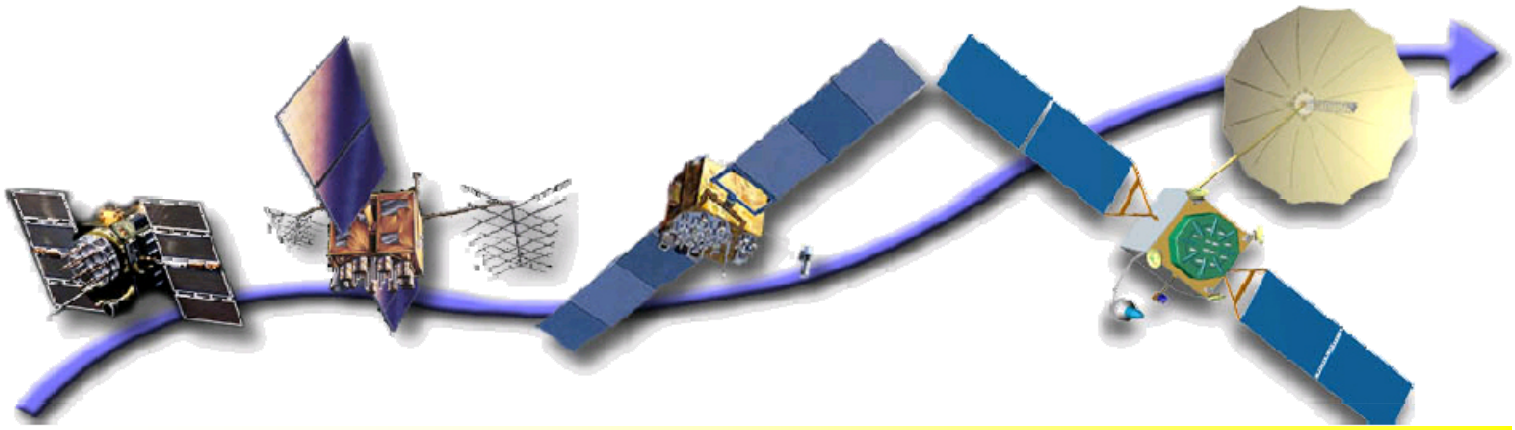
GPS Constellation Status

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



Increasing System Capabilities ◆ Increasing Defense / Civil Benefit

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

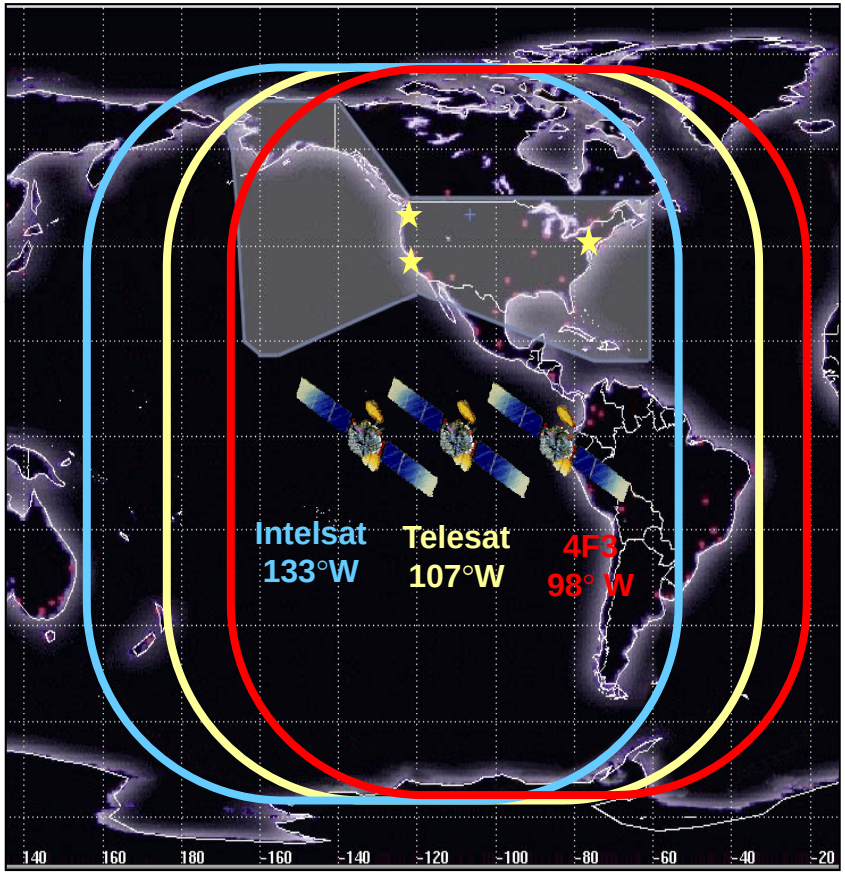
- 3rd civil signal (L5)
- Anti-jam flex power

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

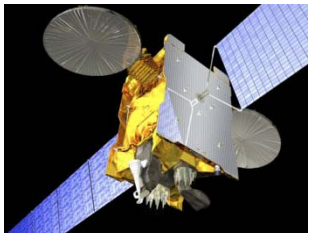
WAAS Architecture



38 Reference Stations

3 Master Stations

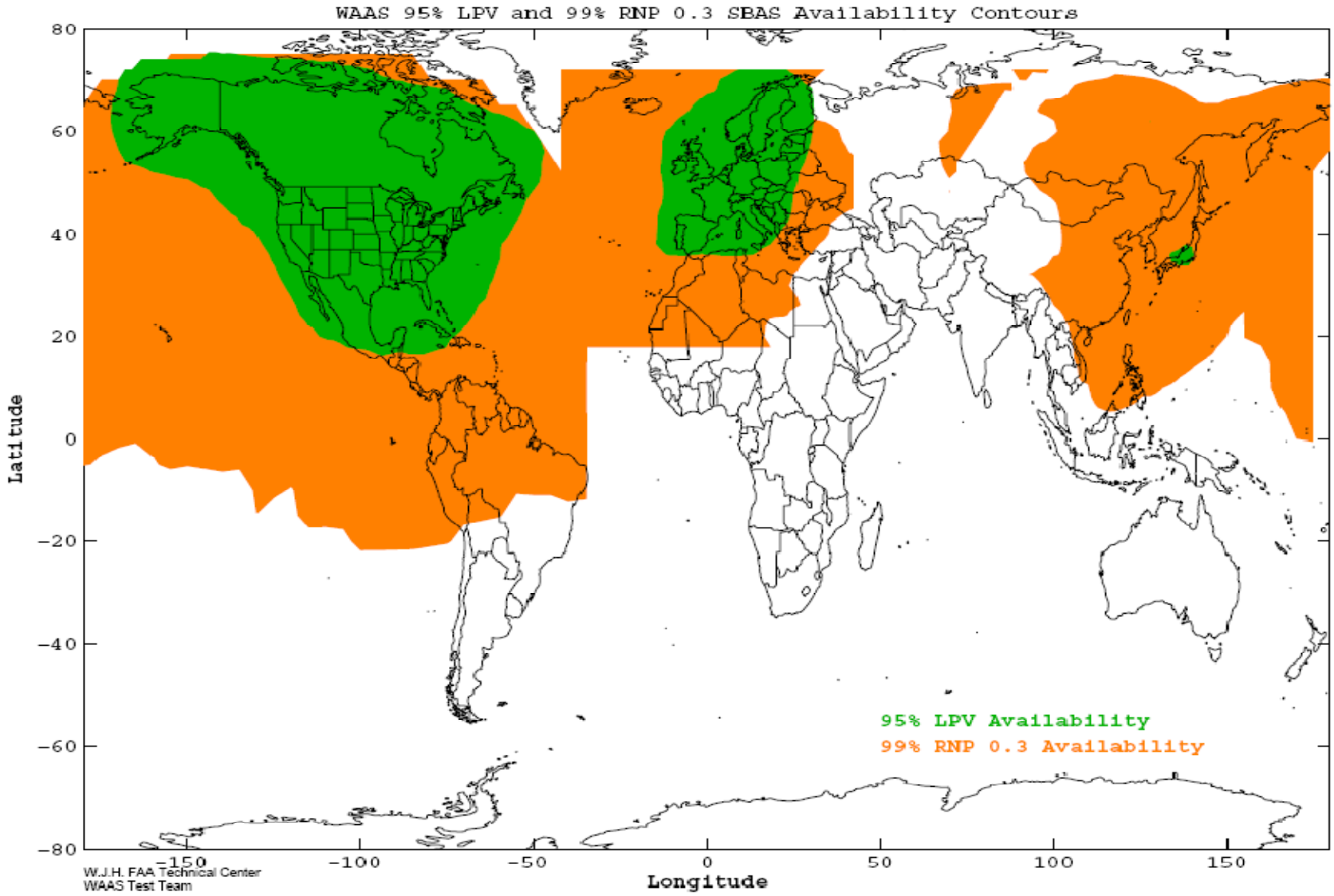
4 Ground Earth Stations



(2+1) Geostationary Satellite Links

2 Operational Control Centers

Global SBAS Coverage



LAAS/GBAS International Efforts

Overview

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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

Oct. 22, 2008 , EU-U.S. Plenary delegations meeting under the auspices of the GPS-Galileo Cooperation Agreement

Signing ceremony for GPS-Galileo Cooperation Joint Statement, Oct. 23, 2008
(Michel Bosco, European Commission;
Kenneth Hodgkins, U.S. Department of State)

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.

APEC (Continued)

- 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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