



SPACE-BASED POSITIONING
NAVIGATION & TIMING
NATIONAL COORDINATION OFFICE



U.S. Space-Based Positioning, Navigation and Timing (PNT) Policy and International Cooperation

CIVIL GPS INTERFACE COMMITTEE

State and Localities
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General Topics



- **U.S. Space-based Positioning, Navigation and Timing (PNT) Policy and Organization**
- **Keys to GPS Success**
- **U.S. Bi-lateral Satellite Navigation Cooperation**
- **U.S. Multi-lateral and Regional Satellite Navigation Cooperation**



U.S. Space-based PNT Policy History



- **1978: First GPS satellite launched**
- **1983: U.S. President offers free civilian access to GPS**
- **1996: U.S. policy establishes joint civil/military GPS management**
- **1997: U.S. Congress passes law that civil GPS shall be provided free of direct user fees**
- **2000: U.S. President set Selective Availability to “Zero”**
- **2004: U.S. President issues U.S. Policy on Space-based PNT**
- **2007: U.S. President announces Selective Availability will no longer be built into modernized GPS III satellites**



2004 U.S. Space-based PNT Policy



- **Provide GPS and augmentations free of direct user fees on a continuous, worldwide basis**
- **Provide open, free access to information needed to develop equipment**
- **Improve performance of GPS and augmentations to meet or exceed that of international systems**
- **Encourage international development of PNT systems based on GPS**
- **Seek to ensure international systems are interoperable with civil GPS and augmentations**
- **Address mutual security concerns with international providers to prevent hostile use**



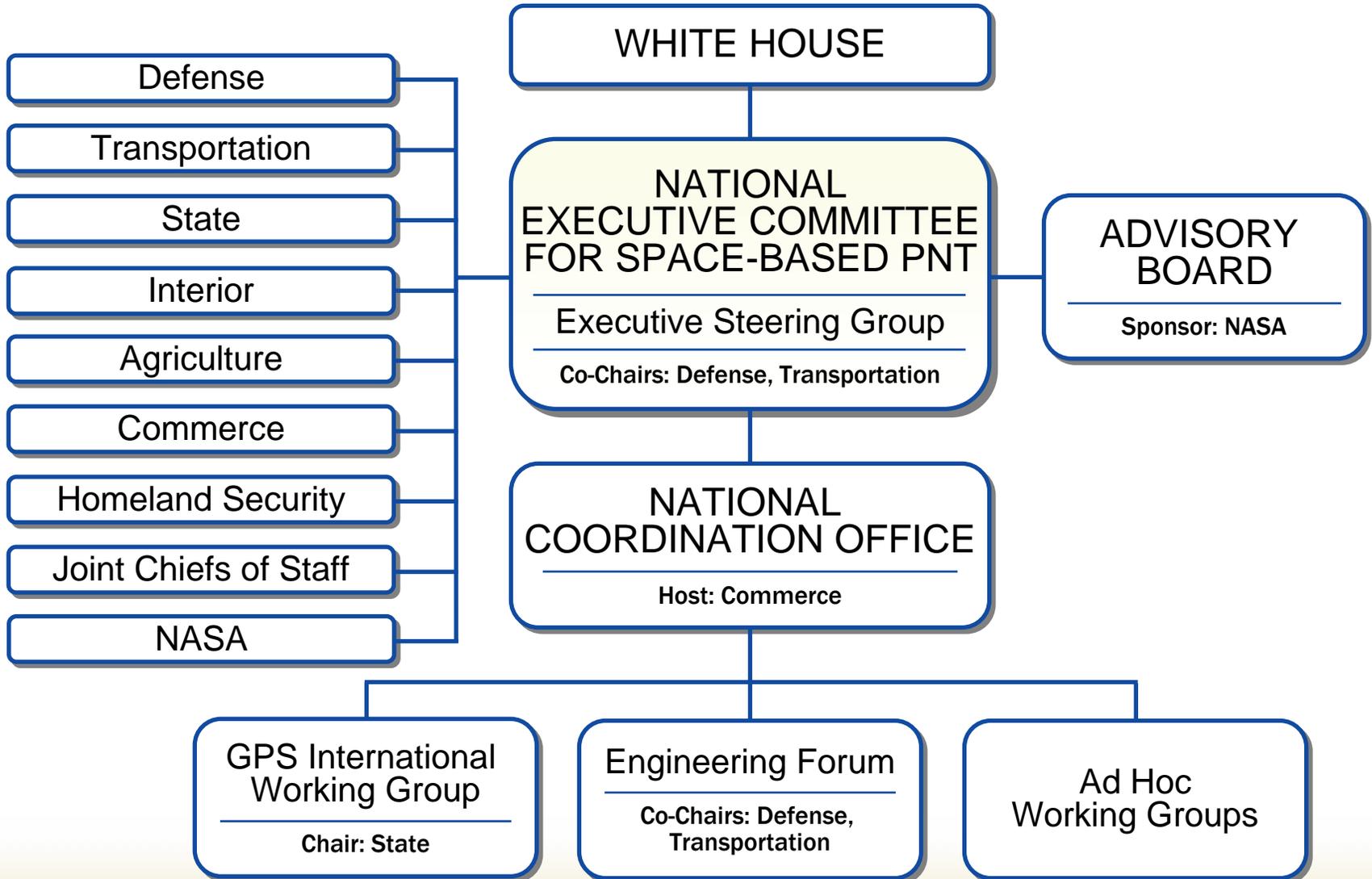
U.S. Space-based PNT Policy: Organization



- **Recognizes the changing international scene**
 - Other nations are implementing space-based systems that provide PNT services
- **National Executive Committee for Space-based PNT**
 - Chaired by Deputy Secretaries of Defense and Transportation
 - Membership includes: State, Interior, Agriculture, Commerce, Homeland Security, Joint Chiefs of Staff and NASA
- **Established National Coordination Office (NCO) with staff from each member agency**



National Space-Based PNT Organization Structure





Keys to the Global Success of GPS



- **Program Stability and Performance**
- **Policy Stability and Transparency**
- **Private Sector Entrepreneurship and Investment**



U.S. Policy Promotes Global Use of GPS/GNSS 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**
- **Service improvements for civil, commercial, and scientific users worldwide**
- **Global compatibility and interoperability with GPS**



Private Sector Competition



- **Encourage fair competition in the private sector in GNSS receiver and application markets**
 - Leads to greater innovation, lower costs
- **Fair competition means no preferential treatment for any particular company (s)**
 - Equal (if not open) access to information and markets
- **Freedom of choice desired for end users**
 - Standards and other governmental measures should not effectively mandate use of one GNSS over another
- **U.S. agreements with other GNSS providers include language on fair trade/open markets (non-discriminatory)**



Planned Global Navigation Satellite Systems (GNSS)



- **Global Constellations**

- GPS (24+)
- GLONASS (30)
- Galileo (27)
- Compass (38)

- **Regional Constellations**

- QZSS (3)
- IRNSS (7)

- **Satellite-Based Augmentations**

- WAAS (3)
- MSAS (2)
- EGNOS (3)
- GAGAN (3)
- SDCM (2)



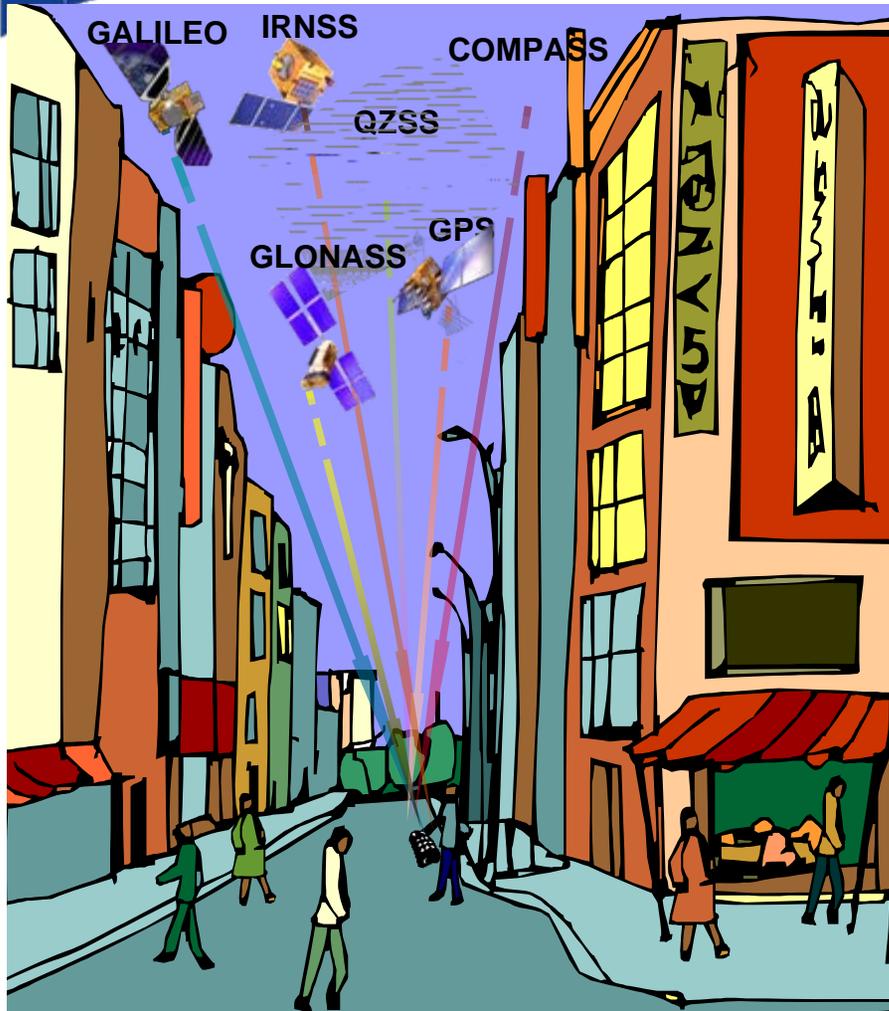
U.S. Objectives in Working with Other GNSS Service Providers



- 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

The Goal of RNSS Civil Interoperability



- Ideal interoperability allows navigation with **one signal each** from four or more systems with **no additional receiver cost or complexity**

Interoperable = Better Together than Separate



U.S. - Russian Federation Cooperation



- **U.S.- Russia Joint Statement issued in December 2004**
- **Negotiations for a U.S.-Russia Agreement on satellite navigation cooperation have been underway since late 2005**
- **Several very productive technical working group meetings have been held:**
 - **Exchange of information regarding radio frequency compatibility and future civil signal designs**
 - **Next meeting of Working Group on Search and Rescue capabilities will be May 18-21 at St. Petersburg**



U.S. - Europe Cooperation



- 2004 U.S.-EU agreement provides foundation for cooperation
- Four working groups were set up under the agreement:
 - Technical, trade, future system, and security issues
- Improved new civil signal (MBOC) adopted in July 2007
- First Plenary Meeting successfully held in October 2008



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)



Other U.S. Bilateral Cooperation



- **U.S.-Japan Joint Statement on GPS Cooperation in 1998**
 - Established foundation for stable policy leading to Japan as a global leader in commercial GPS/GNSS markets
 - Japan's Quasi Zenith Satellite System (QZSS) designed to be fully compatible and highly interoperable with GPS
 - U.S. working with Japan to set up QZSS monitoring stations in Hawaii and Guam in exchange for data access
- **U.S.- India Joint Statement on GNSS Cooperation in 2007**
 - Important topic is ionospheric distortion/solutions to this phenomena
 - Technical Meetings focused on GPS-IRNSS compatibility and interoperability held in January and July 2008
- **U.S.-China**
 - Several meetings under International Telecommunication Union auspices to coordinate signal interference issues



International Committee on Global Navigation Satellite Systems (ICG)



- **ICG-3 held in December 2008 in Pasadena, California**
- **Began implementation of the ICG Work Plan within established working groups:**
 - **A. Interoperability and compatibility**
 - **B. Enhancement of performance of GNSS services**
 - **C. Information dissemination, education, outreach & coordination**
 - **D. Interaction with monitoring & reference station network organizations, e.g. Geodetic Reference Frames including **AFREF****
- **Associated Providers Forum: includes U.S., Russia, EU, China, India, Japan**
 - **Updated definitions of interoperability and compatibility**
- **Russia will host the 4th ICG and Associated Providers Forum in St. Petersburg in September 2009**



APEC GIT Cooperation



- **The Asia-Pacific Economic Cooperation (APEC) forum facilitates economic growth, cooperation, trade and investment in the Asia-Pacific region for its 21 member economies**
- **The APEC GNSS Implementation Team (GIT) has focused on air traffic control and aviation issues**
 - **The group now seeks to broaden its focus to the application of GNSS in all transportation sectors**
 - **Additional participation of GNSS government and industry experts is encouraged**
 - **Next GIT-13 meeting will be held in Singapore in conjunction with the Transportation Work Group**





African Geodetic Reference Frame (AFREF)



- **AFREF aims to unify African reference frames based on the International Terrestrial Reference Frame (ITRF) through a network of GNSS base stations spaced such that users will be less than 1000 km from a station with data freely available to all users**
- **AFREF aims to realize a unified vertical datum and to establish a precise African geoid**
- **AFREF seeks to determine the relationship between the existing national reference frames and the ITRF to preserve legacy information**
- **AFREF plans to provide a sustainable development environment for technology transfer**



U.S. Supports AFREF Development



- **AFREF is an African initiative**
- **ICG Working Group D addresses reference frame issues, including AFREF**
- **In 2008 through UNOOSA/ICG, the U.S. facilitated the travel of twenty Africans to an AFREF workshop at the African Array Conference held at University of Witswatersrand, Johannesburg, RSA**
- **U.S. plans to continue to support AFREF development through Africa Array, the UNOOSA and other existing international initiatives**



Summary



- **International cooperation** in the context of U.S. Space-based PNT Policy principles is a **top priority** for the U.S. Government
- Keys to GPS success include program stability and performance; policy stability and transparency; and private sector initiative and investment
- The U.S. is actively engaged in bi-lateral, multi-lateral and regional cooperation on satellite navigation issues
- Compatibility and civil interoperability are the keys to “success for all”



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BACKUP

GPS is Critical to Our Economy and National Infrastructure



Satellite Operations



Precision Agriculture



Surveying & Mapping



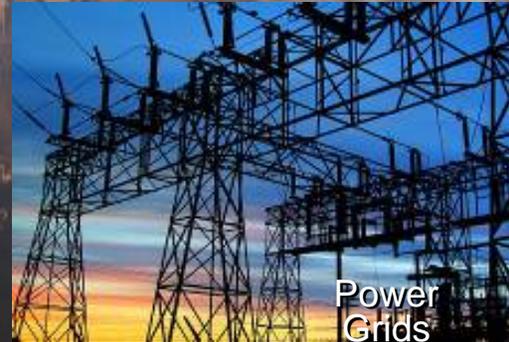
Aviation



TeleComm



Disease Control



Power Grids



Trucking & Shipping



Oil Exploration



Fishing & Boating



Personal Navigation



USDA Equity in Future of NDGPS



Four USDA Agencies currently use NDGPS

- **Natural Resources and Environment**
 - Natural Resources Conservation Service (NRCS)
 - Resource Inventory and Assessment; Easement and Water Resource Programs
 - U.S. Forest Service (USFS)
 - Fire Management; Forest Inventory and Health Protection Programs
- **Farm and Foreign Agricultural Services**
 - Farm Service Agency (FSA)
 - Disaster Assistance; Restore Wetlands and Grassland Reserve Programs
- **Rural Development**
 - Rural Utilities and Business Cooperative Services (RBS)
 - Water & Environmental Programs; Hurricane Katrina Recovery Programs



Web-based Information



- **PNT.gov** established to distribute information on the U.S. National Executive Committee to include:
 - U.S. Policy, Executive Committee membership, Advisory Board and frequently asked questions
 - Recent announcement on Selective Availability and offer letter to International Civil Aviation Organization
 - All recent public presentation
- **GPS.gov** established for public information about GPS applications
 - Available in English, French, Spanish, Arabic and Chinese
 - Brochure also available in hardcopy upon request
 - Contains additional links to various other web sites