



U.S. GPS/GNSS International Activities Update

Civil GPS Service Interface Committee Meeting

Tampa, Florida

Jeffrey Auerbach
Office of Space and Advanced Technology
U.S. Department of State

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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



GNSS: A Global Navigation Satellite System of Systems

- Global Constellations

- **GPS (24+3)**
- GLONASS (24+)
- GALILEO (24+3)
- BDS/BEIDOU (27+3 IGSO + 5 GEO)

- Regional Constellations

- QZSS (4+3)
- IRNSS (7)

- Satellite-Based Augmentations

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





Bilateral Cooperation: China

- First bilateral space-based PNT related meeting on civil cooperation topics held 19 May 2014 in Beijing
 - Topics included: interoperability, service monitoring, interference detection, spectrum protection, and civil aviation applications
 - Agreement to establish a civil satellite navigation cooperation working group for additional discussions
- Second bilateral space-based PNT meeting held 4-5 June 2015 in Washington, D.C.
 - Topics included: Aviation applications, compatibility and interoperability discussions, civil service provision and multilateral issues



Bilateral Cooperation: Europe

- GPS-Galileo Cooperation Agreement signed in 2004
 - Third Plenary meeting in Torrejon, Spain in June 2014
 - Four working groups established under the Agreement – continue to meet regularly as needed
- ITU compatibility coordination completed under Working Group A in July 2014
- Working Group B (Trade & Civil Applications) met June 2015 in Vienna, Austria
- Working Group C met June 2015 – Discussion focused on ARAIM and convergence toward compatible formats for both GPS and Galileo service performance commitments
- 8th U.S.-EU Space Dialogue scheduled for December 2015 in Washington, DC



Bilateral Cooperation: India

- U.S.–India Joint statement signed in 2007
- Discussion on emerging IRNSS and spectrum use
- ITU compatibility coordination completed between GPS and IRNSS
- U.S.-India Civil Space Joint Working Group (CSJWG)
 - Last meeting held in Washington, D.C., March 2013
 - Next meeting scheduled for 23-24 September 2015 in Bangalore, India



Bilateral Cooperation: Japan

- Presidential/Prime Minister level Joint Statement signed in 1998
- U.S. continues to host QZSS monitoring stations in Hawaii and Guam
- ITU compatibility coordination between GPS and QZSS (four satellite configuration) completed in April 2015
- Sixth U.S.-Japan Civil Space Dialogue held September 10 in Tokyo
- Third U.S.-Japan Comprehensive Dialogue on Space held September 11 in Tokyo



Additional Bilateral Cooperation

- *Australia*: Joint Delegation Statement on Cooperation in the Civil Use of GPS in 2007
 - Last bilateral dialogue held in Oct. 2010
- *Canada*: Civil GNSS meeting held May 6, 2015 in Ottawa
 - Agreed to expand cooperation on interference detection and mitigation, jammer enforcement, and geodetic network ground station coverage in Canada
- *Republic of Korea*: 1st Civil Space Dialogue took place in Washington, D.C., July, 2014
 - Korea's interest in developing/deploying an SBAS and potential cooperation discussed
- *Vietnam*: 1st Civil Space Dialogue held December 18, 2014 in Washington, D.C.
 - GNSS applications discussed among other topics



International Committee on Global Navigation Satellite Systems (ICG)

- Emerged from 3rd UN Conference on the Exploration and Peaceful Uses of Outer Space July 1999
 - 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)
 - Other Member States of the United Nations
 - International organizations/associations



<http://www.unoosa.org/oosa/en/ourwork/icg/icg.html>



ICG Providers' Forum

- Members include the U.S., EU, Russia, China, India, and Japan
 - Focused discussions on **compatibility and interoperability**, encouraging development of complimentary systems
 - Exchange detailed information on systems and service provision plans
- Consensus reached on Principles of **compatibility, interoperability and transparency** in civil service provision
 - Compatibility definition includes spectral separation between each system's authorized service signals (e.g. U.S. M-code) and other systems' signals
- Providers are leading efforts to promote GNSS *radio-frequency interference detection and mitigation*
- The Next **Providers' Forum** (15th) Meeting will take place in November in Boulder, CO



ICG-9 Meeting in Prague, November 2014

- Interference Detection and Mitigation (IDM)
 - Nations should evaluate & implement existing/emerging **IDM capabilities** and work with the telecom industry on standards for crowd sourcing IDM techniques
 - The ICG Secretariat and IDM taskforce will organize UN-sponsored workshops on **RNSS spectrum protection** and IDM for user community member nations
 - IDM Task Force initiated a discussion on **GNSS as critical infrastructure**
- International Multi-GNSS monitoring and assessment (IGMA)
 - Existing civil service centers should establish a link to a new ICG web portal allowing users to easily find GNSS monitoring information and products
 - Conduct a workshop in 2015 focused on **multi-GNSS open service monitoring**, parameters to be monitored, and an organizational approach
- Interoperability Task Force and System **Providers** should continue to assess industry feedback received at 4 **interoperability** workshops



2015 ICG Workshops

- Workshop on International GNSS Monitoring and Assessment (IGMA)
 - Held May 2015 in Xi'an, China
 - Discussion focused on
 - Identifying the goal objective for international monitoring
 - Determining service parameters to monitor
 - Organizational approach
- 4th Workshop on Interference Detection and Mitigation
 - Held June 2015 in Vienna, Austria
 - Topics of discussion included
 - Unintentional interference
 - Critical infrastructure
 - Back-up systems
 - Adjacent band compatibility
 - Interference detection and geo-location capabilities



ICG-10: November 1-6, 2015

- **U.S. will host in Boulder, Colorado**

Meeting Venue: University Corporation for Atmospheric Research (UCAR)

- Consortium of more than 100 member colleges and universities focused on atmospheric research and Earth system sciences
- UCAR manages the National Center for Atmospheric Research (NCAR) on behalf of the National Science Foundation

- **Tour Sites**

- NOAA, Space Weather Prediction Center
- UNAVCO
- NIST, Time and Frequency Laboratory

- **PNT Advisory Board Meeting**

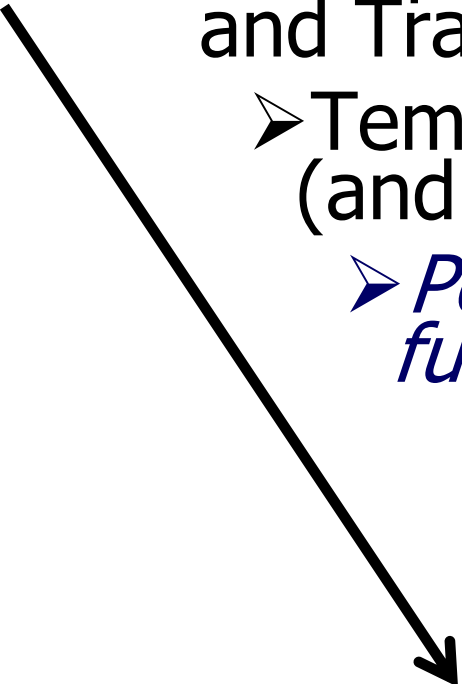
- October 30-31
- Boulder, CO (UCAR)



UCAR Center Green Facility



Progress at ICG in GNSS Civil Service Provision

- ✓ Providers Forum
 - ✓ Providers Forum System Report
 - ✓ Principles of Compatibility, Interoperability, and Transparency
 - Template for Performance Standards (and ICDs)
 - *Postulated Performance Standards for future services*
 - Service Assurances or Commitments
 - *Monitoring of service performance*
 - *Interference monitoring*
- 



Summary

- U.S. policy encourages worldwide civil GPS/GNSS use
- International cooperation to ensure compatibility, interoperability, and transparency is a priority
 - Includes bilateral cooperation with PNT providers and expanded discussions with important allies
- The ICG, with strong U.S. participation, is pursuing a Global Navigation Satellite System-of-Systems to provide civil GNSS services that benefit users worldwide



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International Committee on Global Navigation Satellite Systems

U.S. Attends ICG-9 in Prague, November 9-14

Photo: Martin Hlauka (Pescan)

The United States participated in the 9th meeting of the International Committee on GNSS (ICG), which convened in Prague, Czech Republic.

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