



UNITED NATIONS
Office for Outer Space Affairs



International Committee on
Global Navigation Satellite Systems

International Committee on Global Navigation Satellite Systems and its Programme on the Applications of Global Navigation Satellite Systems

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United Nations Office for Outer Space Affairs

ICG Executive Secretariat

***United Nations/Abdus Salam International Centre for Theoretical Physics (ICTP) Workshop on
the use of global navigation satellite systems for scientific applications***

Trieste, Italy, 1 – 5 December 2014



International Committee on Global Navigation Satellite Systems (ICG)

- ◆ **2005: Establishment of ICG (noted by UNGA 61/111 of 14 December 2006)**
 - ◆ **Promote the use of GNSS and its integration into infrastructures, particularly in developing countries**
 - ◆ **Encourage compatibility and interoperability among global and regional systems**
- ◆ **ICG Membership:**
 - ◆ ***Members: 9 nations & the European Union***
 - ◆ **Current and future core, regional or augmentation system providers (China (BeiDou), EU (Galileo/EGNOS), Russian Federation (GLONASS/SDCM), USA (GPS/WAAS), India (IRNSS/GAGAN), and Japan (QZSS/MSAS))**
 - ◆ **State Members of the UN with an active programme in implementing or promoting a wide range of GNSS services and applications (Italy, Malaysia, United Arab Emirates)**
 - ◆ ***Associate Members and Observers: 20 organizations***
 - ◆ **International and regional organizations and associations dealing with GNSS services and applications (UN system entities, IGOs, NGOs)**



ICG Annual Meetings

UNOOSA (2006), India (2007), USA (2008), Russia (2009), Italy & EU (2010), Japan (2011), China (2012), United Arab Emirates (2013), European Union (2014)

2006: Terms of Reference and Work plan

- ◆ **Compatibility and Interoperability (USA and Russian Federation)**
 - ◆ Focused discussion on compatibility and interoperability, encouraging development of complimentary systems
 - ◆ Exchange detailed information on systems and service provision plans and views on the ICG work plan and activities
- ◆ **Enhancement of GNSS Services Performance (India and ESA)**
 - ◆ Focused on system enhancements (multipath, integrity, interference, etc.) to meet future needs
- ◆ **Information Dissemination and Capacity Building (OOSA)**
 - ◆ Focused on training/workshops, promoting scientific applications, space weather
- ◆ **Reference Frames, Timing and Applications (IAG, IGS and FIG)**
 - ◆ Focused on monitoring and reference station networks



Providers' Forum

2007: Establishment

- ◆ **Members:** China (Compass/BeiDou), India (GAGAN/IRNSS), Japan (QZSS/MSAS), Russian Federation (GLONASS), USA (GPS), EU (Galileo/EGNOS)

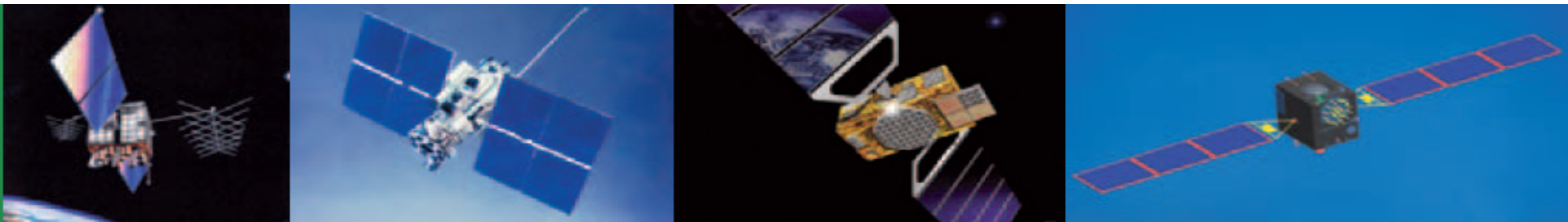
◆ **2008 : Terms of Reference and Work plan**

- ◆ Agreement that all GNSS signals and services must be **compatible** and open signals and services should also be **interoperable** to the maximum extent possible in order to maximize benefit to all GNSS users

- ◆ **Principle of Transparency** – every GNSS provider should publish documentation that describes the signal and system information, the policies of provision and the minimum levels of performance offered for its open services

- ◆ **Thirteenth Meeting, 9 – 13 November 2014, Prague, Czech Republic (in conjunction with the Ninth Meeting of the ICG, 10 – 14 November 2014)**

- ◆ ***Open Service Information Dissemination, Open Service Performance, Spectrum Protection (IDM)***





Interoperability and Compatibility



The **Providers' Forum** continues to investigate the benefits of carrier frequency commonality and diversity, as well as of compatibility and interoperability, as these latter terms are defined below:

Interoperability (“*better together than separate*”) refers to the ability of global and regional navigation satellite systems and augmentations and the services they provide to be used together to provide better capabilities at the user level than would be achieved by relying solely on the open signals of one system;

Compatibility (“*do no harm*”) refers to the ability of global and regional navigation satellite systems and augmentations to be used separately or together without causing unacceptable interference and/or other harm to an individual system and/or service



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Ninth Meeting of the ICG

2014: Ninth Meeting of the ICG, European Union, 10 – 14 November

- ◆ **ICG-9 Local Host: European GNSS Agency (GSA), Prague, Czech Republic**
- ◆ **Agenda:**
 - ◆ **Plenary Sessions: *Providers/Regional System and Service Updates***
 - ◆ **13th Meeting of the Providers' Forum**
 - ◆ **Joint Meeting: *Providers & Members/Associate Members/Observers***
 - ◆ **Expert Seminar: *GNSS Science and Technology applications***
 - ◆ *GNSS market opportunities, Road/Intelligent Transport Systems (ITS), Rail, Precision agriculture*
 - ◆ **Working Group Meetings: *Progress on implementing ICG Work Plan within established working groups***

<http://www.unoosa.org/>



Agenda



	Sunday 9 November	Monday 10 November	Tuesday 11 November	Wednesday 12 November	Thursday 13 November	Friday 14 November	
		Registration 08:00 - 14:00	Registration 08:00 - 14:00	Registration 08:00 - 14:00			
9:00		Opening Ceremony + Welcome/ Opening Remarks Adoption of Agenda	2nd Providers' Forum	Meeting of Members, Associate Members and Observers	WG meetings (preparation of the recommendations)	Third Plenary Session	
AM sessions		First Plenary Session	Working Group A	Working Group D	Working Group B		Working Group C
					2nd Plenary Session Presentation by W.G.	Adourn	
Lunch							
		Applications and/or Experts Seminar	Working Group A	Working Group D	Working Group B	Working Group C	
PM Sessions					2nd Plenary Session Presentation by W.G.	3rd Providers' Forum/ Meeting of Members, Associate Members and Observers	
						Adourn	
18:00	Registration 16:00 - 18:00	Adourn	Adourn	Adourn			
	Meeting with W.G. Chairs						
	1st Providers' Forum Meeting						
		Welcome Dinner		CityTour			





ICG Working Groups: Working Group A recommendations

- **International Mobile Telecommunications (IMT)-GNSS Compatibility**
 - ***To actively participate in the ITU-R and regional WRC-15 preparatory work on new IMT spectrum allocations in order to ensure that proposals do not impact existing and future GNSS operations. Members may also consider forming links with other satellite groups already defending satellite spectrum.***
- **Evaluation and development of Interference Detection and Mitigation (IDM) capabilities**
 - ***To evaluate existing and emerging interference detection, localization, and characterization capabilities and consider developing, testing and implementing these or similar capabilities in their nations or regions of the world***
- **Crowd sourcing interference detection and localization techniques**
 - ***To work with industry groups to determine if standards for crowd sourcing interference detection and localization techniques should be developed and cost effectively implemented by mobile telecom service providers***



ICG Working Groups: Working Group A recommendations (cont.)

- **Radio navigation satellite services (RNSS) spectrum protection and IDM for member nations in the GNSS user community**
 - ***To educate administrations regarding RNSS spectrum management approaches and IDM capabilities; and***
 - ***To provide information as to whether it is legal within their country to: manufacture, sell domestically, export, import, purchase, own, or use GNSS jammers***
- **Open Service Monitoring Information Portal**
 - ***Existing monitoring service centers for GNSS open services establish a link to the ICG info portal designed by the International GNSS Monitoring and Assessment (IGMA) Task Force***
 - ***To allow GNSS users worldwide to easily find GNSS monitoring information and products***
- **IGMA Workshop**
 - ***To discuss the following: (i) Goal and purpose; (ii) Parameters to be monitored using the “Matrices” prepared by the TF; (iii) Organizational approach; (iv) Sharing portal***
 - **The workshop will be held in Xi’an, China, 12 May 2015 immediately preceding CSNC**



ICG Working Groups: Working Group B recommendations

➤ **NeQuick Ionospheric Model**

- ***To distribute to the Service Providers and Users the document providing the detailed description of the Nequick algorithm implemented in Galileo for the correction of the ionospheric error in single frequency users;***
- ***For the Service Providers and interested users participating in the ICG, to assess the performance and usability of a Nequick ionospheric correction algorithm for the single frequency users similar to the one adopted by Galileo in view of its expected good performance compared with other models, i.e. at low latitudes***

➤ **Interoperable GNSS Space Service Volume (SSV) Characterization Outreach**

- ◆ ***To support the SSV outreach by making the booklet on “Interoperable GNSS Space Service Volume” available to the public through their relevant websites once the booklet is available***



ICG Working Groups: Working Group C recommendations

- **Capacity Building and GNSS outreach activities in South East Asia**
 - *To organize workshops and technical seminars in the field of GNSS and its applications in South East Asia region (in cooperation with the NAVIS Centre, Italy and GEospatial and Space Technology consortium for Innovative Social Services (GESTISS), Japan)*
- **Outreach material and contribution to the UN-affiliated regional centres for science and technology acting as information centres for the ICG**
 - ◆ *To cooperate with industry leaders (seminars/trainings and supportive materials)*
 - **Develop template for cooperation between existing or developing provider and GNSS user information centers for ICG Member Consideration**
 - ◆ *To improve cooperation between existing and developing provider user information centres, all the provider and GNSS user information centres consider development and adoption of a process for referring inquiries to each other where appropriate*



ICG Working Groups: Working Group D recommendations

- **Support for the UN GA Resolution on the Global Geodetic Reference Frame**
- **Improving the accuracy of multi-GNSS orbits determination**
 - *Interested GNSS Providers consider the possibility of making available the following list (or a sub-set) of satellite data for better orbit dynamics modeling*
 - **Primary list:**
 - *Surface geometry and dimensions*
 - *Surface optical properties (or material types)*
 - *Nominal attitude model*
 - *Transmitted power in all signals (and direction if relevant)*
 - *Solar panel construction information (thickness, conductivity, power draw)*
 - *Position and power output of radiators*
 - *Thermal properties of multi-layered insulation*

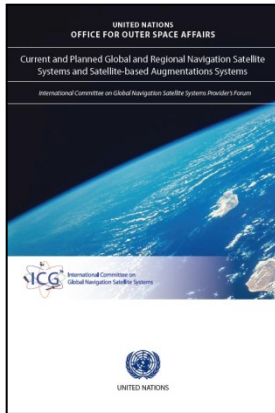


Information Dissemination

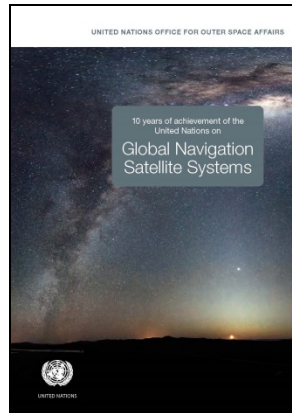
The way forward to provide positioning, navigation and timing globally



2007

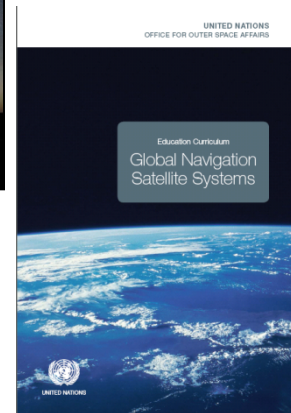


2010



2011

Achievements of providers and users of positioning, navigation, and timing services, under the umbrella of the United Nations, in promoting GNSS over the past 10 years



2012

Education Curriculum and Glossary of GNSS Terms (English, French, Spanish, Arabic)



Programme on GNSS Applications

Regional Workshops on the Applications of GNSS:

- ◆ *Zambia and China (2006), Colombia (2008), Azerbaijan (2009), Moldova (2010), UAE (2011), Latvia (2012), Croatia (2013), ICTP (2014)*
 - ◆ *increase awareness among decision and policy makers of the benefits of GNSS and develop regional and national pilot projects on GNSS applications, and strengthen the networking of GNSS related institutions in the regions*

- ◆ **2014:** United Nations/International Centre for Theoretical Physics Workshop on the use of GNSS for scientific applications, 1 – 5 December, Trieste, Italy
 - Follow-up to the workshops and training courses carried out between 2009 and 2013
 - Developing partnerships and networks, including the possibility of one or more national, regional and international pilot projects
 - Establishment of a partnership through voluntary actions that could include Governments, international organizations and other relevant stakeholders



Programme on GNSS Applications (continued)

Promoting the use of GNSS technologies as tools for scientific applications, including space weather effects on GNSS:

- ◆ ***Reference Frames and Timing (ICG WG D)***
 - ◆ ***The objective and goals: to provide technical knowledge on the operational and practical aspects and issues relating to references frames, more specifically,***
 - ◆ ***facilitate a regional forum for geodetic agencies, improve data sharing (GNSS, levelling, tide gauge, gravity) and dense regional reference frame***
- ◆ ***Space Weather and its effects on GNSS (Boston College and ICTP)***
- ◆ ***Ionospheric modelling is an effective approach for correcting the ionospheric range error and improving the GNSS positioning accuracy***
 - ◆ ***The abundance of GPS measurements from worldwide distributed GPS reference networks, which provide 24-hour uninterrupted operational services to record dual-frequency GPS measurements provides an ideal data source for ionospheric modelling research***



Regional Centres for Space Science and Technology Education, affiliated to the United Nations, as Information Centres for ICG

- ◆ ***Africa: Morocco and Nigeria***
- ◆ ***Latin America and the Caribbean: Brazil and Mexico***
- ◆ ***Asia and the Pacific: India***
- ◆ ***Western Asia: Jordan***
- ◆ ***Remote Sensing & GIS, Satellite Meteorology & Global Climate, Satellite Communications, Space & Atmospheric Science and [Global Navigation Satellite Systems \(2013\)](#)***





International Committee on Global Navigation Satellite Systems

- **As new space-based GNSS are emerging globally, interoperability is the key to “success for all”**
- **ICG is a forum to discuss GNSS to benefit people around the world**
- **Mission Statement (ICG-8) and Vision Statement (ICG-9):**

The International Committee on Global Navigation Satellite Systems (ICG) strives to encourage and facilitate compatibility, interoperability and transparency between all the satellite navigation systems, to promote and protect the use of their open service applications and thereby benefit the global community. Our vision is to ensure the best satellite based positioning, navigation and timing for peaceful uses for everybody, anywhere, any time.





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