



International Committee on Global Navigation Satellite Systems

23 – 26 January 2018

**Training Course on Global Navigation Satellite Systems
AIT, Bangkok, Thailand**

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Office for Outer Space Affairs**



Space yesterday

- **Moving Frontier** – improving technology and its impact
- Need for **governance**
 - 5 Treaties and 5 Principles
 - 50 Years of the Outer Space Treaty
- Call for **trust and cooperation**
- **Interlinkages** –cross-sectoral impact as applicability of space technologies has been broadening
- **Dependency** – space offers critical infrastructure and we have become more and more dependent on it





UNITED NATIONS
OFFICE FOR OUTER SPACE AFFAIRS

United Nations Programme on Space Applications



UNITED NATIONS

1959: UN General Assembly created the Committee on the Peaceful Uses of Outer Space (COPUOS).

- ✓ To review the scope of international cooperation in peaceful uses of outer space.
- ✓ To devise the programmes in this field to be undertaken under the UN auspices.
- ✓ To encourage continued research & dissemination of information on outer space matters.
- ✓ To study legal problems arising from the exploration of outer space.

1968: “UN Programme on Space Applications (PSA)” was established in response to recommendations of the first UNISPACE (UN Conference on Exploration and Peaceful Uses of Outer Space).

1971: The Programme became operational. **UNOOSA, as the Secretariat of COPUOS,** was also given the responsibility for implementing the Programme.



Space Today

- Space technology supports our common goals to address **global challenges of the 2030 Agenda for Sustainable Development.**
- There is no better example of UNOOSA's vision **'to bring the benefits of space to humankind'** by showing space's importance in the realization and implementation of the 17 Sustainable Development Goals.





Space in the UN system

UNOOSA is the only UN office with a number of General Assembly mandates to bridge access to space technologies and space-based information for Member States and other UN agencies and to build capacity in the use of such technologies.

UN-Space

The annual interagency meeting (est. 1975) - since 2014 = UN-Space.

For the attainment of all 17 SDGs and 169 targets **space tools** carry significant relevance:

Direct — as enablers and drivers for sustainable development

Indirect — as an integral part of the indicators for monitoring progress





Vision

Bringing the benefits of space to humankind

Mission Statement

The core business of the Office is to promote international cooperation in the use of outer space to achieve development goals for the benefit of humankind



Mandates – overview

- Secretariat of the **Committee on the Peaceful Uses of Outer Space** (& Scientific and Subcommittee and Legal Subcommittee)
- United Nations Inter-Agency meeting on Outer Space Activities (**UN-Space**)
- **UN Programme on Space Applications**
- **Executive Secretariat** for International Committee on Global Navigation Satellite Systems (**ICG**)
- **Coordination/cooperation** with space agencies, IGOs & NGOs involved in space-related activities
- Maintains the **Register of Objects Launched into Outer Space**
- Discharges responsibilities of the Secretary-General under the **UN treaties and principles on outer space**
- Implements the United Nations Platform for Space-based Information for Disaster Management and Emergency Response (**UN-SPIDER**) programme



Committee on the Peaceful Uses of Outer Space

Space and
climate change

Disaster
Management

Space debris
mitigation

National space
legislation

International
mechanisms for
cooperation

Long-term
sustainability of
outer space
activities

Definition and
delimitation
of outer space

Space
applications for
socioeconomic
development

Near-Earth
objects

Global Navigation
Satellite Systems

Space
Weather

GGE-report and
TCBM's



International Committee on GNSS (ICG)

- Promote voluntary cooperation on matters of mutual interest related to civil satellite-based positioning, navigation, timing, and value added services
- Contribute to the sustainable development of the world
- Encourage coordination among GNSS Providers to ensure greater **compatibility, interoperability, and transparency**
- Promote the introduction and utilization of GNSS services in developing countries, by assisting with the integration into their infrastructure
- Assist GNSS users with their development plans and applications, by encouraging coordination and serving as a focal point for international information exchange

Mission Statement: ICG-8 Meeting, 2013, Dubai, United Arab Emirates



International Committee on GNSS (ICG)

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.

Vision Statement: ICG-9 Meeting, 2014, Prague, Czech Republic





Background

2001 – 2004: Action Team on GNSS (Italy and the United States) – *in implementation of the recommendations of UNISPACE-III, June 1999, Vienna*

- An international framework to support operational coordination and exchange of information among system operators and national and international user communities would be important
- The assumption was that current and future system operators would soon move from a competitive to a collaborative mode where there is a shared interest in the universal use of GNSS services regardless of the system

2005: Establishment of the ICG (noted by UNGA 61/111 of 14 December 2006)

- Promote the use of GNSS and its integration into infrastructure, particularly in developing countries;
- Encourage **compatibility and interoperability** among global and regional systems

Main challenge is to provide assistance and information for those countries seeking to integrate GNSS into their basic infrastructure, including at governmental, scientific and commercial levels



Membership

Members: 9 nations and the European Union

- Current and future core, regional or augmentation systems providers: China (BeiDou), EU (Galileo/EGNOS), Russia (GLONASS/SDCM), United States (GPS/WAAS), India (IRNSS (NavIC)/GAGAN), and Japan (QZSS/MSAS)
- State Members of the United Nations 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: 21 organizations

- International & regional organizations and associations dealing with GNSS services and applications: UN system entities, IGOs, NGOs

ICG participation is open to all countries and entities that are either GNSS providers or users of GNSS services, and are interested and willing to actively be engaged in ICG activities



Annual Meetings

- UNOOSA (2006), India (2007), United States (2008), Russian Federation (2009), Italy & European Union (2010), Japan (2011), China (2012), United Arab Emirates (2013), European Union (2014), United States (2015), Russian Federation (2016), **Japan (2017)**, **China (2018)**, India (2019), Vienna (2020)
- **2006:** Terms of Reference and Workplan
- **Systems, Signals and Services (United States & Russian Federation):** Focused discussion on compatibility and interoperability, encouraging development of complimentary systems; Exchange detailed information on systems and service provision plans
- **Enhancement of GNSS Performance, New Services and Capabilities (India, China and European Space Agency):** Focused discussion on system enhancements (multipath, integrity, interference, etc.) to meet future needs
- **Information Dissemination and Capacity Building (UNOOSA):** Focused on education and training programmes, promoting GNSS for scientific exploration (space weather specifically)
- **Reference Frames, Timing and Applications (IAG, IGS & FIG):** Focused on monitoring and reference station networks



Providers' Forum

2007: Establishment - UNGA Res. 62/217 of 1 February 2008: Agenda item “Recent developments in GNSS (Scientific and Technical Subcommittee)

- Members: Current and future global and regional satellite navigation systems and Satellite-based Augmentation Systems (SBAS) providers
- PF provides ways and means of promoting communication among system providers on key technical issues and operational concepts such as the GNSS spectrum protection, orbital debris, and orbit de-confliction

2008: Terms of Reference and Workplan

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



Providers' Forum

2017: 19th Meeting, 2 and 6 December, Kyoto, Japan (ICG-12)

- **Adjacent Band Compatibility:** can potentially occur not only in the L1 frequency band; potential deployments of wireless microphone applications in the band below 1164MHz, which could impact the L5 frequency band;
- **Medium Earth Orbit Search and Rescue (MEOSAR):** Currently there are three space segment MEOSAR providers –GPS, Galileo, and GLONASS;
- **Multi-GNSS Asia:** <http://www.multignss.asia/index.html>
- **Space Weather:** First ever GPS data release to boost space weather science:
<http://www.lanl.gov/discover/news-release-archive/2017/January/01.30-space-weather-science.php>

2018: 20th Meeting, 18 June 2018, Vienna, Austria

- Open Service Information Dissemination, Open Service Performance, Spectrum Protection (interference detection and mitigation)



Working Group S

▪ **Interference Detection and Mitigation (IDM)**

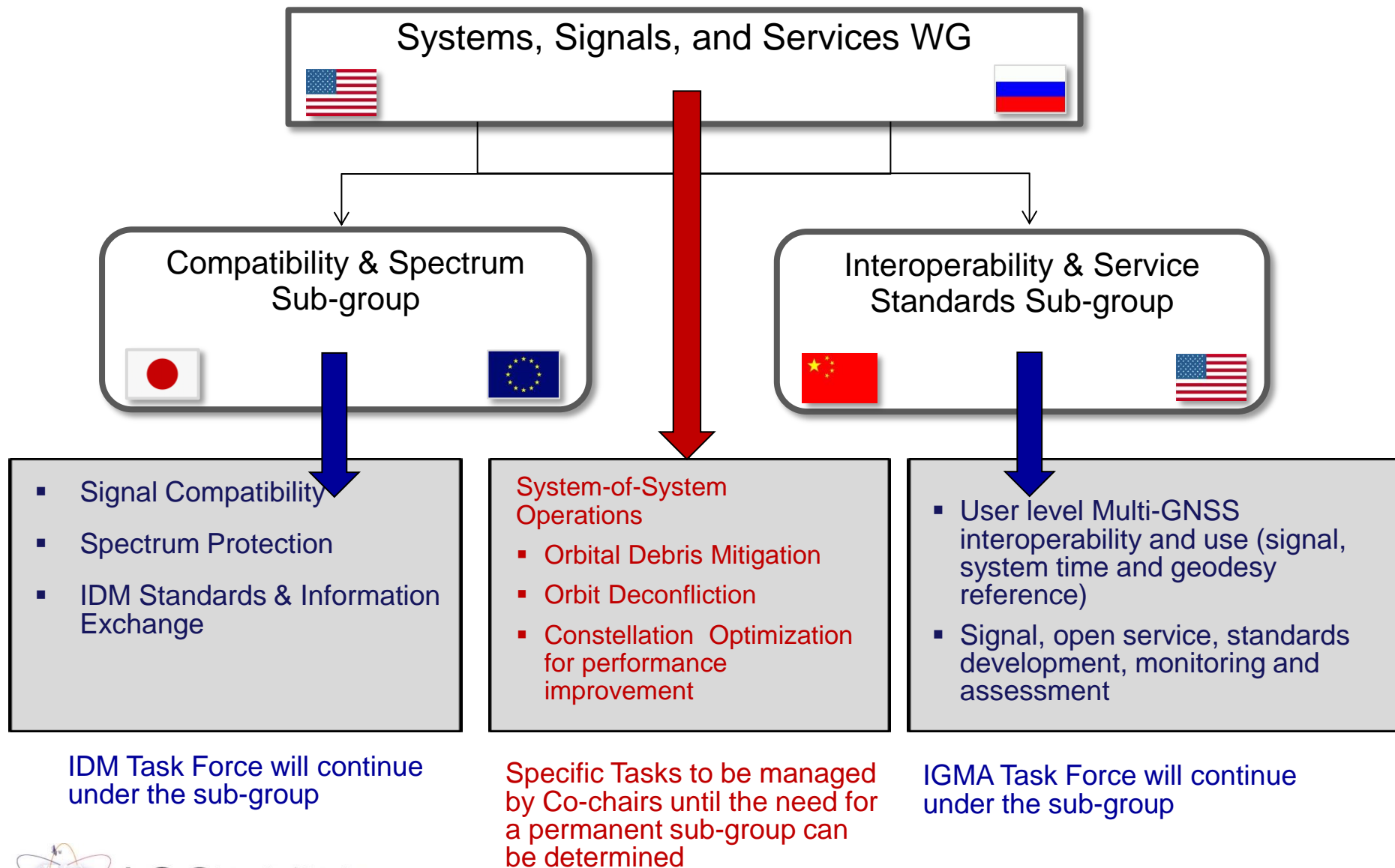
- To continue addressing the need for worldwide GNSS spectrum protection
- To establish a multi-year agenda item focused on national efforts to protect RNSS spectrum, and pursue GNSS IDM in member states

▪ **Request for voluntary reporting on national RNSS spectrum protection practices and GNSS IDM capabilities (A/AC.105/C.1/2017/CRP.18):**

STSC agreed that, a general exchange of information should be included on issues related to GNSS IDM, with a view to raising awareness of efforts to achieve the overall goal of promoting effective use of GNSS open services by the global community.

http://www.unoosa.org/res/oosadoc/data/documents/2017/aac_105c_12017crp/aac_105c_12017crp_18_0_html/AC105_C1_2017_CRP18E.pdf

Systems, Signals, and Services WG (WG-S)





Working Group B

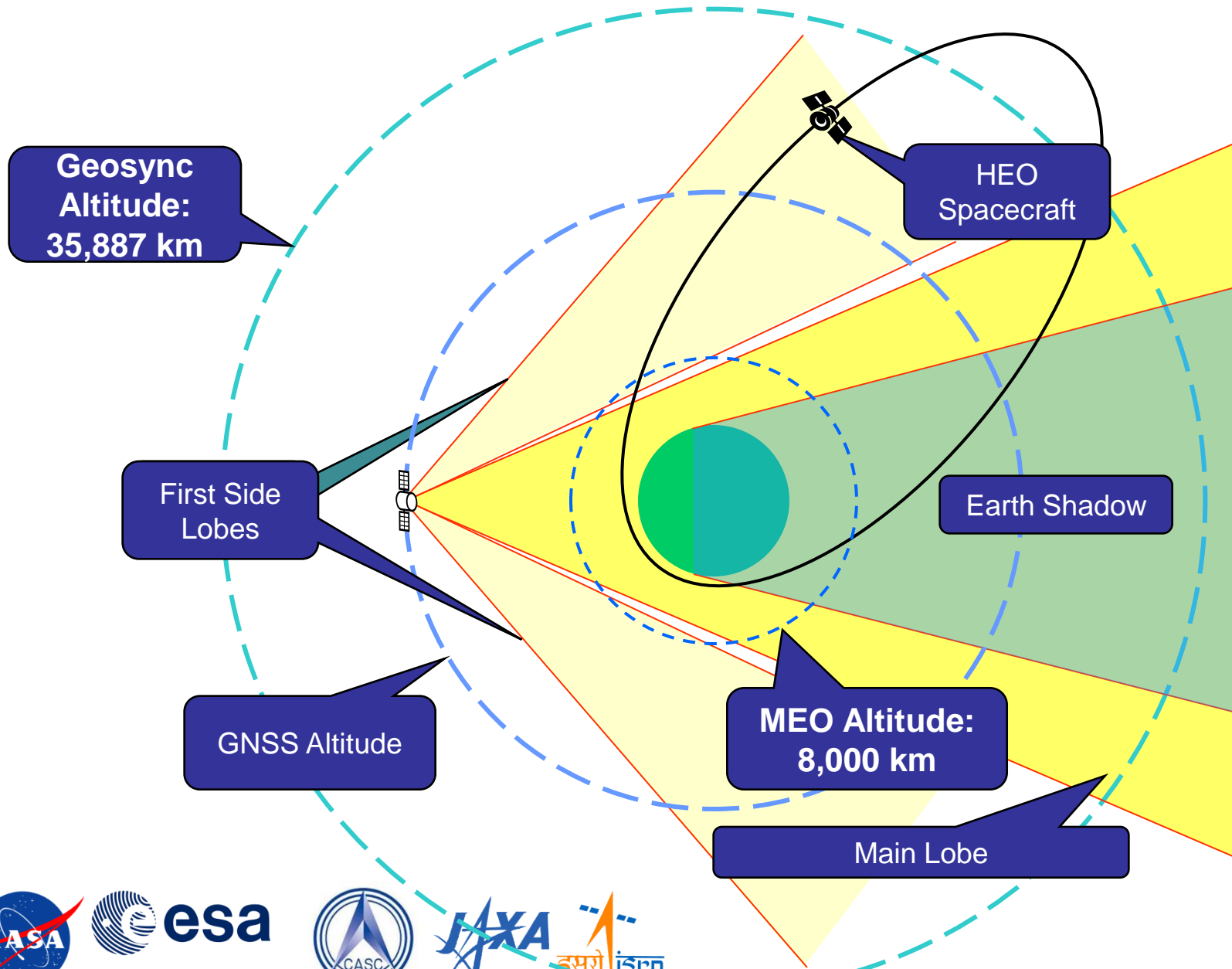
▪ **Interoperable GNSS Service Volume (SSV)**

- A booklet defining the characteristics of a fully **interoperable space service volume is being finalized**;
- GNSS SSV and potential augmentations can be seen as an enabler for many ambitious missions and activities in the context of space exploration going beyond low Earth orbit to the Moon, Mars and other celestial bodies;
- New concepts such as the Deep Space Gateway, could use the SSV capability to serve humankind in its next phase of space exploration.

The GNSS Space Service Volume (SSV) is the region of space extending to approximately the geostationary altitude or even beyond where terrestrial GNSS performance standards may not be applicable. The SSV defines GNSS system performance for space users by specifying at least three parameters:

1. Pseudorange Accuracy
2. Received Power and
3. Signal Availability

Reception Geometry for GNSS Signals in Space





Working Group D

▪ **The monitoring of offsets between GNSS times**

- Offsets between GNSS times are important information for GNSS users. Monitoring of the offsets between GNSS times and provision of consistent broadcast information are essential to improve interoperability and combined navigation using multiple GNSS

▪ **Guidelines on Selection and Prioritizing Laser Ranging to GNSS Satellites by the International Laser ranging Service (ILRS)**

- The International Laser Ranging Service (ILRS) coordinates a global network of approximately 40 laser tracking stations
- Laser tracking provides a very accurate means of determining satellite orbits, including of the GNSS satellites fitted with laser retroreflectors
- The ILRS supports a variety of satellite missions, with the highest priority being for the ITRF and Earth remote sensing. Currently the ILRS tracks all GNSS satellites in an uncoordinated fashion.



Programme on GNSS Applications

United Nations Regional Workshops/training courses on the use and applications of GNSS

- These activities increase awareness among decision and policy makers of the benefits of GNSS, and develop regional and national pilot projects on GNSS applications
- These activities bring together a large number of experts, including those from developing countries, to discuss and act on issues that are also of high relevance to the ICG

United Nations/Argentina Workshop on GNSS, 19 – 23 March 2018, Falda Del Carmen, Cordoba

- To focus on identifying the needs of users with respect to the compatibility and interoperability of global and regional systems, and space-based augmentations providing and planning to provide GNSS service
- Seminar on GNSS Spectrum Protection and IDM, and Space Weather



Programme on GNSS Applications

- **Promoting the use of GNSS technologies as tools for scientific applications**

- These activities are to provide technical knowledge on the operational and practical aspects and issues relating to reference frames, in particular to facilitate a regional forum for geodetic agencies, improve data sharing (GNSS leveling, tide gauge, gravity)
- [Technical Seminars on Reference Frames in Practice, FIG Working Week 2018, 4 – 5 May, Istanbul, Turkey](#)

- **Space Weather and its effects on GNSS**

- Extreme space-weather events have the potential to significantly threaten safety and property on Earth, with resulting cascading failures
- ICTP and Boston College: [Workshop on Space Weather Effects on GNSS Operations at Low Latitudes, 23 April - 4 May 2018, Trieste, Italy](#)

- **United Nations/Italy Long-term Fellowship Programme: Master in Navigation and Related Applications (MNA), Politecnico di Torino, Turin, Italy, 23 January 2018**

- The curriculum is structured to meet effectively work market demands for high-level technicians endowed with a broad vision of the navigation/localization state-of-the-art



ICG Information Portal



Our Work - ICG

International Committee on Global Navigation Satellite Systems (ICG)

MISSION STATEMENT

The International Committee on Global Navigation Satellite Systems (ICG), established in 2005 under the umbrella of the United Nations, promotes voluntary cooperation on matters of mutual interest related to civil satellite-based positioning, navigation, timing, and value-added services. The ICG contributes to the sustainable development of the world. Among the core missions of the ICG are to encourage coordination among providers of global navigation satellite systems (GNSS), regional systems, and augmentations in order to ensure greater compatibility, interoperability, and transparency, and to promote the introduction and utilization of these services and their future enhancements, including in developing countries, through assistance, if necessary, with the integration into their infrastructures. The ICG also serves to assist GNSS users with their development plans and applications, by encouraging coordination and serving as a focal point for information exchange.



International Committee on
Global Navigation Satellite Systems

VISION STATEMENT

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.

At the "United Nations International Meeting for the Establishment of the International Committee on Global Navigation Satellite Systems (ICG)" held on 1-2 December 2005 in Vienna, Austria, the ICG was established on a voluntary basis as an informal body for the purpose of promoting cooperation, as appropriate, on matters of mutual interest related to civil satellite-based positioning, navigation, timing, and value-added services, as well as compatibility and interoperability among the GNSS systems, while increasing their use to support sustainable development, particularly in the developing countries. The participants in the meeting agreed on an establishment of the ICG information portal, to be hosted by UNOOSA, as a portal for users of GNSS services.

Our Work

Secretariat of COPUOS
Programme on Space
Applications

UN-SPIDER

ICG

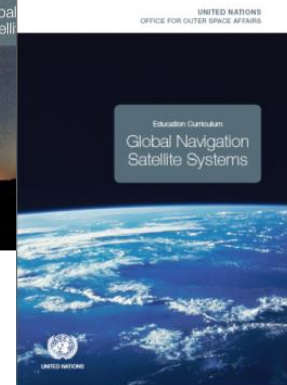
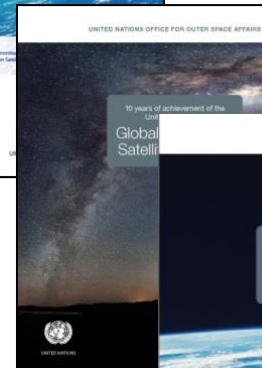
Members
Providers' Forum
Working Groups
ICG Annual Meetings
ICG Programme on GNSS
Applications
Resources
ICG Documents
Space Weather & GNSS
Other Events
ICG Timeline

UN-Space

Space Law

Topics

Photo Gallery

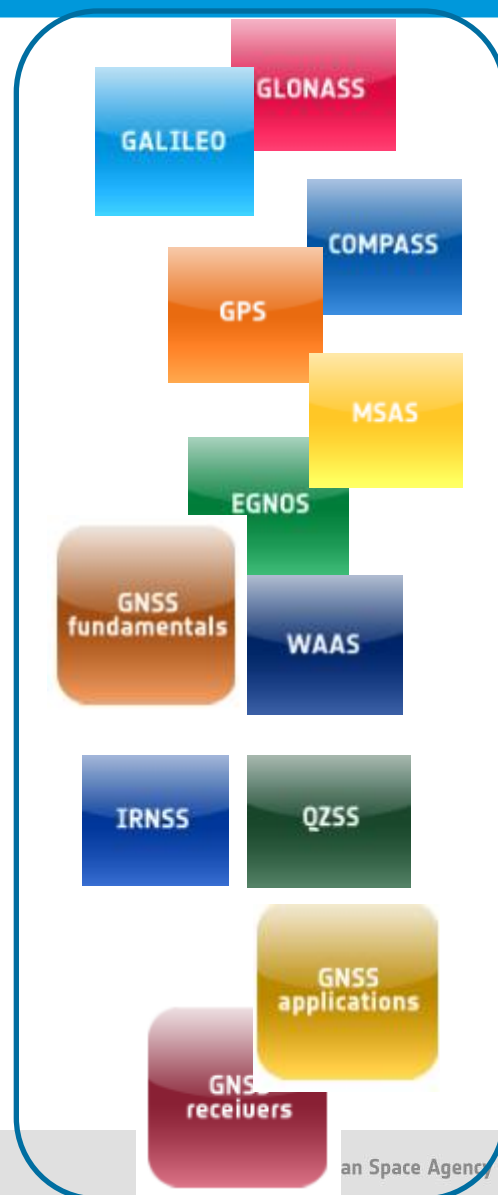


WWW.UNOOSA.ORG

WWW.UNOOSA.ORG/OOSA/EN/OURWORK/ICG/ICG.HTML

- In line with ICG2012 recommendation on NAVIPEDIA, ESA has been maintaining and developing further NAVIPEDIA with up-to-date information.
- NAVIPEDIA is today extensively used by universities and Galileo application developers.
- NAVIPEDIA is also used as reference as part of the European Satellite Navigation Conference (ESNC) for the GNSS application developers
- An APP version of NAVIPEDIA (for both Android and iOS operational systems) is currently under development. This should be ready by the end of 2016.
- Most visited articles are on GNSS fundamentals and GNSS applications.

www.navipedia.org





Conclusion

- Significant progress continues to be made through ICG, and the results of this work not only promote the capabilities of GNSS to support sustainable development, but also promote new partnerships among members of ICG and institutions of the broader user community, particularly in developing nations
- The activities and opportunities provided through the ICG result in the development and growth of capacities that will enable each country to enhance its knowledge, understanding and practical experience in those aspects of GNSS technology that have the potential for a greater impact on its economic and social development, including the preservation of its environment
- The ICG is an important vehicle in the multi-lateral arena, as satellite-based positioning, navigation and timing becomes more and more a genuine multinational cooperative venture

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THANK YOU



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