

**REPORT ON THE FOURTH MEETING OF THE
INTERNATIONAL COMMITTEE ON
GLOBAL NAVIGATION SATELLITE SYSTEMS (ICG)**
St Petersburg, Russian Federation, September 2009
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INTRODUCTION

The International Committee on Global Navigation Satellite Systems (ICG), met in St Petersburg, Russia from 14 to 18 September 2009. Vice President Matt Higgins attended representing the International Federation of Surveyors (FIG). The ICG has been formed as a result of recommendations of the UN Committee on the Peaceful Use of Outer Space (COPUOS), as ratified by the General Assembly of the UN. The United Nations Office for Outer Space Affairs (UN OOSA) acts as the secretariat for the ICG. It should be noted that FIG has an MoU with UN OOSA.



Figure 1: Attendees at ICG-4

JOINT STATEMENT FROM ICG-4

The Joint Statement issued at the end of the meeting outlines the highlights of the broad scope of work across the ICG and the most recent developments in St Petersburg. The Joint Statement from ICG-4 is included in this report as Attachment A. The Joint Statement, Working Group Reports and all of the Presentations made at the ICG-4 in St Petersburg are now available on the ICG Information portal. (see www.oosa.unvienna.org/oosa/en/SAP/gnss/icg/meetings.html).

REPORTS ON THE STATUS OF ALL OF THE MAJOR GNSS SUB-SYSTEMS

A key part of the membership of the ICG is the so-called “Provider’s Forum” and presentations were made on the status of all of the major GNSS sub-systems, including:

- China: Compass/BeiDou Navigation Satellite System (CNSS);
- European Community: European Satellite Navigation System (Galileo) and European Geostationary Navigation Overlay Service (EGNOS);
- India: GPS and GEO Augmented Navigation System (GAGAN) and Indian Regional Navigation Satellite System (IRNSS);
- Japan: Quasi-Zenith Satellite System (QZSS) and MTSAT (Multi-functional Transport Satellite) Satellite-based Augmentation System (MSAS);
- Russian Federation: Global Navigation Satellite System (GLONASS) and Wide-area System of Differential Corrections and Monitoring (SDCM);
- United States: Global Positioning System (GPS) and Wide-area Augmentation System (WAAS).

Several companies and government organisations from Russia were represented in an exhibition attached to the meeting and many also gave interesting presentations in the open sessions of the ICG meeting. Overall, presentations at the ICG are a very useful *snap shot* of the state of the art with the various GNSS and with issues across key user groups.

FIRST MEETINGS OF THE TASK FORCES ON GEODETIC AND TIMING REFERENCES

A major development for the surveying and geodesy community at ICG-4 was the first meetings of the Task Forces on Geodetic and Timing References. The Task Forces are convened under Working Group D, which is Co-Chaired by John Dow and Ruth Neilan (IAG/IGS) and Matt Higgins (FIG). The detailed report of Working Group D activities at ICG-4 is available on the UN OOSA web site (same link as given above) and the following is a summary of the major issues covered during ICG-4.

Task Force D1 on Geodetic References

- The need for the GNSS System Providers to document the geodetic references currently used or proposed for each system. It was also suggested that the Working Group A template for system providers to describe their ‘open service’ should include elements that describe the geodetic reference;
- Regarding Working Group D’s Recommendation #3 at ICG-3 about alignment of Geodetic References and synchronization of Time References to international standards, it was agreed that there is a need to recognize that system providers need to maintain, strengthen and retain their specific reference frames (such as PZ-90, WGS84, CGCS2000, GTRF), while also explaining how their geodetic reference is related to ITRF and thus also to the geodetic references of other GNSS;
- It was also recognized that there is a need to describe how those relationships between the various geodetic references are maintained over time (e.g. to account for tectonic motion of a particular System Provider’s monitor stations);
- Another of Working Group D’s Recommendations at ICG-3 was about the desirability of placing retro-reflectors on GNSS satellites. This was also re-visited in the context of recognizing that while GNSS is important for the realization of ITRF, it also requires other non-GNSS space techniques, including Satellite Laser Ranging (SLR).
- There was also recognition that better sharing of data from GNSS Monitor Stations and matching with data from IGS stations could significantly improve integration of geodetic references.

Task Force D2 on Time References

- There was considerable discussion on alternative means of aligning GNSS system times;
- The need to recognize the interdependence between geodetic and timing references and especially the need to consider Earth Orientation Parameters and their prediction;
- As with the Geodetic Task Force, it was felt that it would be useful for Task Force D2 to compile descriptions from the providers of the current situation with the Time Reference used in each system and to add that to the template where system providers describe their 'open service'. This was seen as a useful starting activity in the work plan of Task Force D2.

Recommendations of the Consultative Committee on Time and Frequency (CCTF)

There was considerable discussion of the fact that all member nations of the ICG are signatories to the Metre Convention, which has international treaty status and gives the CCTF its head of power. At its most recent meeting the CCTF made a number of recommendations that are relevant to the ICG. There is a need for the ICG to consider and respond to these recommendations from the CCTF and Working Group D and its Task Forces will develop that response. The CCTF recommendations are listed below (with responsibility as allocated in WG-D):

- CCTF Recommendation #3 On the Weakness of the Present Definition of UTC (Leap Second) *(To be addressed by ICG TF D2 on Time References)*;
- CCTF Recommendation #4 Concerning adoption of a common terrestrial reference system by CGPM *(To be addressed by ICG TF D1 on Geodetic References)*;
- CCTF Recommendation #5 Alignment of Geodetic References and Synchronization of Time references to International Standards *(This is similar to ICG WG-D Recommendations at ICG-2 & ICG-3 and will need to be addressed by both Task Forces of ICG WG-D)*.

Proposal for ITRF as an ISO Standard

The International Earth Rotation Service (as part of IAG/GGOS) is investigating the value of moving the International Terrestrial Reference System (ITRS) from its current status as a de-facto global standard to become an ISO standard. Therefore, it was agreed that while Task Force D1 is only just beginning its deliberations on possible alignment of GNSS Geodetic References to ITRF, Working Group D needs to monitor these developments in ISO and to get involved as appropriate.

Progress with Existing Recommendations from WG-D to the ICG

The detailed report also gives the status of previous recommendations of Working Group D.

New Recommendation on Multi-GNSS Demonstration Project for Asia and Oceania

The only recommendation from WG-D at ICG-4 in relation to new initiatives was to support Japan's proposal for a Multi-GNSS Demonstration Project in Asia and Oceania, which will deploy receivers to track as many of the existing and emerging global and regional systems as possible and as soon as possible to demonstrate the utility of the extra satellites and their signals.

**Fourth Meeting of the International Committee on
Global Navigation Satellite Systems (ICG)
14 – 18 September 2009
Saint-Petersburg, Russian Federation**

Joint Statement

The Fourth Meeting of the International Committee on Global Navigation Satellite Systems (ICG) was held in Saint Petersburg, Russian Federation from 14 to 18 September 2009, to continue reviewing and discussing developments in global navigation satellite systems (GNSS) and to allow ICG members, associate members and observers to consider matters of interest. ICG also addressed GNSS science and innovative technology applications and future commercial applications. Representatives from industry, academia and Governments shared views on GNSS compatibility and interoperability.

The Meeting was hosted by the Government of the Russian Federation. Attendees included China, Italy, Japan, the Russian Federation, the United States of America, the European Community and the European Space Agency (ESA), as well as the following international organizations: the Civil Global Positioning System Service Interface Committee (CGSIC), the European Position Determination System (EUPOS), the IAG Reference Frame Sub-Commission for Europe (EUREF), International Bureau of Weights and Measures (BIPM), the International Federation of Surveyors (FIG), the International Association of Geodesy (IAG), the International Earth Rotation and Reference Systems Service (IERS), the International Association of Institutes of Navigation (IAIN), the International GNSS Service (IGS), and the Office for Outer Space Affairs. The representatives of the International Civil Aviation Organization (ICAO), the UN-affiliated Regional Centres for Space Science and Technology Education located in Mexico, Brazil, Morocco and Nigeria, and Space Generation Advisory Council attended the Meeting.

ICG recalled that the General Assembly, in its resolution 63/99 of 5 December 2008, had noted with appreciation that ICG had been established on a voluntary basis as an informal body to promote cooperation, as appropriate, on matters of mutual interest related to civil satellite-based positioning, navigation, timing and value-added services, as well as the compatibility and interoperability of global navigation satellite systems, while increasing their use to support sustainable development, particularly in developing countries, and that it held its first meeting in Vienna, 2006, and its second meeting in Bangalore, India, 2007, and its third meeting in Pasadena, USA, 2008.

ICG noted that the working groups focused on the following issues: compatibility and interoperability; enhancement of the performance of GNSS services; information dissemination and capacity-building; and interaction with national and regional authorities and relevant international organizations. It also noted that substantive progress had been made in furthering the ICG and Providers' Forum workplans that had been approved at the previous meetings of the ICG.

ICG noted that the Working Group A (WG A) on compatibility and interoperability had organized two workshops in 2009 to explore further the issue of GNSS interoperability from users' perspectives before resuming its deliberations at the Fourth Meeting of the ICG. At the Fourth Meeting of the ICG, WG A made some amendments to its workplan, in particular, regarding further elaboration and implementation of the principle of compatibility, consistent with International Telecommunication Union (ITU) regulations and recommendations, and proposed a new principle of transparency. At a minimum, WG A plans to hold an additional interoperability workshop in 2009 and a compatibility workshop in 2010.

The Working Group B (WG B) on enhancement of the performance on GNSS services discussed techniques for enhancement of GNSS services and the opportunity to monitor the ionosphere during the next solar maximum and its effects on GNSS receivers.

The Working Group C (WG C) on information dissemination and capacity-building continued to develop a programme on GNSS applications and emphasized the participation of ICG in the International Space Weather Initiative (ISWI).

The Working Group D (WG D) on interaction with national and regional authorities and relevant international organizations successfully initiated the work of its Task Forces to develop processes to align and maintain Geodetic and Timing references, which are fundamental to interoperability of GNSS for users. It was also agreed to hold additional workshops in between the annual ICG meetings.

ICG and the Providers' Forum discussed the revision of their workplans. During a plenary session ICG also decided to support a proposal for a multi-GNSS Demonstration Project in the Asia/Oceania region.

ICG accepted the invitation of Italy and the European Community to jointly host the Fifth Meeting in Turin, Italy, from 18 to 22 October 2010. The Office for Outer Space Affairs, as the Executive Secretariat of ICG and the Providers' Forum, will assist in the preparations for those meetings and for interim planning and working group activities. ICG noted the expression of interest by Japan to host ICG-6 in 2011 and by China to host ICG-7 in 2012.