



Sixteenth Meeting of the Providers' Forum

United Nations Office at Vienna, Vienna International Centre

**6 June 2016
Vienna, Austria**

Summary of Discussions

The Sixteenth Meeting of the Providers' Forum, co-chaired by Mr. Sergey Karutin of the Russian Federation and Mr. Kenneth Hodgkins of the United States was held on 6 June 2016 in Vienna, Austria preceding the 59th Session of the Committee on the Peaceful Uses of Outer Space (COPUOS), 08 – 17 June 2016. The meeting agenda is attached (see Annex I) herewith.

China, Japan, the Russian Federation, the United States and the European Union were represented at the meeting. The list of attendees is attached (see Annex II) herewith.

At the outset of the meeting, the co-chairs thanked the participants for their cooperation and active participation in the work of the International Committee on Global Navigation Satellite Systems (ICG) and its Providers' Forum.

K. Hodgkins thanked all the participants for making the ICG-10 (Boulder, Colorado, United States) a success, and support provided. The 16th US Space-based Positioning, Navigation and Timing (PNT) Advisory Board meeting, organized by the National Aeronautics Space Administration (NASA) concurrently with ICG-10 meeting, was an opportunity to facilitate information exchange with ICG delegates, and thus highlighting that the GNSS sector was becoming increasingly important in the international context.

Mr. James Miller of the United States noted that NASA's active engagement at fora such ICG supplements technical contributions to Global Positioning Systems (GPS) enterprise and strengthens policy advocacy, including: Radio-navigation Satellite Service (RNSS) spectrum protection; GPS-based science applications (radio-occultation, geodesy, earthquake/tsunami warning, etc.); GPS/GNSS civil signal monitoring (operational performance); GPS Medium-Earth Orbit Search and Rescue (MEOSAR) (search and rescue); Laser Retro-reflector Arrays (LRA) on GPS III; GNSS space receivers; interoperable GNSS space service volume (SSV).

1. Open service information dissemination

The meeting heard the following presentations, which posted on the ICG Information Portal: <http://www.unoosa.org/oosa/en/ourwork/icg/providers-forum/meetings/16-.html>

- a) “Summary of the May US PNT Advisory Board Meeting” by James Miller of the National Aeronautics and Space Administration (NASA), United States;
- b) “Multi-GNSS Space Service Volume Update” by Frank Bauer of NASA, United States;
- c) “Update on US Adjacent Band Compatibility (ABC) Testing” by Frank Clark of the United States Air Force, United States;
- d) “MEOSAR Update” by Lisa Mazzuca of NASA, United States;
- e) “SAR/Galileo Service Status by Pieter De Smet of the European Commission, Brussels.

2. Service performance monitoring

S. Karutin noted that at the ICG-10 meeting in 2015, the International GNSS monitoring and assessment (IGMA) Task Force initiated a joint trial project with the International GNSS Service (IGS) in order to demonstrate a global GNSS monitoring and assessment capability after the completion of a set of the required parameters. It was noted that an intersessional meeting of the Task Force, held in February 2016, discussed the preliminary set of parameters.

Mr. Jeffrey Auerbach of the United States presented the status of GNSS Interface Control Documents (ICD) and Open Service Performance Standards. The document is available at: <http://www.unoosa.org/oosa/en/ourwork/icg/providers-forum/meetings/16-.html>

It was noted that a Performance Standard Template for all GNSS considered as a reference document defining minimal set of parameters (and calculation methods), and all providers agreed on to be used for monitoring and assessment as well as the guidelines for new GNSS/RNSS providers.

Ms. Xiaochun Lu of China noted that 16 iGMAS stations had been completed and the system possessed BDS/GPS/GLONASS/Galileo monitoring capability. The 40m observation antenna had also been completed with the capability of space signal quality assessment. It was also noted that the website was currently being finalized.

3. Spectrum protection: interference detection and mitigation

The meeting noted that the discussions and information collected on spectrum protection, interference detection and mitigation had been limited to ICG members and participants. Thus, the Working Group on systems, signals and services (WG-S) at the ICG-10 meeting recommended to raise awareness of the issue of spectrum protection, interference detection and mitigation among States members of the Committee on the Peaceful Uses of Outer Space (COPUOS) in order to achieve the overall goal of promoting effective use of GNSS open services by the global community.

The meeting noted that a technical seminar on GNSS spectrum protection and interference detection and mitigation was organized by the Working Group during the ICG expert meeting held on 15 – 18 December 2015 in Vienna. Discussions were held on how GNSS jammers work, with examples of when they were used and the problems that they caused. The legality of exporting, importing, selling, using and purchasing jammers in several States was summarized. The seminar fulfilled its purpose of educating participants on the

importance of GNSS spectrum protection and challenged them to be engaged with their respective national spectrum agencies to ensure continued access to GNSS benefits.

The meeting agreed that any recommendation on spectrum protection, to be made to COPUOS, should be coordinated among the providers taking into account radionavigation satellite service (RNSS) spectrum issues and agenda items under consideration by the International Telecommunication Union (ITU) and its Working Parties. It was requested that the WG-S elaborate on the draft paragraph to be presented at the Scientific and Technical Subcommittee session in 2017 for the ICG-11 consideration in Sochi in November 2016.

4. Space Weather

The meeting noted that the United States National Space Weather Strategy was presented at the ICG-10 meeting. The strategy was devoted to address societal and economic impacts in the event of a severe space weather event.

The meeting noted that some providers were studying space weather effects on navigation satellites and were planning to report at the ICG-11 meeting on what could be contributed to solar activities prediction and how could predictions be used with GNSS. The representatives of Europe and China will present the outcomes of their work in the next meeting in Sochi, in November 2016.

The meeting noted that the regional workshop on GNSS was scheduled to take place from 12 to 16 December 2016, in Kathmandu, Nepal. It was noted that a one-day seminar on "Space Weather and its effects on GNSS" will be held during the Workshop. The purpose of the seminar was to provide a background on the phenomena of space weather and illustrate its effects on GNSS. This seminar will describe the challenging aspects of space weather phenomena, their impact on GNSS users, the variability of these impacts and the actions that may mitigate their effects. The seminar will be organized in collaboration with the Boston College.

It was also noted that the ICG's WG-S was invited to organize a session on "GNSS spectrum protection and interference detection and mitigation" in conjunction with the Workshop. The purpose of the session is to highlight the importance of GNSS spectrum protection at the national level and explain how to reap the benefits of GNSS.

5. ICG Information Centres: Regional Centres for Space Science and Technology Education (affiliated to the United Nations)

The ICG Executive Secretariat informed participants that the experts of the State Space Corporation (ROSCOSMOS) and the Reshetnev Information Satellite Systems Joint Stock Company gave lectures on GLOBAL NAVIGATION Satellite System (GLONASS) and future perspectives of GNSS at the African Regional Centre for Space Science and Technology Education - in French Language (CRASTE-LF) in Rabat, Morocco.

It was also noted that the regional centres were requesting on-site training courses, to be conducted by GNSS providers, in order to develop top-level skills to execute their missions as information centres for ICG and its Providers' Forum, and hence to work towards the establishment of a network of associated centres in the regions and increase awareness among

the main actors around GNSS, such as decision makers, research institutions, industry, service and data providers and end users.

The providers were invited to contribute to the 9-month postgraduate course on GNSS to be conducted by the centres in 2017.

6. Report on a multi-GNSS demonstration project in the Asia/Oceania region

The meeting noted that regional workshops on GNSS continued to be organized in the framework of the workplan of the Asia Oceania Multi-GNSS Demonstration Campaign. It was also noted that more than 80 sites provided multi-constellation's tracking data under collaboration with organizations such as geodetic research institutes and space agencies.

The meeting noted that 8th Multi-GNSS Asia Conference was scheduled to take place on 14 – 16 November 2016 in Manila, the Philippines. The solutions for the disaster mitigation such as volcanoes, typhoons and floods will be discussed at the conference.

7. Comments on the Agenda of the 11th Meeting of the ICG, 6 – 11 November 2016, Sochi, Russian Federation

The meeting noted that thematic topic of the applications and experts' session, to be held on 7 November 2016, will be "High precision GNSS applications in various fields of the world economy". Providers were requested to make presentations in this session.

The meeting approved the schedule of work at the ICG-11 meeting.

8. Draft provisional agenda for the 17th Meeting of the Providers' Forum, 6 – 11 November 2016, Sochi, Russian Federation

The meeting agreed that the 17th Meeting of the Providers' Forum will be held in conjunction with the 11th Meeting of the ICG in Sochi, Russian Federation.

9. Other matters

- The ICG document: Extracts from reports of the ICG and its Providers' Forum

The meeting noted that the ICG document "Extracts from reports of the ICG and its Providers' Forum", consolidating decisions and conclusions reflected in the reports of past meetings of the ICG and its Providers' Forum, will be posted on the ICG information portal. The Providers' Forum points of contact were invited to provide comments on how to improve the usefulness and readability of the document before it is posted on the website.

- The Providers' Forum Terms of Reference

The meeting agreed to revise the part D "Procedures of work, structure and organization" of the Terms of Reference of the Providers' Forum in order to reflect rotation schedule for the co-chairs of the Providers' Forum for the period of 2018 through 2020.

- ICG Working Groups Reports

The Working Group S (formerly Working Group A) co-chairs informed that the WG-S interim meeting will take place on 8 – 10 June 2016 at the Vienna International Centre (VIC) and summarized the status of the current work and activities carried out.

Spectrum Protection: (i) Seek common understanding on appropriate methods to determine compatibility among all GNSS; (ii) Review existing ITU regulations and recommendations related to the avoidance of harmful interference to GNSS; (iii) Develop educational material on sources of interference to GNSS.

Interference Detection and Mitigation: (i) Develop standards for interference reports submitted to GNSS Civil Service National Centers and establish routine communications among the centers; (ii) Recommend standards for interference detection and mitigation capabilities to be implemented by national governments and industry.

Interoperability: (i) Continue efforts to interact with industry experts and user community representatives in order to solicit input on improving the overall open service provided by global and regional navigation satellite systems in a manner that allows for effective multi-GNSS use at the user level; (ii) In cooperation with Working Group D, consider the role of system time and geodetic reference frames in enabling interoperable multi-GNSS service.

Open Service Performance Standard: The status of each system provider's system Performance Standards was reviewed as the following: GPS (new revision is underway); BDS (released); Galileo (underway); GLONASS (approval stage); QZSS (underway).

Global Monitoring and Assessment Demonstration Project: (i) IGMA Terms of Reference finalization and approval will be available approximately the end of 2016; (ii) Long-term Roadmap development will be discussed; (iii) "Call for participants" documents are being prepared; (iv) Next IGMA Workshop will be held in Shanghai in conjunction with the China Navigation Satellite Conference (CNSC) in 2017.

The Working Group B (WG-B) co-chairs informed that the WG-B interim meeting will take place on 8 June 2016 at VIC and briefed on the status of the current work.

Space Service Volume (SSV): (i) Established a committed group of institutions (NASA, the European Space Agency, the China Academy of Space Technology, the Japan Aerospace Exploration Agency, the Indian Space Research Organization) to advance the ICG SSV booklet including a series of simulation results; (ii) 3-Phase simulation roadmap established leading to the ICG SSV booklet: (Phase 1) Pure Geometrical Visibility and Availability Analysis for users at GEO sphere (single constellation and multi-constellation); (Phase 2) Parametric Availability analysis considering simplified propagation characteristics for users at GEO sphere (single constellation and multi-constellation); and (Phase 3) Availability simulations based on agreed link budget calculation for selected space missions, including user trajectory (single constellation and multi-constellation); (iii) 10 group teleconferences held (as of January 2016), every 2-3 weeks a teleconference with the objective to align all 4 simulation tools for the 3-step simulation roadmap established. The SSV booklet will be completed by ICG-11.

Application Subgroup: Update of the User Questionnaire presented already at ICG-10. Way forward will be discussed at the WG-B interim meeting in June 2016.

The **Working Group C (WG-C)** chair informed that the template for each GNSS provider with links and contact information for all user information centres had been developed and would be posted on the ICG information portal. It was noted that the WG-C continued working on the paper “Economic Benefits of Utilizing GNSS” in consultation with the experts of the Boston College, United States, and Politecnico di Torino, Italy. The first draft paper will be made available prior to the ICG-11 meeting. This paper will be included in information for dissemination purposes.

The **Working Group D (WGD)** co-chairs briefed on a research in modelling satellite orbit dynamics. A joint trial project, initiated by the IGMA (International GNSS Monitoring and Assessment) Task Force and IGS, to demonstrate a global GNSS Monitoring and Assessment capability was also outlined.