SUMMARY
of the Nineteenth Meeting of the Providers' Forum
held in conjunction with the Twelfth Meeting of
the International Committee on Global Navigation Satellite Systems (ICG)
2 and 6 December 2017
Kyoto, Japan

1. The nineteenth meeting of the Providers' Forum, co-chaired by Japan and the Russian Federation, was held in conjunction with the twelfth meeting of the International Committee on Global Navigation Satellite Systems (ICG), on 2 and 6 December 2017, in Kyoto, Japan. The meeting agenda is attached as an annex to this report. China, Japan, the Russian Federation, the United States and the European Union were represented at the meeting. In the opening remarks, the United States expressed appreciation for the work carried out by the Providers' Forum, noting that since its establishment during the second ICG meeting, significant progress and accomplishments have been made and it continues to provide an effective multilateral mechanism for cooperation in GNSS.

Open Service Information Dissemination

The following presentations were provided:

Adjacent Band Compatibility

2. The United States presented an update on the adjacent band compatibility study that resulted from a proposal by a US private company in 2011 to broadcast terrestrial mobile telecommunication signals adjacent to the radio navigation satellite systems (RNSS) L1 frequency band in the United States. The goal of the study was to determine the power levels that can be tolerated in the adjacent radiofrequency bands. The presentation focused on the GNSS protection criteria recommended by the U.S. space-based Positioning, Navigation and Timing (PNT) Advisory Board, including the 1 dB carrier-to-noise (CNR) degradation as a GNSS receiver interference protection criterion. In order to determine appropriate Interference Tolerance Masks (ITMs) at the GNSS receiver antenna input, radiated testing in an anechoic chamber was completed in 2016 using eighty civil global positioning system (GPS)/GNSS receivers, which included the following six categories: general aviation (non-certified), general location/navigation, high precision and networks, timing, space based, and cellular. The impact regions of a 1dB or greater CNR degradation by the potential deployment of terrestrial mobile and base stations was computed for different network

deployment scenarios. The results demonstrated that high precision receivers could experience a 1 dB degradation beyond 10 km based on a macro urban deployment with loss of lock on all GNSS satellites within 1 km of the interfering transmitter. The results highlighted that the distance from the GNSS receiver to the transmitter is a key factor, as well as the transmitter density and inter-site distance of the network deployment.

3. It was noted that the full report of the adjacent band compatibility study will be discussed within the U.S. government and publically available in the next few months.

4. The providers emphasized that it is necessary to protect the use of GNSS which has been a goal of the work of the ICG. The providers also noted that the adjacent band issue can potentially occur not only in the L1 frequency band as there are concerns in the European Union about potential deployments of wireless microphone applications in the band below 1164 MHz, which could impact the L5 frequency band. Therefore, the providers agreed that it is important to follow these issues closely.

Medium Earth Orbit Search and Rescue (MEOSAR) System Update

5. The United States presented an update on the progress of the implementation of the Medium Earth Orbit Search and Rescue (MEOSAR) system. MEOSAR implementation is currently in initial operating capability with 20 experimental S-band payloads and 7 operational L-Band payloads. MEOSAR offers near instantaneous beacon detection in comparison to its low earth orbit (LEO) and geosynchronous orbit (GEO) satellite system, which can experience a delay in signal acquisition, processing, and transmission to the ground.

6. Currently there are three space segment MEOSAR providers – GPS, Galileo, and GLONASS. It was also reported that the future inclusion of the BDS SAR payload into COSPAS-SARSAT has been acknowledged. The next steps will be to amend the MEOSAR space segment correspondence working group terms of reference to encourage China to participate.

7. COSPAS-SARSAT acknowledges that downlink discussions need to continue within the programme to ensure beam collision is mitigated, as all four providers will need to share two downlink bands (1544.0 – 1544.2 MHz and 1544.8 – 1545.0 MHz).

8. The providers agreed to continue discussion in WG-B and to consider specific downlink

discussions in WG-S.

8bis. The European Union expressed its concerns about the potential interference between MEOSAR downlinks in the 1544-1545 MHz band. The European Union recognizes that the substantive discussion takes place in COSPAS-SARSAT groups, but given the urgency, it encourages the GNSS providers to fully engage as a matter of priority in those technical discussions, consider all options to prevent interference, and then report back to the ICG on the progress in due course.

Update on Space Service Volume

9. The United States presented an update on the progress in developing and utilizing a GNSS Space Service Volume (SSV) and the benefits of SSV to real-time on-board navigation, Earth sciences, launch vehicle range operations, attitude determination, and time synchronization domains.

10. The benefits of using GNSS for real-time navigation in SSV provides improved real-time navigation performance, quicker trajectory maneuver recovery, reduced need for expensive onboard clocks, increased satellite autonomy, and better performance for highly-elliptical orbit (HEO) and GEO missions and beyond.

11. The presentation also noted the examples of using GNSS for positioning, navigation and timing of GEO and HEO satellites, including United States, European Union and Japanese meteorological satellites.

12. On 13 October 2017, the National Aeronautics and Space Administration (NASA) signed a Memorandum of Understanding with the United States Air Force on civil SSV requirements. NASA is the United States civil space representative for the organizations that use GNSS in space and, as a result, will have insight into the procurement, design, and production of new satellites from an SSV capability perspective.

13. There is a collaboration between the Interagency Operations Advisory Group (IOAG) and ICG to encourage service providers and others to contribute to the GNSS space user database.

14. In conclusion, SSV continues to evolve, and space missions are increasingly benefiting from SSV to improve mission performance.

15. The providers agreed that ICG should be relevant to the wider space sector by ensuring GNSS' future contribution to SSV. One possible way for this is to improve its GNSS system interoperability by transmitting intersystem timing offsets.

Latest progress on the International GNSS Monitoring and Assessment System

16. China presented the progress on the International GNSS Monitoring and Assessment System (iGMAS) and its applicability to contribute to the International GNSS Monitoring and Assessment (IGMA) Joint Trial Project.

17. iGMAS has successfully monitored and assessed the constellation status, quality of navigation signals and service performance. It has also provided highly accurate multi-GNSS orbit and satellite clock products, as confirmed by comparison to satellite laser ranging (SLR) and International GNSS Service (IGS) products. Information concerning the system is now available in Chinese and English languages through a website (www.igmas.org) and a mobile app. Some issues about the detailed strategy for GNSS monitoring and assessment were also described. Further discussion about definition, methodology, and output format will be continued.

GNSS Application Activities in the Belt and Road

18. China introduced BDS/GNSS application activities that support the Belt and Road Initiative.

19. In 2013, the Chinese President developed this new initiative to promote global economic development. The Belt and Road region now covers over 60 countries, which accounts for 60% of the world's population and a collective GDP equivalent to 33% of the world's wealth.

20. BDS currently provides regional services and covers 30 countries in the Belt and Road region. Between 2015 and 2016, 5 BDS-3 testing satellites were launched, while new technologies and concepts for BDS-3 were validated and tested. BDS-3 will include a nominal 30 satellite constellation. The first pair of BDS-3 satellites were successfully launched on 5 November 2017.

21. An important partner for this Belt and Road initiative in the field of satellite navigation is Russia. Several key China-Russia Cooperation projects have been identified and launched.

"The Joint BDS/GLONASS Tests along the Belt and Road" project has generated fruitful results. The China-Europe railway express trains are equipped with BDS/GPS receivers, and initial operational tests and trials are currently underway. Other BDS/GNSS application cases along the Belt and Road include the Pakistan National Positioning Network, the New Islamabad Airport, BDS application promotion activities in many countries, BDS-based precision agriculture, etc. BDS will guarantee continuous and stable operations, with steady improvement.

22. China called on all the GNSS providers to continue to work together to provide high-quality PNT services to users in the Belt and Road region as well as the whole world.

Space Weather

23. The United States highlighted the recent release of specialized space weather data by the Los Alamos National Laboratory (U.S. Department of Energy) collected by GPS satellites over the past 16 years. This is a unique source of information for improving the understanding of space weather, and is available online at: http://www.lanl.gov/discover/news-release-archive/2017/January/01.30-space-weather-science.php.

Multi-GNSS Demonstration Project in the Asia/Oceania Region

24. Japan provided an update on the multi-GNSS demonstration project in the Asia/Oceania region. Multi-GNSS Asia (MGA) is an organization to promote the project with 57 participating organizations from 20 countries. After the eleventh meeting of ICG in 2016, two MGA conferences were held, in Manila on 14-16 November 2016, and Jakarta on 9-11 October 2017. New formats such as an industry seminar, matchmaking dinner and sponsors' exhibition, were conducted successfully. The goals for 2018 and beyond are to strengthen the user community towards "Open innovation hub"; align more closely with ICG to support regional implementation of ICG recommendations; transition Secretariat responsibilities from the Japan Aerospace Exploration Agency (JAXA) to the Institute of PNT of Japan; provide a stronger role of local partners in the conference; develop a theme based conference, and membership structure. The next MGA conference will be held on 23-25 October 2018 in Melbourne, Australia. MGA will be discussing possible updates to its work plan in order to enhance linkage with ICG.

ICG Information Centres: Regional Centres for Space Science and Technology

Education (affiliated to the United Nations)

25. The ICG executive secretariat reported that a seminar on GPS data for ionospheric studies was held at the "African Regional Centre for Space Science and Technology – in French language", in Rabat on 16 – 20 January 2017. Further information is available on the ICG information portal: http://www.unoosa.org/oosa/en/ourwork/icg/activities/2017/icg2017-event.html.

Other Matters

Review of Provider's Forum Work Plan

26. The ICG executive secretariat noted that the Providers' Forum workplan has references to the working group on compatibility and interoperability and suggested that it be updated to reflect the working group's name change to the Working Group on Systems, Signals and Services (WG-S) following the tenth meeting of the ICG in 2015. The working group co-chairs agreed to provide modifications to the workplan accordingly.

Next meeting of the Providers' Forum

27. The providers agreed to hold the 20th Meeting in Vienna on 18 - 19 June 2018 in conjunction with UNISPACE+50 in the Vienna International Centre.

28. The United States also noted that 2017 was the 50th anniversary of the 1967 United Nations Outer Space Treaty. In this regard, it was also noted that Prof. Setsuko Aoki of Japan chaired a working group in the Committee on the Peaceful Uses of Outer Space that produced a report adopted by the United Nations General Assembly in 2017 on International Mechanisms for Space Cooperation (A/AC.105/C.2/112). In that report, the ICG was presented as a highly successful example of how the United Nations States member and international organizations can organize to use space technologies to improve the quality of life for people on Earth and stimulate economic growth globally.