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Committee on the Peaceful Uses of Outer Space
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Draft report

VII. Recent developments in global navigation satellite systems

1. In accordance with General Assembly resolution 76/76, the Subcommittee considered agenda item 10, entitled "Recent developments in global navigation satellite systems", and reviewed matters related to the International Committee on Global Navigation Satellite Systems (ICG), the latest developments in the field of global navigation satellite systems (GNSS) and new GNSS applications.

2. The representatives of China, India, Indonesia, Japan, Mexico, Pakistan, the Republic of Korea, the Russian Federation and the United States made statements under agenda item 10. During the general exchange of views, statements relating to the item were made by representatives of other member States.

3. The Subcommittee heard a technical presentation entitled "Development of the BeiDou Navigation Satellite System", by the representative of China.

4. The Subcommittee had before it the report of the Secretariat on activities carried out in 2021 in the framework of the workplan of ICG (A/AC.105/1249) and a report on the United Nations/Mongolia workshop on the applications of global navigation satellite systems, held in Ulaanbaatar from 25 to 29 October 2021 (A/AC.105/1252).

5. The Subcommittee noted that ICG was an important platform for communication and cooperation in the field of GNSS, especially in the areas of compatibility and interoperability among the different systems and GNSS spectrum protection and interference detection.

6. The Subcommittee also noted that the Office for Outer Space Affairs, as the executive secretariat of ICG, continued to play an active role in facilitating cooperation and communication among the providers and users of GNSS and hosted the fifteenth meeting of ICG, held in Vienna from 27 September to 1 October 2021 and the twenty-fourth meeting of the Providers' Forum, held in Vienna on 27 September and 1 October 2021.

7. The Subcommittee expressed its appreciation to the Office for its efforts in promoting the use of GNSS through its capacity-building and information dissemination initiatives, in particular in developing countries.

8. The Subcommittee further noted that, through ICG, all providers had agreed on the information presented in the second edition of the publication entitled *The*

Interoperable Global Navigation Satellite Systems Space Service Volume (ST/SPACE/75/Rev.1) and on a number of recommendations on continuing the development, support and expansion of the multi-GNSS space service volume concept. That would enable improved navigation for future space operations that went beyond a geosynchronous equatorial orbit and even for lunar missions.

9. The Subcommittee noted that the United States had continued to upgrade the capability and service of its Global Positioning System (GPS) through the integration of the next generation of satellites, GPS Block III, which were broadcasting the new L1C signal, in addition to L2C, L5 and the L1C/A signal. It was noted that two Block III satellites had been launched in 2021, bringing the total number of GPS III satellites in orbit to five, and that additional satellites would become available in the coming months and years as the modernization effort moved forward. In addition to those space segment enhancements, the United States continued its effort to upgrade the GPS ground control system to support the new capabilities enabled by the Block III and Block IIIF satellites. It was noted that the new GPS Next Generation Operation Control System (OCX) was being developed in phases, and further performance improvements and increased capabilities for all users were foreseen as the rollout was completed.

10. The Subcommittee noted that the United States intended to continue improving the accuracy and availability of GPS through the enhanced performance of the most advanced satellites. The United States intended to continue to broadcast GPS signals free of direct user charges and was committed to keeping GPS as an important pillar in an emerging international system of GNSS.

11. The Subcommittee noted that in 2021, the Russian Federation had started a new 10-year federal programme for maintaining, developing and use of the Global Navigation Satellite System (GLONASS). The fourth generation of satellites, GLONASS-K2, was planned to be launched in 2022 and would transmit code division multiple access (CDMA) signals in the L1, L2 and L3 radio frequency bands in addition to frequency division multiple access (FDMA) signals in the L1 and L2 radio frequency bands. By 2030, at least 18 such satellites would be launched, and because of their signal-in-space user ranging accuracy, those satellites would provide an average user equivalent range error of 30 cm.

12. The Subcommittee also noted that the System for Differential Correction and Monitoring, an augmentation of GLONASS, continued to be updated and was to be used in civil aviation for enhancing navigation precision. It was noted that the next step would be the deployment of the GLONASS high-orbit space complex, consisting of six satellites in inclined geosynchronous orbits. Those satellites would transmit three CDMA signals and improve the accuracy and availability of the GLONASS service in difficult terrain, such as the Arctic region and dense urban areas.

13. The Subcommittee noted that the BeiDou Navigation Satellite System (BDS) constellation of China had continued to be improved and to expand its applications. It was noted that positioning, navigation and timing services, as measured by the global monitoring and evaluation system, had a global horizontal positioning accuracy of approximately 1.52 meters and a vertical positioning accuracy of approximately 2.64 meters. Regarding the satellite-based augmentation service, it was noted that the Civil Aviation Administration of China was preparing a test and evaluation of satellite-ground integration and that positioning accuracy, alarm time, integrity risk and other indicators had met requirements. Meanwhile, in terms of the ground-based augmentation system, real-time centimetre-level and post-event millimetre-level high-precision services had been provided within China for industry and public sector users.

14. The Subcommittee further noted that the testing and verification of mass alerts sent using short message service communication to mobile phones had been completed and would be implemented on a large scale. It was also noted that BDS receivers and search and rescue services would be supported through the release by

the International Electrotechnical Commission of a global standard for the detection of emergency markers for maritime distress and safety systems.

15. The Subcommittee noted that the European Satellite Navigation System (Galileo) of the European Union provided accurate positioning and timing information and that its data were used for a broad range of applications.

16. The Subcommittee noted that India was pursuing two paths as part of its satellite navigation programme: the GPS-aided Geostationary Augmented Navigation System (GAGAN) and the Indian Regional Navigation Satellite System, also known as "Navigation with Indian Constellation" (NavIC). GAGAN, a satellite-based augmentation system, provided the increased positioning accuracy required for civil aviation applications. NavIC had been implemented as an independent regional satellite-based navigation service, and the NavIC signal-in-space interface control document had been made available to the public to enable the production of user receivers.

17. The Subcommittee further noted that, in 2021, India had worked on the development of the International Electrotechnical Commission standard for NavIC-based shipborne receiver equipment. It was noted that the NavIC-based safety-of-life alert dissemination system had been in operation for fishermen to provide alerts on impending disasters. India had also developed a distress acknowledgement system using NavIC that would soon be operational.

18. The Subcommittee noted that the Quasi-Zenith Satellite System (QZSS), also known as Michibiki, of Japan was being operated as a four-satellite constellation. QZSS was currently providing three types of services: a service complementing GPS that transmitted ranging signals from satellites; a service that augmented GNSS by providing error corrections through QZSS; and a short messaging service to contribute to disaster risk reduction. It was noted that the QZS-1R satellite, launched in 2021, was conducting an on-orbit test and would be in service in March 2022.

19. The Subcommittee further noted that, in 2021, QZSS had been approved as a component of the World Wide Radionavigation System of the International Maritime Organization. It was noted that Japan was currently developing a GNSS augmentation service for high-accuracy applications based on a precise point positioning (PPP) technique known as the Multi-GNSS Advanced Demonstration Tool for Orbit and Clock Analysis (MADOCA-PPP), and an early warning service for the Asia and Oceania regions, both of which would be put into operation in 2024.

20. The Subcommittee noted that the Republic of Korea was currently developing a satellite-based augmentation system, namely, the Korea Augmentation Satellite System, and that upon completion of the system in 2022, safety-of-life service would be provided beginning in 2023. It was further noted that the Korea Positioning System, a regional satellite system, would provide a precise positioning, navigation and timing service over the Korean Peninsula. The first satellite was to be launched in 2027, and the positioning, navigation and timing service would be initiated in 2035.

21. The Subcommittee noted with appreciation that Indonesia, Mexico and Pakistan had reported on their projects and activities focused on helping to bring applications of GNSS technology to the widest possible user community.