



**Committee on the Peaceful
Uses of Outer Space
Scientific and Technical Subcommittee
Fifty-seventh session
Vienna, 3–14 February 2020**

Draft report**VII. Recent developments in global navigation satellite systems**

1. In accordance with General Assembly resolution [74/82](#), 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, 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 also made by representatives of other member States.
3. The Subcommittee heard the following scientific and technical presentations:
 - (a) “Status of KPS plans: Korea Positioning System”, by the representative of the Republic of Korea;
 - (b) “Education and training activities: APSCO Student Small Satellite project”, by the observer for APSCO.
4. The Subcommittee had before it the following documents:
 - (a) Note by the Secretariat on the fourteenth meeting of the International Committee on Global Navigation Satellite Systems ([A/AC.105/1217](#));
 - (b) Report of the Secretariat on activities carried out in 2019 in the framework of the workplan of the International Committee on Global Navigation Satellite Systems ([A/AC.105/1213](#)).
5. The Subcommittee noted that the Office for Outer Space Affairs maintained a comprehensive information portal for ICG and users of GNSS services and continued to play an active role in facilitating cooperation and communication among the providers and users of GNSS.
6. 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.



7. The Subcommittee noted with satisfaction that the fourteenth meeting of ICG and the twenty-third meeting of the Providers' Forum, organized by the Indian Space Research Organization on behalf of the Government of India, had been held in Bengaluru, India, from 8 to 13 December 2019.
8. The Subcommittee also noted with satisfaction that concrete progress had been made in ICG, in particular with regard to compatibility and interoperability, and in the area of GNSS spectrum protection and interference detection and mitigation. It was noted that ICG aimed to create an interoperable, multi-GNSS space service volume that would enable improved navigation for future space operations beyond the geostationary orbit or even lunar missions.
9. The Subcommittee noted that the fifteenth meeting of ICG would be hosted by the Office for Outer Space Affairs in Vienna from 14 to 18 September 2020. The Subcommittee also noted the expression of interest by the United Arab Emirates to host the sixteenth meeting, in 2021.
10. The Subcommittee also noted that the Global Positioning System (GPS) of the United States remained a central pillar in the expansion of GNSS coverage and use throughout the world, and that the United States intended to continue to improve GPS accuracy and availability through the enhanced performance of modernized satellites, and to broadcast GPS signals free of direct user charges.
11. The Subcommittee further noted that the United States had continued to work on the integration of the next generation of satellites, GPS Block III, to provide more capability and improved service with the broadcast of the fourth civil signal, L1C. It was noted that the first of those satellites had become operational in January 2020, thus marking a significant milestone for the GPS programme. In addition to making enhancements to the space segment, an upgraded ground control system, called "OCX" (which stands for operational control system), was being developed. The first phase of the programme was operational and was supporting the new GPS Block III satellites, and further performance improvements and increased capabilities for all users of the system were anticipated.
12. The Subcommittee noted that the civilian services of the Global Navigation Satellite System (GLONASS) of the Russian Federation were provided free of direct user charges and were available to all users on a continuous, worldwide basis, and that the GLONASS constellation was upgraded on an ongoing basis, with new satellites added annually. It was noted that, in 2020, the programme of the GLONASS-M series satellites would be completed and the launch of the GLONASS-K series satellites would continue. There were also plans to launch a new series of satellites, GLONASS-K2, which would provide code division multiple access (CDMA) signals in the L1, L2 and L3 bands and the traditional signals with frequency division multiple access (FDMA).
13. The Subcommittee also noted that the GLONASS open service performance standard, specifying the minimum level of performance, had been published in 2019. The standard was to serve as a basic document for inclusion of the GLONASS system in various international standards on the use of navigation technology, primarily those of the International Civil Organization (ICAO), the International Maritime Organization (IMO), the Radio Technical Commission for Aeronautics (RTCA) and the European Organization for Civil Aviation Equipment (EUROCAE). The revised edition of the GLONASS interface control document, containing recommended models for the evaluation of tropospheric and ionospheric delays that would further improve navigation accuracy, was expected to be released by the end of 2020.
14. The Subcommittee further noted that, while providing autonomous navigation and positioning services, Galileo, the European Satellite Navigation System, was interoperable with other GNSS. It was noted that the Galileo system, once fully operational, would offer high-performance services and provide new business opportunities in a wide variety of applications.
15. The Subcommittee noted that Galileo was the first global navigation satellite system to offer global search and rescue capability, launched as part of the system's

initial services. The service would be available at sea, in the mountains, across the desert and in the air, within the Galileo search and rescue service coverage area. That essential Galileo service had been helping operators respond to distress signals faster and more efficiently. The Galileo search and rescue service was also Europe's contribution to the upgrade of the International Satellite System for Search and Rescue (COSPAS-SARSAT), an international satellite-based system for search and rescue distress alert detection and information distribution.

16. The Subcommittee also noted that the BeiDou Navigation Satellite System (BDS), a global navigation satellite system operated by China, was providing all users with high-precision and high-reliability positioning, navigation and timing services. It was noted that the BeiDou system had been developed in three stages, named BDS-1, BDS-2 and BDS-3, respectively, and had begun to provide a global service in December 2018. It was noted that, by means of its upgraded intelligent operation and maintenance capabilities, BDS-3 had provided stable and accurate services, boosting positioning accuracy to five metres or less.

17. The Subcommittee further noted that the 22-nanometre process navigation and positioning chip supporting the new signal frequencies introduced in BDS-3 had a smaller volume, lower power consumption and higher accuracy, and had realized the large-scale application of the system. The new generation of BDS system-related products, including high-precision antennas, circuit boards and broadband radio frequency chips, had been developed. The BDS systems had been increasingly applied in emerging fields such as the industrial Internet of things and the Internet of things, as well as autonomous driving, parking and logistics.

18. The Subcommittee noted that the GPS-aided Geostationary Augmented Navigation System (GAGAN) had been developed by the Indian Space Research Organization (ISRO), together with the Airports Authority of India (AAI), in an effort to deploy and certify an operational satellite-based augmentation system. GAGAN had been the first such system in the world to serve the equatorial region and was providing satellite-based navigation services that offered the accuracy and integrity required for civil aviation applications. GAGAN services had also been extended to enable the broadcasting of messages within its coverage area by means of three GAGAN geostationary orbit satellites, including messages relating to fishing in deep seas, meteorological information, alert and early warning of natural disasters, search and rescue, humanitarian relief and life safety.

19. The Subcommittee also noted that ISRO had implemented an independent regional navigation system, the Indian Regional Navigation Satellite System, also known as "Navigation with Indian Constellation" (NavIC), to provide positioning, navigation and timing services for users throughout the Indian region. The system comprised a constellation of seven satellites, three in geostationary equatorial orbit and four in geosynchronous orbit. A signal-in-space interface control document had been released to the public to facilitate research and development and aid the commercial use of the NavIC signals for navigation-based applications.

20. The Subcommittee further noted that the satellite-based augmentation system of Japan, the Quasi-Zenith Satellite System (QZSS), also known as Michibiki, had been operated as a four-satellite constellation, with three satellites in inclined geosynchronous orbit and one in geostationary orbit, since November 2018. 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 constellation of seven satellites, to be completed by 2023, would enable sustainable positioning.

21. The Subcommittee noted that the Republic of Korea was developing an advanced satellite-based augmentation system named the Korea Augmentation Satellite System, which would be completed by the end of 2022 and would begin providing safety-of-life services in 2023. It was also noted that a regional satellite navigation system, the Korea Positioning System, would be built and deployed over

the Korean Peninsula, with a view to improving positional, navigational and timing performance.

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