



General Assembly

Distr.: General
16 November 2009

Original: English

Committee on the Peaceful Uses of Outer Space

Report on the United Nations/Azerbaijan/United States of America/European Space Agency Workshop on Applications of Global Navigation Satellite Systems

(Baku, 11-15 May 2009)

I. Introduction

1. By its resolution 54/68, the General Assembly endorsed the resolution entitled “The Space Millennium: Vienna Declaration on Space and Human Development”,¹ which had been adopted by the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III), held in Vienna from 19 to 30 July 1999. In the Vienna Declaration, the States participating in UNISPACE III declared that, in using space applications for human security, development and welfare, action should be taken, inter alia, to improve the efficiency and security of transport, search and rescue, geodesy and other activities by promoting the enhancement of, universal access to and compatibility of space-based navigation and positioning systems.
2. Through regional workshops, expert meetings, pilot projects and training opportunities, the Office for Outer Space Affairs of the Secretariat, as part of the United Nations Programme on Space Applications, has promoted the use of global navigation satellite systems (GNSS) to support sustainable development, in particular in developing countries.
3. At its fifty-first session, the Committee on the Peaceful Uses of Outer Space endorsed the programme of workshops, training courses, symposiums and conferences scheduled to be held in 2009.² Subsequently, the General Assembly

¹ *Report of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space, Vienna, 19–30 July 1999* (United Nations publication, Sales No. E.00.I.3), chap. I, resolution 1.

² *Official Records of the General Assembly, Sixty-third Session, Supplement No. 20 (A/63/20)*, para. 77.



endorsed the United Nations Programme on Space Applications for 2009 in its resolution 63/90.

4. Pursuant to General Assembly resolution 63/90 and as part of the Programme, the Office held the United Nations/Azerbaijan/United States of America/European Space Agency Workshop on Applications of Global Navigation Satellite Systems in Baku from 11 to 15 May 2009. The Ministry of Communication and Information Technologies hosted the Workshop on behalf of the Government of Azerbaijan. The Workshop was co-sponsored by the United States of America, through the International Committee on Global Navigation Satellite Systems (ICG), and the European Space Agency.

5. The present report contains the background to and objectives of the Workshop and provides a summary of the presentations and observations made by the participants. It was prepared for submission to the Committee at its fifty-third session and to its Scientific and Technical Subcommittee at its forty-seventh session, both to be held in 2010.

A. Background and objectives

6. GNSS, which consist of satellites, ground stations and user equipment, are utilized worldwide across many areas of society. They include the Global Positioning System (GPS) of the United States, the Global Navigation Satellite System (GLONASS) of the Russian Federation, Galileo of the European Commission and the Compass/BeiDou Navigation Satellite System of China. In addition, there are the GPS and Geostationary Augmented Navigation System of India and the Quasi-Zenith Satellite System of Japan, which are regional navigation satellite systems providing signal coverage over a number of countries or regions. All six systems benefit from additional information transmitted by space-based augmentation systems such as the United States Wide-area Augmentation System, the Russian Wide-area System of Differential Corrections and Monitoring and the European Geostationary Navigation Overlay Service.

7. Pursuant to recommendations of UNISPACE III and in an attempt to build a system of GNSS, ICG was established in 2005. It has held meetings annually — in Vienna in 2006 (A/AC.105/879), in Bangalore, India, in 2007 (A/AC.105/901) and in Pasadena, United States, in 2008 (A/AC.105/928) — to review and discuss matters relating to GNSS and their applications. The Fourth Meeting of ICG was held in Saint Petersburg, Russian Federation, from 14 to 18 September 2009 (A/AC.105/948).

8. The ultimate goal of ICG is to achieve GNSS compatibility and interoperability, thereby keeping costs down through international cooperation and making positioning, navigation and timing services available globally for the benefit of society.

9. Ground-based instrument arrays for exploring atmospheric phenomena related to space weather and climate change have been established since 2004. Currently, more than 1,000 instruments, including GPS receivers, are operational and will be integrated into the International Space Weather Initiative during the period 2010-2012.

10. To implement the recommendation of UNISPACE III on the use of global navigation and positioning systems and to support the workplan of ICG (A/AC.105/879, annex II), in 2006 the Office for Outer Space Affairs started organizing, within the framework of the United Nations Programme on Space Applications, annual workshops to address the use of GNSS in areas such as aviation, maritime and land transportation, mapping and surveying, environmental monitoring, precision agriculture and natural resources management, disaster warning and emergency response. In addition, it has provided an overview of available educational and training opportunities on GNSS and their applications. One aim of those workshops has been to initiate pilot projects and provide opportunities for networking at the regional level. Workshops have been held in Zambia, for the countries of sub-Saharan Africa (A/AC.105/876), in China, for the countries of Asia and the Pacific (A/AC.105/883), and in Colombia, for the countries of Latin America and the Caribbean (A/AC.105/920).

11. The specific objectives of the Workshop held in Baku were the following: (a) to strengthen regional information and data exchange networks on the use of GNSS technology; (b) to identify the specific needs, including training and capacity-building needs, for plans and projects on GNSS at the regional and international levels for short, medium and long-term applications, taking into consideration the local institutional settings; and (c) to develop a regional plan of action that would promote the wider use of GNSS technology, including through one or more national and/or regional pilot projects for facilitating the use of GNSS technology by interested institutions.

B. Programme

12. At the opening of the Workshop, introductory and welcoming statements were made by the Minister of Communication and Information Technologies of Azerbaijan and representatives of the Office for Outer Space Affairs, the State Department of the United States and the European Commission. Representatives of Maryland University, United States, and the Office for Outer Space Affairs made keynote presentations.

13. The programme of the Workshop consisted of six thematic sessions, at which presentations were given on the following: (a) GNSS in operation and in development; (b) GNSS infrastructure; (c) international and regional experiences of the use and implementation of GNSS technologies; (d) education and training on GNSS; and (e) GNSS applications: national programmes and case studies. A total of 38 presentations were made during the thematic sessions. Four additional sessions allowed for deliberations on structured topics, such as capacity-building and the institutional strengthening of a geodetic reference network and specific GNSS applications, which led to the development of a plan of action for forming partnerships in the region and initiating pilot project proposals.

C. Attendance

14. A total of 80 participants from the following 28 countries attended the Workshop: Argentina, Azerbaijan, Belgium, China, Egypt, Germany, India,

Iran (Islamic Republic of), Italy, Kazakhstan, Kyrgyzstan, Latvia, Morocco, Norway, Pakistan, Poland, Republic of Moldova, Romania, Russian Federation, Sri Lanka, Sweden, Switzerland, Syrian Arab Republic, Tajikistan, Turkey, Ukraine, the United States and Uzbekistan. Representatives of the Office for Outer Space Affairs also attended.

15. Funds provided by the United Nations, the Government of Azerbaijan, the United States (through ICG) and the European Space Agency were used to defray the costs of air travel and living expenses for 17 participants from developing countries and two representatives of the Office for Outer Space Affairs.

II. Summary of presentations

16. Through the presentations and the exchange of views that took place during the Workshop participants raised awareness of issues and opportunities in GNSS technology and their applications and made a number of observations and recommendations.

17. Further information on the Workshop programme, background materials and presentations are available at the website of the Office for Outer Space Affairs (www.unoosa.org).

18. In their keynote addresses, participants highlighted those aspects of GNSS technology that would offer Eurasian countries cost-effective options for achieving sustainable development goals in the region by strengthening many sectors, such as aviation, marine and land transportation, mapping and surveying, environmental monitoring, precision agriculture and natural resources management, disaster warning and emergency response.

19. Participants were informed about space-based radio-navigation systems that provided reliable positioning, navigation and timing services to users worldwide on a continuous basis and that were readily accessible at ground level to anyone operating a receiver. It was said that GNSS technology provided accurate information on location and time to an unlimited number of people, in all weather conditions, day and night, anywhere in the world. It was mentioned that reductions in the size and cost of receivers were allowing more and more people to use such technological solutions, including available survey and geographic information system (GIS) packages, to collect data to support a variety of scientific and economic applications.

20. Participants were also informed about the role of ICG as a forum for providers and users to make available to end-users systems that were compatible and interoperable. Speakers noted that if they achieved interoperability, global and regional navigation satellite systems and augmentations, as well as the services they provided, could provide better data to users. If they achieved compatibility, global and regional systems and augmentations could be used, separately or together, without causing unacceptable levels of interference and/or otherwise harm individual systems and services.

21. Participants learned about the European Position Determination System (EUPOS), which is a European initiative aimed at the development of “full-scale accuracy” integrated differential GNSS infrastructure in Central and

Eastern Europe. Participants were also given an overview of GNSS network real-time kinematic technology that, compared with traditional single baseline real-time kinematic technology, removes a significant amount of spatially correlated error due to the troposphere, ionosphere and satellite orbit errors.

22. Several presenters informed participants about studies of universal processes in the solar system that affect the interplanetary and terrestrial environments, including the deployment and operation of new and existing instrument arrays (GPS receivers, radio antennas, magnetometers, cosmic ray detectors) aimed at understanding the impacts of space weather on Earth and the near-Earth environment. Information was also provided on the International Space Weather Initiative, an international campaign aimed at increasing awareness of the benefits of space applications through educational activities among the general public and in universities.

23. Various presentations were made on the fundamental role of capacity-building in space science and technology. Information was given about the regional centres for space science and technology education, affiliated to the United Nations. Those centres provided support for education and training in satellite navigation and location-based services and hosted training courses for the development of a GNSS curriculum similar to that developed for the regional centres on remote sensing and GIS, space and atmospheric science, satellite communications, satellite meteorology and the climate. The NAVKIT, a multimedia tool for training in satellite navigation technology, was another example of educational material on GNSS-related subjects.

24. In the sessions that focused on GNSS applications, information was provided on the various areas in which GNSS technology had become a mainstay. The presentations on national programmes and case studies provided an additional opportunity to share experiences on the use of GNSS for aviation, for ground-based and maritime operations and for disaster relief and emergency services; they also provided opportunities for participants to better understand how surveyors, geologists and farmers work more efficiently using GNSS signals.

III. Conclusions and recommendations

25. Participants were divided by area of expertise and interest into one of three groups: capacity-building and institutional strengthening; geodetic reference network; and specific GNSS applications. In sessions, each group discussed activities that would contribute to increasing the use of GNSS technology in the region. Participants also discussed the establishment of a regional network that would promote partnerships. The deliberations were summarized and presented at the closing session, when a final round-table discussion was held and the conclusions and recommendations were adopted.

26. The working group on capacity-building and institutional strengthening emphasized the need to strengthen national capacity to use GNSS technology, specifically through targeted training courses and workshops that were tailored to the regional context and took advantage of existing regional structures and centres of excellence. The need for continuing education and training in GNSS science and applications, raising the awareness of decision makers and the development and consolidation of national and regional expertise were identified as possible focus

areas. The importance of training trainers and the growing popularity of online education materials for distance learning or e-learning were highlighted as vital for a variety of users. Cooperation with industry was also recommended.

27. The working group on a geodetic reference network discussed ways and means of following up on the geodetic framework project, based on continuous observation and analysis of GNSS data that could support many geospatial applications across the region. The working group agreed that GNSS training courses and workshops should be organized for countries in the region that were not currently operating permanent reference stations. In that respect, tutorials should be made available to improve understanding of concepts related to terrestrial reference systems and frameworks. Collaboration between States in the region and reference station networks such as EUPOS and the International Association of Geodesy Reference Frame Sub-commission for Europe (EUREF) was encouraged.

28. The working group on specific GNSS applications emphasized several issues and recognized that all actions should be coordinated at the national, regional and global levels. It noted that there was a need to establish elements for a GNSS policy in order to encourage a common approach to radio navigation, positioning and timing across all potential sectors of utilization. The benefits of GNSS applications vis-à-vis the specific needs of the region should also be identified. Particular attention should be paid to promoting the interoperability of navigation, positioning and timing systems in adjacent regions.

29. Furthermore, ongoing efforts should be made to raise awareness among local decision makers, service providers and product manufacturers of the potential of GNSS technology and institutions within each country should assume responsibility for periodically carrying out activities focusing on the use of GNSS technology and its applications and on how such technology could contribute to sustainable development.

30. Participants recognized that the website of the Office for Outer Space Affairs was vital for disseminating information and recommended that the Office further develop its site, in particular its ICG pages (www.icgsecretariat.org).

31. Participants also recognized the need for additional workshops and training courses that would build upon the results of the current workshop.