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## Committee on the Peaceful Uses of Outer Space

### Report on the United Nations/China/European Space Agency Training Course on the Use and Applications of Global Navigation Satellite Systems

(Beijing, 4-8 December 2006)

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## I. Introduction

### A. Background and objectives

1. The Plan of Action proposed by the Committee on the Peaceful Uses of Outer Space in its review of the implementation of the recommendations of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (A/59/174) and endorsed by the General Assembly in its resolution 59/2 of 20 October 2004 presented findings and proposed specific actions in areas that are important for strengthening and further developing the well-being and future of all nations. These actions include, among others, maximizing the benefits of the applications of global navigation satellite systems (GNSS) to support sustainable development, improving medical and public health services through the use of space technologies, developing a comprehensive, worldwide environmental monitoring strategy and improving the management of the Earth's natural resources.

2. Since 2001, the Office for Outer Space Affairs of the Secretariat has organized a series of regional workshops and international meetings to promote the use of GNSS. These workshops and meetings reviewed the status of existing GNSS and their augmentations, as well as examples of GNSS applications that supported sustainable development. Information on these regional workshops and international meetings, including programme and background material, are available at the website of the Office ([www.unoosa.org/oosa/en/SAP/gnss/index.html](http://www.unoosa.org/oosa/en/SAP/gnss/index.html)).

3. The participants of the United Nations/United States of America International Meeting on the Use and Applications of Global Navigation Satellite Systems, held in Vienna from 13 to 17 December 2004, summarized the follow-up projects and initiatives that had been proposed and implemented since December 2003 and made a number of observations and recommendations in the area of enhancing awareness of GNSS and their applications to increase their use to support sustainable development, in particular in developing countries (A/AC.105/846).

4. At its forty-eighth session, in 2005, the Committee on the Peaceful Uses of Outer Space endorsed the schedule of workshops, training courses, symposiums and conferences of the Programme on Space Applications for 2006.<sup>1</sup> Subsequently, the General Assembly, in its resolution 60/99 of 8 December 2005, endorsed the schedule of activities of the Programme on Space Applications for 2006.

5. Pursuant to General Assembly resolution 60/99, the United Nations/China/European Space Agency Training Course on the Use and Applications of Global Navigation Satellite Systems was held in Beijing from 4 to 8 December 2006. Organized by the Office for Outer Space Affairs and the Ministry of Science and Technology of China, the training course was co-sponsored by the European Space Agency (ESA), the China National Space Administration and the Secretariat of Asia-Pacific Multilateral Cooperation in Space Technology and Application and hosted by the National Remote Sensing Centre of China and the China-Europe GNSS Technology Training and Cooperation Centre.

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<sup>1</sup> *Official Records of the General Assembly, Sixtieth Session, Supplement No. 20* and corrigendum (A/60/20 and Corr.1), para. 94.

6. The training course focused on the basics of geodetic reference systems and the functional principles of navigation systems and provided overviews of and reported on the current status of the Galileo programme, the Global Navigation Satellite System and the Global Positioning System. The training course also addressed, inter alia, GNSS applications for transport and communications, aviation, location-based services, the management of natural disasters, emergency response, surveying and mapping and precision agriculture. Overviews were presented of the cooperation between China and Europe, as well as of GNSS educational and capacity-building activities at the national, regional and international levels resulting from that cooperation.

7. The objectives of the training course were (a) to introduce GNSS technology and its applications for transport and communications, aviation, surveying and mapping, the management of natural resources and natural disasters, the protection of the environment, and agriculture; (b) to promote the exchange of experiences of specific applications; and (c) to encourage greater cooperation in the use and applications of GNSS technologies in the region.

8. The present report was prepared for submission to the Committee on the Peaceful Uses of Outer Space at its fiftieth session, in 2007.

## **B. Programme**

9. Introductory and welcoming statements were made by the Director-General of the National Remote Sensing Centre of China, the Deputy Director-General of the China National Space Administration, the representative of ESA working in the China-Europe GNSS Technology Training and Cooperation Centre and a representative of the Office for Outer Space Affairs.

10. The five-day programme included lectures, presentations on examples of ongoing and planned initiatives on GNSS implementation and uses, working group discussions and a technical visit. Two discussion sessions allowed for deliberations on the scheduled topics, with the aim of defining follow-up activities for the region. During the first session, the participants were divided into three working groups on the basis of their areas of expertise and interest: the first group focused on further development and implementation of the Asia Pacific Regional Geodetic Project (APRGP), the second group on capacity-building related to GNSS education and training, and the third group on specific GNSS applications. During the second session, the three groups presented the results of their discussions and together defined a regional strategy for forming partnerships and for increasing the use of GNSS technologies in the region.

11. The speakers and instructors for the technical sessions of the training course came from the China-Europe GNSS Technology Training Cooperation Centre, the China Earthquake Administration, the China National Space Administration, the China Meteorological Administration, the National Aeronautics and Space Administration of the United States of America, the Highway Research Institute (China), Beijing University, Beihang University (China), Wuhan University (China) and the Istituto Superiore Mario Boella (Italy). Presentations were also made by representatives of the Galileo Joint Undertaking and the United States Department of State. Briefings were given by representatives of the following companies: GNSS

Infrastructure, China Satellite Navigation and Communication Industry, OlinkStar and China Galileo Industries. The Office for Outer Space Affairs also contributed, with presentations entitled “The United Nations and GNSS: Global in Space and Time”, in which the work carried out by the Office in supporting activities to promote the use of GNSS-based applications was highlighted, and “Educational opportunities in space applications: regional centres for space science and technology education, affiliated to the United Nations” in which the goals and activities of the centres were outlined.

12. The lecture notes and papers presented at the training course are available at the website of the Office for Outer Space Affairs (<http://www.unoosa.org/oosa/en/SAP/gnss/index.html>).

### **C. Attendance**

13. A total of 56 participants from the following 24 countries attended the training course: Austria, Azerbaijan, Bangladesh, Brunei Darussalam, China, Egypt, India, Indonesia, Iran (Islamic Republic of), Italy, Malaysia, Mongolia, Myanmar, Nepal, Netherlands, Pakistan, Philippines, Republic of Korea, Sri Lanka, Thailand, Turkey, United States, Uzbekistan and Viet Nam. The Office for Outer Space Affairs and ESA were also represented.

14. Funds provided by the United Nations, ESA and the Government of China were used to cover the travel and living expenses of 21 participants from developing countries and countries with economies in transition.

## **II. Summary of discussions and recommendations**

15. Two discussion sessions were held as part of the training course. During the first, three working groups met in parallel to discuss the following themes: the Asia Pacific Regional Geodetic Project; developing capacity in and building knowledge of the use and applications of global navigation satellite systems; and specific applications of global navigation satellite systems. During the second, the groups presented the results of their deliberations and formulated a common plan of action for the region.

### **A. Working group on the implementation of the Asia Pacific Regional Geodetic Project**

16. The working group on the implementation of the Asia Pacific Regional Geodetic Project held discussions on ways and means of following up APRGP, including the possibility of holding expert meetings and hands-on training courses that would contribute to implementation of the project. The working group adopted a workplan comprising the following activities, which were to be carried out in support of the project: (a) conduct of a feasibility study to identify the number of permanent Global Positioning System reference stations required in the APRGP area; (b) arrangement of GNSS training for countries in the region that were not currently operating permanent reference stations; and (c) identification of suitable

locations for additional GNSS infrastructure on the basis of scientific and national and regional need for positioning, navigation and timing.

17. Participants recognized that there were a number of ongoing projects and initiatives on the establishment of regional reference frames, such as the African Geodetic Reference Framework (AFREF), the European Position Determination System (EUPOS), the International Association of Geodesy Reference Frame Sub-Commission for Europe (EUREF) and the Geocentric Reference System for the Americas (SIRGAS), that could be of benefit in the implementation of APRGP and recommended that the institutions represented by the participants seek opportunities to profit from the experience provided by such initiatives.

## **B. Working group on developing capacity in and building knowledge of the use and applications of global navigation satellite systems**

18. The working group on developing capacity in and building knowledge of the use and applications of global navigation satellite systems held discussions on building capacity in GNSS education and training, as well as on the appropriate format for a regional network that would enable the creation of partnerships in the use of GNSS and related applications. Participants also discussed the existing capacity-building opportunities offered by national and international institutions.

19. Participants recognized the need to continue building national and regional expertise through the long- and short-term training courses and education offered by the regional centres for space science and technology education, affiliated to the United Nations, and through the Master's degree-level programme in navigation and related applications offered by the Politecnico di Torino and the Istituto Superiore Mario Boella, in cooperation with the Office for Outer Space Affairs, and also through other academic and thematic centres of excellence worldwide. Participants also recognized the need for short training courses on GNSS to be developed as part of workshops on the topic of GNSS.

20. With a view to enabling knowledge-sharing, participants recommended that an Internet-based discussion forum be set up to facilitate the exchange and dissemination of information by electronic mail (e-mail) and to hold periodic virtual meetings. The offer made by the University of Malaysia Sabah to establish and host a website and the proposed Internet forum was welcomed. It was further recommended that the discussion forum should include links to existing initiatives such as the GNSS forum of the International Telecommunication Union.

## **C. Working group on specific applications of global navigation satellite systems**

21. The working group on specific applications of global navigation satellite systems considered the following application areas: aviation, transportation, the management of natural resources and natural disasters, and the protection of the environment. Participants were divided into two subgroups on the basis of the application areas of most interest and relevance to them. The subgroups focused on ways and means of strengthening the use of GNSS technologies in Asia and discussed ongoing and planned initiatives and the actions that should be carried out

collaboratively for the establishment of a global information exchange network on the applications of GNSS among national and regional institutions. In addition, each subgroup discussed a number of projects that would have the potential to demonstrate the benefits of GNSS.

22. With regard to the management of natural resources and natural disasters and the protection of the environment, the participants agreed that the objective of the proposed regional network should be to promote and disseminate information on the use of GNSS technologies and to improve and facilitate management and decision-making. With regard to transportation, the overall objective should be to raise the awareness of decision makers and end users concerning the potential benefits of GNSS applications to all transportation modes.

23. The participants considered possible pilot projects and recommended that institutions that were part of the proposed regional network should recognize work in progress, especially work that already had local commitment. These institutions would interact primarily using e-mail, providing information to all interested institutions on activities being proposed or carried out and fostering partnerships among the different initiatives and interests. Once partnerships had been defined, a further step would be to identify pilot projects and the most appropriate institutions that could participate in them.

24. The working group agreed that either the Office for Outer Space Affairs, in cooperation with the International Committee on GNSS (ICG), or ICG itself should be invited to assist in soliciting seed funding and expertise for potential projects related to the management of natural resources and natural disasters and the protection of the environment. Participants were asked to outline projects that could be completed in a short period of time (one to two years) and that would involve cooperation between two or more countries, and to identify contact points for each.

### **III. Conclusions**

25. The participants recommended that a list of existing training and educational opportunities in the area of GNSS and its applications, including those supported by electronic learning technologies, be compiled and distributed to interested regional and national institutions in order to provide an updated view of the training and educational opportunities that were currently available.

26. Participants agreed that the regional centres for space science and technology education, affiliated to the United Nations, as well as other academic centres of excellence within the region, could play an important role in capacity development and knowledge-building in the use of GNSS and its applications.

27. Participants stressed that cross-linkages needed to be developed for APRGP with other ongoing projects and initiatives such as AFREF, EUPOS, EUREF and SIRGAS and suggested that ICG could act as a facilitating body to strengthen cooperation among the regional geodetic reference frames.

28. Participants agreed to establish a website where useful information could be posted by contributing institutions and to create an Internet discussion forum to facilitate the exchange and dissemination of information on GNSS and its applications.

29. 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 the ICG information portal.

30. Participants expressed their deep appreciation to the China-Europe GNSS Technology Training and Cooperation Centre for the excellent opportunity provided to participants at the training course to learn about GNSS and their applications.

31. Participants also expressed their appreciation for the significant support provided by the Government of China, the United Nations and ESA.

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