



General Assembly

Distr.: General
10 December 2007

Original: English

Committee on the Peaceful Uses of Outer Space

Second Meeting of the International Committee on Global Navigation Satellite Systems

Note by the Secretariat

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I. Introduction

A. Background

1. In its resolution 61/111 of 14 December 2006, the General Assembly noted with appreciation that the International Committee on Global Navigation Satellite Systems had been established on a voluntary basis as an informal body to promote cooperation, as appropriate, on matters of mutual interest related to civil satellite-based positioning, navigation, timing and value-added services, as well as the compatibility and interoperability of global navigation satellite systems, while increasing their use to support sustainable development, particularly in developing countries.

2. In 2006, the Office for Outer Space Affairs of the Secretariat scheduled, in coordination with the co-organizers, two activities focusing on building capacity so that global navigation satellite systems (GNSS) could be used more widely to support sustainable development:

(a) The United Nations/Zambia/European Space Agency Regional Workshop on the Applications of Global Navigation Satellite System Technologies for Sub-Saharan Africa, held in Lusaka from 26 to 30 June 2006 (see A/AC.105/876);

(b) The United Nations/China/European Space Agency Training Course on the Use and Applications of Global Navigation Satellite Systems, held in Beijing from 4 to 8 December 2006 (see A/AC.105/883).

3. The Office for Outer Space Affairs also organized the first Meeting of the International Committee on Global Navigation Satellite Systems, held in Vienna on 1 and 2 November 2006 (see A/AC.105/879).

4. As decided by the Committee at its meeting held in Vienna in November 2006, the Second Meeting of the International Committee on Global Navigation Satellite Systems was held in Bangalore, India, on 6 and 7 September 2007. The Second Meeting was hosted by the Indian Space Research Organization (ISRO).

B. Structure and programme of the Meeting

5. At the opening of the Second Meeting, introductory and welcoming statements were made by representatives of ISRO and the Office for Outer Space Affairs.

6. The programme of the Meeting consisted of plenary sessions and working group sessions. At the plenary sessions, participants reviewed and identified specific actions to be taken within the framework of the workplan of the Committee (A/AC.105/879, annex II), which was also addressed by the working groups. Each working group focused on one of the following issues: (a) compatibility and interoperability; (b) enhancement of the performance of GNSS services; (c) information dissemination; and (d) interaction with national and regional authorities and relevant international organizations. Taking into account the recommendations of its working groups and the conclusions of the Providers' Forum (see paras. 37-41 below), the Committee reached the results summarized in a joint statement (see para. 34 below).

7. The Providers' Forum was held on 4 September 2007, under the chairmanship of India and the United States of America. The Providers' Forum addressed key technical issues and operational concepts such as compatibility and interoperability, the protection of the GNSS spectrum, orbital debris/orbit deconfliction and other matters related to the work of the Committee. The presentations made at the Providers' Forum are available on the website of the Office for Outer Space Affairs (<http://www.unoosa.org/oosa/en/SAP/gnss/icg/meetings.html>).

8. Experts of global navigation satellite systems (GNSS) held a meeting on 5 September 2007. The meeting consisted of five scientific and technical sessions, each focusing on one of the following issues: (a) the application of GNSS to predict natural disasters and to carry out research on climate change and earth science; (b) geodetic reference frames; (c) atomic time standards, Coordinated Universal Time (UTC) and time transfer; (d) ionospheric/tropospheric models and space weather effects; and (e) GNSS activities in India. At the meeting of experts, 25 presentations were given by representatives of GNSS service providers, Member States, and intergovernmental and non-governmental organizations dealing with GNSS applications. Presentations were also made by representatives of the Indian private sector involved in the area of GNSS. The presentations made at the meeting are available on the website of the Office for Outer Space Affairs (<http://www.unoosa.org/oosa/en/SAP/gnss/icg/meetings.html>). Ten Indian companies also contributed to an exhibition held near the site of the Meeting from 4 to 7 September 2007.

C. Attendance

9. Representatives of the following States participated in the Second Meeting: China, India, Italy, Japan, Russian Federation and United States. Representatives of the European Community and the Office for Outer Space Affairs also participated.

10. Representatives of Malaysia and the United Arab Emirates also attended the Meeting and were granted member status by the Committee.

11. The following intergovernmental and non-governmental organizations were represented at the Meeting: International Bureau of Weights and Measures (BIPM), International Association of Geodesy (IAG), IAG Reference Frame Sub-Commission for Europe (EUREF), International Association of Institutes of Navigation (IAIN), the International GNSS Service (IGS), International Steering Committee of the European Position Determination System (EUPOS), International Federation of Surveyors (FIG) and Union radio-scientifique internationale (URSI).

12. The States Members of the United Nations and intergovernmental and non-governmental organizations that are members of the Committee are listed in annex I.

D. Documentation

13. A list of the documents of the Second Meeting is contained in annex II. (The documents are available on the website of the Office for Outer Space Affairs (<http://www.unoosa.org/oosa/en/SAP/gnss/icg.html>).

II. Deliberations of the Meeting

14. At its plenary sessions, held on 6 and 7 September 2007, the Committee considered the implementation of the recommendations of the working groups and plans to address the current and future work under each working group.

15. In accordance with the workplan of the Committee, the four working groups met in parallel on 6 September 2007 to address the issues listed in paragraph 6 above. (The reports of the working groups are available on the website of the Office for Outer Space Affairs (<http://www.unoosa.org/oosa/en/SAP/gnss/icg.html>).) A special session on the certification of satellite-based augmentation systems was also held on 6 September 2007.

16. The Meeting adopted its agenda on 7 September 2007.

17. The chairman made a statement outlining the work that the Committee had before it at its Second Meeting and reviewing related events held in conjunction with the Meeting.

18. The co-chairman of the Providers' Forum made a statement on the results of the Providers' Forum, held on 4 September 2007, immediately preceding the Second Meeting. It was noted that the Providers' Forum had been established to enhance the compatibility and interoperability of current and future global and regional satellite-based systems. It was also noted that the Forum was not a policymaking body, but that it provided a means to promote discussions on important issues addressed by the Committee that required system providers to make relevant, well-defined contributions.

19. The Committee noted that since China was developing the Compass Navigation Satellite System, it should be recognized as a provider of GNSS.

20. The chairman informed the Committee that requests for membership in the Committee had been received from Malaysia and the United Arab Emirates.

21. The Committee heard statements by the representatives of Malaysia and the United Arab Emirates on their countries' plans for implementing GNSS services and applications.

22. The secretariat was requested to amend the terms of reference of the Committee to reflect the change in the status of China and the addition of new members. Accordingly, in paragraph 4 (a) of the terms of reference (ICG/TOR/SEP2007), "China (Compass)" was included in the list of current and future core system providers and "Malaysia and United Arab Emirates" were included as States Members of the United Nations with an active programme in implementing or promoting a wide range of GNSS services and applications.

23. A statement was made by the representative of Italy.

24. It was noted that, in order to avoid duplication of efforts by the working groups, the workplan of the Committee should be streamlined. It was agreed that the matter would be considered at future meetings of the Committee.

25. The Committee noted with satisfaction that, in accordance with its workplan, the working groups had made significant progress and had successfully carried out their tasks.

26. The representative of BIPM was of the view that consideration should be given to the redefinition of UTC as a uniform timescale without leap-second discontinuities. A position paper was submitted to the Working Group on Compatibility and Interoperability and the Working Group on Interaction with National and Regional Authorities and Relevant International Organizations.
27. The view was expressed that the working group papers should be properly labelled and submitted to the secretariat of the Committee before being circulated.
28. The Committee requested the Working Group on Compatibility and Interoperability to consider the issue raised in paragraph 26 above and to develop recommendations to be considered at the informal meeting of the Providers' Forum to be held in February 2008, during the forty-fifth session of the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space.
29. The Committee noted with satisfaction that the secretariat had continued to develop the information portal of the Committee as part of the website of the Office for Outer Space Affairs (www.unoosa.org/oosa/en/SAP/gnss/icg.html).
30. Taking into account the recommendations of the working groups and reviewing the progress made since the first Meeting of the Committee, held in Vienna in November 2006, a joint statement was adopted at the conclusion of the Second Meeting on 7 September 2007.
31. The Committee accepted the invitation of the United States to host the Third Meeting, to be held in 2008, and noted the offer of the Russian Federation to host the Fourth Meeting, in 2009. It was noted that the Office for Outer Space Affairs, acting as secretariat for both the Committee and the Providers' Forum, would assist in the preparations for those meetings and for the working groups' activities.
32. The Committee agreed on a tentative schedule for the informal preparatory meetings for the Third Meeting, to be held in 2008, during the forty-fifth session of the Scientific and Technical Subcommittee and the fifty-first session of the Committee on the Peaceful Uses of Outer Space.
33. The Committee also agreed that the exact schedule for the informal preparatory meetings would be transmitted to its members by its secretariat.

III. Joint statement

34. The Committee adopted by consensus the following joint statement:
 1. The Second Meeting of the International Committee on Global Navigation Satellite Systems was held in Bangalore, India, from 4 to 7 September, 2007, to review and discuss global navigation satellite systems (GNSS) and their promising applications. These applications include safety and economic development, particularly the efficiency and safety of transport, search and rescue, geodesy, land management and sustainable development and other activities. The Committee addressed the use of the applications to promote the enhancement of universal access to, and compatibility and interoperability of, global and regional navigation satellite systems and the integration of these services into national infrastructure, particularly in developing countries.

2. The Meeting was hosted by the Indian Space Research Organization. Attendees included China, India, Italy, Japan, the Russian Federation and the United States of America and the European Community, as well as the following international and non-governmental organizations: International Bureau of Weights and Measures, International Association of Geodesy, Reference Frame Sub-Commission for Europe, International Association of Institutes of Navigation, International GNSS Service, International Steering Committee of the European Position Determination System, International Federation of Surveyors and Union radio-scientifique international. Representatives of the Office for Outer Space Affairs of the Secretariat also participated. Malaysia and the United Arab Emirates also attended and were recognized as new members of the Committee.

3. The Committee recalled that the General Assembly, in its resolution 61/111 of 14 December 2006, had noted with appreciation that the International Committee on Global Navigation Satellite Systems had been established on a voluntary basis as an informal body to promote cooperation, as appropriate, on matters of mutual interest related to civil satellite-based positioning, navigation, timing and value-added services, as well as the compatibility and interoperability of global navigation satellite systems, while increasing their use to support sustainable development, particularly in developing countries. It was agreed that the Committee had made substantive progress in furthering its workplan approved at its first meeting, organized by the Office for Outer Space Affairs in Vienna in 2006.

4. A major development at the Second Meeting was the establishment of the Providers' Forum to enhance compatibility and interoperability among current and future system providers, as a mechanism to continue discussions on important issues addressed by the Committee that require focused input from system providers. Members of the Providers' Forum that met on the first day of the Meeting included China, India, Japan, the Russian Federation and the United States, as well as the European Community. The Providers' Forum addressed key technical issues and operational concepts such as compatibility and interoperability, the protection of GNSS spectrum, orbital debris/orbit deconfliction and other matters related to the work of the Committee.

5. The second day of the Second Meeting was devoted to expert presentations made by India, GNSS service providers, States Members, intergovernmental organizations and non-governmental organizations dealing with GNSS applications. On the third day of the Meeting, the Committee addressed its workplan through the working groups, which focused on: (a) compatibility and interoperability; (b) enhancement of performance of GNSS services; (c) information dissemination; and (d) interaction with national and regional authorities and relevant international organizations. Recommendations and plans to address the current and future work under each working group were presented to the Committee.

6. The Committee accepted the invitation of the United States to host the Third Meeting, to be held in 2008. The Committee also noted the offer of the Russian Federation to host the Fourth Meeting in 2009. Acting as the secretariat for the Committee and the Providers' Forum, the Office for Outer

Space Affairs will assist in the preparations for those meetings and for interim planning and working group activities.

IV. Providers' Forum

35. At the first Meeting of the Committee, held in Vienna on 1 and 2 November 2006, and in response to an action recommended in the Committee's workplan, providers of global and regional navigation satellite systems proposed establishing an ad hoc providers' forum to enhance compatibility and interoperability among current and future systems. On this basis, the Providers' Forum, co-chaired by India and the United States, was held on 4 September 2007, immediately preceding the Second Meeting of the Committee. China, India, Japan, the Russian Federation and the United States, as well as the European Community, were present at the Meeting. In addition to the co-chairman's opening remarks, opening statements were also made by each provider. The agenda of the Meeting included system and service updates from each of the following providers:

- (a) *China*: Compass/BeiDou Navigation Satellite System (CNSS);
- (b) *India*: Global Positioning System and Geostationary (GEO) Augmented Navigation System (GAGAN) and Indian Regional Navigation Satellite System (IRNSS);
- (c) *Japan*: Quasi-Zenith Satellite System (QZSS) and Multi-functional Transport Satellite (MTSAT) Satellite-based Augmentation System (MSAS);
- (d) *Russian Federation*: Global Navigation Satellite System (GLONASS) and Wide-area System of Differential Corrections and Monitoring (SDCM);
- (e) *United States*: Global Positioning System (GPS) and Wide-area Augmentation System (WAAS).
- (f) *European Community*: European Satellite Navigation System (Galileo) and European Geostationary Navigation Overlay Service (EGNOS).

36. Consistent with the template for sharing information among providers (see annex III), which had been circulated prior to the Providers' Forum, many system providers also shared their views on compatibility and interoperability, spectrum protection and other items to be addressed under the workplan of the Committee.

Conclusions of the Providers' Forum

Continuation of the Providers' Forum

37. At the conclusion of the meeting, the participants agreed to establish the Providers' Forum as a mechanism for continuing discussions on important issues addressed by the Committee that required focused input from system providers. It was noted that the Forum would not be a policymaking body but would provide a means of promoting discussion among system providers on key technical issues and operational concepts such as compatibility and interoperability, protection of the GNSS spectrum, orbital debris/orbit deconfliction and other matters related to the work of the Committee. The participants also agreed to meet again no later than

during the Third Meeting of the Committee, to be held in the United States in 2008, and possibly during the forty-fifth session of the Scientific and Technical Subcommittee, to be held in February 2008. The Office for Outer Space Affairs, as the secretariat of the Committee, would continue to act as the focal point for the preparations for the Providers' Forum. The chairmanship of the Providers' Forum would rotate among the members of the Forum on an annual basis.

Service provision from current and planned global navigation satellite systems

38. Information exchanged at the Providers' Forum revealed that all current and future providers were committed to their plans to deploy and/or modernize their respective global and regional satellite navigation systems having the following important characteristics:

(a) Service to users was provided or would be provided from all systems in radiofrequency spectrum bands internationally allocated for radio-navigation satellite services (RNSS) in L-band (960-1300 MHz and 1559-1610 MHz). Two systems would also broadcast a navigation signal in S-band (2491.005 ± 8.25 MHz). The band 5000-5030 MHz could be used in the future by one or more systems;

(b) All systems were broadcasting or would broadcast an open service using one or more signals provided to users free of direct user charges;

(c) Many systems also broadcast authorized services specifically designed to meet the needs of authorized users in support of governmental functions.

39. Participants in the Providers' Forum also agreed that:

(a) Transparency in the provision of open services was desirable and required the open publication and dissemination of signal and system characteristics, in due time, required to allow manufacturers to design and develop GNSS receivers on a non-discriminatory basis;

(b) Discussions should emphasize that cooperation regarding GNSS infrastructure (space and ground control/monitoring segments) for open services was desirable in order to permit open, free commercial competition in receiver and applications markets;

(c) System providers should strive to monitor the performance of their open signals and provide timely updates to users regarding critical performance characteristics such as timing accuracy, positioning accuracy and service availability;

(d) The protection of RNSS spectrum was vital to GNSS service provision. Therefore, adequate spectrum protection through domestic and international regulation should be pursued. In addition, steps to detect and mitigate interference to GNSS worldwide should be pursued;

(e) Physical separation of operational satellite constellations and end-of-life disposal orbits should also be examined;

(f) The concept of service guarantees should also be examined.

Principles of compatibility and interoperability

40. Global and regional system providers agreed that at a minimum, all GNSS signals and services must be compatible. To the maximum extent possible, open signals and services should also be interoperable, in order to maximize benefit to all GNSS users. In order to achieve compatibility and interoperability, the Providers' Forum reached consensus on the following general definitions of those principles:

(a) *Compatibility* referred to the ability of space-based positioning, navigation and timing services to be used separately or together without interfering with each individual service or signal:

- (i) Radiofrequency compatibility should involve thorough consideration of detailed technical factors, including effects on receiver noise floor and cross-correlation between interfering and desired signals. The International Telecommunication Union provided the framework for discussions on radiofrequency compatibility;
- (ii) Compatibility should also involve spectral separation between each system's authorized service signals and other systems' signals;
- (iii) Any additional solutions to improve compatibility should be encouraged;

(b) *Interoperability* referred to the ability of open global and regional satellite navigation and timing services to be used together to provide better capabilities at the user level than would be achieved by relying solely on one service or signal:

- (i) Ideal interoperability allows navigation with signals from at least four different systems with no additional receiver cost or complexity;
- (ii) Common centre frequencies were essential to interoperability, and commonality of other signal characteristics was desirable;
- (iii) Multiple constellations broadcasting interoperable open signals would result in improved observed geometry, increasing end-user accuracy everywhere and improving service availability in environments where satellite visibility was often obscured;
- (iv) Geodetic reference frames and system time standards should also be considered;
- (v) Any additional solutions to improve interoperability should be encouraged.

Future work of the Providers' Forum

41. Global and regional system providers in attendance agreed to support the Committee and actively participate in its working groups formed to address its workplan. The United States agreed to prepare a draft workplan for the next Providers' Forum based on the results of the first Forum and the Second Meeting of the Committee.

Annex I

List of States Members of the United Nations and intergovernmental and non-governmental organizations participating in the International Committee on Global Navigation Satellite Systems

China
India
Italy
Japan
Malaysia
Nigeria
Russian Federation
United Arab Emirates
United States of America
European Community
International Bureau of Weights and Measures (BIPM)
Civil Global Positioning System Service Interface Committee (CGSIC)
Committee on Space Research (COSPAR)
European Space Agency (ESA)
International Association of Geodesy (IAG)
International Association of Geodesy Reference Frame Sub-Commission for Europe
(EUREF)
International Association of Institutes of Navigation (IAIN)
International Cartographic Association (ICA)
International Federation of Surveyors (FIG)
International Global Navigation Satellite System Service (IGS)
International Steering Committee of the European Position Determination System
(EUPOS)
Office for Outer Space Affairs of the Secretariat
Union radio-scientifique internationale (URSI)

Annex II**Documents of the Second Meeting of the International
Committee on Global Navigation Satellite Systems**

<i>Symbol</i>	<i>Title or description</i>
ICG/WGA/SEP2007	Report of the Working Group on Compatibility and Interoperability
ICG/WGB/SEP2007	Report of the Working Group on Enhancement of Performance of Global Navigation Satellite Systems Services
ICG/WGC/SEP2007	Report of the Working Group on Information Dissemination
ICG/WGD/SEP2007	Report of the Working Group on Interactions with National and Regional Authorities and Relevant International Organizations
ICG/WGSBAS/SEP2007	Report of the Working Group on Satellite-based Augmentation System Certification
ICG/TOR/SEP2007	Terms of reference

Annex III

Template for sharing information between service providers

- I. System description
 - A. Space segment: technical parameters such as altitude and inclination or geosynchronous orbit (GEO) slot position. As appropriate, it could also address satellite disposal procedures and orbit information, to establish a baseline for ensuring deconfliction with other constellations
 - B. Ground segment
 - C. Signals: current and planned signals
 - D. Performance: performance standards versus actual performance
 - E. Timetable for system deployment and operation
- II. Services provided and provision policies
- III. Perspective on compatibility and interoperability
 - A. Definition of compatibility and interoperability
 - B. Efforts to ensure radiofrequency compatibility through bilateral and multilateral venues
 - C. Efforts to pursue interoperability through bilateral and multilateral venues
- IV. Global navigation satellite system (GNSS) spectrum protection activities
 - A. National-level radio-navigation satellite system (RNSS) spectrum regulation/management procedures
 - B. Views on International Telecommunication Union (ITU) RNSS spectrum issues or agenda items of the World Radiocommunication Conference, as appropriate or necessary
 - C. RNSS interference detection and mitigation plans and procedures
- V. Participation in the International Committee on Global Navigation Satellite Systems
 - A. Discussion of the service providers involvement in the working groups and workplan activities of the Committee
 - B. Views on future areas of focus and activities of the Committee as appropriate