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Third 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 63/90 of 5 December 2008, the General Assembly noted with appreciation that the International Committee on Global Navigation Satellite Systems (ICG) had been established on a voluntary basis as a forum to promote cooperation, as appropriate, on matters of mutual interest to its members related to civil satellite-based positioning, navigation, timing and value-added services, as well as cooperation on the compatibility and interoperability of global navigation satellite systems, and to promote their use to support sustainable development, particularly in developing countries; that it had held its first meeting in Vienna on 1 and 2 November 2006 and its second meeting in Bangalore, India, from 4 to 7 September 2007; that it would hold its third meeting in Pasadena, California, United States of America, from 8 to 12 December 2008; and that its fourth meeting would be held in the Russian Federation in 2009.

2. In order to implement the activities in the priority thematic area on global navigation satellite systems (GNSS) within the framework of the United Nations Programme on Space Applications, the Office for Outer Space Affairs of the Secretariat organized the United Nations/Colombia/United States of America Workshop on Applications of Global Navigation Satellite Systems, for the benefit of countries in Latin America and the Caribbean, in Medellin, Colombia, from 23 to 27 June 2008 (A/AC.105/920).

3. In further support of ICG, the Office for Outer Space Affairs, serving as the executive secretariat of ICG and the Providers' Forum, held additional meetings (see A/AC.105/922), in conjunction with major international symposiums and conferences focusing on the application of GNSS in various areas to support sustainable development. Those meetings were co-sponsored by the Government of the United States, which also provided substantive technical support for the meetings. The Government of India, through the Regional Centre for Space Science and Technology Education in Asia and the Pacific, the Government of the Russian Federation and the European Community provided funds for experts to participate in and contribute to those meetings.

4. The Third Meeting of the International Committee on Global Navigation Satellite Systems was held in Pasadena, California, United States, from 8 to 12 December 2008.

B. Structure and programme of the Meeting

5. At the opening of the Third Meeting, an introductory and welcoming statement was made by the chairman of the Meeting. Statements were also made by the director of the Jet Propulsion Laboratory of the National Aeronautics and Space Administration (NASA), and the director of the Office for Outer Space Affairs. A keynote presentation entitled "Looking ahead for GPtS" was made by a representative of Stanford University and a presentation on the activities of ICG in 2008 was made on behalf of the Office for Outer Space Affairs.

6. The programme of the Meeting consisted of plenary sessions and working group sessions. The presentations made in the plenaries focused on the status and future plans of GNSS service providers and augmentation system providers, and GNSS applications, education and capacity-building activities at the global, regional and national levels. In the plenaries, participants also reviewed and identified specific actions to be taken in line with the workplan of ICG; those actions were also addressed by the four working groups that met on 10 December 2008. Each working group focused on one of the following issues: (a) compatibility and interoperability, led by the Russian Federation and the United States; (b) enhancement of the performance of GNSS services, led by India; (c) information dissemination and capacity-building, led by the Office for Outer Space Affairs and the United States; and (d) interaction with national and regional authorities and relevant international organizations, led by the International Federation of Surveyors (FIG), the International Association of Geodesy (IAG) and the International GNSS Service (IGS).

7. The plenary sessions also included presentations by representatives of industrial and academic entities on GNSS science and innovative technology applications and future commercial applications. The presenters also gave their views on GNSS compatibility and interoperability. GNSS exhibits could be viewed throughout the Meeting.

8. The Providers' Forum held its third meeting in conjunction with the Third Meeting of the International Committee on Global Navigation Satellite Systems in Pasadena, California, United States, on 7, 11 and 12 December 2008 (see paragraphs 24-27).

9. After considering the various items before it, ICG made the recommendations and decisions contained in paragraphs 17-22 and agreed on the joint statement summarized in paragraph 23.

C. Attendance

10. Representatives of the following States participated in the Third Meeting: China, India, Italy, Japan, Malaysia, Nigeria, Russian Federation, United Arab Emirates and United States. Representatives of the European Community also participated.

11. The following intergovernmental and non-governmental organizations dealing with GNSS services and applications were represented at the Meeting: Civil Global Positioning System Service Interface Committee (CGSIC), European Position Determination System (EUPOS), FIG, IAG, IGS and Office for Outer Space Affairs.

12. A representative of the IAG Reference Frame Sub-Commission for Europe (EUREF) also attended and EUREF was recognized by ICG as a new associate member.

13. The Meeting was also attended by observers from the International Bureau of Weights and Measures, the Committee on Space Research (COSPAR) and the International Association of Institutes of Navigation.

14. Observers for the Canadian Space Agency and the Regional Centre for Space Science and Technology Education in Latin America and the Caribbean were invited, at their request, to participate in the Meeting.

15. A list of States Members of the United Nations and governmental, intergovernmental and non-governmental organizations that participated in the Meeting is contained in annex I.

D. Documentation

16. A list of the documents of the Third Meeting is contained in annex II. The documents are also available on the website of ICG (<http://www.icgsecretariat.org>).

II. Recommendations and decisions

17. The chairman of the Third Meeting outlined the work that ICG had before it at the Third Meeting and reviewed related events held in conjunction with that Meeting.

18. ICG continued to consider, as a matter of priority, the implementation of the recommendations of the working groups and planned to address the current and future work under each working group.

19. ICG endorsed the recommendations of the working groups with regard to the implementation of the actions contained in the ICG workplan.

20. ICG noted that the International Council for Science (ICSU) would be represented in ICG by COSPAR, which is an ICSU Interdisciplinary Body, and by the International Society for Photogrammetry and Remote Sensing and the Union radio-scientifique internationale (URSI), which are ICSU Union Members.

21. ICG adopted section D of the ICG terms of reference on procedures of work, structure and organization, as revised during the informal preparatory meetings held in Vienna in 2008 ahead of the Third Meeting.

22. ICG requested that the Office of Outer Space Affairs prepare a draft terms of reference for work it will undertake in support of ICG.

III. Joint statement

23. ICG adopted by consensus the following joint statement:

1. The Third Meeting of the International Committee on Global Navigation Satellite Systems (ICG) was held in Pasadena, California, United States of America, from 8 to 12 December 2008, to continue reviewing and discussing developments in global navigation satellite systems (GNSS) and to allow ICG members, associate members and observers to consider matters of interest. ICG also addressed GNSS science and innovative technology applications and future commercial applications. Representatives from industry, academia and Governments shared views on GNSS compatibility and interoperability.

2. The Meeting was hosted by the Government of the United States. Attendees included China, India, Italy, Japan, Malaysia, Nigeria, the Russian Federation, the United Arab Emirates and the United States and the European Community, as well as the following international organizations: International Bureau of Weights and Measures (BIPM), Committee on Space Research (COSPAR), the Civil Global Positioning System Service Interface Committee (CGSIC), the European Position Determination System (EUPOS), the International Federation of Surveyors (FIG), the International Association of Geodesy (IAG), the International Association of Institutes of Navigation (IAIN), the International GNSS Service (IGS), and the Office for Outer Space Affairs of the Secretariat. The Canadian Space Agency and the Regional Centre for Space Science and Technology Education in Latin America and the Caribbean attended as observers. The IAG Reference Frame Sub-Commission for Europe (EUREF) also attended and was recognized by ICG as a new associate member.
3. ICG recalled that the General Assembly, in its resolution 62/217 of 22 December 2007, had noted with appreciation that ICG 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, and that it held its first meeting in Vienna, on 1 and 2 November 2006, and its second meeting in Bangalore, India, from 4 to 7 September 2007.
4. ICG noted that the working groups focused on the following issues: compatibility and interoperability; enhancement of the performance of GNSS services; information dissemination and capacity-building; and interaction with national and regional authorities and relevant international organizations. It also noted that substantive progress had been made in furthering the ICG workplan that had been approved at the First Meeting of the International Committee on Global Navigation Satellite Systems.
5. ICG noted that the Providers' Forum had adopted a terms of reference and a workplan. During a plenary session, ICG also decided that the regional centres for space science and technology education, affiliated to the United Nations, would act as ICG information centres. ICG further agreed to establish a task force on geodetic references and a task force on time references in order to promote progress in its workplan.
6. ICG accepted the invitation of the Russian Federation to host the fourth meeting in St. Petersburg, from 14 to 18 September 2009. ICG also noted the offer of Italy and the European Community to jointly host the subsequent meeting, in 2010. The Office for Outer Space Affairs, as the executive secretariat of ICG and the Providers' Forum, will assist in the preparations for those meetings and for interim planning and working group activities.

IV. Providers' Forum

24. The third meeting of the Providers' Forum, which consisted of three sessions (on 7, 11 and 12 December 2008), was held in conjunction with the Third Meeting of the International Committee on Global Navigation Satellite Systems. China, India, Japan, the Russian Federation and the United States, as well as the European Community, were represented at the Meeting. The first session of the Providers' Forum started with introductory and welcoming remarks by the chairman.

25. On 7 December 2008, participants in the Providers' Forum reviewed the agenda and meeting procedures for the Forum and the Third Meeting of ICG and discussed the terms of reference and the workplan of the Providers' Forum.

26. On 11 December 2008, participants dealt with the recommendations made by ICG working groups with regard to issues affecting system providers. On 12 December, participants adopted the terms of reference and the workplan of the Providers' Forum.

27. The terms of reference and the workplan of the Providers' Forum are included in the present report in annex III and annex IV, respectively.

Annex I

List of States Members of the United Nations and governmental, intergovernmental and non-governmental organizations participating in the Third Meeting of 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

Canadian Space Agency

International Bureau of Weights and Measures (BIPM)

Civil Global Positioning System Service Interface Committee (CGSIC)

Committee on Space Research (COSPAR)

International Association of Geodesy (IAG)

International Association of Geodesy Reference Frame Sub-Commission for Europe (EUREF)

International Association of Institutes of Navigation (IAIN)

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)

Regional Centre for Space Science and Technology Education for Latin America and the Caribbean

Annex II

Documents of the Third Meeting of the International Committee on Global Navigation Satellite Systems

<i>Symbol</i>	<i>Title or description</i>
ICG/WGA/DEC2008	Report of the Working Group on Compatibility and Interoperability
ICG/WGB/DEC2008	Report of the Working Group on Enhancement of Performance of Global Navigation Satellite Systems Services
ICG/WGC/DEC2008	Report of the Working Group on Information Dissemination and Capacity Building
ICG/WGD/DEC2008	Report of the Working Group on Interactions with National and Regional Authorities and Relevant International Organizations
ICG/TOR/DEC2008	Terms of reference

Annex III

ICG/PF/TOR/DEC2008

Terms of reference of the Providers' Forum

A. Background

1. The International Committee on Global Navigation Satellite Systems (ICG) was established on a voluntary basis as an informal body to promote cooperation, 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 response to a recommended action in the ICG workplan, providers of global and regional navigation satellite systems and satellite-based augmentation systems proposed establishing a Providers' Forum to enhance compatibility and interoperability among current and future systems. The first Providers' Forum meeting, co-chaired by the United States of America and India, was held on 4 September 2007, immediately preceding the second meeting of the ICG. China, India, Japan, the Russian Federation and the United States, as well as the European Community, were present at the meeting.

B. Objectives

3. The objectives of the Providers' Forum are to:
 - (a) Promote compatibility and interoperability among current and future global and regional space-based systems by exchanging detailed information about planned or operating systems and the policies and procedures that govern their service provision, consistent with the template for information sharing among providers that was circulated prior to the first meeting;
 - (b) Act as a mechanism to continue discussions on important issues addressed by the ICG that require focused inputs from system providers.
4. The Providers' Forum is not a policymaking body, but provides a means to promote discussion among system providers based on agreed guidelines for provision of open services, including transparency, cooperation, performance monitoring and spectrum protection; and agreed principles for ensuring compatibility and interoperability among systems.

C. Membership

5. The Providers' Forum will be open to States Members of the United Nations that are or will be global navigation satellite systems (GNSS) providers. Current members and their respective systems are as follows:
 - (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).

6. Additional Member States who become GNSS service providers will be invited to join the Providers' Forum upon consensus of the current members.

D. Procedures of work, structure and organization

7. During each meeting, the members will select, on the basis of consensus, a chair for the next meeting. The Office for Outer Space Affairs of the United Nations Secretariat, consistent with its role as the Executive Secretariat of ICG, will also fulfil these responsibilities for the Providers' Forum, in support of the chair.

8. The Providers' Forum will convene once every year in conjunction with the ICG annual meeting and more often if needed. Actions and recommendations developed by working groups of ICG that could impact the compatibility and interoperability, system development and operations, and/or service provision policies and procedures of providers of GNSS will be of particular interest to the Providers' Forum. Therefore, the results of Providers' Forum deliberations and consensus decisions on these and other issues will be reported to ICG as appropriate and when possible, at the next scheduled plenary session of ICG immediately following a Providers' Forum meeting.

9. The meetings of the Providers' Forum will be organized by the chair and designated host, with support from the Executive Secretariat. Each member should designate its principal and additional points of contact.

10. Any recommendations resulting from Providers' Forum meetings will be decided on the basis of consensus of its members.

11. Members will fund their own participation in the activities of the Providers' Forum. Financial support (in-kind or direct funding) to the Executive Secretariat that is above and beyond the annual budget of the Office for Outer Space Affairs or existing funds provided for ICG secretariat services will be provided by members on a voluntary basis.

12. The Providers' Forum may revise these terms of reference on the basis of proposals made by members and adopted by consensus.

Annex IV

ICG/PF/WP/DEC2008

Workplan of the Providers' Forum

In order to accomplish the objectives of the Providers' Forum as described in the terms of reference, the members of the Providers' Forum have agreed to pursue the following actions.

Promotion of compatibility and interoperability

1. The principles of compatibility and interoperability and their definition were adopted at the first meeting of the Providers' Forum, held in Bangalore, India, in September 2007 (A/AC.105/901). At the third meeting of the Providers' Forum, held in Pasadena, California, United States of America, in December 2008, these principles and their definition were updated (see appendix). The Providers' Forum will continue to refine these principles of compatibility and interoperability and their definition.

2. The providers will actively support the actions of the working group of the International Committee on Global Navigation Systems (ICG) on compatibility and interoperability, which is focused on defining these principles from the perspective of various user applications and equipment manufacturers. This may require sponsoring and participating in workshops and meetings designed to solicit input from users of global navigation satellite systems (GNSS). It may also require elaboration of an approach for quantitative interoperability evaluation.

3. The providers will draft individual reports on their respective planned or operating systems and the policies and procedures that govern their service provision, consistent with the template for information sharing:

(a) The reports will be consolidated and maintained by the ICG Executive Secretariat on behalf of the providers and updates will be provided at least annually in preparation for each major meeting of ICG;

(b) The reports will emphasize each provider's current and planned efforts to ensure compatibility and interoperability among the global, regional and augmentation system components of the global system of navigation satellite systems.

Open service information dissemination

4. Consistent with the principle of transparency in the provision of open services, each individual provider will strive to publish and disseminate all signal and system information necessary to allow manufacturers to design and develop GNSS receivers on a non-discriminatory basis.

5. Based on individual publication of open service signal information, the Providers' Forum will consider developing a template for sharing and disseminating

information from individual GNSS open service signal specifications and service standards.

Service performance monitoring

6. Providers will consider the development and discussion of proposals to widely 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.

7. These discussions should focus on potential cooperation in the development of the necessary ground infrastructure to monitor signal and service performance for open services, recognizing that the actual implementation of this infrastructure is subject to the budgetary limitations of each system provider, and the completion of provider-to-provider agreements as necessary and appropriate.

Spectrum protection: interface detection and mitigation

8. The Providers' Forum will pursue the protection of radio-navigation satellite services (RNSS) spectrum through appropriate domestic and international regulation. When necessary and appropriate, providers will share their views on RNSS spectrum issues and related agenda items under consideration by the International Telecommunication Union and its working parties.

9. In addition, the Providers' Forum will pursue the development of a strategy to detect and mitigate interference in GNSS worldwide by supporting the efforts of the ICG working group on compatibility and interoperability in this regard. This could lead to concrete proposals for detecting interference.

10. This workplan will be reviewed on an annual basis and revised as necessary in order to address important issues that require the attention and focus of system providers.

Appendix

ICG/PF/WP/DEC2008

Providers' Forum principles of compatibility and interoperability and their further definition

Global and regional system providers agreed that at a minimum, all global navigation satellite systems (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. For many applications, common carrier frequencies are essential to interoperability and commonality of other signal characteristics is desirable. In some cases, carrier frequency diversity may be preferable to improve performance. The Providers' Forum will continue to investigate the benefits of carrier frequency commonality and diversity, as well as of compatibility and interoperability, as these latter terms are defined below:

(a) *Interoperability* refers to the ability of global and regional navigation satellite systems and augmentations and the services they provide to be used together to provide better capabilities at the user level than would be achieved by relying solely on the open signals of one system:

- (i) Interoperability allows navigation with signals from different systems with minimal additional receiver cost or complexity;
- (ii) Multiple constellations broadcasting interoperable open signals will result in improved observed geometry, increasing end-user accuracy everywhere and improving service availability in environments where satellite visibility is often obscured;
- (iii) Geodetic reference frames realization and system time steorage standards should adhere to existing international standards to the maximum extent practical;
- (iv) Any additional solutions to improve interoperability should be encouraged.

(b) *Compatibility* refers to the ability of global and regional navigation satellite systems and augmentations to be used separately or together without causing unacceptable interference and/or other harm to an individual system and/or service:

- (i) The International Telecommunication Union provides a framework for discussions on radiofrequency compatibility. Radiofrequency compatibility should involve thorough consideration of detailed technical factors, including effects on receiver noise floor and cross-correlation between interfering and desired signals;
- (ii) Compatibility should also respect spectral separation between each system's authorized service signals and other systems' signals. Recognizing that some signal overlap may be unavoidable, discussions among providers

concerned will establish the framework for determining a mutually acceptable solution;

(iii) Any additional solutions to improve compatibility should be encouraged.
