United Nations A/AC.105/846

General Assembly

Distr.: General
30 March 2005

Original: English

Committee on the Peaceful Uses of Outer Space

Report on the United Nations/United States of America International Meeting on the Use and Applications of Global Navigation Satellite Systems

(Vienna, 13-17 December 2004)

Contents

V.05-82707 (E) 100505 110505

I. Introduction

A. Background

1. The Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III) adopted a strategy to address global challenges in the future through space activities. The strategy, contained in "The Space Millennium: Vienna Declaration on Space and Human Development",[1] included key actions to use space applications for human security, development and welfare. One such action was 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. The use of the signal from global navigation satellite systems (GNSS) constitutes one of the most promising space applications that can be used to implement this action.

2. In 2001, Member States accorded high priority to a limited number of selected recommendations of UNISPACE III. The Committee on the Peaceful Uses of Outer Space established action teams under the voluntary leadership of Member States to implement those priority recommendations. The Action Team on GNSS was established under the leadership of the United States of America and Italy to carry out the recommendation relating to GNSS.

3. The Action Team on GNSS reported to the Committee and its Scientific and Technical Subcommittee in 2001 concerning its objectives, work plan and final product. The final product of the Action Team on GNSS was the *Report of the Action Team on Global Navigation Satellite Systems (GNSS): Follow-up to the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III)*[2] presented at the United Nations/United States of America International Meeting on the Use and Applications of Global Navigation Satellite Systems (hereafter referred to as the Meeting), convened from 13 to 17 December 2004 in Vienna as a meeting of GNSS experts who had attended the four United Nations/United States of America regional workshops and two international meetings held between 2001 and 2003.

B. Structure and programme of the Meeting

4. At the opening of the Meeting, introductory and welcoming statements were made by representatives of the Office for Outer Space Affairs and the United States of America.

5. The programme of the Meeting consisted of plenary sessions and working group sessions. The presentations made at the plenary focused on the status of activities and developments relating to GNSS service providers, and GNSS education and capacity-building activities at the international, regional and national levels. Two working groups were established. One working group reviewed the status of the projects and initiatives being implemented on the basis of recommendations of the United Nations/United States of America International Workshop on the Use and Applications of Global Navigation Satellite Systems (Vienna, 8-12 December 2003). The other working group reviewed the implementation of the recommendations of the Action Team on GNSS. On 16 and

17 December 2004, the deliberations of the Meeting focused on the draft terms of reference for the establishment of an international committee on global navigation satellite systems.

C. Attendance

6. The Meeting was attended by 85 participants from the following 27 countries and nine international organizations: Austria, Brazil, Bulgaria, Canada, China, Colombia, Czech Republic, Egypt, Hungary, India, Italy, Japan, Kenya, Malaysia, Nigeria, Peru, Poland, Portugal, Romania, Russian Federation, Slovakia, South Africa, Syrian Arab Republic, Turkey, Ukraine, United States of America, Zambia, International Telecommunication Union (ITU), European Commission (EC), European Space Agency (ESA), European Association for the International Space Year (EURISY), Civil Global Positioning System Service Interface Committee (CGSIC), International Association of Geodesy (IAG), International Cartographic Association (ICA), International Federation of Surveyors (FIG), International GPS Service (IGS). The United Nations Office for Outer Space Affairs was also represented.

7. The United Nations and the United States of America provided funding support to 35 participants from developing countries and countries with economies in transition and covered the cost for the use of conference facilities and services.

II. International committee on global navigation satellite systems: draft terms of reference

8. The participants attending the deliberations on the establishment of an international committee on global navigation satellite systems revised the draft terms of reference for the committee as indicated below.

A. Background

1. GNSS have evolved from an early period of limited programmes to a point where a number of systems and their augmentations are operating or planned. In the future, a number of international and national programmes will operate simultaneously and support a broad range of interdisciplinary and international activities. Discussions taking place at the national, regional and international levels have underscored the value of GNSS for a variety of applications. The emergence of new GNSS and regional augmentations has focused attention on the need for the coordination of programme plans among current and future operators in order to enhance the utility of GNSS services.

2. An international committee on GNSS is established in accordance with the following understanding:

The representatives of GNSS system providers, GNSS system augmentation providers and the international organizations primarily associated with the use of GNSS and representatives of international projects in developing countries,

Aware of the overlap of GNSS mission objectives and of the interdisciplinary applications of GNSS services,

Recognizing the advantages of ongoing communication and cooperation among operators of GNSS and their augmentations,

Recognizing the need to protect the investment of the current user base of GNSS services through the continuation of existing[a] services,

Aware that the complexity and cost of user equipment should be reduced whenever possible,

Convinced that GNSS providers should pursue greater compatibility and interoperability among all current and future systems in terms of signal structures, time and geodetic reference standards to the maximum extent possible,

Noting that the United Nations General Assembly, in paragraph 11 of its resolution 59/2, invited GNSS and augmentation providers to consider establishing an international committee on GNSS in order to maximize the benefits of the use and applications of GNSS to support sustainable development, and

Desiring to promote the international growth and potential benefits of GNSS,

Have agreed to establish an international committee on GNSS for the purpose of promoting the use and application of GNSS.

3. The aim of the committee is to facilitate the exchange of information among users and providers of GNSS services with a view to promoting GNSS applications on a global basis, without prejudice to the roles and functions of GNSS service providers and intergovernmental bodies such as ITU, the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO).

B. Objectives

4. The objectives of the committee are to:

(a) Benefit users of GNSS services through consultations among members of the committee;

(b) Encourage coordination among providers of GNSS core systems and augmentations in order to ensure greater compatibility and interoperability;

(c) Encourage and promote the introduction and utilization of satellite positioning, navigation and timing services, particularly in the developing countries through assistance with the integration of GNSS services into their infrastructures;

---

[a] While users may wish to have the services continue for as long as possible, service providers could continue the services only for a reasonable time period as they would continue to improve their systems.

(d) Assist both the members of the committee and the international user community by, inter alia, serving as the focal point for international information exchange relating to GNSS activities;

(e) Better address future user needs in the GNSS development plans and applications; and

(f) As desirable and appropriate, report on its activities to the Committee on the Peaceful Uses of Outer Space.

C. Members and observers[b]

5. National or international entities operating under governmental authority that are responsible for GNSS and their augmentations or are involved in promoting GNSS services and applications and that are eligible for membership or observer status in the committee are:

(a) Future and current global system providers, such as the Global Positioning System (GPS) (United States), the Global Navigation Satellite System (GLONASS) (Russian Federation) and Galileo (European Union);

(b) Regional or augmentation system providers—GPS and Geo-Augmented Navigation System (GAGAN) (India), the European Geostationary Navigation Overlay Service (EGNOS) (European Union), the Wide-Area Augmentation System (WAAS) (United States), the Multi-Transport Satellite-based Augmentation System (MSAS) (Japan), Beidou (China) and other compatible systems;

(c) International and regional organizations and associations dealing with GNSS services and applications may participate and declare their participation as members or observers. Potential members or observers[c] could include the Office for Outer Space Affairs, ICAO, IMO, ITU, CGSIC, IAG, the International Association of Institutes of Navigation (IAIN), ICA, IGS, the International Society for Photogrammetry and Remote Sensing (ISPRS), the International Earth Reference and Rotation Systems Service (IERS), FIG, the Committee on Space Research (COSPAR), the International Council for Science (ICSU), the International Bureau of Weights and Measures (BIPM) and ESA;

---

[b] The terms of reference of the international committee on GNSS would need to specify the roles of “members” and “observers”. While “members” would participate in the decision-making process of the international committee, “observers” would not, but would provide advice when requested, monitor the work of the international committee and report back to their legislative bodies. “Observers” would not be expected to assume the secretariat role, host meetings or provide support to a permanent secretariat that might be established. There should be, however, a meaningful role for “observers”. The definitions of “members” and “observers” should be further examined, taking into account the experience of other international bodies, such as the Committee on Earth Observation Satellites (CEOS). CEOS makes decisions by consensus of the members, but not of the “associates”, the second category in this body.

[c] Regional coordination bodies, if any, could be included as observers.

(d) On a case-by-case basis, international, regional or national organizations may request participation as a corresponding member. A corresponding member would participate as an observer but for a limited period and for a specific purpose related to the work plan (see sect. G).

6. The addition of members and observers will be with the consensus of the members of the committee.

D. Scope of work

7. The committee will convene at least once every year in plenary sessions. Meetings of the committee will be organized and chaired by the designated host organization. Each member should designate its principal or point of contact. Any change of the principals or points of contact should be communicated to the chairperson of the committee.

8. The committee may establish, as mutually agreed and on an ad hoc basis, special temporary working groups to investigate specific areas of interest, cooperation and coordination and to report thereon at subsequent plenary sessions. The continuation of each ad hoc working group would require confirmation at each plenary session.

9. Conclusions resulting from the plenary sessions or the findings and recommendations of ad hoc working groups will be arrived at on the basis of consensus. Decisions are recommendations and do not create legal obligations.

10. It is understood that the members of the committee would ultimately determine their activities. However, attached is an indicative work plan that may be revised as considered necessary and appropriate by the committee. Revision of the work plan may be undertaken periodically, but would not require revision of these terms of reference.

11. The committee may revise these terms of reference on the basis of proposals made by members and adopted by consensus.

E. Structure of the international committee on GNSS

(To be defined)

F. Financing of the international committee on GNSS

(To be determined)

G. Work plan of the international committee on GNSS

(See annex II to the present report)

III. Working group on the implementation of the recommendations of the Action Team on Global Navigation Satellite Systems

9. A number of experts of the Action Team on GNSS had provided a series of recommendations for promoting a more efficient use of GNSS technology around the world. The four regional workshops held in 2001 and 2002, the two international expert meetings on GNSS held in 2002 and 2003, responses to questionnaires sent to experts, participants and service providers and members of the Action Team on GNSS also served as sources of information for the working group on the implementation of the recommendations of the Action Team on GNSS.

10. The working group met from 14 to 16 December 2004 to review the recommendations in the light of the work done during the previous years and of the invitation by the General Assembly, in its resolution 59/2, to GNSS and augmentation providers to consider establishing an international committee on GNSS. The working group agreed that the following recommendations should be implemented.

A. Recommendations regarding an institutional framework addressed to service providers

Recommendation 1. Creation of an international committee on global navigation satellite systems

11. An international committee on GNSS would provide a mechanism for coordination among service providers to address, among other things, coordination of activities and plans for system modernization and development:

(a) To encourage compatibility and interoperability in terms of signal structure, time and geodetic reference standards;

(b) To establish standards for service provision and user equipment;

(c) To reduce the complexity and cost of user equipment;

(d) To ensure continuity of existing services to protect the investment of the current user base;

(e) To maintain the use of the systems on a free and non-discriminatory basis; and

(f) To advocate long-term protection of the spectrum reserved for GNSS.

12. The working group recognized the necessity to further implement the recommendation under (a) above and agreed that the Office for Outer Space Affairs, in cooperation with the international committee, or the international committee itself, should host a seminar to educate national spectrum managers regarding international, regional and national regulations that affect GNSS.

13. The working group agreed that the implementation of the recommendation under (b) required the participation of two other international organizations involved in scientific research and agreed that the Committee on Space Research

(COSPAR) and the International Union of Radio Science (URSI) should be invited to become members of the international committee.

B. Recommendations regarding an institutional framework addressed to the Office for Outer Space Affairs

Recommendation 1. The United Nations should continue to hold regional workshops.

14. The series of joint United Nations and United States of America regional workshops has been helpful to service providers as a means of collecting input from users. It has also been useful as a means of promoting the use of GNSS and their augmentations in developing countries. The workshops should therefore continue in the same manner, with a focus on user input. Conducting workshops in connection with well-attended international GNSS meetings may also be desirable.

15. The working group agreed therefore that additional regional workshops should be held.

Recommendation 2. Support should be given for the establishment of national (and perhaps even regional) GNSS planning and coordination groups.

16. The working group agreed that the international committee on GNSS, in cooperation with the Office for Outer Space Affairs, should plan a workshop devoted to this effort, or focus on this subject at one of the currently planned regional workshops. Potential organizers of these national or regional groups should be invited to participate in the workshops.

Recommendation 3. An assessment of current institutional models should be commissioned.

17. The working group, having considered the whole programme of the Meeting and that the institutional model for the international committee on GNSS was scheduled to be presented on 16 and 17 December, considered this recommendation as already being implemented.

Recommendation 4. Support should be provided for capacity-building through GNSS education and training.

18. The working group recognized that a GNSS curriculum supplementing the existing four education curricula (ST/SPACE/15-18) of the regional centres for space science and technology education affiliated with the United Nations was already on the agenda for discussion.

19. The working group agreed that a task force should be established to develop the GNSS education curriculum and to oversee the design of an associated pilot project focused on GNSS education and training.

20. The working group also agreed that the Office for Outer Space Affairs should disseminate existing educational material relevant to GNSS and its applications to interested regional and national educational institutions.

Recommendation 5. Support should be given to promoting the use of GNSS.

21. The working group agreed with this recommendation and suggested that the topic should be addressed by the Office for Outer Space Affairs and the international committee on GNSS at their earliest opportunity.

C. Recommendations regarding specific global navigation satellite systems applications

1. Aviation

Recommendation 1. Research should be encouraged on the development of ionospheric models, including ionospheric measurements using GNSS and the exchange of related information.

22. The working group recognized that a better atmospheric modelling (ionosphere, troposphere and scintillation) could improve GNSS accuracy for all users, making GNSS a tool of large-spectrum utility and not only limited to the aviation community. A very large and cross-cutting subgroup of the GNSS community would be interested in these improved atmospheric models.

23. The working group agreed that the Office for Outer Space Affairs should contact relevant organizations and research institutes to organize and host a workshop focused on GNSS atmospheric modelling.

24. The working group recommended that the member States of the GNSS Action Team should solicit participants from their respective national research institutions and user communities to serve as representatives on standard-setting bodies recognized by the United Nations, such as ICAO, the Satellite Based Augmentation System International Working Group (SBAS IWG) and IMO.

25. The working group observed that the Meeting had considered a most suitable model, among those existing, appropriate modality and responsibility and liability for the dissemination of information and data to various GNSS user groups.

26. The working group also referred to the following recommendations:

Recommendation 2. The feasibility of implementing a “one African sky” concept similar to the “single European sky” initiative currently under way in Europe should be considered.

Recommendation 3. The Office for Outer Space Affairs and ICAO should continue to encourage the use of GNSS and its applications for the benefit of African countries.

27. The working group observed, with reference to the recommendations listed in the previous paragraph, that the Office for Outer Space Affairs in cooperation with the international committee on GNSS, or the international committee on GNSS itself, should contact ICAO to verify the efficiency and adequacy of existing efforts to implement those recommendations.

2. Surveying, mapping and Earth science

28. The working group referred to the following recommendations:

Recommendation 1. A continental reference frame for Africa, or African Reference Frame (AFREF), consistent with the International Terrestrial Reference Frame (ITRF), should be established.

Recommendation 2. The development of integrated Differential GNSS (DGNSS) "full-scale accuracy" infrastructure with well-defined unified standards at regional levels, for example, the European Position Determination System (EUPOS) in Europe, should be expanded.

Recommendation 3. The density of the continuously operating reference stations (CORS) should be increased for the areas of the Geocentric Reference System for the Americas (SIRGAS) of Latin America and the Caribbean in order to promote the use of GNSS and CORS, covering all of the Americas.

29. The working group recognized ITRF to be the de facto GNSS terrestrial reference frame, and the need for individual GNSS reference systems to be compatible with ITRF and among each other.

30. The working group agreed, for this purpose, that the international committee on GNSS should ask IGS to officially monitor individual GNSS reference systems (i.e., the World Geodetic System 1984 (WGS-84), the Galileo Reference Frame and Parametri Zemli 1990 (PZ-90)) and system times with a view to assisting in ensuring their consistency with ITRF and Temps Atomique International (TAI) and Coordinated Universal Time (UTC).

3. Management of natural resources, the environment and disasters

31. The working group referred to the following recommendations:

Recommendation 1. Demonstration projects should be set up in the areas of agriculture and health to convince and attract the attention of government policy and decision makers in Africa.

Recommendation 2. International donors should support disease vector mapping projects in Africa using GNSS.

32. The working group observed that the focus of the recommendations on the management of natural resources, the environment and disasters should be expanded to other regions of the world, in addition to Africa.

33. The working group agreed that the Office for Outer Space Affairs should assist in soliciting seed funding and expertise for these GNSS application areas from relevant United Nations organizations sponsoring projects and programmes relating to health care, natural resources, the environment and disaster management.

4. Timing, telecommunications and related applications

34. The working group agreed that a category of GNSS user applications concerning timing, telecommunications and related public interest and market-driven applications should be supported by the Office for Outer Space Affairs and the international committee on GNSS.

35. The working group observed that specific sponsorship of pilot projects by the United Nations or by Governments would probably not be required in this application area. However, the working group agreed that many developing countries could nonetheless benefit from a workshop at which manufacturers could provide information on their available products and services.

D. Other recommendations and conclusions

36. The working group recommended further consideration of the following topics: atmospheric modelling, GNSS educational materials, time and geodetic standards, a seminar on radio regulations and national rules applicable to GNSS for spectrum managers, GNSS seminars for policy and decision makers, and GNSS applications.

37. The working group on the implementation of the recommendations of the Action Team on GNSS expressed its support for projects being reviewed by its complementary working group, the working group to review the status of the follow-up projects and initiatives undertaken since the United Nations/United States of America International Workshop on the Use and Applications of Global Navigation Satellite Systems (Vienna, 8-12 December 2003), and recommended that further proposals in these areas should be solicited by the Office for Outer Space Affairs.

IV. Working group to review the status of the follow-up projects and initiatives taken since the United Nations/United States of America International Workshop on the Use and Applications of Global Navigation Satellite Systems (Vienna, 8-12 December 2003)

38. The working group to review the status of the follow-up projects and initiatives taken since the United Nations/United States of America International Workshop on the Use and Applications of Global Navigation Satellite Systems (Vienna, 8-12 December 2003) met from 14 to 16 December 2004. The working group reviewed the work that had been undertaken at the Workshop and also reviewed the latest developments regarding the proposed projects and initiatives. The working group held discussions on ways and means to follow up the proposed projects and initiatives, including the possibility of holding workshops and hands-on training courses that could assist in the implementation of the projects and initiatives. The working group adopted its report, which consisted of a comprehensive table, updated during the Meeting, describing the proposed projects and initiatives and identifying contact points for each of them (see annex I).

39. While performing the above-mentioned tasks, the working group took into consideration the activities based on or related to GNSS that had been discussed and presented by working groups on surveying, mapping and Earth sciences; agriculture and the management of natural resources; the management of environmental and natural disasters; transportation; and training, education and awareness increase,

during the United Nations/United States of America International Workshop on the Use and Applications of GNSS organized in Vienna from 8 to 12 December 2003.

40. The following elements were considered by the members of the working group in order to update the table containing the proposed projects and initiatives: (a) follow-up of comments by the Action Team on GNSS; (b) follow-up of remarks by the Office for Outer Space Affairs; (c) accomplishments; (d) the most recent information on the status of the projects and initiatives; (e) the commitment of the contact person(s) to the projects; (f) the priority of activities; and (g) support that could be provided by the Office for Outer Space Affairs.

V. United Nations/Italy long-term fellowship programme on global navigation satellite systems and related applications

41. The Meeting noted, with reference to the recommendations that had emanated from the Action Team on GNSS, that priority was being given to the recommendation on capacity-building related to GNSS education and training.

42. The Meeting noted that a Master's-level programme in Navigation and Related Applications (MNA) had been organized as a joint initiative of the Politecnico di Torino (Turin, Italy) and the Istituto Superiore Mario Boella (Turin, Italy), in cooperation with the Office for Outer Space Affairs.

43. The MNA programme had been organized as a long-term fellowship, co-sponsored by Italian national institutions and the Office for Outer Space Affairs for the benefit of developing countries.

44. The MNA programme started in January 2005 and will have a duration of 12 months, including a four- to six-month internship to prepare pilot projects. The programme will provide extensive background knowledge of navigation/localization systems, as well as a detailed analysis of NAV/COM integration and environmental monitoring applications.

45. The MNA programme curriculum has been structured to meet effectively work market demands for high-level technicians endowed with a broad vision of the navigation/localization state-of-the-art but also with specific skills.

Notes

[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] *Report of the Action Team on Global Navigation Satellite Systems (GNSS): Follow-up to the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III)* (United Nations publication, Sales No. E.05.I.3).

Annex I

Status of the follow-up projects and initiatives taken since the United Nations/United States of America International Workshop on the Use and Applications of Global Navigation Satellite Systems (Vienna, 8-12 December 2003), as reviewed by the working group

Description of the project /initiative	*Link to the related presentation(s)*	*Contact person(s)*
1. African Reference Frame (AFREF)		
Establishment of the African Reference Frame (AFREF) (see sect. III.C.2, recommendation 1). The following activities are scheduled: - A meeting of the newly formed AFREF Steering Committee, to be held at FIG/GSDI, Cairo, 2005; - A general meeting on formulation of the "call for participation in AFREF", Cape Town, South Africa, 2005; - Organization of the subregional and regional preparatory and technical meetings (see sect. III.B, recommendation 1); - Organization of short training courses and a course evaluation workshop (see sect. III.B, recommendation 4); - Establishment of permanent GPS observation stations; determination of the geoid; acquisition of telecommunication facilities and logistics (see sect. III.A, recommendation 1); and - Establishment of the centre for data processing, data archives and data dissemination (see sect. III.A, recommendation 1).	http://www.oosa.unvienna.org/SAP/act2004/vienna/presentations/tuesday/am/merry.ppt http://www.oosa.unvienna.org/SAP/act2004/vienna/presentations/tuesday/am/zambia-1.ppt http://www.oosa.unvienna.org/SAP/act2004/vienna/presentations/tuesday/am/zambia-2.ppt	R. Wonnacott (South Africa) C. Merry (South Africa) cmerry@eng.uct.ac.za bmerry@iafrica.com S. Mahmoud (Egypt) salahm55@yahoo.com M. Kamamia (Kenya) muyack@rcmrd.org R. Moyo (Zambia) rmmoyo@zasurvey.org.zm
2. European Position Determination System (EUPOS)		
Meetings of the International Steering Committee, to promote the development and implementation of EUPOS, scheduled to be held in 2005 and 2006 (see sect. III.C.2, recommendation 2). The EUPOS stand scheduled to be organized at INTERGEO-EAST, Zagreb, 2005.	http://www.oosa.unvienna.org/SAP/act2004/vienna/presentations/tuesday/am/milev.ppt	G. Milev (Bulgaria) milev@bas.bg G. Rosenthal (Germany) gerd.rosenthal@senstadt.verwalt-berlin.de

Description of the project /initiative	*Link to the related presentation(s)*	*Contact person(s)*
3. Geocentric Reference System for the Americas (SIRGAS)		
Organization of a workshop/meeting to promote the implementation of the SIRGAS reference frame in the Central American and Caribbean countries (see sect. III.C.2, recommendation 3): - A workshop scheduled to be organized as part of the Cartographic Conference for Central America, 2005 (see sect. III.B.1, recommendation 1) - A meeting of SIRGAS members scheduled to be organized as part of the International Congress on Geodesy and Cartography, Maracaibo, Venezuela, 2005.	http://www.oosa.unvienna.org/SAP/act2004/vienna/presentations/tuesday/am/diaz.ppt	W. Martínez-Díaz (Colombia) wamartin@igac.gov.co H. Drewes (Germany) drewes@dgfi.badw.de A. Hernández (Mexico) L. P. Fortes (Brazil) fortes@ibge.gov.br
4. Asia Pacific Regional Geodetic Project (APRGP)		
The following activities were scheduled to be carried out in support of the Asia Pacific Regional Geodetic Project (APRGP): - An expert meeting, 2005 (see sect. III.B.1, recommendation 1); - Feasibility study to identify the number of permanent GPS reference stations required in the APRGP area; - Capacity-building and training for countries that are not currently operating permanent reference stations (see sect. III.B, recommendation 4).		T. Chee Hua (Malaysia) tengcheehua@jupem.gov.my M. Higgins (Australia) matt.higgins@nrm.qld.gov.au
5. Site quality, integrity and interference monitoring		
Establishment of an international working group on site quality, integrity and interference monitoring	http://www.oosa.unvienna.org/SAP/act2004/vienna/presentations/monday/am/fejes.ppt	I. Fejes (Hungary) fejesi@sgo.fomi.hu
6. Working relations with IAG, FIG, ICA and ISPRS		
Establishment of working relations with entities such as the International Association of Geodesy (IAG), the International Federation of Surveyors (FIG), the International Cartographic Association (ICA) and the International Society for Photogrammetry and Remote Sensing (ISPRS)	http://www.oosa.unvienna.org/SAP/act2004/vienna/presentations/wednesday/am/konecny.ppt	M. Konecny (ICA) konecny@geogr.muni.cz P. Rapant (Czech Republic) petr.rapant@vsb.cz

Description of the project /initiative	*Link to the related presentation(s)*	*Contact person(s)*
7. Working relations between ICA and spatial data infrastructure organizations		
Establishment of working relations between the International Cartographic Association (ICA) and spatial data infrastructure organizations.		M. Konecny (ICA) konecny@geogr.muni.cz
This project is aimed at the organization of two workshops to permit the exchange of information and the development of common ground between the global navigation satellite systems and the geospatial communities. The two communities have their own approaches to geographic space: the former mainly deals with the position and geometry of spatial features; the latter mainly deals with (non-spatial) attributes of these features. The position and geometry description represents the "final" product of the GNSS community, but the starting point for the geospatial community (see sect. III.B, recommendation 1).		P. Rapant (Czech Republic) petr.rapant@vsb.cz W. Martínez-Díaz (Colombia) wamartin@igac.gov.co
Additional information: Spatial data infrastructures (SDIs) developed at different levels, from the local up to the global, are crucial to sharing geospatial data on the Internet. The common ground for SDIs and for geospatial data sharing is position and geometry.		
8. Meta-information system on GNSS		
Development of a meta-information system of GNSS applications, research education and training activities (see sect. III.A, recommendation 1).	http://www.oosa.unvienna.org/SAP/act2004/vienna/presentations/wednesday/am/rapant.ppt	P. Rapant (Czech Republic) petr.rapant@vsb.cz
Additional information: A meta-information system (called WebCastle—Web-based case study locator service) has been developed in the framework of the GINIE project (Geographic Information Network for Europe, under the auspices of the 5th Framework Programme). This system has been further developed and run for the European Umbrella Organization for Geographic Information (EUROGI) as the unique meta-information system in the field of geographic information applications in Europe (http://gis.vsb.cz/webcastle).		
9. Agriculture and management of natural resources		
Establishment of a global information exchange network on the applications of GNSS in agriculture and natural resources. The objective of this network is to promote and disseminate the use and applications of GNSS technologies, to improve and facilitate management and decision-making (see sect. III.C.3, recommendation 1).	http://www.oosa.unvienna.org/SAP/act2004/vienna/presentations/monday/pm/vettorazzi.doc http://www.oosa.unvienna.org/SAP/act2004/vienna/presentations/monday/pm/molin.ppt	C. A. Vettorazzi (Brazil) cavettor@carpa.ciagri.usp.br cavettor@esalq.usp.br J. P. Molin (Brazil) jpmolin@esalq.usp.br
The proposal is based on the following steps:	http://www.oosa.unvienna.org/SAP/act2004/	

Description of the project /initiative	*Link to the related presentation(s)*	*Contact person(s)*
Establishment of a global information exchange network on the applications of GNSS in agriculture and natural resources. The objective of this network is to promote and disseminate the use and applications of GNSS technologies, to improve and facilitate management and decision-making (see sect. III.C.3, recommendation 1). The proposal is based on the following steps: - The establishment of a specific committee on agriculture and natural resources, with representatives from all regions; - A committee meeting to define the objectives and protocols of the network and plan regional meetings; - Four regional meetings to establish the network by connecting people and institutions with related activities (see sect. III.B, recommendation 1). Actions to be taken: - Definition of the protocols to be adopted for the implementation of the network; - Development of a webpage as part of the Office for Outer Space Affairs website on GNSS; - Connection of this webpage to the regional websites (Latin America and the Caribbean, Central and Eastern Europe, Africa, and Asia and the Pacific); - Definition of how institutions will participate in the network.	http://www.oosa.unvienna.org/SAP/act2004/vienna/presentations/monday/pm/vettorazzi.doc http://www.oosa.unvienna.org/SAP/act2004/vienna/presentations/monday/pm/molin.ppt http://www.oosa.unvienna.org/SAP/act2004/vienna/presentations/monday/pm/vintila.ppt	C. A. Vettorazzi (Brazil) cavettor@carpa.ciagri.usp.br cavettor@esalq.usp.br J. P. Molin (Brazil) jpmolin@esalq.usp.br R. Vintila (Romania) rvi@icpa.rom rvintila@avignon.inra.fr I. Osório (Portugal) iposorio@fc.up.pt C-W. Chan (Malaysia) cwchan@mardi.my T. Ahmed-Rufai (Nigeria) ahmedtimasaniyu@yahoo.co.uk
10. Development of common applications		
Development of common applications are also required in the following areas: - Agriculture and management of natural resources (see sect. III.C.3, recommendation 1); - Management of the environment and natural disasters (see sect. III.3, recommendation 1); - Support for communication and information exchange through a (common) GNSS portal (see sect. III.C.1, recommendation 1).		J. Neuner (Romania) neuner@rosa.ro hneuner@softnet.ro O. Balota (Romania) badea@rosa.ro a_badea@surf.ro
11. Agricultural industry		
The Afram Plains Investment Initiative (APII) is aimed at promoting the development of an agricultural industrial estate in Ghana. The main focus will be on precision farming using GPS (see sect. III.C.3, recommendation 1). Additional information: the Afram Plains in Ghana, with a population of nearly one million, form a large transitional zone		C. J. Dobbins (United States of America) J. Karner (United States of America)

Description of the project /initiative	*Link to the related presentation(s)*	*Contact person(s)*
The Afram Plains Investment Initiative (APII) is aimed at promoting the development of an agricultural industrial estate in Ghana. The main focus will be on precision farming using GPS (see sect. III.C.3, recommendation 1). Additional information: the Afram Plains in Ghana, with a population of nearly one million, form a large transitional zone between the forest and savannah areas of the country. Agricultural practices, cutting trees for timber and burning grassland to promote pasture growth are increasingly degrading this environment. More appropriate practices and natural resource protection are critical for the ecosystem.		C. J. Dobbins (United States of America) J. Karner (United States of America) M. Rasher (United States of America)
12. Management of the environment and natural disasters		
The projects will focus on the following: - Monitoring of mountain glaciers and animal migrations in East Africa using GPS and GIS (see sect. III.C.1, recommendation 3); - Estimation of the water vapour in the atmosphere using GPS (GPS-Meteorology) (see sect. III.C.1, recommendation 1); - Study of the ionosphere, including the effects of the equatorial ionosphere anomaly on GNSS signals, in particular the time delay and scintillation (see sect. III.A, recommendation 1); - Capacity-building in the use of GNSS in the environment and disaster management (see sect. III.B, recommendation 4).	http://www.oosa.unvienna.org/SAP/act2004/vienna/presentations/wednesday/am/niyakwada.ppt http://www.oosa.unvienna.org/SAP/act2004/vienna/presentations/wednesday/pm/monico.ppt	W. Nyakwada (Kenya) nyakwada@meteo.go.ke director@meteo.go.ke L. Lo Presti (Italy) letizia.lopresti@polito.it J. F. Galera Monico (Brazil) galera@prudente.unesp.br
13. Transportation (awareness increase)		
The overall objective of the project is to raise the awareness of administrators and decision makers concerning the potential benefits of GNSS applications for all transportation modes through: - Development of multimedia information materials; - Organization of regional workshops in Latin America and the Caribbean, Africa, Asia and the Pacific, Europe and Western Asia (see sect. III.B, recommendation 1).	http://www.oosa.unvienna.org/SAP/act2004/vienna/presentations/wednesday/am/subari.ppt http://www.oosa.unvienna.org/SAP/act2004/vienna/presentations/thursday/am/lucas.ppt http://www.oosa.unvienna.org/SAP/act2004/vienna/presentations/wednesday/am/riveros.ppt	T. Ahmed-Rufai (Nigeria) ahmedtimasaniyu@yahoo.co.uk M. Din Subari (Malaysia) m.subari@fksg.utm.my R. Lucas (ESA) rafael.lucas.rodriguez@esa.int C. Fagan (United States of America) carey.fagan@faa.gov H. J. Matamoros (Colombia) hmatamor@aerocivil.gov.co hmatamoros@yahoo.com

Description of the project /initiative	*Link to the related presentation(s)*	*Contact person(s)*
The overall objective of the project is to raise the awareness of administrators and decision makers concerning the potential benefits of GNSS applications for all transportation modes through: - Development of multimedia information materials; - Organization of regional workshops in Latin America and the Caribbean, Africa, Asia and the Pacific, Europe and Western Asia (see sect. III.B, recommendation 1).	http://www.oosa.unvienna.org/SAP/act2004/vienna/presentations/wednesday/am/subari.ppt http://www.oosa.unvienna.org/SAP/act2004/vienna/presentations/thursday/am/lucas.ppt http://www.oosa.unvienna.org/SAP/act2004/vienna/presentations/wednesday/am/riveros.ppt	T. Ahmed-Rufai (Nigeria) ahmedtimasaniyu@yahoo.co.uk M. Din Subari (Malaysia) m.subari@fksg.utm.my R. Lucas (ESA) rafael.lucas.rodriguez@esa.int C. Fagan (United States of America) carey.fagan@faa.gov H. J. Matamoros (Colombia) hmatamor@aerocivil.gov.co hmatamoros@yahoo.com J. Riveros Gutiérrez (Colombia) jriveros@aerocivil.gov.co W. Martínez-Díaz (Colombia) (for the Latin American region) wamartin@igac.gov.co
14. Transportation (pilot projects)		
The project “Intelligent transportation system for Africa and Eastern Europe” will focus on: - Digital mapping of the Pan Africa Highway (road and rail); - A vehicle tracking and management system (see sect. III.B, recommendation 1).		T. Ahmed-Rufai (Nigeria) ahmedtimasaniyu@yahoo.co.uk
15. Inland waterway/marine transportation		
The project “Inland waterway marine transportation system for the Americas, Asia and the Pacific” will focus on: - GNSS navigation for the Magdalena River, Latin America (see sect. III.B, recommendation 2).	http://www.oosa.unvienna.org/SAP/act2004/vienna/presentations/wednesday/am/riveros.ppt http://www.oosa.unvienna.org/SAP/act2004/vienna/presentations/wednesday/am/subari.ppt	H. J. Matamoros (Colombia) hmatamor@aerocivil.gov.co hmatamoros@yahoo.com J. Riveros Gutiérrez (Colombia) jriveros@aerocivil.gov.co M. Din Subari (Malaysia) m.subari@fksg.utm.my

Description of the project /initiative	*Link to the related presentation(s)*	*Contact person(s)*
16. Education satellite navigation centre/Moscow Aviation Institute education project		
Establishment of a centre for satellite navigation education, based at the Moscow Aviation Institute (MAI) facilities. MAI will contribute to the development of an education curriculum on GNSS as pursued in project/initiative 21 (see sect. III.B, recommendation 4)		V. V. Malyshev (Russian Federation) mai604@online.ru
17. Training, education, and awareness increase		
Organization of and/or support to workshops and conferences that have GNSS-related issues on their agendas: (see sect. III.B, recommendations 1 and 4)		B. Mwape (Zambia) bmwape@cboh.org.zm
- A workshop to be held for the benefit of the Latin American and Caribbean region within the framework of follow-up to the Fourth Space Conference of the Americas;		F. Walter (Brazil) fw@ele.ita.cta.br
- Future EUREF symposiums; - A workshop scheduled to be held in Bulgaria in 2005; - Summer schools on GNSS for graduate students and young professionals, scheduled to be held in Warsaw in 2005 and in Olsztyn, Poland, in 2006; - Workshops scheduled to be held in 2007 at the University of Technology in Warsaw and the Technical University in Prague;		G. Beutler (IAG) beutler@aiub.unibe.ch
- The regional workshop on GNSS for policy and decision makers, scheduled to be held in Zambia in 2005; - Development of training, education and awareness programmes for short-term courses on GNSS to be implemented as part of meetings that have GNSS-related programmes; Joint European-Asian educational and application development programme on Galileo (JEAGAL).		
18. Publications		
Development, publication and distribution of basic books and information material on GNSS in native languages, taking into account the development of an education curriculum on GNSS as pursued in project/initiative 21		F. Walter (Brazil) fw@ele.ita.cta.br
19. (Post-)Graduate courses at the Master's and Ph.D. levels		
Announcement of courses on GNSS in the area of civil aviation to be offered at the Instituto Tecnológico de Aeronáutica, Brazil, particularly directed to graduate students with a degree in	http://www.oosa.unvienna.org/SAP/act2004/vienna/presentations/monday/pm/walter.ppt	F. Walter (Brazil) fw@ele.ita.cta.br

Description of the project /initiative	*Link to the related presentation(s)*	*Contact person(s)*
Announcement of courses on GNSS in the area of civil aviation to be offered at the Instituto Tecnológico de Aeronáutica, Brazil, particularly directed to graduate students with a degree in electrical engineering or the equivalent. Announcement of courses on GNSS in the area of geodesy, mapping, atmospheric modelling, and surveying to be offered at São Paulo State University and other universities in Brazil (see sect. III.B, recommendation 4).	http://www.oosa.unvienna.org/SAP/act2004/vienna/presentations/monday/pm/walter.ppt	F. Walter (Brazil) fw@ele.ita.cta.br A. Póz (Brazil) alvir@prudente.UNESP.br
	20. BOREAS activities	
Announcement of activities of BOREAS, a non-governmental organization, which, among other things, aims to: - Establish a regional information and training centre on GNSS in the Czech Republic; - Disseminate knowledge and information on GNSS technology and its applications and services, upon request; - Increase public awareness of the benefits of the use and applications of GNSS to support sustainable development efforts (see sect. III.B, recommendation 4).	http://www.boreas.wz.cz/eng_bor_celek.htm	I. J. Dvorak (Czech Republic) idvorak@krnap.cz

Description of the project /initiative	*Link to the related presentation(s)*	*Contact person(s)*
21. Education curriculum on GNSS		
A working group will be established in 2005 to develop an education curriculum on GNSS for the regional centres for space science and technology education, affiliated with the United Nations, for Africa, Asia and the Pacific, and Latin America and the Caribbean. The education curriculum should take into consideration a number of specific GNSS-related disciplines, particularly surveying, electrical engineering, civil aviation and land transport. The development of the education curriculum should include a review of the GNSS modules, which are part of the education curricula of the above-mentioned regional centres already available in the disciplines of remote sensing and GIS, satellite meteorology and global climate, satellite communications, and space and atmospheric science. A draft education curriculum on GNSS will be available in 2006 for consideration at the third United Nations Expert Meeting on Education Curricula and Regional Centres, tentatively scheduled for 2006 (see sect. III.B, recommendation 4). The final education curriculum on GNSS should be integrated into relevant curricula at higher educational institutions, in particular, in the first instance, at the University of Zambia and Evelyn Hone College in Zambia (see sect. III.B, recommendation 4).	http://www.oosa.unvienna.org/SAP/act2004/vienna/presentations/monday/pm/presti.ppt http://www.oosa.unvienna.org/SAP/act2004/vienna/presentations/tuesday/am/zambia-1.ppt http://www.oosa.unvienna.org/SAP/act2004/vienna/presentations/tuesday/am/zambia-2.ppt	L. Lo Presti (Italy) letizia.lopresti@polito.it N. El-Sheimy (Canada) naser@geomatics.ucalgary.ca M. Higgins (Australia) matt.higgins@nrm.qld.gov.au B. Mwape (Zambia) bmwape@cboh.org.zm J. Narkiewicz (Poland) jnark@meil.pw.edu.pl

Annex II

Work plan of the international committee on global navigation satellite systems

The committee's indicative work plan contains the following elements:

(a) Since compatibility and interoperability are highly dependent on the establishment of standards for service provision and user equipment, the committee might need to address the topic of the adoption of and adherence to common guidelines. However, the committee would not itself set guidelines; instead it should identify applications where no guidelines currently exist, such as land transport use of GNSS, and recommend possible organizations that could appropriately set new guidelines. Consultation with existing standard-setting bodies, such as ICAO, IMO, ITU and the International Organization for Standardization would also be required;

(b) The committee could consider the establishment of user information centres by GNSS providers. The maintenance of a globally-focused website would be a major task of these centres. The United Nations, through the Office for Outer Space Affairs and on behalf of the committee, could combine all the websites into a single site to act as a portal for users of GNSS services;

(c) The committee could organize and sponsor regional workshops and other types of activity in order to fulfil its objectives;

(d) The committee could establish links with national and regional authorities, particularly in developing countries. This could include establishing regulatory mechanisms to detect and mitigate sources of electromagnetic interference that can degrade signals from GNSS and their augmentations;

(e) The committee could consider, make recommendations and agree on actions to promote appropriate coordination across GNSS programmes. Furthermore, the committee could encourage its members to maintain communication, as appropriate, with other groups and organizations involved in GNSS activities and applications, through the relevant channels within their respective Governments or organizations.