Report of Working Group A: Compatibility and Interoperability

1. The International Committee on Global Navigation Satellite Systems (ICG) Working Group A (WG-A) on Compatibility and Interoperability met on Tuesday and Wednesday, September 15 and 16, 2009 under the co-chairmanship of Mr. Sergey Revnivykh, Russian Federation, and Mr. David Turner, United States of America.

2. After brief introductory remarks focused on the goals of the meeting, to include the development of a new work plan for the group, the co-chairs invited presentations on compatibility, interoperability and related subjects from the members of the working group.

   a) Mr. Karl Kovach of the United States, continued to discuss the issue of global navigation satellite systems (GNSS) open service commitments, first introduced by Lt. Col. Patrick Harrington in a presentation to WG-A at the Third Meeting of the ICG (ICG-3), and discussed at two subsequent WG-A meetings[1]. The presentation explained the U.S. view that the signal-in-space is the line of demarcation where a Providers responsibilities end and manufacturers begin. Therefore, defining signal-in-space performance parameters that users and manufacturers can depend on and committing to these levels of performance should be a principle that all providers accept for open service provision. Responding to this suggestion, Mr. Jeremie Godet, European Commission (EC), pointed out that new service providers cannot make a performance commitment before service is observed, and a proposed template for standardizing the use of terminology for open service provision may not be achievable because performance is a contractual issue for some systems that is tied to specific parameters identified in completed contracts.

   b) Col. David Goldstein followed with an additional U.S. presentation focused on the anomaly that has been experienced on GPS satellite vehicle number (SVN) 49. The purpose was to share lessons learned that may be helpful to other service providers in resolving anomalies with their own systems if and when they occur.

   c) Mr. Grigory Stupak, Russian Federation, briefed an evolution of his views first presented last year at ICG-3, describing increasing levels of multi-GNSS integration beginning with compatibility and leading to the concept of interchangeability, described as the highest order of interoperability. He again recommended that collaboration among GNSS be pursued on these different integration levels, but also stressed that the integration of augmentation systems with global and regional systems, and the integration of other PNT technologies were equally important to lowing vulnerability of GNSS to providing incorrect information to users.

   d) The European Union views on compatibility and interoperability were presented by Mr. Frederic Bastide, EC Directorate for Transport and Energy and Mr. Tony Pratt, Consultant to the Galileo programme. They explained that compatibility, as described in the current ICG Providers Forum Principles of Compatibility and Interoperability and Their Definition[2], is clearly their first priority; emphasized the need to limit maximum noise floor in common GNSS frequency bands in order to control harmful interference; and, depending on the views of the Providers Forum, fully address multilateral compatibility coordination in the revised work plan of WG-A. At the conclusion of the briefing, China explained that their COMPASS multiplexed binary offset carrier (MBOC) power level is -154 dBW like GPS and Galileo, not the -148 dBW value shown in the EC presentation. When Tony Pratt

[1] ICG Workshop on GNSS Interoperability, Munich, Germany, 2- 3 March 2009 and Vienna, Austria, 30 – 31 July 2009 (see www.icgsecretariat.org)

[2] See United Nations General Assembly document A/AC.105/928

stated that the currently observed power level from orbiting COMPASS satellites has a receive power level of -151 dBW from the existing COMPASS satellites, Bing Zhou of the Chinese delegation explained that this power level can be changed.

e) Satoshi Kogure of the Japan Aerospace Exploration Agency (JAXA), presented a proposal for a multi-GNSS demonstration campaign in the Asia-Oceania region, which he explained is an ideal location for such an effort, due to the potential coverage of three global and three regional systems as early as the end of 2010. Specifically JAXA is proposing to deploy multi-GNSS receivers in an observation network in the Asia-Pacific region in cooperation with the International GNSS Service (IGS) and other interested participants, hopefully to include all system providers.

f) The next presentation was a joint effort of U.S. and European Commission experts who are jointly working on the development of estimates of availability of worldwide aviation navigation service using satellite-based Augmentation Systems (SBASs) that will be operational in the 2010 timeframe. This work is considered important to aviation and safety-of-life applications since several SBAS systems are either already available or plan to be commissioned in the near future, thus contributing overall GNSS service provision.

g) Finally, China shared its views on compatibility and interoperability through a presentation by Jun Lu of the China Satellite Navigation Project Center. With respect to compatibility, the presentation emphasized that each navigation system should realize compatibility with all the other systems at a minimum. Regarding the spectral separation aspect of compatibility, Lu emphasized that it will be very difficult to achieve the spectral separation of all authorized service signals and other systems signals due to very limited frequency resources. Referring to the ICG and Providers Forum working definition of interoperability, the briefing emphasized that interoperability among GNSS should result in benefits that exceed costs and should make it easier for industry to design and manufacture multi-system receivers. To this end, the presentation listed three COMPASS frequencies that are common with other GNSS signals (B1-C – 1575.42 MHz; B2a – 1176.45 MHz; and B2b – 1207.14 MHz) and emphasized that a COMPASS signal interface control document has been completed and will soon be published. Lu also mentioned geodetic reference frame alignment, synchronization of system times to Coordinated Universal Time (UTC) as important to interoperability.

3. At the conclusion of presentations from working group members, the co-chairs outlined the remaining work to be accomplished by WG-A before the conclusion of ICG-4. To begin, the Co-chairs reviewed the status of all past working group actions and recommendations, as a foundation for revising the group's work plan and for making other appropriate recommendations to the ICG.

4. Reviewing the five original actions in the work plan of WG-A adopted in 2006[3], it was noted that one action is complete (the establishment of a Providers Forum), two are ongoing concerns (workshops and surveys related to compatibility and interoperability), and one action remains vitally important, but has not been a major focus of work accomplished to date (efforts to detect and mitigate sources of radio-frequency (RF) interference). The co-chairs proposed that one item in the original plan, the consideration of guidelines for the broadcast of natural disaster alarms via GNSS, not be retained in the updated work plan for WG-A. After reviewing the status of five additional actions proposed at the second ICG meeting (ICG-2)[4], and briefly discussing

[3] See United Nations General Assembly Document A/AC.105/879
[4] See United Nations General Assembly Document A/AC.105/901

the two interim meetings held between ICG-3 and the fourth meeting of the ICG (ICG-4) focused on interoperability, as recommended at ICG-3, the co-chairs proposed that WG-A turn to preparing an updated work plan to the ICG for adoption. The resulting attached work plan is closely aligned with the current Providers Forum work plan, but also accounts for the views expressed by WG-A members during the meeting as summarized above.

5. In addition to completing an updated work plan, the working group was able to reach consensus on 4 additional recommendations as attached.

Attachment I

Recommendation for Committee Decision

Prepared by: Working Group A

Date of Submission: 09/17/09

Issue Title: Updated Work Plan for Working Group A

Background/Brief Description of the Issue:

The original ICG work plan from UN General Assembly Document A/AC.105/879 - 29 December 2006 - *Meeting of the International Committee on Global Navigation Satellite Systems, Vienna, 1 and 2 November 2006* assigned five actions to the Working Group on Compatibility and Interoperability (WG-A).

Discussion/Analyses:

One of the five original WG-A actions has been completed, two are being actively pursued, one remains critically important as an area of future work, and one is no longer considered essential to pursuing compatibility and interoperability among all GNSS.

The revised work plan for WG-A maintains a focus on compatibility and interoperability and adds additional areas of work consistent with the work plan of the Providers Forum.

Recommendation of Committee Action:

The ICG should adopt the attached work plan for WG-A

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Appendix

Updated Work Plan of the International Committee on Global Navigation Satellite Systems Working Group -A

WORKING GROUP A – Compatibility and Interoperability [Leads, the United States of America and the Russian Federation]

Global and regional system providers agree that at a minimum, all GNSS signals 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.

Since compatibility and interoperability are highly dependent on the establishment of standards for service provision and user equipment, the ICG and associated Providers Forum will consider guidelines and standards developed by existing standard-setting bodies applicable to GNSS service provision and use, such as the International Civil Aviation Organization (ICAO), the International Maritime Organization (IMO), the International Telecommunication Union (ITU) and potentially, the International Organization for Standardization (ISO).

In order to assist the Providers Forum in accomplishing its objectives, as described in the Terms of Reference, and in order to further the work of the committee focused on compatibility and interoperability, Working Group A, co-led by the United States of America and the Russian Federation, will pursue the activities described below.:

Compatibility and Interoperability

The principles of compatibility and interoperability and their definition were adopted at the first Providers Forum meeting held in Bangalore, India, September 2007. (United Nations Document A/AC.105/901). The Third Providers Forum meeting, held in Pasadena, CA, USA, December, 2008, updated these principles and their definition, as attached.

Considering the principle of compatibility and its definition, the working group will:

- In particular, review existing ITU regulations and recommendations related to the avoidance of harmful interference;
- Seek common understanding on appropriate methods to determine compatibility among all GNSS; and,
- If necessary, propose new questions or studies for ITU consideration, through appropriate mechanisms, to further protect the noise floor impacting all GNSS, and to define methodology used between GNSS providers to ensure compatibility.

Consistent with the principle of interoperability and its definition, the working group will consider the perspective of various user applications and equipment manufacturers, and will:

a) continue efforts to survey industry and user community experts and may require sponsoring and participating in workshops and meetings designed to solicit GNSS user input. It may also require elaboration of an approach for quantitative interoperability evaluation;

b) support measures to promote the interoperability of regional ground-based DGNSS in cooperation with Working Group D.

The Working Group will assist Providers in drafting individual reports on their respective planned or operating systems and the policies and procedures that govern their service provision, consistent with the Providers Forum template for information sharing.

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

b) The reports will emphasize each Providers 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 Sharing

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. The Working Group will develop a template to promote common terminology and definitions in individual GNSS Open Service Signal Specifications.

The Working Group will also develop a template that each individual GNSS provider may consider using in their publication of signal and system information, the policies of provision, and the minimum levels of performance offered for open services.

As requested by a provider or providers, the working group will assist in exchanging information with ICG participants important to resolving GNSS open service anomalies that impact users.

Service Performance Monitoring

The Providers Forum has agreed to 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.

Working Group A will support this activity by focusing 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 - Interference Detection, and Mitigation

The Providers Forum has agreed to pursue the protection of radionavigation satellite service (RNSS) spectrum through appropriate domestic and international regulation. When necessary and appropriate, the Working Group will facilitate Provider discussions on their individual views and actions related to RNSS spectrum issues and agenda items under consideration by the ITU and its Working Parties.

The Working Group will develop a strategy for ICG support of mechanisms to detect and mitigate sources of electromagnetic interference, taking existing regulatory mechanisms into consideration. This could lead to concrete proposals for detecting interference.

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

Attachment II

Recommendation for Committee Decision

Prepared by: Working Group A

Date of Submission: 09/17/09

Issue Title: User Community Input on GNSS Interoperability

Background/Brief Description of the Issue:

At ICG-3, the following WG-A recommendation was adopted:

WG-A should convene at least two interim meetings with system providers and industry before ICG-4 to:

- continue collecting user/manufacturer perspectives on interoperability;
- evaluate various levels, concepts, and dimensions of interoperability as described by the presenters to the working group at ICG-3.

Discussion/Analyses:

2 meetings were held this year, one in Munich and one in Vienna.

Munich:

- Provided industry and user representatives an opportunity to express their view on the interoperability issue and provide feedback to the working group based on a review of presentations and final documents from ICG-3;
- 35+ participants from system providers, industry, and the user community;
- Perspectives on interoperability presented from the following sectors: mobile phones; timing and high precision for professional and scientific applications; transportation;
- Presentations and discussions resulted in a Summary Record that will inform the working group report to the ICG on interoperability;
- To be combined with additional inputs and the results of the interoperability Questionnaires.

Vienna:

- 25 participants from system providers and industry/user community;
- Working Group received system updates from providers and presentations on GNSS Applications;
- Available results of interoperability questionnaires were discussed;
- Revisions to questionnaire discussed and approved;
- Co-chairs discussed preparation of a WG-A report to ICG-4 to include recommendations and an updated work plan closely aligned with the Providers Forum work plan.

Recommendation of Committee Action:

WG-A recommends the ICG endorse its efforts to continue the process of surveying industry and user community experts regarding GNSS interoperability through a revised questionnaire (Attached) and additional workshops. WG-A will:

- Re-engage with respondents to questionnaire and ask for revised answers to updated questions;
- Continue to disseminate updated questionnaires;
- First proposed post-ICG-4 meeting is an Interoperability workshop to be held in conjunction with IGNSS 2009, Queensland, Australia, December 2009. At a minimum, the agenda will include:

    - A discussion of the following specific signal and system characteristics important to interoperability:

        - Common/diverse carrier frequencies;
        - Common [power Spectral density][modulation][signal power spectra];
        - Common maximum power levels, based on the same link budget assumptions;
        - Common standards for geodesy and time references;

    - A joint discussion with Working Group D to consider the time and geodesy aspects of GNSS and the proposed definition of ground-based DGNSS interoperability
    - A discussion of the Multi-GNSS campaign proposed by the Government of Japan

Appendix

ICG WORKING GROUP ON COMPATIBILITY & INTEROPERABILITY
Global and Regional Navigation Satellite Systems and Satellite-based Augmentations

INDUSTRY AND USER COMMUNITY QUESTIONNAIRE

NAME:_____

AFFILIATION:_____
APPLICATION SECTOR(S) YOU REPRESENT OR DESIGN/MANUFACTURE EQUIPMENT FOR:
_____

Dear Respondent:

The ICG working group on compatibility and interoperability invites you to provide us with answers to each item in this questionnaire to the best of your ability. The intent is to obtain worldwide input from industry, academic institutions, and other representatives of the GNSS user community with technical expertise regarding characteristics of GNSS signals which, from your perspective, aid or hinder the combined use of these signals in applications for which you are responsible or for which you supply equipment or services.

Before beginning the questionnaire, please refer to briefings which describe current and planned GNSS signals from GPS (U.S.), GLONASS (Russia), Galileo (Europe), Compass (China), QZSS (Japan), and IRNSS (India). These are available at the following web site:

http://www.unoosa.org/oosa/SAP/gnss/icg/pf/03/pres.html

The ICG Providers Forum, comprised of the six system providers mentioned above, has developed the following working definition of GNSS interoperability:

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

1. Interoperability allows navigation with signals from different systems with minimal additional receiver cost or complexity.
2. 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.
3. Geodetic reference frames realization and system time steerage standards should adhere to existing international standards to the maximum extent practical.
4. Any additional solutions to improve interoperability are encouraged.

Please consider this definition in your answers or if your definition of GNSS interoperability is different from this one, please provide this definition below:

QUESTIONS

Some of the questions below ask you to grade certain signal characteristics as to their importance in overall interoperability considerations for a particular type of application. We understand there may be different answers for different products or applications, and there will be the opportunity for different answers for each type of product or application. Please feel free to explain your answers in as much detail as you would like, by typing in additional text in the blank rows below each bullet.

1. On a scale of one to five, with five being most important and one being least important, please score each performance characteristic below in terms of its importance as a potential benefit of using signals from two or more global and/or regional navigation satellite systems for your area of GNSS application.

1. Improved accuracy	1 2 3 4 5
2. Improved availability	1 2 3 4 5
3. Quicker time to first fix	1 2 3 4 5
4. Better in-door signal tracking	1 2 3 4 5
5. Greater protection against intentional or unintentional radio frequency interference, and/or spoofing	1 2 3 4 5

2. Are there any other characteristics that should be considered a benefit of using two or more GNSS?

3. On a scale of minus five to plus five, with negative five representing the greatest performance detriment and positive five representing the greatest performance benefit, please quantify the detriment/benefit of each characteristic below on increasing the performance of multi-system receivers vs. single system receivers:

1. common carrier frequencies	-1 -2 -3 -4 -5 0 1 2 3 4 5
2. uncommon carrier frequency bands (frequency diversity)	-1 -2 -3 -4 -5 0 1 2 3 4 5
3. Spectral separation within the same frequency band* ** Spectral separation refers to different modulations on the same center frequency such as a BPSK 1 and a BOC signal centered on 1575.42 MHz or two signals in the same band like 960-1215 MHz but on two different center frequencies, regardless of the services that the separated signals provide.*	-1 -2 -3 -4 -5 0 1 2 3 4 5
4. Uncommon signal differentiation (CDMA vs. FDMA)	-1 -2 -3 -4 -5 0 1 2 3 4 5
5. Common signal power spectra	-1 -2 -3 -4 -5 0 1 2 3 4 5
6. Common signal modulation types	-1 -2 -3 -4 -5 0 1 2 3 4 5
7. Common data message rate	-1 -2 -3 -4 -5 0 1 2 3 4 5
8. Common message format	-1 -2 -3 -4 -5 0 1 2 3 4 5
9. Common system performance metrics (equivalency of single system accuracy (URE), availability, etc.)	-1 -2 -3 -4 -5 0 1 2 3 4 5
10. Coincident reference systems	-1 -2 -3 -4 -5 0 1 2 3 4 5
11. Coincident system times	-1 -2 -3 -4 -5 0 1 2 3 4 5

4. When considering the use of multiple GNSS, with five being most important and one being not very important, please rank the importance of the following service related considerations:

The provision of service assurances such as a commitment to maintain constellation performance	1 2 3 4 5
Publication of a service performance standard or specification	1 2 3 4 5
The issuance of notices when service may degrade due to maintenance or outage	1 2 3 4 5

5. On a scale of minus five to plus five, with negative five representing the greatest detrimental impact and positive five representing the greatest beneficial impact, please quantify the impact of each characteristic below on the cost, power consumption, and size/weight of multi-system receivers vs. single system receivers:

13. Common carrier frequencies	
14. Cost	-1 -2 -3 -4 -5 0 1 2 3 4 5
15. Power consumption	-1 -2 -3 -4 -5 0 1 2 3 4 5
16. Size/Weight	-1 -2 -3 -4 -5 0 1 2 3 4 5
17. Uncommon carrier frequency bands (frequency diversity)	
18. Cost	-1 -2 -3 -4 -5 0 1 2 3 4 5
19. Power consumption	-1 -2 -3 -4 -5 0 1 2 3 4 5
20. Size/Weight	-1 -2 -3 -4 -5 0 1 2 3 4 5
21. Spectral separation within the same frequency band* ** Spectral separation refers to different modulations on the same center frequency such as a BPSK 1 and a BOC signal centered on 1575.42 MHz or two signals in the same band like 960-1215 MHz but on two different center frequencies, regardless of the services that the separated signals provide.*	
22. Cost	-1 -2 -3 -4 -5 0 1 2 3 4 5
23. Power consumption	-1 -2 -3 -4 -5 0 1 2 3 4 5
24. Size/Weight	-1 -2 -3 -4 -5 0 1 2 3 4 5
25. Uncommon signal differentiation (CDMA vs. FDMA)	
26. Cost	-1 -2 -3 -4 -5 0 1 2 3 4 5
27. Power consumption	-1 -2 -3 -4 -5 0 1 2 3 4 5
28. Size/Weight	-1 -2 -3 -4 -5 0 1 2 3 4 5
29. Common signal power spectra (Power Spectral Density)	
30. Cost	-1 -2 -3 -4 -5 0 1 2 3 4 5

31. Power consumption	-1 -2 -3 -4 -5 0 1 2 3 4 5
32. Size/Weight	-1 -2 -3 -4 -5 0 1 2 3 4 5
33. Common signal modulation types	
34. Cost	-1 -2 -3 -4 -5 0 1 2 3 4 5
35. Power consumption	-1 -2 -3 -4 -5 0 1 2 3 4 5
36. Size/Weight	-1 -2 -3 -4 -5 0 1 2 3 4 5
37. Common data message rate	
38. Cost	-1 -2 -3 -4 -5 0 1 2 3 4 5
39. Power consumption	-1 -2 -3 -4 -5 0 1 2 3 4 5
40. Size/Weight	-1 -2 -3 -4 -5 0 1 2 3 4 5
41. Common message format	
42. Cost	-1 -2 -3 -4 -5 0 1 2 3 4 5
43. Power consumption	-1 -2 -3 -4 -5 0 1 2 3 4 5
44. Size/Weight	-1 -2 -3 -4 -5 0 1 2 3 4 5
45. Common system performance metrics (equivalency of single system accuracy, availability, etc.)	
46. Cost	-1 -2 -3 -4 -5 0 1 2 3 4 5
47. Power consumption	-1 -2 -3 -4 -5 0 1 2 3 4 5
48. Size/Weight	-1 -2 -3 -4 -5 0 1 2 3 4 5
49. Coincident reference systems	
50. Cost	-1 -2 -3 -4 -5 0 1 2 3 4 5
51. Power consumption	-1 -2 -3 -4 -5 0 1 2 3 4 5
52. Size/Weight	-1 -2 -3 -4 -5 0 1 2 3 4 5
53. Coincident system times	
54. Cost	-1 -2 -3 -4 -5 0 1 2 3 4 5

55. Power consumption	-1 -2 -3 -4 -5 0 1 2 3 4 5
56. Size/Weight	-1 -2 -3 -4 -5 0 1 2 3 4 5

6. Would each of these characteristics also impact the cost of associated differential systems, and or the cost of data processing?

7. Are there any other criteria that should be considered a potential cost of using signals from more than one GNSS?

8. Are there any other signal parameters that should be considered?

9. On a scale of minus five to plus five, with negative five representing the greatest detrimental impact and positive five representing the greatest beneficial impact, evaluate the impact that small carrier frequency shifts (up to 200 - 250 KHz for signals in common frequency bands) for signals from an additional GNSS would have on the complexity of a multi-system receiver, and quality of signal processing and performance.

-1 -2 -3 -4 -5
0 1. 2. 3. 4. 5.

10. Is there a limit to how many satellites-in-view from multiple GNSS constellations your application can use, beyond which there is no benefit or even a detriment to your areas of GNSS application?

11. On a scale of one to five, with five being most important and one being least important, please evaluate whether collaboration between system providers and integration of one or more GNSS at the space segment or ground control segment-level would be beneficial to user-level interoperability.

0 1. 2. 3. 4. 5.

Annex

Providers Forum Working Principles of Compatibility and Interoperability and their Further Definition

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. 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 compatibility and interoperability, as these latter terms are defined below.

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:

1. Interoperability allows navigation with signals from different systems with minimal additional receiver cost or complexity.
2. 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.
3. Geodetic reference frames realization and system time steerage standards should adhere to existing international standards to the maximum extent practical.
4. Any additional solutions to improve interoperability are encouraged.

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:

5. The International Telecommunication Union (ITU) 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.
6. 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.
7. Any additional solutions to improve compatibility should be encouraged.

Attachment III

Recommendation for Committee Decision

Prepared by: Working Group A

Date of Submission: 09/17/09

Issue Title: Multi-GNSS Demonstration Campaign

Background/Brief Description of the Issue:

During WG-A, Satoshi Korgure, JAXA, presented a preliminary concept for a multi-GNSS demonstration campaign

- It is expected to contribute to the ICG activity defining interoperability among GNSS systems.
- The presentation explained that Japan invites:
  - Other GNSS providers to participate and contribute in the campaign;
  - Collaboration with IGS and related organizations; and
  - WG-A Participation in the campaign

Discussion/Analyses:

Working Group A agreed that the proposed campaign would be beneficial to ICG efforts focused on promotion of interoperability among multiple GNSS.

Recommendation of Committee Action:

WG-A recommends that the ICG endorse the implementation of the proposed multi-GNSS demonstration campaign and encourages participation by all Providers.

Attachment IV

Recommendation for Committee Decision

Prepared by: Working Group A

Date of Submission: 09/17/09

Issue Title: Planned WG-A Meetings prior to ICG-5

Background/Brief Description of the Issue:

Consistent with the revised work plan of WG-A, the group will convene at least two meetings and/or workshops prior to ICG-5

Discussion/Analyses:

The first proposed meeting would occur on the margins of the iGNSS 2009 Symposium, Queensland, Australia, 30 November – 3 December 2009, as described in WG-A recommendation 2.

The second Working Group A meeting would involve system providers and would be focused on the subject of compatibility among GNSS consistent with the revised work plan. As required, the Providers will also review and discuss the ICG Providers Forum principle and definition of compatibility.

Recommendation of Committee Action:

WG-A recommends that the Committee endorse its proposal to hold at least two meetings in preparation for ICG-5 as described above.

Attachment V

Recommendation for Committee Decision

Prepared by: Working Group A

Date of Submission: 09/17/09

Issue Title: Principle of Transparency for Open Services

Background/Brief Description of the Issue:

The United States proposed a new ICG Principle of Transparency in the provision of GNSS open services for addition to the ICG Terms of Reference.

Discussion/Analyses:

The working group reached consensus on adding this new principle to the summary report of ICG-4, rather than the terms of reference.

Recommendation of Committee Action:

WG-A recommends that the following language be included in the Report of the Fourth Meeting of the ICG:

The ICG adopted the Principle of Transparency, that every GNSS provider should publish documentation that describes the signal and system information, the policies of provision and the minimum levels of performance offered for its open services.