



International Civil Aviation Organization

**Performance Based Navigation/Global Navigation Satellite System
Task Force (PBN/GNSS TF)**

Fourth Meeting
(Cairo, Egypt, 02 – 04 October 2011)

Agenda Item 6: GNSS Specific Issues

STRATEGY FOR THE IMPLEMENTATION OF GNSS IN MID REGION

(Presented by the Secretariat)

SUMMARY

This paper discusses the Strategy for the implementation of GNSS in the MID Region and for necessary updates also the paper requests identification of any hurdles in process of GNSS implementation.

Action by the meeting is at paragraph 3.

REFERENCES

- Assembly Resolution A37-11
- PBN GNSS TF/3 Report
- MIDANPIRG/12 Report

1. INTRODUCTION

1.1 The Twelfth Meeting of the Middle East Air Navigation Planning and Implementation Regional Group (MIDANPIRG/12), held in Amman, Jordan, from 17 to 21 October 2010 adopted the Strategy for the implementation of GNSS in the MID Region.

1.2 ICAO 37th General Assembly held in Montreal 28 September to 08 October 2010, adopted Resolution A 37-11 Performance-based navigation global goals.

1.3 The PBN GNSS TF/3 meeting held in Cairo, Egypt, 30 November - 02 December 2010, was attended by 35 participants, which included experts from eight (8) States (Bahrain, Egypt, Iraq, Jordan, Kuwait, Qatar, Saudi Arabia and U.A.E.) and two (4) International Organizations (IATA, and IFALPA). The meeting developed 5 Conclusions and decisions

2. DISCUSSION

2.1 The meeting may wish to recall that the frequency Interference-free operation of Global Navigation Satellite System (GNSS) is essential. The meeting may further wish to note that the frequency band 1 559 - 1 610 MHz, is used for elements of GNSS.

2.2 The PBN GNSS TF/3 meeting was apprised on the International Telecommunication Union (ITU) process, where footnotes Nos. **5.362B** and **5.362C** allowing the operation of the fixed service in some countries on a primary basis until 1 January 2010 and on a secondary basis until 1 January 2015. The above band is allocated, on a worldwide, primary basis, to the Aeronautical Radio Navigation service (ARNS) and to the Radio Navigation-Satellite Service (RNSS).

2.3 The meeting may wish to note that the band already supports operation of two prime elements of GNSS that are the Global Navigation Satellite System (GLONASS) and Global Positioning System (GPS), the standards for which have been adopted into ICAO SARPs. SARPs for other RNS systems, such as the European Galileo system, are under-development.

2.4 The PBN GNSS TF/3 meeting was apprised of the Studies undertaken in preparation for WRC-2000 indicate that a geographical separation distance exceeding line-of-sight (in the order of 400 km) between aircraft using GNSS and stations of the fixed service is required to ensure safe operation of GNSS.

2.5 The above restriction is very severe which can prohibit the safe use of GNSS over wide areas around any fixed service installation, where a fixed service to be introduced into this band could raise a harmful interference situations leading disruption to GNSS, affecting the safety of aircraft in flight. Thus, the WRC-2000 agreement to terminate all use by the fixed service in this band in 2015 still constitutes a severe and unacceptable constraint on the safe and effective use of GNSS in some areas of the world. It is, therefore, recommended that deletion of these allocations be effective from 2011.

2.6 The PBN GNSS TF/3 meeting agreed that good coordination with the radio frequency regulators and civil aviation experts is essential, where the civil aviation's experts are required to educate the radio regulator on the importance of civil aviation frequency spectrum requirements, and seek their support for aviation spectrum needs at WRC meetings

2.7 The PBN GNSS TF/3 meeting noted that the following States (*Egypt, Iraq, Israel, Jordan, Qatar, Sudan, Syrian Arab Republic, and Yemen*) have their States names under footnotes 5.362C. Accordingly, the PBN GNSS TF/3 meeting urged these States to delete their names from footnote 5.362C in order to allow interference free GNSS signal and agreed to the following Draft Conclusion:

DRAFT CONCLUSION 3/XX: PROTECTION OF GNSS SIGNAL

That, MID States with their names listed in the footnotes 5.362B and 5.362C are urged to take necessary measures to delete their names from these footnote as soon as possible in order to protect the GNSS signal and provide regular reports to ICAO MID Regional Office on action taken.

2.8 The meeting may wish to recall that MIDANPIRG/12 was informed that European Space Agency and GNSS Supervisory Authority already completed their study which was the only study on GNSS (EGNOS extension) in the MID Region. In this regard Saudi Arabia informed the MIDANPIRG/12 meeting on the institutional issues that need to be tackled.

2.9 The PBN GNSS TF/3 meeting was informed that Ranging Integrity Monitoring Stations (RIMS) for EGNOS extension has been installed in Egypt (Alexandria fully operational) and in Abu-Simbel under installation, while under feasibility study in Jordan.

2.10 Furthermore, it was brought to the attention of the PBN GNSS TF/3 meeting that SBAS Implementation in Regions ACAC and ASECNA (SIRAJ) project is being pursued by Arab Civil Aviation Commission (ACAC).

2.11 The meeting may wish to recall that IATA does not support Satellite Base Augmentation Systems (SBAS) as IATA users already invested in Aircraft Based Augmentation Systems (ABAS) Avionics.

2.12 The PBN GNSS TF/3 meeting noted that ICAO 37th General Assembly held in Montreal 28 September to 08 October 2010, adopted Resolution A37-11 Performance Based Navigation global goals superseding assembly resolution A36-23.

2.13 Based on the above, the PBN GNSS TF/3 meeting reviewed and updated the Strategy for the implementation of GNSS in the MID Region and agreed to the following Draft Conclusion:

DRAFT CONCLUSION 3/4: STRATEGY FOR THE IMPLEMENTATION OF GNSS IN THE MID REGION

*That, the Strategy for implementation of GNSS in the MID Region be updated as at **Appendix A** (to this working paper), to the Report on Agenda Item 7.*

2.14 The PBN GNSS TF/3 meeting noted that the Secretary of the Navigation Systems Panel (NSP) has coordinated the revision of the GNSS Manual (Doc 9849) by sending list of hurdles and requesting additional hurdles from ICAO regions, to ensure that the revised manual meets the goal of supporting GNSS implementation at national level. In this regard the meeting was updated on the revised version of Doc 9894, which has been presented at NSP Working Group of the Whole Meeting in Montreal, 09-18 November 2010.

2.15 The PBN GNSS TF/3 meeting was of the view that GNSS activities need to be enhanced in the MID Region. Accordingly, the meeting encouraged MID States to conduct GNSS studies, workshops and seminars, since GNSS is the only sensor that supports all PBN navigation specification. The meeting developed the survey as at **Appendix B** to this working paper, to assess the level of GNSS implementation.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) note the information in this working paper and its **Appendices**;
- b) encourage MID States to share their experience in GNSS implementation and provide status of implementation;
- c) approve the Draft Conclusion in paragraph 2.7 and 2.13 of this working paper;
- d) review and update the Strategy for the implementation of GNSS in the MID Region;

APPENDIX A

REVISED STRATEGY FOR THE IMPLEMENTATION OF GNSS
IN THE MID REGION

The following is the Strategy for the implementation of GNSS aligned with PBN in the MID Region:

Considering that:

- a) Safety is the highest priority.
- b) Elements of Global Air Navigation Plan on GNSS and requirements for the GNSS implementation will be incorporated into the CNS part of FASID.
- c) GNSS Standards and Recommended Practices (SARPs), PANS and guidance material for GNSS implementation are available.
- d) Human, environmental and economic factors will affect the implementation.
- e) The availability of avionics, their capabilities and the level of user equipage.
- f) The development of GNSS systems including satellite constellations, augmentation systems and improvement in system performance.
- g) The airworthiness and operational approvals allowing the current GNSS applied for en-route and non-precision approach phases of flight without the need for augmentation services external to the aircraft.
- h) The effects of ionosphere on GNSS and availability of mitigation techniques;
- i) The PBN concept and the availability of PBN guidance material
- j) The monitoring of the GNSS signal according to ICAO Document 9849 (GNSS Manual) and other related ICAO documents
- k) States pay fair cost for GNSS to service providers (according to ICAO provisional policy guidance on GNSS cost allocation)

The general strategy for the implementation of GNSS in the MID Region is detailed below:

- 1) Introduction of GNSS Navigation Capability should be consistent with the Global Air Navigation Plan.
- 2) Implementation of GNSS and Augmentations should be in full compliance with ICAO Standards and Recommended Practices and PANS.
- 3) Assessment of the extent to which the GNSS system accessible in the Region can meet the navigational requirements of ATM service providers and aircraft operators in the Region.
- 4) Introduce the use of GNSS with appropriate augmentation systems, as required, for en-route navigation and Implementation of approach procedures with vertical guidance (Baro-VNAV and/or augmented GNSS), including LNAV only minima, for all instrument runway ends, either as the primary approach or as a back-up for precision approaches by 2016 with intermediate milestones as follows: 30 per cent by 2010, 70 per cent by 2014 as per 37th ICAO General Assembly resolutions 37-11 and according to Regional PBN Implementation Plan A-36-23 (APV), for all instrument runway ends, either as the primary approach or as a back-up for precision approaches by 2016 with intermediate milestones as follows: 30 per cent by 2010, 70 per cent by 2014.
- 5) States, in their planning and introduction of GNSS services, take full advantage of future

- benefits accrued from using independent core satellite constellations, other GNSS elements and their combinations, and avoid limitations on the use of specific system elements.
- 6) Facilitate the use of GNSS; as enabler for PBN for en-route, terminal, approach and departure navigation. States should coordinate to ensure that harmonized separation standards and procedures are developed and introduced concurrently in adjacent flight information regions along major traffic flows to allow for a seamless transition to GNSS based navigation.
 - 7) States should to the extent possible work co-operatively on a multinational basis under ICAO MID Office guidance to implement GNSS in order to facilitate seamless and inter-operable systems and undertake coordinated R&D programmes on GNSS implementation and operation.
 - 8) States consider segregating traffic according to navigation capability and granting preferred routes to aircraft that are appropriately equipped for PBN to realize the benefits of such equipage taking due consideration of the need of State aircraft.
 - 9) ICAO and States should undertake education and training programs to provide necessary knowledge in AIM concept, PBN, GNSS, Augmentation systems theory and operational application.
 - 10) States establish multidisciplinary GNSS implementation teams, using section 5.2.2 and Appendix C of ICAO Document 9849, GNSS Manual.
 - 11) States, in their planning for implementation of GNSS services, provide effective spectrum management and protection of GNSS frequencies to reduce the possibility of unintentional interference.
 - 12) During transition to GNSS, sufficient ground infrastructure for current navigation systems must remain available. Before existing ground infrastructure is considered for removal, users should be given reasonable transition time to allow them to equip accordingly.
 - 13) States should approach removal of existing ground infrastructure with caution to ensure that safety is not compromised, such as by performance of safety assessment, consultation with users through regional air navigation planning and plan for complete decommissioning of NDBs by 2012.
 - 14) Implement GNSS with augmentation as required for APV where operationally required in accordance with the MID Regional and National PBN Implementation plans.
 - 15) States continue their efforts to implement GNSS applications for en-route, APV and TMA operations. Attention should be accorded to meeting all GNSS implementation requirements, including establishment of GNSS legislation, regulatory framework, and approval procedure.

Notes:

GNSS (and ABAS using RAIM in particular) is available on a worldwide basis, not much needs to be done in terms of infrastructure assessment. Nonetheless, the responsibility for providing services based on GNSS within the airspace of a particular State remains within that State.

A decision on whether or not to develop a status monitoring and NOTAM system for ABAS operations should be made by taking into account the nature of PBN approvals. In many cases ABAS operations are predicated on having a full complement of traditional NAVAIDs available for back-up when ABAS cannot support service.

APPENDIX B

GNSS ASSESSMENT SURVEY

The following GNSS survey has been developed by ICAO to assess the Regional (Global) level of GNSS implementation and to determine the role that States would like ICAO to assume

Please return the completed survey to icaomid@cairo.icao.int by 30/Mar 2011

State Name:

Contact Name:

Contact email:

- 1) Has your State developed a plan to implement GNSS -- Yes No
- 2) Was the GNSS Manual (Doc 9849) used as a reference when considering the implementation of GNSS Yes No
- 3) Has the basic GNSS regulation been promulgated in your State -- Yes No
- 4) a-Has your administration received requests from domestic aircraft operators to provide GNSS-based services -- Yes No

b-Has your administration received requests from international aircraft operators to provide GNSS-based services -- Yes No
- 5) What is the level of WGS – 84 survey completion in your State
 - a. For Waypoints -- _____%
 - b. For Airports -- _____%
 - c. eTOD
- 6) What percentage of aircraft are equipped with GNSS avionics _____%
- 7) a- What is the number of runways in your State that meet instrument standards but do not have an instrument approach or _____

b- What is the number of runways in your State that are only served by a circling procedure
- 8) In your State, how many PBN approach procedures are promulgated based on
 - a. GNSS -- _____
 - b. Conventional navigation-aids _____

9) How many ILS systems are equipped with marker beacons only (no DME) for aircraft to perform altitude/distance cross checks? _____

10) Do you allow the use of FMS GPS based computed distance checks? -- Yes No

11) Does your State plan to implement ADS-B -- Yes When _____ No

12) Does your State plan to implement Multilateration -- Yes When _____ No

13) What is the Status of the following systems in your State

a. ADS-C -- Equipped Yes No Operational Yes No

b. CPDLC -- Equipped Yes No Operational Yes No

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14) Does your State have any plans to implement augmentation systems

a. SBAS -- Yes When _____ No

b. GBAS -- Yes When _____ No

15) What role would your State like ICAO to assume in your GNSS Programme

16) Any comments
