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 3: Recent development in PBN and GNSS

PROPOSALS FOR THE AMENDMENTS

(Presented by the Secretariat)

SUMMARY

This paper presents Amendment 86 to Annex 10 , concerning the global navigation satellite system (GNSS) ground-based augmentation system (GBAS) and PANS-OPS, Doc 8168.

Action by the meeting is at paragraph 3.

REFERENCES

- MIDANPIRG/12 Report
- PBN GNSS TF/3 Report

1. INTRODUCTION

1.1 The Air Navigation Commission, at the eighth meeting of its 183rd Session held on 9 March 2010, considered proposals developed by the Navigation Systems Panel (NSP) Working Group of the Whole to amend the Standards and Recommended Practices (SARPs) in Annex 10 — *Aeronautical Telecommunications*, Volume I — *Radio Navigation Aids* concerning the Global Navigation Satellite System (GNSS) Ground-Based Augmentation System (GBAS), which was transmitted to Contracting States and appropriate international organizations for comments under State letter AN 7/1.3.97-10/43. The proposed amendment to Annex 10, Volume I, is envisaged for applicability on 17 November 2011.

1.2 The above proposal was adopted by the council at the third meeting of its 192nd Session on 4 March 2011, under amendment 86 to the *International Standards and Recommended Practices, Aeronautical Telecommunications* (Annex 10 to the Convention on International Civil Aviation).

2. DISCUSSION

2.1 The PBN GNSS TF/3 meeting noted that the purpose of the proposed amendment is to reflect the initial experience gained with the ongoing technical implementations of GBAS for Category I operations. A number of changes to the GBAS SARPs are proposed, including the following:

a) removal of material on ground-based ranging functions;
b) clarification of the definition of the GBAS digital modulation method;
c) introduction of an optional authentication protocol;

d) clarification of the B-values coding requirements;
e) introduction of forward compatibility requirements;
f) modification of carrier smoothing requirements for airborne equipment;
g) modifications to the guidance material on frequency coordination requirements, link budget, vertical deviations, Type 2 message, and signal quality monitoring; and
h) several minor editorial changes.

2.2 The meeting may wish to note that the approval of Amendments 4 and 3 to the fifth edition of the *Procedures for Air Navigation Services — Aircraft Operations*, Volume I — *Flight Procedures* and Volume II — *Construction of Visual and Instrument Flight Procedures* (PANS-OPS, Doc 8168). The nature and scope of the amendments to PANS-OPS, Volume (I) are as follows:

a) introduction of the definition of GBAS landing system (GLS) to align with Volume II;

b) new provisions pertaining to area navigation (RNAV) holding requirements consequential to existing PANS-OPS, Volume II design criteria that seek alignment with the performance-based navigation (PBN) concept. They furthermore remove impracticable requirements, incorporated before the PBN concept materialized, that cannot be coded into the navigation database; and

c) new provisions concerning the use of satellite-based augmentation system (SBAS) approach procedures with vertical guidance (APV)/barometric vertical navigation (baro-VNAV) that are consequential to existing PANS-OPS, Volume II design criteria.

2.3 The meeting may wish to note that the nature and scope of the amendments to PANS-OPS, Volume (II) are as follows:

a) introduction of the definition GBAS landing system (GLS);

b) a new provision to emphasize that the ILS criteria cannot be used for assessing the effect on safety of penetrations of the Annex 14 — *Aerodromes* obstacle limitation surfaces;

c) modifications to the provisions regarding design criteria to address navigation database coding problems of instrument flight procedures that are published in State aeronautical information publications (AIPs); and

d) refinement of procedure design quality assurance aspects with emphasis on flight validation.

2.4 The meeting may wish to note that it is necessary to publish in the Aeronautical Information Publication a list of any significant differences which will exist on 18 November 2010 between the amended provisions of PANS-OPS, Volumes I and II and the national regulations and practices.

2.5 The PBN/GNSS TF/3 meeting was updated by UAE that they had conducted two workshops (12th July 2010 in Dubai, and 14th July 2010 in Abu Dhabi) for GBAS implementation, where representatives from Airports, ATS, Airlines, and Regulators attended the workshops. The purpose of the workshops was to provide stakeholders with common understanding of GBAS capabilities and implementation program elements, details on the workshops are at **Appendix A** to the this working paper, furthermore, UAE informed the meeting that there is an interest to implement GBAS in Dubai by 2014

2.6 The meeting may wish to urged MID States to provide information on their operational experience with GBAS implementation, including any operational issues or problems identified.

3. ACTION BY THE MEETING

3.1 The meeting is invited to take action as requested in para 2.6 above and share information on GNSS and GBAS in general.

APPENDIX A

Workshop Objectives

1. Obtain common understanding of stakeholder requirements and challenges
2. Provide stakeholders with common understanding of GBAS capabilities and implementation program elements
3. Determine optimal (value added) approaches for initial implementation at Dubai International Airport
4. Formation of initial stakeholder project team
5. Identify the way forward for a GBAS operational implementation program at Dubai International Airport

The summery of the GBAS value is as follows:

1. *Increased airport capacity*
    a. Eliminates ILS critical zones
    b. Enables flexible approaches, improved accuracy versus ILS
    c. Offers precision approach where ILS cannot due to geography
    d. ANSP benefits from improved ATM capacity
    e. Airport benefits from increased revenue (landings fees, concessions, etc.) and cost avoidance (capacity increase w/o adding runways)
2. *Lower life-cycle cost: GBAS is more cost efficient than ILS*
    a. One GBAS serves all runways, initial acquisition cost is lower
    b. Lower maintenance cost
    c. Lower flight inspection cost
3. *GBAS improves safety*
    a. Certification pedigree
    b. Signal stability (immune to signal bends inherent in ILS)

4. *Reduced noise/ shorter routes: Variable glide slopes, RNAV/RNP to GLS finals*

    a. Airports benefit: increased capacity and schedule flexibility, improved community relations

    b. Airlines benefit: fuel and emission savings, increased schedule flexibility, avoid noise violations

Conclusion:

The workshop concluded that Dubai has the interest to implement GBAS in the near future and that UAE will include GBAS as a source of Local area augmentation for space based navigation solutions in the PBN Implementation Plan.

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