

ELEVENTH AIR NAVIGATION CONFERENCE

Montreal, 22 September to 3 October 2003

Agenda Item 6 Aeronautical navigation : issues

OVERVIEW OF GNSS-RELATED DEVELOPMENTS IN TECHNICAL AND OPERATIONAL AREAS

(Presented by the Secretariat)

SUMMARY

This paper presents brief overview of current developments concerning GNSS and related aeronautical navigation matters. It also provides information on the related work in progress in a number of international expert groups.

1. RE-ORGANIZATION AND RENAMING OF THE GNSS PANEL AS THE NAVIGATION SYSTEMS PANEL (NSP)

1.1 The fourth meeting of the Global Navigation Satellite System Panel (GNSSP/4) held in Montreal from 23 April to 2 May 2003, among other things, reviewed information on the status of currently defined elements of GNSS and the plans for the development of new GNSS elements and signals. Having recognized that the future work of the panel will continue to focus on GNSS issues, the meeting believed, however, that the panel has to be re-organized in the way to accommodate the work on the conventional nav aids and suggested to rename the GNSS Panel as the Navigation Systems Panel (NSP). The meeting also proposed that the new work programme of the NSP should incorporate the work which was previously progressed with the assistance of the Testing of Radio Nav aids Study group (TRNSG, see section 5 below), and that this study group should be integrated into the NSP.

1.2 The ICAO Air Navigation Commission (163-10) approved the revised work programme of the panel as recommended by GNSSP/4 (see appendix). Recognizing that this work programme can be progressed most efficiently by a group with expertise in satellite-based and conventional navigation systems, the Commission agreed to change the name of the GNSS Panel to the Navigation Systems Panel. The ANC also accepted a recommendation of the panel to integrate the TRNSG and its remaining work into the NSP. States and international organizations that participated in the work of the GNSSP were invited to provide the

NSP with additional expertise in conventional navigation systems including expertise in the testing of radio navigation aids.

2. OBSTACLE CLEARANCE PANEL (OCP) WORK IN PROGRESS ON GNSS PROCEDURES AND CRITERIA

2.1 The thirteenth meeting of the Obstacle Clearance Panel (OCP/13, 28 October to 8 November 2002) developed new material regarding GNSS for inclusion in the *Procedures for Air Navigation Services — Aircraft Operations* (PANS-OPS, Doc 8168). GNSS-related material in Volume I was expanded to account for the operation of basic GNSS receivers in a multi-sensor environment. Volume II material was expanded to incorporate ground-based augmentation system (GBAS) Category I approach criteria based on the instrument landing system (ILS) Category I equivalency method, helicopter GNSS criteria for point in space operations and satellite-based augmentation system (SBAS) departure criteria.

2.2 Future work programme of the panel as approved by the Air Navigation Commission (ANC) includes the development of procedures, areas and obstacle clearance criteria for inclusion in the PANS-OPS, Volumes I and II for:

- a) SBAS RNAV in support of departure and arrival operations (by 2005);
- b) SBAS RNAV in support of APV operations (by 2005);
- c) GBAS RNAV in support of CAT II and III operations (by 2007); and
- d) development of instrument procedures for helicopter operations at heliports (by 2005).

3. OPERATIONS PANEL (OPSP) WORK IN PROGRESS ON GNSS ISSUES

3.1 The work programme of the Operations Panel (OPSP) as approved by the Air Navigation Commission (154-9) following its decision to re-establish the panel includes the development procedures for all weather operations, in particular:

- a) examine operational aspects of proposals by other ANC panels for SARPs and guidance material relating to the design and airworthiness certification of flight management systems (FMS) including electronic navigation displays and FMS database coding;
- b) develop proposals for SARPs and guidance material relating to the operational approval of flight management systems (FMS) and electronic navigation displays; and
- c) review criteria for RNAV departure, en-route, arrival and approach procedures and develop proposals for amendments as necessary to the *Procedures for Air Navigation Services — Aircraft Operations* (PANS-OPS, Doc 8168).

3.2 The sixth meeting of the Operations Panel (OPSP/6, 8 to 19 September 2003) discussed proposals for extension of the work programme in this area to include a review of operational requirements for instrument approach and departure procedures. The objective of the proposed task is to review presently available and future technology, particularly GNSS, options against the operational needs in order to establish objectives and priorities for further development of technical SARPs, procedures and criteria, and aerodrome infrastructure requirements. Panel recommendations will be reviewed by the ANC in early 2004.

4. SEPARATION AND AIRSPACE SAFETY PANEL (SASP) WORK IN PROGRESS ON GNSS ISSUES

4.1 Under its work programme task to develop material relating to the introduction of advanced concepts in respect to communication, navigation and surveillance performance with emphasis on an increased utilization of developing technologies and systems supporting area navigation (RNAV) and required navigation performance (RNP) the panel is addressing separation minima for en-route and the terminal control area (TMA), taking into account GNSS capabilities.

5. TESTING OF RADIO NAVAIDS STUDY GROUP (TRNSG)

5.1 Since its establishment in 1995 the study group has held six meetings. During the first stage of its work TRNSG undertook comprehensive review of Doc 8071, Volumes I and II and produced a new, fourth edition of Volume I (published in 2000), which covered testing of all terrestrial navigation aids thus replacing old Volumes I and II.

5.2 At the second stage, TRNSG addressed testing of GNSS and GNSS-based procedures. New edition of Volume II of Doc 8071 (published recently) contains guidance on testing of non-precision approach (NPA) procedures using aircraft-based augmentation systems (ABAS). At its last meeting (TRNSG/6, 25 to 29 August 2003), the study group completed development of additional material on testing of SBAS and GBAS. This material will be incorporated in the next edition of Volume II envisaged for publication in 2004.

6. ESTABLISHMENT OF THE REQUIRED NAVIGATION PERFORMANCE STUDY GROUP (RNPSG)

6.1 On 10 June 2003, during consideration of the report of the fourth meeting of the Global Navigation Satellite System Panel (GNSSP/4), the Air Navigation Commission (163-10) agreed that, as proposed in Recommendation 1/1 of the report, action should be taken to establish a focal point for the further development of area navigation (RNAV) and required navigation performance (RNP). It had been noted during consideration of this matter that there was an urgent need to address a number of various issues surrounding different definitions and concepts related to RNP and RNAV in order to ensure a harmonized approach to the future development of RNP and RNAV. Accordingly, a new air navigation study group named as the Required Navigation Performance Study Group (RNPSG) has been established.

7. **SBAS INTEROPERABILITY WORKING GROUP (IWG)**

7.1 The SBAS Interoperability Working Group (IWG) formed in 1997 initially incorporated members representing the European Geostationary Navigation Overlay System (EGNOS), the Japanese multi-functional transport satellite (MTSAT) satellite-based augmentation system (MSAS); and the American wide area augmentation system (WAAS). Canada was included in the group by virtue of its work with the FAA to extend WAAS stations and service into Canada. In 2002, the Indian GPS and GEO augmented navigation (GAGAN) system GAGAN team joined IWG.

7.2 There are five objectives that are actively being pursued by the group:

- a) available SBAS performance consistency and compliance with ICAO Standards and Recommended Practices (SARPs);
- b) improve the service level available in the regions outside the nominal SBAS service volumes;
- c) improve individual system performance through SBAS data interchange;
- d) improve SBAS prediction capabilities through SBAS data interchange; and
- e) identify future improvements.

7.3 The primary product of the IWG is the SBAS Technical Interface Document (STID). This document, which is updated at each meeting, contains the results of studies, the identification of test scenarios that describe procedures to be followed, identification of system parameters/assumptions for simulation studies etc. through shared research and development activities. Besides the full IWG, several small working groups address issues in specialised areas such as ionospheric effects, timing issues and service volume model.

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