



International Civil Aviation Organisation

Sixth Meeting of CNS/MET Sub Group of APANPIRG

Bangkok, Thailand, 15 - 19 July 2002

Agenda Item 6:

Review:

- a) **Strategy for the provision of Precision Approach and Landing Guidance Systems**
- b) **GNSS strategy**

**REVIEW OF STRATEGIES FOR IMPLEMENTATION OF GNSS AIR
NAVIGATION CAPABILITY AND THE PROVISION OF PRECISION APPROACH
AND LANDING GUIDANCE SYSTEMS**

(Presented by the Secretariat)

SUMMARY

This paper presents the Regional Strategies for the implementation of GNSS navigation capability and for the provision of precision approach and landing guidance systems for review and appropriate action.

1. INTRODUCTION

1.1 The strategies for implementation of GNSS air navigation capability and the provision of precision approach and landing guidance systems were reviewed and updated by the Fifth meeting of COM/MET/NAV/SUR Sub Group of APANPIRG in July 2001. The updated strategies were adopted by APANPIRG at its Twelfth meeting in August 2001 in its Conclusions 12/16 and 12/17. The Strategy for the Provision of Precision Approach and Landing Guidance Systems is provided in the Attachment 1 and the Strategy for Implementation of GNSS Navigation Capability is provided in the Attachment 2 to this paper.

2 DISCUSSION

2.1 The 12th meeting of APANPIRG reviewed both strategies in light of available information presented to the meeting. During the review clarification was sought on paragraph b) of the Strategy for Precision Approach and Landing Guidance System whether currently available SBAS can support PA Category I approach. It was clarified that, although SBAS architecture provides for PA CAT I, the currently available service (WAAS) is yet to support PA Category I. Consequently, it was recognized that in the ASIA/PAC region GBAS would be required to support PA CAT I operations. In order to clarify this issue, para b) of the strategy was amended as shown in the Attachment 1. It was noted that States, in particular, smaller States, considered the Strategies as useful guidance for planning and implementation of the GNSS based non-precision approaches and precision approaches in the region.

2.2. The Strategies were considered as living documents and the Sub-group is expected to continue to review both Strategies on a periodic basis and propose appropriate amendments, as required.

2.3 It should be noted that GNSS is identified as a standard navigation systems and relevant SARPs including augmentations systems serving flight operations up to Category I precision approach have been included in the amendment No.76 to Annex 10 which became applicable on 1 November 2001.

2.4 In light of technological developments in GNSS, and in accordance with the Terms of Reference, the Sub-Group is expected to review both the Strategies.

2.5 The Strategies and a Checklist for introduction of GNSS based operations adopted APANPIRG were forwarded to States on 20 March 2002. The Checklist was considered as a guidance material to facilitate implementation of GNSS based operations. While reviewing APANPIRG/12 report, the ANC noted the Checklist for GNSS implementation and requested the Secretary General to monitor related developments in other regions to harmonize GNSS-based operations.

3. ACTION BY THE MEETING

3.1 The meeting is expected to review the Strategy for Precision Approach and Landing Guidance Systems and the Strategy for the Implementation of GNSS Navigation Capability in the ASIA/PAC region and make necessary recommendations, as required.

STRATEGY FOR THE PROVISION OF PRECISION APPROACH AND LANDING GUIDANCE SYSTEMS

Considering:

- a) that, in the ASIA/PAC Region, ILS is capable of meeting the majority of requirements for precision approach and landing;
- b) that, requirements for provision of terrestrial-based navigation facilities non-precision and precision approach and landing have been implemented in most cases;
- c) that, the availability of a proven and standardized MLS to meet all weather operations requirements;
- d) the availability of initial ICAO GNSS SARPs and guidance material;
- e) feasibility of GBAS systems to support category II and III operations in 2006;
- f) the development and deployment of multimode receivers;
- g) the definition of Required Navigation Performance for approach, landing and departure operations;
- h) the knowledge that GNSS without augmentation can support non-precision approaches and the augmented GNSS based systems will be available to support Category I operations from the year 2003;
- i) the need to maintain aircraft interoperability both within the region and between the ASIA/PAC region and other ICAO regions and to provide flexibility for future aircraft equipage.

The strategy for ASIA/PAC Region in the provision of precision approach and landing guidance is:

- a) ILS be retained as an ICAO standard system for as long as it is operationally acceptable and economically beneficial;
- b) Implement GNSS, with GBAS to support Category I operations where appropriate;
- c) Conduct studies for the implementation of GNSS ground based augmentation systems and GNSS avionics equipment for Category II and III operations;
- d) Introduce the applicable Required Navigation Performance (RNP) for approach, landing and departure operations in accordance with ICAO provisions.

- e) Conduct necessary on-going education and training for operational personnel in using GNSS to ensure safe operations.
- f) Implement MLS where operational requirements cannot be satisfied by implementation of ILS or GNSS.

STRATEGY FOR THE IMPLEMENTATION OF GNSS NAVIGATION CAPABILITY IN THE ASIA/PACIFIC REGION

Considering that:

- 1) Safety is the highest priority;
- 2) Elements of Global Air Navigation Plan for CNS/ATM system on GNSS and requirements for the GNSS implementation have been incorporated into the CNS part of FASID;
- 3) GNSS Standards and Recommended Practices (SARPs), PANS and guidance material for GNSS implementation are available;
- 4) The availability of avionics including limitations of some receiver designs; the ability of aircraft to achieve RNP requirements and the level of user equipage;
- 5) Development of GNSS systems including satellite constellations and improvement in system performance;
- 6) Airworthiness and operational approvals allowing the current GNSS to be applied for en-route and non precision approach phases of flight without the need for augmentation services external to the aircraft;
- 7) Development status of aircraft-based augmentation systems;
- 8) Regional augmentation systems include both satellite-based and ground-based systems;
- 9) Human, environmental and economic factors will affect the implementation of GNSS.

The general strategy for the implementation of GNSS in the Asia/Pacific Region is detailed below. This strategy is based on the regional navigation requirements of:

- (a) RNP10 for en-route in remote/oceanic areas;
 - (b) RNP4 for en-route and terminal phases of flight;
 - (c) NPA/APV for approaches and departures; and
 - (d) Precision approaches at selected airports.
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- 1) There should be an examination 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;
 - 2) Evolutionary introduction of GNSS Navigation Capability should be consistent with the Global Air Navigation Plan for CNS/ATM Systems;
 - 3) Implementation shall be in full compliance with ICAO Standards and Recommended Practices and PANS;

- 4) Introduce the use of GNSS as primary means of navigation in remote/oceanic areas;
- 5) Introduce the use of GNSS as a supplementary means of en-route navigation and non-precision approach;
- 6) Any external augmentation system deemed necessary for the implementation of GNSS for a particular flight phase in an area under consideration (SBAS/GBAS including ground based regional augmentation system) should be implemented in full compliance with ICAO SARPs;
- 7) To the extent possible, States should work co-operatively on a multinational basis to implement GNSS augmentation systems in order to facilitate seamless and inter-operable systems;
- 8) States consider segregating traffic according to navigation capability and granting preferred routes to aircraft with better navigation performance with the exception of State aircraft;
- 9) States undertake a co-coordinated R & D programme on GNSS implementation and operation;
- 10) ICAO and States should undertake education and training to provide necessary knowledge in GNSS theory and operational application, and
- 11) States establish multidisciplinary GNSS implementation teams, using section 6.10.2 of ICAO Circular 267, Guidelines for the Introduction and Operational Approval of the GNSS , as a guide.

Note1: Identified SBAS systems are EGNOS, MSAS and WAAS. The MSAS is expected to be available for providing augmentation for the Asia/Pacific region;