



International Civil Aviation Organisation

**Seventh Meeting of CNS/MET Sub-Group of APANPIRG and
Tenth Meeting of CNS/ATM IC Sub-Group of APANPIRG**

Bangkok, Thailand, 15 – 21 July 2003

Agenda Item 5: Radio navigation Aids

**1) review strategies for Precision Approach and Landing Guidance
Systems and GNSS Implementations**

**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 the meeting's review and appropriate updates.

1. INTRODUCTION

1.1 The regional strategies for implementation of GNSS air navigation capability and the provision of precision approach and landing guidance systems were reviewed and updated by the Sixth meeting of CNS/MET Sub Group of APANPIRG in July 2002.

1.2 The updated strategies were adopted by APANPIRG/13 in its Conclusions 13/18. The Regional 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 in the Asia/Pacific Region is provided in the Attachment 2 to this paper.

2 DISCUSSION

2.1 The 13th meeting of APANPIRG reviewed both strategies in light of available information presented to the meeting. The meeting agreed to the changes proposed to the Strategy for the Provision of Precision Approach and Landing Guidance System. With regard to the Strategy for the Implementation of GNSS Navigation Capability in the ASIA/PAC region, the meeting discussed the need to retain RNP4 in para b) of the Strategy for en-route and specify RNP 1.0 for terminal phase of flight. Since the Strategy was developed by an experts group, it was agreed, after a considerable discussion, to refer it back to the Sub-Group for comments. The Strategy with the amendments proposed by the Sub-Group was adopted without any change.

2.2 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.

2.3 As the Regional Strategies are considered living documents, the Sub-group is expected to continue to review both Strategies on a periodic basis and propose appropriate amendments, as required, taking into account technological developments in GNSS.

2.4 In this context, the meeting may wish to note that the Global Navigation Satellite System Panel (GNSSP), in preparation for the Eleventh Air Navigation Conference, had reviewed the following documents and proposed updates to them:

- a) ICAO Strategy for the introduction and application of non-visual aids to approach and landing in Annex 10, Volume 1, Attachment B (Attachment 3 to this paper); and
- b) Global Air Navigation Plan for CNS/ATM systems (Doc 9750), particularly those dealing with GNSS (Attachment 4 to this paper).

3. ACTION BY THE MEETING

3.1 The meeting is expected to review the Regional Strategy for Precision Approach and Landing Guidance Systems and the Strategy for the Implementation of GNSS Navigation Capability in the ASIA/PAC region, in light of developments in aeronautical navigation, and make necessary updates, , 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) the availability of a proven and standardized MLS to meet all weather operations requirements;
- d) the availability of 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 that augmented GNSS- based systems will be available to support Category I operations from end of year 2004;
- 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 applicable Required Navigation Performance (RNP) for approach, landing and departure operations in accordance with ICAO provisions.

- e) Conduct necessary on-going GNSS and RNP education and training for operational personnel 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 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 used 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) Augmentation systems include both satellite-based (SBAS) and ground-based systems (local and regional) augmentation;
- 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.
- 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 SARPs 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) States are encouraged to implement future GNSS approvals based on TSO C145/146 receiver standards or equivalents;
- 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, including RNP, 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;