



International Civil Aviation Organization

**NINTH MEETING OF THE
COMMUNICATIONS/NAVIGATION/SURVEILLANCE AND
METEOROLOGY SUB-GROUP OF APANPIRG
(CNS/MET SG/9)**

Bangkok, Thailand, 11–15 July 2005

Agenda Item 5: Navigation

**3) implementation of GNSS approach with Vertical Guidance
(APV)**

**REVIEW OF GNSS APV APPROACH STANDARDS AND
IMPLEMENTATION**

(Presented by Australia)

SUMMARY

This paper reviews the existing standards for APV approaches, work being undertaken in developing further standards and the issues that need to be addressed in implementing the ICAO AN-Conf/11 recommendation.

1. INTRODUCTION

1.1 As an outcome on CFIT studies into aircraft approach accidents ICAO developed an additional classification of approach design – APV (approach with vertical guidance). The CFIT studies indicated that providing vertical guidance as opposed to a ‘dive and drive’ approach was significantly safer. The AN-Conf/11 of 2003 recommended that these approaches be the minimum level provided by states and this recommendation was adopted by ICAO. Standards for APVs have been published in DOC 8168-OPS Vol II PANS-OPS for one form of APV – Chapter 34 on baro-VNAV and work is continuing to develop further designs. Some states have already developed designs and are currently implementing SBAS supported APVs.

2. TYPES OF APV APPROACH

2.1 APVs may be currently divided into two types – those that use vertical guidance provided by a path derived by the baro-altimeter and the flight management systems and those where the vertical guidance is provided by a GNSS augmentation system such as SBAS.

2.2 The ICAO baro-VNAV APV design incorporates a sloping splay design and requires the aircraft to be fitted with a certified baro/FMC combination capable of containing the vertical error budget within the design limits. ICAO designs also allows this form of vertical guidance to be provided for RNP based designs in Chapter 35 of PANS-OPS.

2.3 The difference between vertical ‘advisories’ and vertical guidance should be noted as there have already been a number of incidents arising from this confusion.

2.4 In addition some states have approved RNP (baro-VNAV) designs to RNP levels less than the 0.3NM used in PANS-OPS and the US FAA has recently published Order 8260.52 to provide standards for the design and implementation of such approaches.

2.5 APV designs using an augmented GNSS are nominally divided into two types, APV-I and APV-II – the difference being the vertical error limits. At this time the United States is the only state to certify an SBAS system (WAAS) and to provide APV-I approaches (known in the US as an LPV). Flying these approaches requires a SBAS capable receiver such as the TSO C145 or C146 design operating within a defined SBAS service area. At present larger airline aircraft are not fitted with SBAS receivers and current indications are that no such fitments are planned.

3. DISCUSSION

3.1 The ICAO recommendation for the implementation of APVs does not provide guidance as to the type to be used. Each has its own operational advantages and disadvantages and implementation cost differential both from the state and operators perspective. Some states are undertaking reviews to determine the way ahead. However the results of these studies are not yet available to the CNS/MET SG and a common implementation strategy has not been adopted.

4. ACTION BY THE MEETING

4.1 The meeting is recommended to:

- a) review the current status of APV implementation in the participating states;
- b) determine if a common implementation strategy can be developed; and
- c) determine if further work is required to assist in APV implementation.
