



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: Air Navigation

PLAN FOR TRANSITION TO GNSS

(Presented by Australia)

SUMMARY

This paper provides an update on Australia's plans to transition to GNSS and its intentions to maintain a backup network of conventional navigation aids through to the year 2020.

1. INTRODUCTION

1.1 Traditionally, aircraft have navigated point to point along fixed Routes. The routes are denoted by ground based Navigation Aids (NavAids). The NavAids used in Australia are the Non-Directional Beacon (NDB), the VHF Omni-Range (VOR), and Distance Measuring Equipment (DME) and Instrument Landing System (ILS).

1.2 The tenth ICAO Air Navigation Conference (ANC10) in September 1991 endorsed a world-wide transition to Global Navigation Satellite System (GNSS) based navigation for aviation, and foreshadowed transition would be well advanced by 2000. In September 2003 the eleventh Air Navigation Conference (ANC 11) re-endorsed this strategy, but noted that the transition (world wide) had progressed much slower than anticipated.

1.3 Many modern aircraft have a capability to navigate on an “area” basis rather than just directly to/from ground aids. Area Navigation systems allows an aircraft to fix its position anywhere at any time and to navigate along any chosen path. GNSS has enabled the deployment of practical Area Navigation avionics for all levels of aviation, where fitted.

1.4 ASTRA (formerly the Australian ATM Strategic Planning Group) published the second edition of Australia's ATM Strategic Plan in September 2003. The plan was “commended” to industry by the Deputy Prime Minister at the 2003 Safe Skies conference. Volume 1 of the plan identifies Area Navigation and ADS-B surveillance as key enablers to support future operational concepts such as Flexible Use Airspace (FUA), User Preferred Routing (UPR) and User Preferred Trajectory (UPT).

1.5 Airservices Australia has been continually deferring capital renewal of the Navaid network since 1991 in anticipation that GNSS would functionally replace ground aids. Consequently of the some 400 navigation aids, most are older than their design life (15 years); 60% of the NDBs are more than 30 years old and 55% of VORs are more than 20 years old. Few of these Navaids continue to enjoy manufacturer support. To ensure continuity of service of the aids it will be necessary to either remove the need for these aids or embark on a major equipment renewal program.

1.6 While the use of GNSS in aviation is substantial, most currently deployed GPS units are not suitable or approved for “only means” navigation in the approach environment. For General Aviation aircraft which forms greater than 80% of all aircraft in Australia, there is little economic benefit by fitment of new GNSS receivers and so the uptake of GNSS navigation by these aircraft owners has been slow and is far from complete.

1.7 Conversely, generally larger, more modern regular public transport aircraft who are already equipped for Area Navigation can not exploit the full benefits as they are generally required to fly the old fixed routes and navigate using conventional Navigation Aids.

1.8 Until (virtually) all aircraft have another form of “only means” navigation, the Navigation Aid network can not be withdrawn or significant expenditure required to sustain the service potentially avoided.

2. STRATEGY

2.1 The ASTRA Navigation Strategy envisages Area Navigation will be the prime means of navigation for all phases of flight except Precision Approach. A thin network of Navigation Aids (less than 200) (the backup network) will be retained to provide a backup capability for Terminal and Non-Precision Approach operations and assist older international aircraft.

2.2 Instrument Landing System will remain the general Precision Approach aid for at least five and probably 10 years. GPS augmented by Ground Based Augmentation System (GBAS) is expected to replace ILS; the timing will be driven by industry and is not yet clear.

2.3 Modern jet aircraft will use a Flight Management System supported by GPS and Inertial sensors to provide Area Navigation. The rapid turn over and young age of the Australian fleet has caused rapid introduction of these systems. Examples: Qantas and Virgin B737-7/800, Qantas A330 and JetStar A320 aircraft.

2.4 A new generation of GPS Sensors and Navigators designed to FAA Technical Standards Order TSO-C145a/146a, meet the basic requirements for “only means” navigation. This equipment is suitable to provide Area Navigation in Regional, Charter and General Aviation aircraft. A CASA project, strongly supported by AsA is developing the case to support a Rule change authorising “Only Means” navigation using this equipment.

2.5 Navaids required in the Backup Network will be replaced and the recovered old equipment will be used to extend the life of the remaining Aids until wide spread fitment of Area Navigation is in place.

3. PROGRESS

3.1 Under the auspices of the ASTRA GNSS Implementation Team (GIT), a group comprising Qantas, Virgin, CASA and Airservices Australia (AA) staff has identified and is working through issues associated with allowing full use of Area Navigation equipment on modern jet aircraft. It is

anticipated that these aircraft will be authorised to use the existing (more than) 550 GPS approach procedures, a number of additional approach procedures will need to be developed and Minimum Safe Altitudes reviewed.

3.2 Airservices Australia is supporting the CASA project to gather evidence to make the case for a regulatory change to allow “Only Means” Navigation using TSO-C145a/146a Avionics. This rule change has been drafted and is expected to be promulgated before the end of 2005. Airservices Australia anticipates expanding its GPS RAIM prediction service to provide briefing in support of this equipment.

3.3 A Team has been formed in AA to identify and address the ATC implications of the wide spread adoption of Area Navigation. In particular, determine the Procedural Separation Standards to be applied.

3.4 Replacement Projects are underway to renew Nav aids required in the Backup Network to ensure continuity of service as transition to GNSS/Area navigation proceeds;

- Replacement of the Terminal VORs at Adelaide (completed), Hobart (completed), Cairns (in progress) and Canberra is underway
- Replacement of 61 NDBs and 23 VORs; Contract signed with major equipment suppliers and installation will commence towards the end of the year.
- A project to replace 14 ILS is also in progress

4. CONCLUSION

4.1 The meeting is invited to note the plans for transition from ground based radio navigation to GNSS/Area based navigation and the retention of a core backup network of conventional navigation aids for the medium term.

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