



International Civil Aviation Organization

Automatic Dependent Surveillance – Broadcast (ADS-B)

Study and Implementation Task Force

Brisbane, Australia, 24-26 March 2003

Agenda Item 5: Implementation Plan

- a) initial consideration for implementation of ADS-B in the Asia/Pacific Region

MANDATORY FITMENT OF EXTENDED SQUITTER ADS-B

SUMMARY

The attached paper was presented at the March 02 meeting of the CNS/ATM Implementation Coordination Sub Group of APANPIRG.

The paper proposes that TCAS equipped aircraft, which have a suitable navigation system, be encouraged to transmit Extended Squitter from their Mode S Transponder. The Extended Squitter is required to support automatic aircraft position reporting for use by Air Traffic Control and Enhanced TCAS.

It recommended that the group target mandatory carriage of Mode S Extended Squitter in the Asia Pacific Region by 1 January 2006 or earlier.

(Presented by Australia)

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International Civil Aviation Organisation

Ninth Meeting of CNS/ATM Implementation Co-ordination Sub Group of APANPIRG

Bangkok, Thailand, 11 – 15 March 2002

Agenda Item 4: Review and identify key priorities for implementation of CNS/ATM systems for the Asia/Pacific Region

EXTENDED SQUITTER

This paper proposes that TCAS equipped aircraft, which have a suitable navigation system, be encouraged to transmit Extended Squitter from their Mode S Transponder. The Extended Squitter is required to support automatic aircraft position reporting for use by Air Traffic Control and Enhanced TCAS.

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1. Background

The benefit of Automatic Position Reporting using ADS-B technology was demonstrated as early as 1994 (Logan, Gulf of Mexico). There are many trials continuing (Capstone, NEAN, SafeFlight 21, Frankfurt).

ICAO has formalised two ADS-B datalinks with SARPs in Annex 10 (Mode S Extended Squitter and VDL mode 4). There is a proposal to standardise a third datalink (UAT). The three datalinks are not inter-operable.

There has been and continues to be wide debate on the merits of each of the three datalinks. However, there seems to be little prospect of one standardised ADS-B datalink being adopted worldwide. The most probable scenario is Europe adopting Mode-S and VDL-4, USA adopting Mode-S and UAT. While the debate may continue for many years, there is scope to obtain automatic aircraft position reports at low cost without compromising the ADS-B link decisions in Europe and USA.

Currently, Air Carrier Aircraft (30 passenger seats or more, 15,000Kg MTOW or more) are required to carry TCAS II. A TCAS II installation includes a Mode S Transponder. Current Transponders spontaneously transmit Acquisition Squitter once per second. Acquisition Squitters allows TCAS equipped aircraft to learn of the presence of other Mode S and TCAS equipped aircraft.

ICAO Annex 10 SARPs and RTCA DO-260 MOPS already define Mode S Extended Squitter (DF 17). Extended Squitter includes Aircraft:

- Flight ID
- Position (Lat/Long) and FOM (Figure of Merit)
- Pressure Altitude

In addition, aircraft transiting Asia to Europe will be required to interface the Transponder to the Navigation system to downlink similar information to meet the European requirement for downlink of aircraft parameters (DAPS). It would make economic and logistical sense to implement extended squitter DF17 capability at the same time as the DAPS hardware and software changes.

2. Benefits of Automatic Position Reports

Ground ATC Surveillance

In a number of Asia-Pacific States the high capital, operating and maintenance costs of radar precludes complete or even basic radar coverage. For example, Australia has radar coverage along the east coast, Darwin and Perth but the bulk of centre of the continent is without radar coverage thus Procedural separation is used.

The large procedural separation standards impose considerable constraint on efficiency of aircraft operation; 50/50 separation standard and non optimum altitude. It is likely that Automatic Aircraft Position Reporting could support radar like services including aircraft separation using 5NM standards without the high cost of installing and operating radars. Radar like position information would also support safety net applications within ground systems. The low cost and simplicity of Extended Squitter ground receivers makes wide area coverage extremely cost effective.

Australia's en-route radars are expected to reach end of economic life in 2008. ADS-B is being seriously considered as a lower cost alternative to direct replacement of these radars.

Australia is deploying an operational, small scale system using Automatic Position Reports in Bundaberg; refer separate paper.

The Australia ATM Strategic Plan identifies a number of Strategic Initiatives. Automatic Position Reporting is identified as a required to support a number of these initiatives; refer separate paper.

Enhanced TCAS

Airlines have commenced equipping their fleet with newer models of TCAS, which can display aircraft at ranges in excess of 100NM. This greatly increased detection range provides pilots with a much more comprehensive situational awareness. There is at least one airline operating Enhanced TCAS equipped aircraft in the region.

These new TCAS systems operate by listening to Extended Squitter from other aircraft and use the positional information contained these messages to display relative position. Until all aircraft are transmitting Extended Squitter, the value of Enhanced TCAS is reduced.

Ease of Implementation

Transponder manufacturers have demonstrated Extended Squitter software upgrades to existing Mode S Transponders. At least one manufacturer has products available and installed in aircraft providing revenue service.

Enabling of Extended Squitter in the existing aircraft fleet requires a software upgrade to the Transponder and wire connection between the Navigation System and the Transponder; to provide the position information.

Due to the technical simplicity, the provision of Extended Squitter from aircraft already equipped with TCAS is expected to be inexpensive. This is totally consistent with the existing ICAO Annex 10 and the development path of Mode S and TCAS.

3. Recommendations

It is recommended that:

- a) the States approach their airline operators to determine the cost impact on avionics of mandatory carriage of Mode S Extended Squitter
- b) the States identify and quantify the specific benefits from Automatic Aircraft Position Reports such as reduced separation standards, optimum altitude, etc in their FIR
- c) States encourage airline operators to upgrade their fleets to Enhanced TCAS the meeting target mandatory carriage of Mode S Extended Squitter by aircraft equipped with TCAS and suitable FMS, in the Asia Pacific region by 1 January 2006 or earlier
- d) Member States encourage and support the development of separation standards based on aircraft automatic position reports

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