



Agenda Item 7: Surveillance: Automatic Dependent Surveillance (ADS) developments

PROPOSAL TO USE REQUIRE 1090 EXTENDED SQUITTER ADS-B EQUIPAGE

(Presented by Australia)

SUMMARY

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 can be used to support automatic aircraft position reporting for use by Air Traffic Control.

It is recommended that the group target systematic carriage of Mode S Extended Squitter on TCAS equipped aircraft with a suitable Navigation system in the Asia Pacific Region by 1 January 2006.

1 Background

At the Ninth Meeting of CNS/ATM Implementation Co-ordination Sub Group of APANPIRG Bangkok, Thailand, 11 – 15 March 2002 a paper was presented which argued for fitment of ADS-B to TCAS capable aircraft in Asia Pacific.

Since the CNS/ATM Implementation Co-ordination Sub Group meeting, there has been considerable activity regarding ADS-B. This paper proposes that Asia Pacific adopt ADS-B as a useable ATC surveillance tool for the provision of radar like services.

2 Recent ADS-B activities

During the last 4 months there have been a number of activities, decisions and meetings which have contributed towards the deployment of ADS-B as a surveillance tool. These are briefly described below:

2.1 FAA link decision

The United States of America has formally announced that it will use 1090MHz extended squitter as the ADS-B link technology for Air Transport category aircraft.

< www.faa.gov/apa/pr/pr.cfm?id=1574 >

2.2 SASP acceptance of plan to develop ADS-B separation standards

ICAO's Separation and Airspace Safety Panel (SASP), first meeting of the working group of the whole, in Canberra, Australia, 2 – 13 May 2002 recently agreed that an ICAO

separation standard be developed for ADS-B using radar surveillance characteristics as a reference system .

"The meeting supported the agreement reached by the members of the project team that a comparative assessment of ADS-B against a reference system such as radar was a valid methodology to use in the establishment of suitable separation minima for this surveillance system."

2.3 JAFTI Meeting

A meeting on 14 June 2002 of the Joint User Requirement Group (JURG) of Association of European Airlines and IATA concluded that 1090 MHz extended squitter ADS-B was the interoperable link. The draft minutes read:

Quote:

- *No requirement for two links on the same airframe unless decided voluntarily by the airline concerned;*
- *1090ES is accepted as the interoperable link with the USA*
- *1090 ES is accepted for general use in Europe for the Package 1 applications, to be accommodated wherever ADS-B service is provided*
- *Reciprocal treatment by the US for 1090ES equipped aircraft arriving from Europe*

Unquote

2.4 Position of major Aircraft manufacturers

Airbus has indicated that it will make ADS-B out capability, using 1090 MHz extended squitter, available on all aircraft produced after early 2003. Airbus also States that retrofit kits will also be made available at that time.

Some Boeing aircraft are already equipped with ADS-B (eg some British Airways B747 and B757). Boeing is expected to consider ADS_B 1090MHz squitter implementation together with other transponder changes required for Europe's enhanced surveillance and the FAA's anticipated transponder rules regarding security enhancements.

Customer demand from Airlines, not ATS providers, is needed for these units and the associated aircraft fitment STCs to become more readily available. This can be achieved through Airlines recognising the benefits, and initiating fitment or through appropriate rulemaking.

2.5 Position of major Avionics manufacturers

Each of the major avionics manufacturers have available ADS-B capable avionics. In some cases the avionics are certified and in other cases are only available as red label products. Customer demand from Airlines and/or aircraft manufacturers, not ATS providers, is needed for these units to become readily available. This can be achieved through Airlines recognising the benefits, and fitting or through appropriate rulemaking.

2.6 Australian ADS-B ground station

The Australian ADS-B trial ground station has demonstrated 1090 MHz extended squitter comparable to radar from a site in Queensland, in an environment typical of Asia Pacific. See information paper CNS/MET/SG/6-IP/3.

The Australian ADS-B ground station was providing data to the Air Traffic Centre in Brisbane 5 days after the equipment arrived in the country. This illustrates the ease by which the ground system can be deployed.

3 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 most 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.

4 Benefits of ADS-B fitment for certain aircraft

Operational benefits may be made available to ADS-B equipped aircraft operating in airspace served by ADS-B ground stations. These benefits could include the following depending on the capabilities of the Air Traffic Control system :

- Provision of radar like separation services allowing decreased separation minima compared to procedural control
- Increased likelihood of preferred levels and in some increased likelihood of preferred routes and hence decreased fuel burn and lower operating costs
- Reduced pilot and controller workload by removal of routine position reporting and management
- Increased safety through provision of ground based safety alert protection including short term conflict alert, minimum safe altitude warning, danger area infringement warning, cleared level adherence monitoring and route adherence monitoring.

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. A similar situation exists in many parts of Asia Pacific.

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.

5 Provision of radar like services

As a first step, it would seem sensible to provide ATC radar like services, based on ADS-B, to air transport aircraft operating in controlled airspace at high levels. Such aircraft can easily be equipped. In addition, it is easy and simple to deploy ADS-B ground stations in remote areas. The ground stations can be installed at existing VHF outlets, on towers belonging to other agencies eg telecommunication provider towers, on oil rigs, small islands etc etc. They open the possibility of new radar like ATC services in many areas of Asia Pacific where there is no radar today.

However, for ATC providers to invest in the necessary ground based infrastructure, an commensurate investment is required by Airlines to make the small but necessary changes to the relevant aircraft using the airspace.

One way of achieving a match between Air Traffic Providers and Airline investment would be for all parties to plan towards systematic use of ADS-B in Asia Pacific by 2006. Aircraft, already equipped with TCAS transponders, and with appropriate navigation systems, could be required to equip when operating in airspace served by ADS-B ground stations. This would allow adequate time and incentive for ATC providers to deploy ADS-B ground systems as well as for Airlines to make the necessary modifications to aircraft. Without a coordinated approach obtained by systematic fitment, the necessary incentives, competition and pressures will not be exerted to ensure low cost avionics certifications occur. Without it, investments by Air Traffic Providers are also unlikely to occur.

In addition, reduced enroute charges may be viable in some organisations as a result of the lower costs of providing radar like services compared to the costs of supporting procedural control.

6 Recommendations

It is recommended that

- a) States note the changes that have occurred in recent months regarding ADS-B
- b) the States approach their airline operators to determine the cost impact on avionics of carriage of Mode S Extended Squitter
- c) the States identify and quantify the specific benefits from Automatic Aircraft Position Reports such as reduced separation standards, optimum altitude, etc in their FIR
- d) States encourage airline operators to upgrade their fleets to Enhanced TCAS
- e) the meeting target systematic carriage of Mode S Extended Squitter on TCAS equipped aircraft with a suitable Navigation system in the Asia Pacific Region by 1 January 2006 or earlier
- f) member States encourage and support the development of Separation Standards based on aircraft Automatic Position Reports
- g) Asia Pacific adopt ADS-B as a useable ATC surveillance tool for the provision of radar like services.

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