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

TWO TIER ADS-B AIR TRAFFIC SURVEILLANCE SERVICES

SUMMARY

This paper discusses possibility of a two tier ADS-B Air Traffic Surveillance service.

(Presented by Australia)

1. Background

1.1 The deployment of ADS-B services for ATC implies the installation of ADS-B ground stations.

1.2 The common practice when deploying radars is that a very high quality service is required so that the full range of radar services are made available to ATC. This makes sense when the investment required to install a radar is so high. The maximum use is obtained for this substantial investment.

1.3 ADS-B ground station deployment can be 10% to 15% of the cost of the deployment of a radar site. The costs of the data communication paths to the ground station become as significant as the cost of the ground station.

2. Tier 1 service

2.1 When radar services are provided to separate aircraft typically one expects duplicated communications infrastructure, duplicated ground station and high capacity datalinks which imposed a small latency on the data delivery to the controller. These are necessary to protect against sudden unexpected loss of radar data (reliability – no common point of failure) and to provide ATC with adequate manoeuvre detection capabilities when vectoring.

2.2 The same requirements can be expected from systems that are used to provide radar like services from ADS-B.

2.3 These levels of redundancy and performance are expensive to provide but are warranted in most occasions. In other cases, the business case for deployment will fail because of these costs particularly where the operational requirements do not require the full range of services.

3. Tier 2 service

3.1 In areas where the traffic is light and radar vectoring & separation are not required a second tier of radar like services is proposed at a reduced capital and operating cost:

- Envisaged capabilities
  These sites could be expected to have all the attributes of other ADS-B stations with the exception of latency and reliability. In particular, the integrity (veracity) of the received data would be as good as a full capability station. Ie: if the data is received at ATC it will be accurate and "true".

- **Reliability**
  It is envisaged that these sites could be non duplicated sites, using third party communication provider data links. They could perhaps be located at data communications provider sites further lowering costs.

  Reliability is an important factor in the establishment of separation standards because unplanned outages can result in immediate loss of separation as controller's transition to procedural control techniques/standards.

- **Latency**
  To reduce communications costs, data could be packaged on site and only sent typically every 10 seconds at which time only the most recently received positional data would be transmitted to ATC – instead of sending data every 0.5 seconds.

  A latency of up to 10 seconds within the data communications system is also envisaged so that the ADS-B data received at the ATC centre could be as much as 20 seconds old. (10 seconds latency, 10 seconds in local storage at site). For ADS-B targets received at the normal 0.5 second rate the "normal" latency would not exceed 10.5 seconds)

- Operational use
  In these locations ADS-B would not be used for separation. The ADS-B data could be displayed to controllers using a different position symbol to indicate clearly to the controller that the data was not able to be used for the full range of services.

  However, the data could be used as follows:

  a. to support procedural separation standards by
     - allowing the controller to "see" that aircraft have passed
     - allowing the controller to use DME separation standards (aircraft to aircraft)
  b. to support safety net tools such as Short Term Conflict alert, Cleared level adherence monitoring, route adherence monitoring, danger area infringement warning.
  c. To provide automatic position updates to flight planning systems reducing workload in the cockpit and on the ground
  d. Provide additional search and rescue capability
  e. To provide controllers with situational awareness
  f. Provide support of FIR crossing

4. Safety benefits

4.1 When compared to the alternative of no surveillance, the data from these sites would provide significant safety benefits particularly in detection of aircraft at the wrong flight level, route or longitudinal position.

5. FIR boundary locations

5.1 One particular candidate for the use of these ground stations could at sites which have visibility of non radar FIR boundaries. At these boundaries today, ATC depends on pilot position reporting by VHF or HF. Each year significant numbers of failure of coordination occur at these boundaries where aircraft cross at the wrong level, at an unexpected place (of route) or at an unexpected time.

5.2 These stations, coupled with suitable ATC processing could automatically alert controllers of these events.

5.3 In addition, both FIRs could share the cost of funding such ground stations and each could contract a datalink service provider to deliver the data to both FIR's ATC systems. This may be particularly attractive when the capital expenditure program of one or more of the FIRs is under pressure. The guaranteed ongoing data service revenue could possibly allow the datalink provider to fund the initial deployment.

6. Recommendations

6.1 The meeting note the possibility of a low cost second tier ADS-B radar like service and the safety benefits it could bring.

6.2 The meeting also note that deployment of such a service may bring more immediate safety benefits and may accelerate ADS_B deployment.

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