International Civil Aviation Organization

Automatic Dependent Surveillance – Broadcast (ADS-B)
Study and Implementation Task Force

Brisbane, Australia, 24-26 March 2003

Agenda Item 2: Review of ADS-B activities

e) Review aircraft equipage and future plans by airlines, business aviation and general aviation sectors

AN AIRLINE PERSPECTIVE

SUMMARY

ADS-B is an enabling technology to many of the strategies encompassed in the (draft) ICAO Global ATM Plan. In a mature system, ADS-B will provide airlines with improved operating performance and efficiencies, enhanced safety, and will lower the costs of ATM services. While the benefits in an end state application are clear, the challenge is to provide a coordinated implementation which will bring early returns from investments.

(Presented by Australia)

(Prepared by Walter Dollman, QANTAS Airways)

1. INTRODUCTION

1.1 A vision and operational concept for the future management of air traffic has been developed by ICAO which envisages a system of flexible and seamless management of air traffic in which user preferences are supported, operational data is readily available, and system capacity and safety are optimised. The global vision, which is also reflected in the Australian ATM Strategic Plan, is consistent with future commercial and safety imperatives and goals of airlines such as Qantas.

1.2 The delivery of the future ATM system will require enhanced levels of situational awareness, trajectory prediction and conflict detection in both ground based and airborne systems. It has becoming increasingly apparent that Automatic Dependant Surveillance – Broadcast (ADS-B) will be a principle enabling technology.

2. BENEFITS TO AIRLINES OF ADS-B

2.1 The potential benefits offered by ADS-B to airline operators in a mature ADS-B system in relation to operating performance efficiency, system safety and cost minimisation will be significant in all (ICAO) classes of airspace.

2.2 In airspace in which a separation service is currently provided to IFR/RPT aircraft , ADS/B will enable the optimisation of aircraft trajectories through:

- reduced aircraft spacings applied by ATC in non-radar environments (enroute and TMA). Less restrictive standards would be facilitated by enhanced ATC situational awareness, positional accuracy and trajectory prediction. The degree of benefit will be dependent on communication system performance.

- tactical resolution of conflicts by ATC in a similar manner to radar services (including positive passing, "vectoring" by track or heading assignment, etc.)

- provision of an enhanced situational awareness platform to ATC which will support free routing and vertical navigation of aircraft in en-route airspace

- devolution of separation from ATC to the cockpit for CDTI (ADS-B IN) equipped aircraft

  - for tactical efficiency (eg, less restrictive separation and intrail climb/decent, crossing and passing procedures)

  - when not within range of ground ADS-B surveillance (eg, oceanic airspace)

2.3 ADS-B will increase safety by enhancing cockpit situational awareness through:

- the provision by ATC of accurate and real-time Directed Traffic Information (DTI) in relation to VFR aircraft in non-radar Classes E and D airspace.

- the ability for suitably equipped (ADS-B IN) aircraft to determine relevant VFR traffic in Classes E and D airspace

- the ability for suitably equipped (ADS-B IN) aircraft to determine relevant IFR and VFR traffic in Class G airspace

- exploitation of the additional parameters, especially intent data, provided by ADS-B OUT by both ground and airborne ADS-B IN systems

- supporting the acquisition of VFR traffic and "see and avoid" procedures

- supporting surface operations (aircraft and vehicles), in particular low visibility operations and runway incursion detection, by both ground and aircraft systems

- facilitation of tools to provide defence against systemic failure (eg CDTI alerts and warnings / ground based ATM tools including STCA and CLAM)

2.4 ADS-B will potentially lower direct costs to users by supporting autonomous (free-flight) operations in low density, remote and oceanic airspace by reducing the reliance on 3rd party ATM services. In a mature system, significant indirect cost benefits should also be generated by the reduction of staffing and facility costs in delivering services in non-radar airspace. In en-route radar airspace, there is the potential for significant long-term savings in the replacement of radar systems with ADS-B ground surveillance systems.

2.5 ADS-B derived data may also be applied to enhance airline operations performance by supporting operational control and dispatch flight following, ramp control and gate management.

3. ADDITIONAL POTENTIAL ADS-B BENEFITS TO AIRLINES

3.1 Additional potential benefits to all aircraft operators from ADS-B include:

- satisfying collision avoidance (ACAS) requirements
- supporting closely spaced parallel runway operations
- supporting SAR activities
- temporary marking of obstacles

4. TRAFFIC INFORMATION SERVICE –BROADCAST (TIS-B)

4.1 In airspace where there is already a high level of technologically based surveillance and the possible employment of more than one ADS-B link technology (eg, Europe and the USA), the provision of early benefits to a mixed fleet may be provided in part by TIS-B. However, in environments where there is little primary radar or SSR surveillance such as the ASPAC region, TIS-B will offer little transitional benefits, especially if a single ADS-B link is chosen.

5. COST TO AIRLINES

5.1 The cost of fitting and retrofitting ADS-B systems to aircraft have yet to be clearly established. However, once industry direction is clearly established, it is likely that economies of scale and production will assist in providing fitment at significantly reduced cost.

6. IMPLEMENTATION ISSUES

6.1 Apart from cost of aircraft equipage, a number of implementation issues need to be addressed by airlines:

- Regional and global interoperability of airborne systems

- Integration of ADS-B IN into the flight deck, including HUD
- Conflict warnings / alerts (CDTI)
- Conflict prediction and resolution tools (CDTI)
- Human factors / cockpit workload considerations

7. INCENTIVES TO EQUIP

7.1 The national / regional fleet will need to equip to "critical mass" in order to deliver the anticipated airline savings from improved operational performance and a reduction in ATM infrastructure and service provision costs.

7.2 Airlines are unlikely to invest in ADS-B technology if operational and cost saving benefits are not available within a reasonable period. (Airlines are still looking for a return from their ADS investment of over a decade ago.) If necessary, incentives should be provided for aircraft operators to equip ahead of benefits to achieve agreed target dates and appropriate levels of participation.

7.3 Those aircraft operators which choose not to equip should not be afforded any priority in the system.

8. SUMMARY

8.1 ADS-B promises to deliver significant benefits to airlines in operating performance, safety and cost. The inclusion of intent parameters in ADS – B OUT and the use of ADS – B IN systems will be key to the future introduction of "autonomous operations" or "freeflight" in defined airspaces. While the benefits of a mature system are fairly apparent, the challenge will be transition and the early generation of benefits against investment by both airlines and ATS providers.

9. ACTION BY THE ADS-B STUDY AND IMPLEMENTATION TASK FORCE

9.1 The meeting is invited to note the airline perspective for the employment and deployment of ADS-B.
