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

d) Review activities by Asia/Pacific States in trials and demonstration of ADS-B;
f) Review other relevant activity.

THALES ATM POSITION ON ADS-B

SUMMARY

This paper presents an ATM ground equipment manufacturer perspective on Automatic Dependent Surveillance-Broadcast (ADS-B). Thales ATM has developed ground infrastructure capable of ADS-B based surveillance, including ADS-B 1090 Extended Squitter Ground Stations and ADS-B reports processing and display capability in the EUROCAT air traffic control center system. Such processing capability is currently being implemented in the TAAATS System in Brisbane, Australia. The paper presents Thales ATM activities on future ADS-B based applications through Research and Technology (R&T) study programs, and on the standardization process through EUROCAE and RTCA. The paper concludes with recommendations towards an early implementation of ADS-B based surveillance.

(Presented by Australia)

(Prepared by Michel PROCOUDINE Thales ATM France)

1. THALES ATM activities in ADS-B

1.1 Thales ATM is involved in a number of programs and working groups aiming at the definition and the implementation of ADS-B based applications. These applications include air-to-air applications (generally referred to as Airborne Surveillance Applications : ASA or Airborne Separation Assurance System : ASAS) and air-to-ground applications (Ground Surveillance Applications : GSA). En-route, terminal and airport surveillance based on ADS-B are part of GSA.

1.2 In the scope the EUROCAE Working Group 51, the various applications based on the ADS-B technology have been sorted into 3 main packages corresponding to different time frame of applicability and different levels of separation responsibility transferred from the ground to the flight deck.

1.3 The first package of applications (Package 1) gathers the applications which operational implementation is achievable in the short and medium term (within 5 years) and which do not imply modifications of the respective roles of pilots and controllers.

1.3.1 This package 1 includes 7 air-to-air applications such as for example Enhanced Air Traffic Situational Awareness during Flight Operations (ATSA-AIRB) or Enhanced Visual Acquisition for

See & Avoid (ATSA-S&A), and 5 air-to-ground applications such as for example ATC Surveillance in Non Radar Airspace (ADS-B-NRA) or Airport Surface Surveillance (ADS-B-APT).

1.3.2 The definition of these applications and of the technological means allowing their implementation is being developed following a top-down approach (based on EUROCAE ED78A/RTCA DO264), ensuring that the necessary means are developed to fulfill the needs. This supports the development of the necessary standards to allow global implementation worldwide.

1.4 This approach, proposed by EUROCONTROL/EUROCAE is endorsed by FAA and RTCA (SC-186) in the USA, through an effective co-ordination activity supported by joint FAA/EUROCONTROL/EUROCAE/RTCA meetings namely the RFG (Requirement Focus Group).

1.5 THALES ATM actively participates in EUROCAE WG51 activities, and is chairing the group responsible for the development of GSA MASPS (Minimum Aviation System Performance Specifications)

1.6 Within the framework of European Research and Technology programs, Thales ATM is exploring the operational implementation of ADS-B based applications, addressing applications requirements and procedures, the evolution of ATC ground infrastructure, including ground stations, network architecture and ATC control centers. A follow-up program (Cooperative-ATM) is expected to lead to operational trials in the 2007/8 timeframe.

2. THALES ATM products

2.1 THALES ATM believes that the current status of standards and technology allows the early implementation of the most simple ADS-B applications, which requires minimum modifications on-board aircraft and on ground systems.

2.2 Therefore THALES ATM has included ADS-B technology in its products range to allow implementation of ATC surveillance based on ADS-B. This includes:

- Upgrade of the EUROCAT ATC System to process ADS-B reports from aircraft. To allow actual operational use of ADS-B, this upgrade is fully integrated into the operational system at the same level as the radar processing, and available at each controller working position.
- 1090 Extended Squitter ADS-B Ground Station
- VDL Mode 4 ADS-B Ground Station

2.3 EUROCAT ATC Control Center

2.3.1 Under a contract from Airservices Australia Thales ATM has developed ADS-B functionality for the air traffic control system in Australia (TAAATS). This development lead to a fully integrated ADS-B capability for the ATC center allowing the display of ADS-B tracks when available:

- ADS-B tracks are computed taking benefit of frequent updates of down linked parameters including 3D position and speed vector. Before using ADS-B for separation, the integrity of ADS-B data is checked using on-board integrity qualification factors.
- ADS-B data are also used by the Flight Plan Data Processing to improve the calculation of the Estimated Time of Over flight (ETO) of subsequent points along the planned route.
- All usual safety nets functions that are provided based on radar surveillance sources, such as, for example, RAM (Route Adherence Monitor), STCA (Short Term Conflict Alert) or CLAM (Cleared Level Adherence Monitor) are available for ADS-B tracks as well.
- The logic which is implemented is based on a priority scheme : radar tracks are used in priority when available, then ADS-B tracks, followed by ADS-C tracks and flight plan data.

2.3.2 The upgrade of the TAAATS system has been factory accepted by Airservices Australia and is currently being installed on the Brisbane ATC system to support the ADS-B trials in the Bundaberg area.

2.4 1090 Extended Squitter ADS-B Ground Station

2.4.1 Thales ATM has developed an ADS-B Ground Station capable of receiving ADS-B reports from aircraft and vehicles on 1090 MHz Extended Squitter. The ground station consists of a small-size low power compact unit, which can be hosted indoor or outdoor. The 1090 Extended Squitter messages are received by the station and processed to be forwarded to ATC. The ground station includes Built In Test Equipment and local and/or remote monitor and control based on the open standard SNMP. Various options are proposed for the connection of the ground station to the ATC system.

2.4.2 The Thales ATM 1090 Extended Squitter Ground Station is compliant with ICAO Annex 10 amendment 77, which defines the signal-in-space. It allows to process the airborne messages as defined in RTCA DO-260 / EUROCAE ED-102. The output format towards ATC is according to the ASTERIX standard, Category 21 (dedicated to ADS-B reports).

2.5 VDL Mode 4 ADS-B Ground Station

2.5.1 In the scope of European Research & Development program NUP Phase 1 (Northern Europe ADS-B Network Update Program) Thales ATM has developed and delivered 6 VDL Mode 4 based ADS-B Ground Stations. This station is capable of receiving ADS-B reports from aircraft and vehicles and also of uplinking traffic data to mobile users to support advanced air-to-air applications. The ground station consists of full size 19" cabinet. The VDL Mode 4 messages are received by the station and processed to be forwarded to ATC. The ground station includes Built In Test Equipment and local and/or remote monitor and control based on the open standard SNMP.

2.5.2 The Thales VDL Mode 4 Ground Station is compliant with ICAO Annex 10, which defines the signal-in-space. It allows to process the airborne messages as defined in EUROCAE ED-108 (no RTCA correspondence). The output format towards ATC is according to the ASTERIX standard, Category 21.

2.5.3 A VDL Mode 4 Ground Station was installed by Thales ATM in Papua New Guinea in 2001 to carry out ADS-B trials.

3. Recommendations

3.1 It is proposed that the meeting takes note of the following:

- Thales ATM and its Air Traffic Alliance partners are willing to support the Asia/Pacific region effort to implement operational services based on ADS-B. With this respect the Asia/Pacific pre-operational trials in Australia are considered as a key step towards the implementation of ADS-B based surveillance. In addition the feed back from such trials is essential to the current EUROCAE/RTCA standardization process. It is important to ensure feedback towards these groups.

- ADS-B implementation should be carried out taking into account standards to ensure interoperability of their implementation with other regions of the world, and to ease the work of aircraft operators, Air Traffic Services Providers and manufacturers. Using the 1090 Extended Squitter data link facilitates the airborne installation, thanks to Mode S SSR and TCAS. System studies and safety case development as undertaken by Airservices Australia will allow to establish an approved operational baseline

- However, although the standards related to ADS-B are still evolving due to on-going works on advanced air-to-air applications, an approved standard basis for 1090ES equipment (namely as defined in DO-260A MOPS) is available and should be considered for early implementation of surveillance based on ADS-B. Airborne and ground equipment complying with this standard basis are available today on line with the former issue of the standard (DO-260) and require to be upgraded against DO-260A .

- Therefore it is recommended that the Asia/Pac regions agree on the early implementation of ADS-B based on a common definition of the standard and available equipment that may be later amended according to the results of on-going pre-operational trials. This would ensure interoperability at regional and global level while supporting the ADS-B implementation initiatives in the region.

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