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

AIRBUS POSITION ON ADS-B

SUMMARY

This paper presents an aircraft manufacturer perspective on Automatic Dependent Surveillance-Broadcast (ADS-B). In the first semester of 2003, Airbus will certify Mode S Elementary Surveillance, and Mode S Enhanced Surveillance together with 1090 Extended Squitter ADS-Broadcast output, and another manufacturer has advised industry bodies of similar activity. Airbus is working on initial implementation of ASAS through Research and Technology (R&T) study programmes, and on the standardization process through EUROCAE and RTCA.   The paper concludes with recommendations on the way forward for implementation pioneers.

(Presented by Australia)

(Prepared by Thomas Fixy, Airbus)

1.   Background

1.1   This paper presents the Airbus certification schedule for 1090 Extended Squitter, gives an overview of Airbus ADS-B ASAS applications plans, and provide some comments on Asia/Pacific regional implementation of ADS-B.

1.2   **Airbus certification plans for 1090 Extended Squitter**

1.2.1   Airbus is implementing a Mode S Transponder enhancement program to enable operators to comply with Elementary Surveillance (ELS) and Enhanced Surveillance (EHS) rules applicable to the airspaces of a number of States in Europe. This upgrade was an opportunity to incorporate the necessary software to permit initial 1090 Extended Squitter (ES) output to be implemented and to install the appropriate wiring to provide the parameters to the transponder.

1.2.2   The Airbus installation is compliant with ICAO Annex 10 amendment 77, RTCA DO181B or C, EUROCAE ED73A, and ARINC/AEEC 718A. It has the following capabilities:

- Elementary surveillance (ELS):

    24 bit mode S aircraft address
    Mode A code
    Pressure Altitude reporting (25ft)
    Flight Status
    SI code
    BDS 1.0: Transponder datalink capability report
    BDS 1.7: GICB capability report
    BDS 1.8: MSSS capability report
    BDS 1.9: MSSS capability report
    BDS 2.0: A/C Flight ID
    BDS 3.0: TCAS RA (change 7.0 format)

- Enhanced surveillance (EHS) :

    BDS 4.0: FCU Selected Altitude, baro pressure setting (minus 800 mb)
    (FMS selected altitude is not available)*

    BDS 5.0: Roll angle, Track angle rate, True track angle, Ground Speed,
    True Air speed*

    BDS 6.0: Magnetic Heading, Indicated airspeed, Mach n°, Vertical rate
    (inertial* and baro).

    * Parameters marked "*" are not available on Classic A300s.

- 1090 Extended Squitter (ES):

    BDS 0.5: Baro altitude, GPS Lat, GPS Long, (GPS data received from IRS
    bus, replaced by IRS data when GPS is lost), every 0.5 sec; NUCp (there are
    implementation differences between the different transponder makers; further
    information will be provided when available)
    BDS 0.6: Surface GPS LAT & LONG position, NUCp
    BDS 0.7: Status
    BDS 0.8: A/C Flight Ident, A/C category (not available)
    BDS 0.9: only Airborne E/W velocity, and Airborne N/S velocity,
    BDS 0.A: driven event linked to emergency (not really well defined today)

1.2.3   Three new models of transponders and the wiring for ELS, EHS and ES are being certified,
(scheduled between March and May 2003). Installations on new-build aircraft and Service Bulletins
for in-service aircraft will be available a few months after a customer requests the changes, as is usual.
Consideration is being given to installation of these transponders as standard equipment, rather than
on customer request. Installation of these transponders results in no change in new-build aircraft price.

1.2.4   Boeing have also advised industry bodies that they are making available similar
installations shortly after.

1.2.5   Benefit for the airlines of a combined introduction. These transponders, associated with the
wiring modification, allow a combined introduction of all three functions (EHS, ELS, ES) without
multiple costly serial aircraft modifications.

1.2.6   The airlines benefit from initial ADS-B implementation, with aircraft that have better visibility by en-route and airport surveillance installations that can receive and process 1090ES information.

1.2.7   This easily-available change enables widespread aircraft equipage of ADS-B Extended Squitter (ES). A large population of aircraft broadcasting ES data (ADS-B OUT) is a pre-requisite to installation of ASAS applications (ADS-B IN).

2.   ADS-B ASAS applications and Links

Airbus is actively involved in activities leading to installation of ASAS applications onboard aircraft. Some of them can be highlighted here:

2.1.   Research and Technology study programmes

2.1.1   Within the framework of European programmes, Airbus is exploring the operational conditions of ASAS implementation, addressing ASAS applications requirements and procedures, the cockpit installation, HMI, and the avionics architecture. A number of major human factors issues remain to be solved to enable safe operation on a routine basis . A follow-up programme (Collaborative-ATM) is expected to lead to operational trials in the 2007/8 timeframe.

2.2.   Standardization

2.2.1   A joint EUROCAE/RTCA activity (WG51/SC186) is currently producing ASAS standards (package 1) using a top/down methodology, as defined for datalink. Starting from the operational environment the group will produce interoperability, safety and performance requirements. This group is supported by the FAA and Eurocontrol who agreed to harmonize their operational needs. Standardization is an essential condition to ensure implementation of interoperable solutions in the air and on the ground.

2.2.2   When conditions mature and depending on customer interest, Airbus will review the opportunity to launch an ASAS programme for new-build and in-service aircraft, with certification targets around 2008/10.

2.3   ADS-B Links

2.3.1   Airbus has advised that it is unable to continue work on VDL mode 4 radios. This is mainly because of resolving interference issues with other VHF radios on the airframe is expected to take up a large part of the remaining life time of the VHF communication spectrum in core Europe. UAT and its development remain a candidate for applications when a second link is needed.

2.3.2   Airbus and other manufacturers are implementing the 1090 Extended Squitter link as selected for initial implementations by the USA and Europe and supported for initial applications by IATA and other organisations.

3.   Recommendation

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

-        Airbus and its Air Traffic Alliance partners are willing to support the Asia/Pacific region effort to field new technologies and services based on ADS-B using 1090 ES. The Asia/Pacific live trial is considered as an important contribution to the current EUROCAE/RTCA standardization process. It is important to ensure feedback towards these groups.

-       When considering a mandate, the Asia/Pacific region needs to take into account different levels of aircraft functionality when standards are changing. The present generation of Airbus aircraft (A310/A300-600, A320 and A330/340 families), which is pioneering implementation of 1090 ES, cannot yet rely on mature ADS-B standards, since these are not presently available. Some capabilities expected by the ground equipment may not always be present. For instance, the NUCp function is not clearly defined and coded by the transponder manufacturers, so various aircraft may send NUCp data that differs.

-       The Mode S transponders installed on Airbus aircraft are designed and certified in accordance with ICAO Annex 10 Amendment 77, consistent with the DO260 MOPS for 1090ES. However MOPS standard changes are expected soon (DO260A considers, for instance, to use NIC & NAC SIL, rather than NUC). Therefore, ground stations must be ready to adapt to different levels of aircraft/transponder functionality.

-       At some stage, the Asia/Pacific region must take into account standards to ensure interoperability of their implementation with other regions of the world, and to ease the work of aircraft operators and manufacturers.

-       EUROCAE and RTCA are effective standards bodies ensuring a good coordination with ICAO. The most effective way to produce effective new standards that are appropriate for the Asia/Pacific region is to progress work at the regional level first in close cooperation with EUROCAE and RTCA. This general principle already applied to data link should also be expected to be effective for ADS-B and ASAS standards for the Asia-Pacific region.

-       It is of prime importance that a common link or in the future a dual link system (if required) be used in all part of the world.

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