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

ADS-B RELATED ACTIVITIES BY STATES

SUMMARY

This paper presents ADS-B related activities conducted by States. The information is extracted from Report on Agenda Item 1 - Progress of implementation of air/ground digit links of Aeronautical Mobile Communications Panel (AMCP) Eighth Meeting held in Montreal, 4 to 13 February 2003

(Presented by Secretariat)

1. DECISION ON ADS-B IN THE UNITED STATES

1.1 The meeting was informed that the United States Federal Aviation Administration (FAA) has announced its automatic dependent surveillance — broadcast (ADS-B) link architecture decision. The United States will implement a combination of 1 090 MHz extended squitter for air carrier and private/commercial operators of high performance aircraft and a universal access transceiver (UAT) for the typical general aviation user. If long range air-air applications are validated for use in the long-term, that cannot be satisfied by 1 090 MHz ES alone, then UAT would be a leading candidate to support these requirements on high performance and air carrier aircraft. The FAA does not envision using very high frequency (VHF) digital link (VDL) Mode 4 to meet its surveillance or communications needs. Any future consideration of VDL Mode 4 would only be initiated due to service needs and would require satisfactory studies on its impact on adjacent bands and an appropriate allocation by a competent World Radiocommunication Conference (WRC) of the International Telecommunication Union (ITU).

1.2 The meeting noted that this decision commits the FAA to moving forward with the operational use of ADS-B enabled capabilities within the United States. It is anticipated that this decision will allow avionics manufacturers to develop plans to produce commercial ADS-B avionics and will allow airspace users to make investment decisions on ADS-B equipage within the scope of the ADS-B link architecture decision. This decision also represents a clear statement of the intent of the FAA to continue with the development and implementation of ADS-B enabled operational capabilities within the United States. The FAA plans to work with ICAO to ensure that ADS-B is globally interoperable

1.3 Further work by the FAA is focussing on the development of operational procedures and certification criteria and guidance are necessary to enable near-term operational use of ADS-B and associated applications within the United States based on the implementation of SSR-Mode S ES and UAT. Considering that these two systems may be in operation in the United States airspace, the FAA is investigating multiple ADS-B link scenarios. Possible configurations may include the option for dual equipment installations on board aircraft, or dual mode operation of ground stations whereby ADS-B data provided by one link is retransmitted to users on the other link (i.e. SSR-Modes-ES or UAT).

1.4 The meeting was further informed that it is not the intention of the FAA to make mandatory the carriage of any ADS-B equipment. It is intended to make enhanced airspace benefits available to those who chose to use ADS-B services where they are provided.

2. RECOMMENDATION ON ADS-B IN EUROPE

2.1 The meeting was informed that EUROCONTROL is considering a recommendation on the selection of ADS-B technologies and suite of applications that will be implemented in the 2007-2012 time scale. Having established the selection criteria, three systems were assessed — 1 090 MHz extended squitter, VDL Mode 4, and the UAT. Some discussion centered on the suitability of the various technologies for general aviation, but this category of user is not within the scope of work, and no data was available.

2.2 In summary the recommendation recognizes that 1090 ES is an appropriate data link choice for ensuring early deployment of ADS-B applications in Europe. For longer term planning (typically the period beyond 2010), the need for the use of an additional ADS-B link must be acknowledged as essential whereby VDL Mode 4 is recognized as the most appropriate candidate for such an additional link pending the resolution of some open issues (frequency availability and airborne integration).

2.3 A number of applications are also proposed, which will provide both ground and airborne separation assurance. These are summarized in Appendix A.

3. COORDINATED POSITION ON ADS-B IMPLEMENTATION

3.1 It was confirmed to the meeting that Eurocontrol, the United States Federal Aviation Administration and the International Air Transport Association (IATA) have worked together to assess the performance of three candidate ADS-B links:

a) Mode S extended squitter;

b) VHF digital link (VDL) Mode 4; and

c) universal access transceiver (UAT).

3.2 Those activities have led to the development of a coordinated position which identifies 1 090 Mode S ES as the initial link for the European Civil Aviation Conference (ECAC[*]) States and for large transport aircraft in the United States.

[*] Albania, Armenia, Austria, Azerbaijan, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta,

4. STATUS OF THE UAT

4.1 The UAT is a broadcast data link that supports the services of ADS-B, traffic information service-broadcast (TIS-B) and flight information services-broadcast (FIS-B). UAT began as part of an independent research and development IR&D project in 1995 to develop and demonstrate a broadcast data link system specifically designed for ADS-B with no constraints from legacy-based systems. Subsequently, UAT became part of a multiple link ADS-B evaluation by the United States Cargo Airline Association. In a separate activity, the FAA's Alaska Region initiated a safety program for Western Alaska known as "Capstone". In 1999, the UAT was selected to support GPS navigation, terrain awareness and traffic/weather broadcast services.

4.2 There are presently over 180 aircraft and ten ground stations using UAT for radar-like services in Alaska. This represents the first operational use of ADS-B to support ATS. System upgrades are planned as well as the addition of 200 more avionics suites and thirty ground stations. It was noted that the approximate cost of the integrated avionics for general aviation aircraft is US $15 000 (this includes UAT plus GPS navigator plus cockpit display). Information on the cost of a ground station was not available.

4.3 Industry standardization activities have included the selection of an operating frequency (978 MHz) in order to minimize the impact on distance measuring equipment (DME) worldwide operating on the same frequency and to ensure that the UAT was robust against extreme levels of interference, for example from DME and L16. Industry standards have been developed as RTCA DO-282, and the FAA has recently issued Technical Standard Order C-154 for UAT equipment certification. There is no impact on the operation of adjacent channel DME's or TACANS.

4.4 Work has been under way in AMCP WG-C on the preparation of draft Standards and Recommended Practices (SARPs), a technical manual, and a set of requirements and desirable features for UAT. This work is scheduled to continue through 2003. Completion is expected by ACP/1. The meeting was invited to support the need to continue the development of SARPs and guidance material for the UAT. The meeting agreed.

5. IMPLEMENTATION OF ADS-B IN SWEDEN

5.1 The meeting reviewed the ongoing and planned implementation of ADS-B services using VDL Mode 4 in Sweden. Under the ADS2005 programme, twenty-three ground stations will be installed to provide national coverage for VDL Mode 4 to support ATM applications covering all phases of flight. The first station at Kiruna in northern Sweden will provide air traffic surveillance in this non-radar airspace. Testing is underway and operational service is expected in 2003.

5.2 In the south, VDL Mode 4 is being implemented at Stockholm — Arlanda to enable enhanced surface movement surveillance and to provide operational data. When fully operational by the end of 2003, services will include global navigation satellite system (GNSS) augmentation, ADS-B reporting, FIS-B, INFO-B which is AOC data, TIS-B, departure clearances, and CPDLC.

Moldova, Monaco, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, The former Yugoslav Republic of Macedonia, Turkey, Ukraine, United Kingdom, Yugoslavia.

6. NEAN UPDATE PROGRAMME — NUP

6.1 The North European automatic dependent surveillance - broadcast network (NEAN) update programme (NUP) Phase II is a European ADS-B programme based on VDL Mode 4. Begun in mid 2001 with a four year life cycle, this programme addresses the transformation of research activities into commercial products, bringing the work to a pre-operational status. Supported by the European Commission, airlines, ATS providers and manufacturers, the project shall establish an European ADS-B network based on global standards supporting certified applications and equipment in synergy with the European ATM concepts providing benefits to ATM stakeholders.

6.2 The work has been divided into five major areas — surveillance in non radar environments, off shore operations, surface movement operations, air to air applications and ATC integration.

7. MEDUP AND MFF PROGRAMMES

7.1 The meeting reviewed information on the ongoing ADS Mediterranean Upgrade Programme (MEDUP) and Mediterranean Free Flight (MFF) programmes that are evaluating the feasibility of applying ADS-B services in the Mediterranean area. MEDUP is focusing on establishing an extensive VHF digital link (VDL) Mode 4 infrastructure while MFF is focusing on operational aspects when taking advantage of ADS-B based services.

7.2 The ADS MEDUP includes the following functions: GNSS augmentation; ADS-B using VDL Mode 4; TIS-B using VDL Mode 4; airborne 4D flight path handling; and, CPDLC for ATC communications. The programme is planned to be completed by mid 2004.

7.3 The MFF programme includes the following objectives: to evaluate CNS/ATM technologies and applications for a future Mediterranean ATM scenario; to verify new procedures for free routing and free flight; to address system standards; and, to define guidelines for free flight. The MFF is also expected to be completed in 2004.

8. SIMULATION OF ADS IN MONGOLIA

8.1 The meeting was advised that the Mongolian CAA, working with the Swedish CAA, has undertaken combined simulation studies of ADS-C and ADS-B in Mongolian airspace. Sparse population with remote airports, rugged terrain and a minimal CNS/ATM infrastructure lend themselves to ADS-B. The studies have found that the implementation of ADS-B can improve the safety and efficiency of the air navigation system. The study recommends further that improvements to navigation including GNSS augmentation, and improvements to communications are also desirable.

8. PRESENTATION ON ADS-B IN RUSSIA

8.1 A presentation on plans for ADS services in Russia highlighted the limited availability of secondary surveillance radar in the vast Russian airspace (less than 10%), and the need to implement ADS. Two forms will be introduced — ADS-C in the polar and arctic regions using the aeronautical mobile satellite service, and ADS-B using VDL Mode 4 in continental airspace.

8.2 In addition, to accommodate rapidly rising helicopter traffic levels over Moscow, a project to implement ADS-B using VDL Mode 4 has been launched.

8.3 Beginning in 1997, Russia carried out a set of flight trials and simulations that led to the selection of ADS-B using VDL Mode 4. In 1999, three implementation phases were established.

8.4 The first phase of ADS-B implementation in Russia will aim to gain experience, demonstrate pre-operational systems, address certification issues and carry out an assessment of technology and procedures in the Tyumen region. For those unfamiliar with Russian geography, this represents 8.5% of the area of all Russia and is larger than the combined airspaces of Germany, Italy, France and United Kingdom. It is planned to install 5 ground stations and 2 airlines will install ADS-B equipment on their aircraft.

8.5 The next phase of the project will install ground stations, providing ADS-B coverage for international air routes in the continental part of Russia's airspace, and will equip nearly 30% of Russia's airline fleet. The aim will be the increasing use of ADS-B as a means of air traffic monitoring.

8.6 The third phase will equip the remaining parts of the fleet and install additional ADS-B ground stations. This period, most of which is going be completed by 2008, will see realization of a seamless ADS-B network in Russian continental airspace. This network is supposed be used as one of the main means of surveillance data and will also be used for navigation (DGNSS with integrity monitoring) and communication (ATIS-B, METAR-B, CPDLC) tasks.

8.7 The meeting discussed the introduction of ADS-B and whether it would become mandatory to carry ADS-B avionics. It is expected that there will be improved services available using ADS-B, but that carriage of equipment may not be made mandatory in Russia.
