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ELEVENTH AIR NAVIGATION CONFERENCE

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Agenda Item 7 : Aeronautical air-ground and air-to-air communications

EUROPEAN RECOMMENDATION ON AN ADS-B DATA LINK SELECTION

(Presented by European Organisation for the Safety of Air Navigation — EUROCONTROL, on behalf of its Member States and those of ECAC[1])

SUMMARY

This paper reports on the extensive work which has been conducted in preparation for the selection of an appropriate ADS-B data link from amongst the three candidate data links, viz. 1 090 ES, VDL-4 and UAT.
The paper proposes that 1 090 ES be accepted as the logical choice to support the early implementation of ADS-B applications (both air-to-ground and air-to-air) and to provide interoperability with the United States, with deployment to begin as soon as practicable. Work on additional data links should continue, to ensure availability when required.

Action by the conference is in paragraph 5.

[*] French, Russian and Spanish versions provided by EUROCONTROL.

[1] The ECAC Member States are: **Albania**, Armenia, **Austria**, Azerbaijan, **Belgium**, Bosnia and Herzegovina, **Bulgaria**, **Croatia**, **Cyprus**, **the Czech Republic**, **Denmark**, Estonia, **Finland**, **France**, **Germany**, **Greece**, **Hungary**, Iceland, **Ireland**, **Italy**, Latvia, Lithuania, **Luxembourg**, **Malta**, **Moldova**, **Monaco**, **the Netherlands**, **Norway**, Poland, **Portugal**, **Romania**, Serbia and Montenegro, **the Slovak Republic**, **Slovenia**, **Spain**, **Sweden**, **Switzerland**, **the former Yugoslav Republic of Macedonia**, **Turkey**, Ukraine **and the United Kingdom**.

The 31 Member States of EUROCONTROL appear in **bold**.

1. INTRODUCTION

1.1 The ICAO Aeronautical Mobile Communication Panel (AMCP) has, in addressing the issue of air-ground data links to support navigation and surveillance applications, developed Standards and Recommended Practices for automatic dependent surveillance — broadcast (ADS-B) data links based on Mode S Extended Squitter (1 090 ES) and very high frequency (VHF) digital link Mode 4 (VDL-4). In addition, work has started to develop SARPs for a data link termed universal access transceiver (UAT).

1.2 Work in the context of the European Air Traffic Management Programme (EATMP) has demonstrated that both airborne and ground applications enabled by automatic dependent surveillance used in a broadcast mode (ADS-B) can bring important benefits in the area of capacity, safety and efficiency. A separate paper on a Roadmap of 3 packages of ADS-B applications to be implemented in the time period up to 2020 is being submitted to this Conference under Agenda Item 1.

1.3 A very critical issue for the implementation of the applications concerned is the selection of an air-to-ground and air-to-air data link that can support these applications. There are at present three candidate data links to support the applications in question, viz. 1 090 ES, VDL-4 and UAT. Also, combinations of two or three of these data links can be considered.

2. DATA LINK SELECTION CRITERIA

2.1 Extensive work has been conducted in preparation for the selection of an appropriate ADS-B data link. A major task has been executed jointly by the Federal Aviation Administration (FAA) of the United States and EUROCONTROL. This work took place two years ago through a Technical Link Assessment Team (TLAT). In addition, studies by a consortium of European companies took place funded by the Directorate General Air Transport of the European Commission.

2.2 The main criteria for the selection of a data link option for these studies were:

a) the required capacity of the Link as a function of expected traffic development with time, in particular in high density traffic environments;

b) the existence and maturity of accepted data link standards (in particular SARPS and MOPS);

c) the availability of spectrum for the link(s);

d) the costs of the link implementation, thereby considering opportunities for sharing infrastructure with other CNS equipment (e.g. for 1 090 ES airborne equipment with Mode S transponders and airborne collision avoidance system facilities;

e) the need for global interoperability of links; and

f) the evolution potential of the selected link option.

3. ADS-B DATA LINK RECOMMENDATION AND SELECTIONS

3.1 After the TLAT activity, considerable work has been conducted in Europe, the United States and elsewhere in the world on the recommendation and selection of data links. Australia selected 1 090 ES for the implementation of ADS-B for basic ground surveillance. The Russian Federation has promulgated a plan for the implementation of the use of ADS-B surveillance through VDL-4.

3.2 The Joint User Requirement Group (JURG) of IATA and the Association of European Airlines (AEA), in June 2002, selected 1 090 ES for early implementation applications. This formed part of the JAFTI (JURG ADS-B Fast Track Initiative) decision, which promoted Package 1 for implementation as soon as practicable.

3.3 In July 2002, the FAA selected a combination of 1 090 ES for air carriers and private/commercial operators and UAT for the typical general aviation operator as the links to support an initial set of ADS-B applications defined in the Safe Flight Twenty-One Programme.

4. EUROPEAN DATA LINK RECOMMENDATION

4.1 Within EUROCONTROL, an ADS-B data link recommendation for the short and medium term has been elaborated. This recommendation is based on the criteria outlined in Section 2 above and takes also into account the link decisions already taken in Europe and elsewhere.

4.2 The recommendation concerns primarily a data link option that can support ADS-B applications planned to be implemented in Europe in the time frame 2008 - 2012.

4.3 It is acknowledged that ADS-B is a key enabler of ATM applications with the potential of providing capacity benefits in all phases of flight.

4.4 The following points have been considered in support of the recommendation:

4.4.1 Note has been taken of the ADS-B data link recommendation from the IATA/AEA ADS Fast Track Initiative-JAFTI (14 June 2002) and the FAA announcement on the ADS-B link selection for the United States (July 2002), both of which propose Mode S Extended Squitter on 1 090 MHz (1 090 ES) as the initial ADS-B data link to be used.

4.4.2 Note has been taken of the VDL Mode 4 based ADS-B plans promulgated by the Russian Federation and Sweden.

4.4.3 It is confirmed that 1 090 ES will provide the required level of data link interoperability between Europe and the United States for ADS-B applications described in Package 1.

4.4.4 The airspace users' view, viz. that the adoption and early deployment of 1 090 ES will enable important progress in the areas of air-to-ground and air-to-air surveillance, is shared. Most importantly, it is

expected to initiate essential work towards the definition of avionics enhancements including cockpit display of traffic information (CDTI) to provide Enhanced Traffic Situational Awareness.

4.4.5 While acknowledging that a 1 090 ES-based single-link solution is an appropriate choice for ensuring early deployment of ADS-B applications for air transport category operations, it is recognised that, based on relevant, currently available data, a number of applications in Package 1 will probably require an additional link when implemented in the future environment. Rationalising the European 1 090 MHz RF environment can potentially extend the period before an additional link would become unavoidable.

4.4.6 It is considered that, for the purposes of longer-term planning, the need for an additional ADS-B data link must be acknowledged as essential. This notwithstanding, work should continue to further develop link technologies to achieve appropriate performance meeting future operational requirements.

4.4.7 It is considered essential that developmental work on future digital data links continue, with special attention to frequency allocation and airborne integration to ensure the availability of an additional link when it is needed.

4.4.8 From an operational point of view, when the 1 090 ES link becomes overloaded, the introduction of an additional link will enable the full implementation of Package 1, and also support expected future applications with corresponding benefits to the airspace users. It is, however, emphasised that even when the dual link environment is established, aircraft equipped only with 1 090 ES, shall not be penalised and/or excluded from European airspace.

4.4.9 It is stressed that all States must adhere to the established ICAO Regional Air Navigation Planning process when planning the introduction of new systems affecting international civil aviation.

4.4.10 In parallel with any early operational implementation by the airlines, the European Commission (EC) and EUROCONTROL will carry out large-scale development and validation trials of the full Airborne Separation Assurance System Package 1 applications; in addition the "early" applications from ASAS Package 2/3 will also be evaluated. For the purpose of these validation trials, the airborne and ground-based equipment will be equipped with two links. The Package 1 validation results will ensure interoperability and also further support early airline operational implementation as recommended below.

4.4.11 Based on the operational experiences gained from the implementation of early ADS-B applications and on the further developments and validation trials of the EC and EUROCONTROL, a decision on future mandatory requirements will be taken in 2007.

4.5 **In view of the above considerations, it is recommended that:**

4.5.1 1 090 ES be accepted as the logical choice to support the early implementation of ADS-B applications (both air-to-ground and air-to-air) and to provide interoperability with the United States, with deployment to begin as soon as practicable.

4.5.2 Work on future digital data links continue, with special attention to frequency allocation and airborne integration, to ensure the availability of an additional link when it is needed in the future.

4.5.3 Efforts are accelerated to define and validate the operational, performance and safety requirements, which the different ADS-B applications in Package 1 and beyond impose on the data link(s).

4.5.4 Rationalisation of the European 1 090 MHz RF environment be started as soon as possible, since this can potentially extend the period before an additional data link would become unavoidable.

5. ACTION BY THE CONFERENCE

5.1 The conference is invited to:

a) endorse the use of 1 090 ES to support the initial package of ADS-B applications;

b) recognise the need with time to have an additional ADS-B data link; and

c) recommend that work on additional data links should continue with special attention being paid to frequency availability and airborne architectural interference issues.

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