International Civil Aviation Organization

AUTOMATIC DEPENDENT SURVEILLANCE – BROADCAST SEMINAR AND FOURTEENTH MEETING OF AUTOMATIC DEPENDENT SURVEILLANCE – BROADCAST (ADS-B) STUDY AND IMPLEMENTATION TASK FORCE (ADS-B SITF/14)

Christchurch, New Zealand, 14 – 17 April 2015

Agenda Item 4: Review States' activities and interregional issues on implementation of ADS-B and multilateration

DIFFERENCES BETWEEN ADS-B REQUIREMENTS ACROSS THE GLOBE

(Presented by United States/Federal Aviation Administration)

SUMMARY

This paper presents information on the differences in ADS-B requirements across the globe, focusing on two questions that are often asked in the United States:

(1) Why are U.S. ADS-B performance requirements different from other countries?
(2) What are the differences between the U.S. rules and foreign requirements?

1. INTRODUCTION

1.1 This paper presents information on the differences in ADS-B requirements across the globe.

1.2 This paper assumes that any ANSP using ADS-B for ATC separation is employing automation filters so that ADS-B reports without sufficient quality are not being used in ATC operations.

1.3 The U.S. expresses appreciation to colleagues from Australia, Canada, and Europe who reviewed and commented on this paper, helping ensuring the paper's accuracy.

2. DISCUSSION

2.1 Why are the U.S. ADS-B performance requirements different from other countries?

2.1.1 Australia and Canada primarily use ADS-B for ATC separation in airspace that was previously procedural en-route airspace. ICAO Asia-Pacific States with ADS-B mandates have followed Australia's lead and use ADS-B for ATC separation in airspace that was previously procedurally controlled en route airspace. These countries do not define a performance level for the position information broadcast from aircraft. Rather, they identify the technical standard(s) required of GPS receivers.

2.1.2 Likewise, the European Union (E.U.) mandate does not define the required ADS-B horizontal position data quality. Instead, EASA aircraft certification material calls out specific types of GPS receivers that are acceptable by design to meet the E.U. mandate. With the current set of acceptable GPS receivers (including ETSO-C129a equipment), the E.U. deems that the nominal performance of such receivers is sufficient to support (at least) 5.0 nm en-route and 3.0 nm terminal separation minima. Australia and other nations have taken a similar approach.

2.1.3 The U.S. mandate is performance-based and does not define specific equipage requirements. A performance-based approach offers flexibility for aircraft operators as technology evolves. The performance parameters in the U.S. are derived from the most stringent separation minima that are applicable in terminal airspace (including 2.5nm in-trail approach and closely-spaced parallel runway separation minima). This performance level ensures that the ADS-B equipage will support the evolution of the U.S. airspace system and permit flexibility in airspace redesign

2.2 What are the differences between the U.S. rules and foreign requirements?

2.2.1 The U.S. mandate and the E.U. mandate define requirements to support current and planned ADS-B applications in the relatively congested, "radar airspace" of the U.S. and Europe. The U.S. mandate requires ADS-B Version 2 and defines 19 parameters required to provide the data necessary for current and planned services, including ATC separation service. The E.U. mandate also requires ADS-B Version 2. The E.U. mandate requires five parameters that are not part of the U.S. mandate (three of which are conditional on the actual availability of the data onboard the aircraft). The U.S. mandate requires one parameter that is not part of the E.U. mandate. These differences are consistent with the current differences in surveillance requirements between the U.S. and the E.U.

2.2.2 Other countries using ADS-B for ATC separation services, such as Canada, Australia, and many countries in the ICAO Asia-Pacific region, are using ADS-B Out to provide surveillance services in mostly low-density airspace for ATC separation, or as support for existing secondary surveillance radar services in higher density en route and terminal airspace. The needs of these nations are generally oriented towards delivery of existing levels of ATC surveillance service in new locations at low cost using existing avionics installations rather than aiming at a generational paradigm shift. Some of these countries use ADS-B for 3.0 nm separation in terminal areas. These countries may transition to more demanding ADS-B requirements over time as their fleets and airspace requirements change.

2.2.3 These implementations accept the legacy ADS-B standards, ADS-B Version 0 and 1, which have a different and smaller set of the ADS-B Out parameters.

2.2.4 Table 1 shows a summary of the differences between the U.S., the E.U., Australia, and EASA AMC 20-24 requirements.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper; and

b) discuss any relevant matters as appropriate.

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Table 1 - Comparison of US and Other ADS-B Mandates/Requirements

Parameters	U.S.	E.U.	Australia[1]	Other[2]
Length and width of the aircraft	R	R	O	O
Latitude and longitude	R	R	R	R
Barometric pressure altitude	R	R	R	R
Velocity	R	R	O	O
TCAS II or ACAS is installed & operating in a mode that can generate resolution advisories	R	R	O	O
If a resolution advisory is in effect when an operable TCAS II or ACAS is installed	R	R	O	O
Mode 3/A transponder code	R	R	O	O
Aircraft Identification (the aircraft's call sign)	R	R	R	R
An emergency, radio, communication failure, or unlawful interference indication	R	R	O (allows generic EMG)	R[3] (allows generic EMG)
''IDENT'' indication (SPI)	R	R	O	O
Assigned ICAO 24-bit address	R	R	R	R
Emitter category	R	R	O	O
ADS–B In capability	R	O	O	O
Geometric altitude	R	R	O	O
Navigation Accuracy Category for Position (NAC_P)	R (≥8)	R (≥7)	R (DO260A/B)	R
Navigation Accuracy Category for Velocity (NAC_V)	R (≥1)	R (≥1)	O	O
Navigation Integrity Category (NIC)	R (≥7)	R (≥6)	R (or NUC in DO260)	R (or NUC in DO260)
System Design Assurance (SDA)	R (≥2)	R (≥2)	O	O
Source Integrity Level (SIL)	R (=3)	R (=3)	R (≥2 for ATC)	R
Version number	R (=2[4])	R (=2[5])	R	R
Geometric Vertical Accuracy (GVA)	O	R	O	O
Vertical rate	O	R	O	O
GNSS antenna offset	O	R	O	O
Selected altitude	O	R	O	O
Barometric pressure setting	O	R	O	O

R = required information; O = optional

[1] Australia requires DO-260 (Version 0) ADS-B above flight level (FL) 285 in its domestic airspace, but allows & encourages later ADS-B versions. Australia has a forward-fit GPS mandate for which requires SA-Aware receivers on newly registered aircraft in 2016. Australia also has an ADS-B forward fit requirement from Feb 2014, and an ADS-B mandate for all IFR aircraft by Feb 2017.

[2] This column describes the European Aviation Safety Agency (EASA) Acceptable Means of Compliance (AMC) 20-24 standard used by Canada and many countries in the ICAO Asia-Pacific region; this is the default minimum standard for providing ATC separation in non-radar airspace. Even though AMC 20-24 lists "Velocity" as optional, there are no known aircraft implementations without it.

[3] AMC 20-24, 8.8.2: For ATC transponder-based ADS-B transmit systems, the discrete emergency code declaration capability should be integrated into the transponder functionality and should be controlled from the transponder control panel. Permissible deviation for initial implementations: For initial implementations, instead of the required transmission of the discrete emergency codes 7500, 7600 and 7700 when selected by the flight crew, the transmission of only the generic emergency indicator can satisfy this requirement. Such deviation from the above target requirement needs to be listed in the Aircraft Flight Manual.

[4] Specifically-approved aircraft equipped with Version 1 avionics are currently receiving ADS-B-only ATC separation services in Alaska and the Gulf of Mexico. On or before 1-Jan-2020, all U.S. ATC separation services will require ADS-B Version 2.

[5] The E.U. mandate requires Version 2 ADS-B avionics. However, specific (early) local deployments in Europe accept the legacy ADS-B standards, ADS-B Version 0 and 1.