

International Civil Aviation Organization

FIFTEENH MEETING OF THE ADS-B STUDY AND IMPLEMENTATION TASK FORCE (ADS-B SITF/15)

Bangkok, Thailand, 18 - 20 April 2016

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

ACQUISITION OF MODE 3/A CODE VIA MODE S DOWNLINK FOR DO-260 AIRCRAFT

(Presented by Hong Kong, China)

SUMMARY

DO-260 aircraft will still be the dominant type of ADS-B aircraft in the region for the coming years. While DO-260 aircraft does not have Mode 3/A code in their ADS-B target reports, association between ADS-B targets and Mode A/C SSR targets could be a potential problem for some of the air traffic management systems. This paper highlights a technical solution of acquiring Mode 3/A code for DO-260 aircraft via Mode S downlink, which could then resolve the problem in integration of ADS-B with Mode A/C SSR targets.

1. INTRODUCTION

1.1 According to the specification of ADS-B avionics, Mode 3/A code is transmitted through ADS-B in DO-260A and DO-260B aircraft by means of TEST messages and regular downlink messages respectively, while no Mode 3/A code is available through ADS-B for DO-260 aircraft. In the APAC region, nowadays most of the ADS-B aircraft are equipped with DO-260 avionics. With the U.S. ADS-B mandate for DO-260B by 2020, although there is an increasing trend of DO-260B aircraft flying in the region, DO-260 aircraft are expected to be the dominant type in the region for the coming years. States/Administrations would need to face the situation where a large amount of ADS-B aircraft without Mode 3/A code in ADS-B target reports flying within their Flight Information Regions. This could be a potential problem for some of the air traffic management systems (ATMS) for fusion of ADS-B targets with Mode A/C SSR targets, because a common identifier to the aircraft, Mode 3/A code, is not available through ADS-B.

2. DISCUSSION

2.1 In the absence of Mode 3/A code as a common aircraft identifier for ADS-B and Mode A/C SSR targets, the ATMS can only rely on proximity analysis of aircraft position and Mode C altitude to determine whether detections from two distinct types of surveillance sources belong to the same aircraft. This matching technique might introduce ambiguity in associating ADS-B with Mode A/C SSR targets for fused display. There are chances for incorrect association or missing

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association thus affecting the effectiveness of ADS-B implementation. To eliminate the ambiguity to the ATMS, one of the technical solutions is to find a way to insert Mode 3/A code into ADS-B target reports for the DO-260 aircraft.

2.2 With the same frequency (1090MHz) for the transmission of Mode S reply and ADS-B, ADS-B ground stations can be enhanced to listen to Downlink Format 5 and 21 (DF 5 and 21) of Mode S interrogation replies which carry the Mode 3/A code of the same aircraft. It is technically feasible for ADS-B ground stations to insert Mode 3/A code acquired from Mode S information downlink into corresponding ADS-B target reports. As a result, ADS-B target reports of the same DO-260 aircraft can be filled with Mode 3/A code information to facilitate matching with Mode A/C SSR targets before transmitting to the ATMS.

2.3 The transmission of DF 5 and DF 21 messages from a Mode S aircraft needs to be triggered by ground-based Mode S interrogators, either through active or passive interrogation.

2.4 For active interrogation, Mode S interrogators can be installed alongside with ADS-B ground stations for actively triggering DF 5 and DF 21 messages transmission from the aircraft. The interrogators shall follow ICAO standard to perform periodic all-call and roll-call to the aircraft in range.

2.5 For passive interrogation, the ADS-B ground stations will only passively listen to the DF messages from the aircraft for acquiring the Mode 3/A code. It is required to ensure that Mode S interrogations are performed by external systems, such as A-SMGCS, MLAT system or Mode S radar under their coverage.

3. ACTION REQUIRED BY THE MEETING

3.1 The meeting is invited to:

- a) note the potential problem encountered by some of the ATMS in associating ADS-B targets with Mode A/C SSR targets in the absence of Mode 3/A code in ADS-B target reports;
- b) note the technical feasibility in enhancing ADS-B ground stations to send out ADS-B target reports carrying the corresponding Mode 3/A code information for DO-260 aircraft; and
- c) consider the need to include this technical solution in the guidance materials for ADS-B implementation within a Mode A/C radar environment.
