International Civil Aviation Organization

FOURTEENTHMEETING OF AUTOMATIC DEPENDENTSURVEILLANCE – BROADCAST (ADS-B) STUDYAND IMPLEMENTATION TASK FORCE (ADS-B SITF/14)

Christchurch, New Zealand , 15 – 17 April 2015

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

Draft Guidance material : Reporting & Analysis of ADS-B anomalies

(Australia, Singapore and Hong Kong)

SUMMARY

Proposed Guidance material regarding reporting, analysis and ATC procedures for ADS-B anomalies

1.   INTRODUCTION

Appendix A contains proposed changes to AIGD regarding detection and reporting of ADS-B avionics deficiencies.

2.   DISCUSSION

ADS-B issues can be detected by a number of ways. However, ANSPs need to systematically collect data on anomalies and address them from a tactical/operational perspective as well as from a more strategic perspective to identify root cause and obtain correction.

3.   ACTION BY THE MEETING

3.1   The meeting is invited to:

a)   Consider the attached proposal to amend the AIGD (see appendix)

— — — — — — — — — — — —

APPENDIX A : Proposed amendments to AIGD Appendix 2

Guidance Materials on Monitoring and Analysis
of ADS-B Avionics Performance

5. Systematic Monitoring and Analysis of the Problem

States using ADS-B should have in place systematic ways to identify and manage ADS-B deficiencies similar to that described below.

5.1 Reporting deficiencies

States using ADS-B should have in place systematic ways to identify ADS-B deficiencies including:
- Systematic capture of ATC reported events and engineering detected events into a database and
- Manual or automatic detection of anomalous avionics behavior independent from controller reports

5.1.1 ATC reported deficiencies

ATC procedures should exist that allow services to continue to be provided safety, as well as to capture relevant information for later analysis. This should include:

- ATC request for the pilot to select the alternate transponder
- ATC to adequately record the circumstances including Flight ID, ICAO Aircraft Address (if readily available) accurate time, Flight plan, and pilot provided information

5.1.2 Non ATC reported deficiencies

5.1.2.1 Where capability is available, States should also identify non ATC reported deficiencies.

5.1.2.2 Without overlapping radar coverage :coverage: ADS-B data may be examined for the following:

(a) NUC of each ADS-B reported position is smaller than required for service delivery for more than 5% of total number of ADS-B updates; or

(b) NIC,NAC,SIL are smaller than required for service delivery for more than 5% of total number of ADS-B updates;

(c) ICAO Aircraft Address (i.e. I021/080) is inconsistent with the flight planned registration (REG/) based on each state's ICAO Aircraft Address allocation methodology;

(c)(d) FLTID entered via cockpit interface and downlinked in ADS-B data (i.e. I021/170 in Asterix CAT 21) is a [1]mismatch with aircraft callsign in the ATS Flight Plan.Flight ID inconsistent with ICAO aircraft address;

(d)(e) Inconsistent vertical rate compared to Flight level change;

(e)(f) Inconsistency of position reports and presence of "jumps".

---

[1] A missing Flight ID, or a Flight ID with only "spaces" should not be considered a mismatch.

5.1.2.3 Overlapping radar coverage : For States that have overlapping radar coverage, a systematic means to monitor and analyze ADS-B could be considered in addition to relying on ATC to report the problem / sample checkingand utilising the evaluation criteria in 5.1.2.2 above.

This can be achieved by comparing radar and flight plan information with ADS-B reported position, velocity, flight level and vertical rate change data as well as examining the ADS-B quality indicators and Flight Identification (FLTID) contained in the ADS-B reports.

For each ADS-B flight, its ADS-B data could be compared with its corresponding radar and flight plan information. For example, this would allow analysis to determine if the following pre-defined criteria are met :-

(a)Deviation between ADS-B reported position and independent referenced radar position is greater than 1NM[2], with the indication of good positional quality in the quality indicators for more than 5% of total number ADS-B updates; or

(b) FLTID entered via cockpit interface and downlinked in ADS-B data (i.e. I021/170 in Asterix CAT 21) is a [3] mismatch with aircraft callsign in the ATS Flight Plan.

 (c) ICAO Aircraft Address (i.e. I021/080) is inconsistent with the flight planned registration (REG/) based on each state's ICAO Aircraft Address allocation methodology.

5.2 Managing & Processing deficiencies

Whether detected by ATC or not, all deficiencies should trigger :

- Systematic recording of the details of each occurrence such as date/time of occurrence, ICAO aircraft address and flight plan information should be obtained. Graphical representations such as screen capture of radar and ADS-B history tracks, graphs of NUC/NIC value changes versus time and deviation between radar and ADS-B tracks along the flight journey would be desirable. Examples of typical graphical representations are shown below:

---
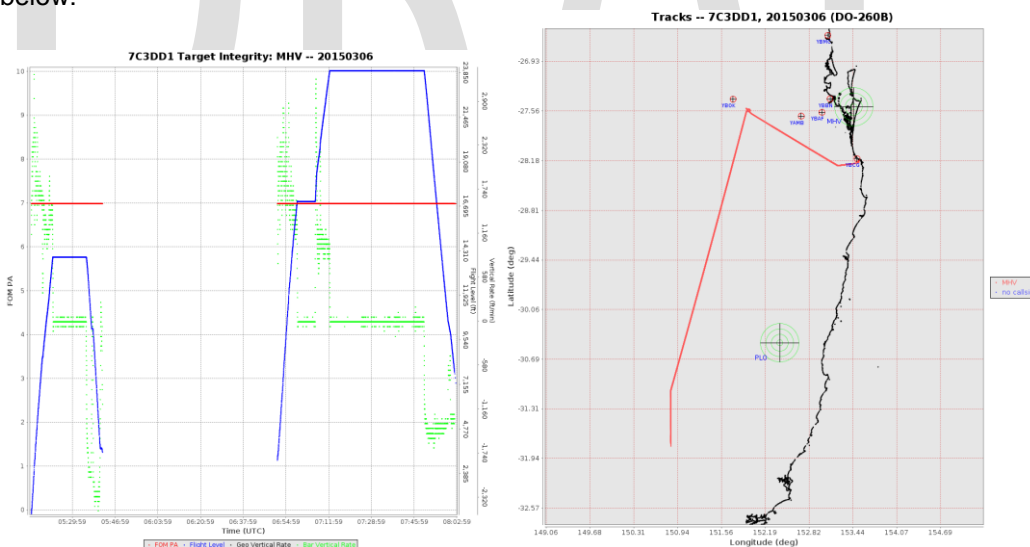
[2] For example, the deviation between ADS-B and radar tracks could be set to 1NM in accordance with ICAO Circular 326 defining position integrity (0.5NM < HPL < 1NM) for 3NM aircraft separation use, on assumption that radar targets are close to actual aircraft position. The values of ADS-B quality indicators (NUC, NAC, SIL, NIC) could be chosen based on the definition in ICAO Circular 326 on Position Accuracy and Position Integrity for 3NM aircraft separation minimum. A threshold of 5% is initially set to exclude aircraft only exhibiting occasional problems during their flight journey. The above criteria should be made configurable to allow fine-turning in future. Evaluation of ADS-B vs radar may alternatively expose radar calibration issues requiring further investigation.

[3] A missing Flight ID, or a Flight ID with only "spaces" should not be considered a mismatch.

- Systematic technical analysis of each detected issue using ADS-B recorded data, to ensure that all detected issues are examined and addressed. Typically this will need
    - systems to record ADS-B data, replay ADS-B data and analyze ADS-B data
    - staff and procedures to analyze each report
    - A database system to manage the status of each event and to store the results of each analysis

- Procedures to support engagement with operators (domestic & foreign), regulators, other ANSPs, Airframe OEMs and avionics vendors to ensure that each issue is investigated adequately and maximize the probability that the root cause of the event is determined. The procedures could include
    - Data collection procedures
    - Telephone & email contact details
    - Mechanisms for reporting, as appropriate, to the APRD database