



ICAO

International Civil Aviation Organization

**Fifth Meeting of the Surveillance Implementation
Coordination Group (SURICG/5)**

Web-conference, 22 – 24 September 2020

Agenda Item 5: Update on surveillance activities and explore potential cooperation opportunities

a) States/Administrations

RECENT ADS-B AVIONICS ISSUES OBSERVED IN THE UNITED STATES

(Presented by United States/Federal Aviation Administration)

SUMMARY

This paper provides a description of recent ADS-B avionics issues observed in the U.S. with DO-260B/ED-102A systems.

1. INTRODUCTION/BACKGROUND

1.1 The FAA monitors all ADS-B Version 2 information received in all airspace covered by FAA-contracted ADS-B ground stations via a tool called the ADS-B Performance Monitor (APM).

1.2 This paper describes issues observed by the FAA for 1090ES systems via the APM. This paper does not include issues with UAT (978 MHz) ADS-B systems, since such systems are not used by other ICAO States.

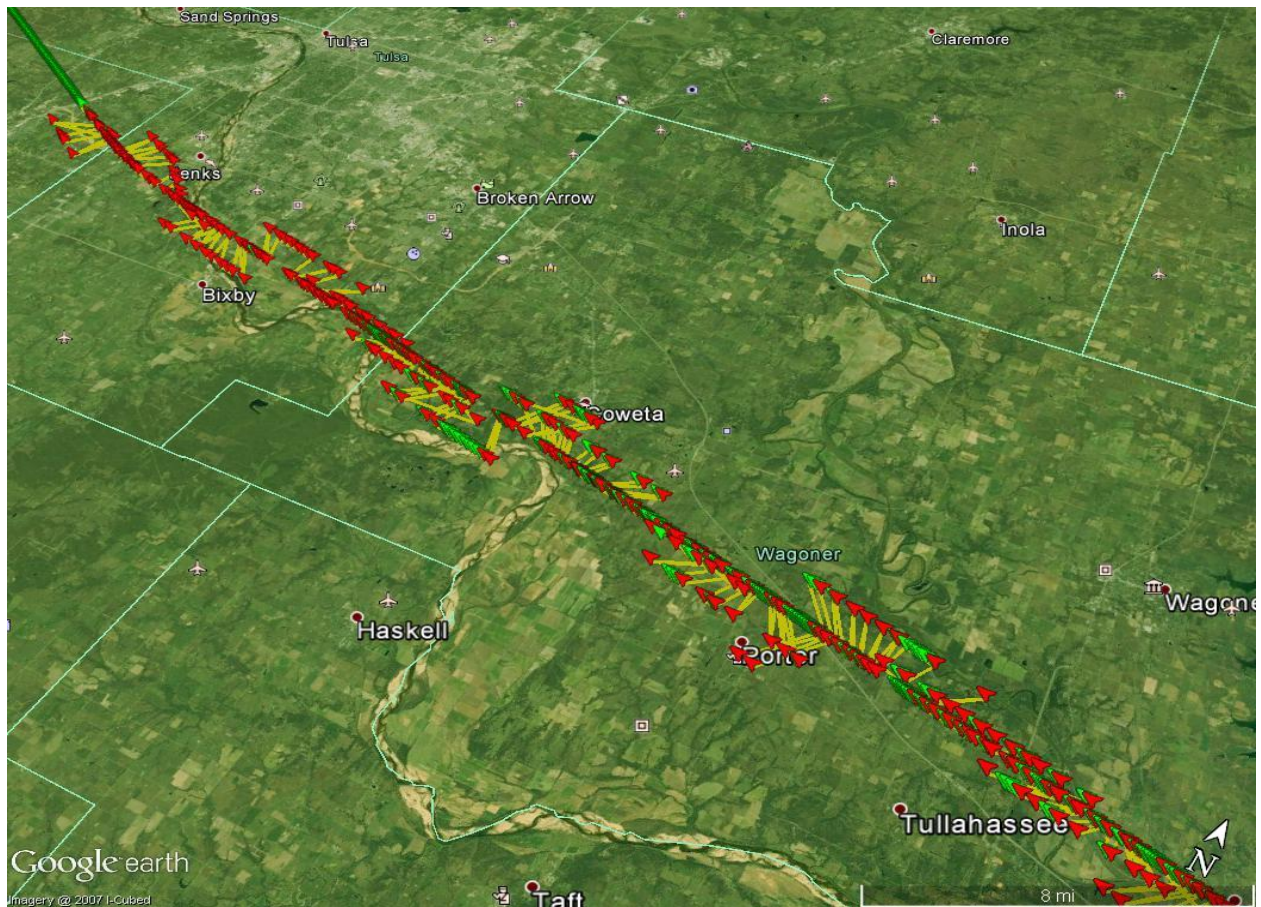
2. DISCUSSION

2.1 Embraer 17x track jumping issue.

In early 2018, FAA monitoring observed ADS-B position jumping by an Embraer 175 regional jet equipped with Honeywell Version 2 transponders. As illustrated in the below graphic, the APM will designate green for compliant ADS-B Data and red for noncompliant ADS-B Data. The graphic is from a flight on 17 Jan 2018; the aircraft was flying from right to left. The transponders were removed from this aircraft, and provided to Honeywell engineering for bench testing.

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This was not the FAA’s first observation of this problem with an Embraer E17x regional jet. In late October 2016, a Skywest E175 was detected exhibiting similar “track jumping” behaviour. FAA Air Traffic personnel notified FAA Flight Standards, who then contacted the operator and ordered replacement of the aircraft’s transponders. Unfortunately, these transponders were returned to a service center without notification to Honeywell engineering, and no “root cause” testing was performed. In late July and early August 2017, FAA detected two E175 aircraft from two different airlines exhibiting “track jumping” behaviour. FAA notified both operators and the transponders were removed from the respective aircraft and sent to Honeywell engineering for additional testing. Bench testing revealed no apparent issues.

In all but one of the observed cases, the issue has never recurred on the same aircraft after the transponders were removed. Bench testing of the removed transponders has revealed no faults or anomalies to date.

The FAA learned from communications with Embraer that the most recent events detected by FAA generated an “ADS-B NOT AVAIL” Crew Alerting System (CAS) message. When flight crews report this message, airline maintenance replaces the transponder(s), which resolves the problem. To date, this has consistently occurred before FAA monitoring detected the problem and FAA personnel could engage with the airline. Occurrence of this issue is rare, as FAA did not observe an occurrence of this issue between November 2018 and March 2020, even though over 500 E17x aircraft were operated daily in the U.S. during this period. The root cause for this issue remains unknown.

2.2 B787 DO-260B/ED-102A track extrapolation issue

This ADS-B V2 issue was first observed by the U.S. in June 2016, during a track extrapolation event on downwind/base/final on approach to KLAX. In response to this issue, and other ADS-B avionics problems which presented hazardously misleading information to ATC, the FAA implemented a No Services Aircraft List (NSAL) in 2017. See: <https://www.federalregister.gov/documents/2017/12/20/2017-27202/change-to-automatic-dependent-surveillance-broadcast-services>

On 5 Nov 2018, FAA issued Airworthiness Directive [2017-NM-118-AD](#), effective 10 Dec 2018, which requires application of Boeing SB B787-81205-SB340036-00 by 10 Dec 2019. EASA has invoked this AD for States under its jurisdiction.

This year, the FAA has been working actively through its international field representatives to engage with State Regulators regarding the B787 aircraft which remain on the NSAL. Aircraft on the NSAL, including B787 aircraft, do not comply with 14 CFR 91.225 (the U.S. ADS B mandate).

As of 9 Sep 2020, 32 B787 aircraft were on the NSAL; 18 of these aircraft have been detected within U.S. ADS-B coverage during 2020. The FAA is coordinating with State Regulators who have operators with B787 aircraft on the NSAL

B787 operators who have applied Boeing Service Bulletin B787-81205-SB340036-00 to their aircraft must have their cognizant State regulator notify the FAA to remove them from the FAA NSAL. Such notification, including the ICAO aircraft addresses of the specific aircraft to which Boeing SB B787-81205-SB340036-00 was applied, should be sent to Brent.R.Elliott@faa.gov with a copy to Alejandro.Rodriguez@faa.gov and doug.arbuckle@faa.gov.

2.3 B787 NACv=0 issue.

In March 2019, FAA noted certain B787s exhibiting a relatively high percentage of NACv =0 reports. FAA's data indicated that these failures were intermittent; FAA ruled out GPS testing or a GPS constellation issue as the cause.

The B787's original Honeywell Integrated Navigation Receiver (INR) did not provide an HFOMv output, therefore B787 aircraft prior to line number 442 had NACv=1 set as a static value. Starting with line number 442 (June 2016), Honeywell INR P/N 940-2001-008 was introduced, which has an HFOMv output. Boeing investigations revealed a software flaw in the ISSPU that causes an erroneous NACv=0 reporting condition on B787s equipped with a mixed set of Honeywell INR part numbers. This condition occurs when the ISSPU switches between an INR with an HFOMv output and an INR without an HFOMv output. The erroneous NACv=0 condition clears at the next power up of the ISSPU.

Whenever an aircraft is reporting NACv=0, its ADS-B data is not being used by FAA ATC and the aircraft is not complying with 14 CFR 91.227; this has an FAA ATC operational impact for B787s operating in airspace where ADS-B is the only surveillance source.

Also, ADS-B-In systems compliant with [E]TSO-C195b may not display an aircraft broadcasting NACv=0, since the [E]TSO prohibits display of such aircraft unless optional requirements are implemented to allow target aircraft display. Additionally, the NACv=0 condition will prevent the subject aircraft from being a reference aircraft in an ITP maneuver, or otherwise the subject of various other ADS-B-In applications defined in [E]TSO-C195b.

Boeing has issued guidance urging B787 operators to not intermix INR P/N 940-2001-002 or -004 (which do not output HFOMv) with INR P/N 940-2001-008 (which does output HFOMv) until the

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ISSPU software has been updated per an available Boeing Service Bulletin. This guidance was provided in Boeing Fleet Team Digest 787-FTD-34-19005 (dated 21 Dec 2019).

As of 9-Aug-2020, FAA has observed no significant occurrences of this issue within U.S. ADS-B coverage during the prior two months. Therefore, the FAA will not further report on this issue in the future.

3. CONCLUSION

3.1 The meeting is invited:

- a) to note the information about the various avionics issues described; and
- b) discuss these matters as appropriate.
