

Highlights of Sur Panel – Aeronautical Surveillance Working Group (Day 1 to 3)

Clarification on BDS 6,2 for Doc 9871

The BDS 6,2 (data for ADS-B for DO-260A and above) provides, *inter alia*:

- a) Target altitude type (I.e. MCP/FCU or FMS);
- b) Target altitude;
- c) Target heading

The change proposal aims to clarify that, as long as MCP/FCU data is available, BDS 6,2 shall contain the MCP/FCU data. FMS data will only be provided only when MCP/FCU is not available or not valid. The same priority is applies for target heading.

The MCP/FCU information is useful to check whether the pilot entered the cleared level/heading correctly. 

Common Clock Architecture (Doc 9924)

- ENRI previously did trials using radio-over-fibre technology. Multilateration was one of the applications that could use the technology. The received RF signals are sent to a central decoder.
- One major benefit is that when part of the signal received by an m-lat station is not decodable, the central decoder may attempt to decode the signal, based on signals received by other stations, thus increasing the probability of detection.
- Such attempt to decode signal would not be possible using the traditional decoding method whereby the signals are decoded at individual m-lat stations.
- Guidance material is proposed in Doc 9924

Update to increase of squitter rate (A10V4)

The MOPS provides a cap of the number of ADS-B messages that the transponder can broadcast. In view of the upcoming version 3 avionics, there will be more messages type which will increase the number of messages being broadcasted. There is also a need to ensure that 1090MHz is not congested, hence version 3 transponders will not reply to Mode A/C/S all-call.

	Version 0,1,2	Version 3
Max average over 60s without emergency	6.2 messages/s	6.7 messages/s
Max per second without emergency	11 messages/s	14 messages/s
Max average over 60s with emergency	7.4 messages/s	9.2 messages/s
Max per second with emergency	11 messages/s	18 messages/s

Introduction of ACAS Xa Xo (Doc 9863)

ACAS X is a new ACAS concept, able to use active and passive surveillance sources and issuing optimized resolution advisories. It aims at reducing unnecessary alerts, fit with future airspace procedures with reduced separations, and supporting new user classes such as remotely piloted aircraft. The first ACAS X variant, ACAS Xa, was standardized in 2018, and provide collision avoidance to the same class of aircraft that can benefit from TCAS v7.1. Both ACAS X and TCAS v7.1 are considered ACAS II systems.

Changes to Annex 10 vol IV was approved at the last Surveillance Panel meeting. The ACAS manual will be changed accordingly.

1090MHz Future utilization (reduce congestion)

- To reduce 1090MHz, there were a list of problem to resolve. The top problems identified are: use of Mode A/C; too high or too low all-call replies; and unavailability of Mode S transponder thus causing excessive interrogations.
- Others include: too many replies by Mode S transponders; uncoordinated or excessive use of reduced capability devices; unnecessary (re-) extraction of BDS registers; high number of all-call replies (DF11) unclustered operations of radar etc

Development of Version 3 transponder

- Among various subjects (~50), these are some of the subjects being reviewed for the new generation transponder.

Subject	Description
Basic Level 2 transponder	This defines the transponder where many advanced but unused features were removed from its definition. This reduces wastage.
MET data requirements for 1090ES	Weather data used to be not available in existing ADS-B. Weather data will be included in the new generation ADS-B as optional messages. Temp will be default msg.
Changes in 1090ES reporting of Geometric Altitude data	Geometric altitude used to be reported using two messages. The first message will report the barometric altitude, the second will report the difference between geometric altitude and the barometric altitude. In the new transponder, geometric altitude can be obtained in a single message.
Aircraft reporting ADS-B airborne position message when on the ground	Existing transponders rely on strut switch (i.e. weight-on-wheels) or pilot action to determine whether the aircraft is in the air or on the ground. The new transponder aims to include an algorithm such as speed to determine whether aircraft is in the air.
Requirements for Commercial Space and Hypersonic Aircraft Operation (High Velocity Messages)	Current ADS-B is not able to report velocities of space vehicles or hypersonic vehicles. The new transponder will have higher reporting limits.
ADS-B All Zero Latitude and Longitude in Position Squitter	It was agreed that an “all-zero lat and lon” position will not be processed. This is to reduce the possibility of broadcast during error. It is noted that if the aircraft reaches a location (west of Africa) where the lat-lon is all zero, there will not be an ADS-B broadcast.

Proposed Pfa for allocation of additional 24-bit aircraft addresses

24-bit addresses were allocated in blocks of

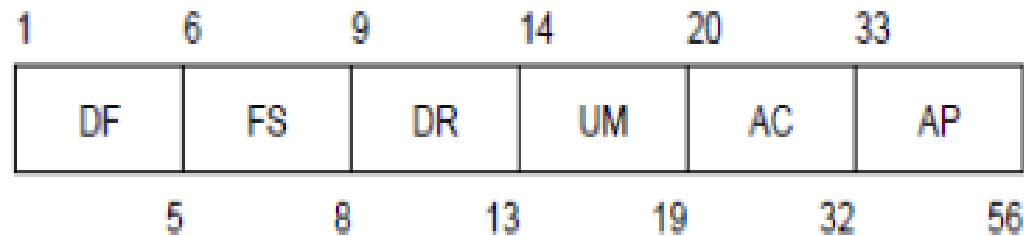
- A)1,048,576;
- B)262,144;
- C)32,768;
- D)4,096;
- E)1,024.

As a result of a few States requesting for additional 24-bit addresses, the ASWG studied various options and exploring the possibility to increase the allocation of 24-bit aircraft addresses to at least 2,048 for each State. Additional allocations may be reviewed on a case-per-case basis.

Proposed Pfa for correction of the Metric AC altitude Field Encoding

- According to the ICAO Annex 10 Vol IV, the downlink message for the altitude reply is as follows

3.1.2.6.5 *SURVEILLANCE ALTITUDE REPLY, DOWNLINK FORMAT 4*



- There were descriptions of the how the AC field is populated. In particular, when the altitude is reported in metric units, bit 26 will be set to 1. The 12-bit field represented by ‘bits 20 to 25 and 27 to 31’ shall be reserved for encoding altitude in metric units. The expression seemed to only cover 11 bits instead of 12.
- The text is hence revised to state ‘bits 20 to 25 and 27 to 32’, so that the text is consistent.

Assignment of II Codes for Multilateration and ADS-B

- Two year ago, the Mode S DAPS WG discussed the possibility of using II=0 for ADS-B and multilateration, since there is no lockout protocol involved. However, it was found that the Annex 10 volume IV do specify strict use of II=0, and seemed to imply that II=0 cannot be used for multilateration. In actual fact, its common to use II=0 in multilateration.
- The Mode S DAPS WG thus coordinated with ASWG to study and revise the text for clarity. Based on the draft text, interrogators that do not use Mode S all-call interrogations, all-call lockout protocol, or multisite datalink protocol can use any interrogator code without a need for coordination with neighbouring systems.
- It is also noted that discrete codes may be used for special purposes such as study on the RF generation. Some additional text will be proposed to provide more info.

Unwanted power

- It was found that some newer type transmitter has relatively high continuous wave before and after the data pulses. This makes the ground receiver difficult to decode the data pulse. It was noted that there were no guidance material on such continuous wave.
- RCTA and Eurocae are working on the necessary standards to limit such unwanted power to 50dB below pulse peak. ASWG is also preparing the necessary changes to the ICAO documents.

