



International Civil Aviation Organization

**The Third Meeting of Automatic Dependent Surveillance – Broadcast (ADS-B)
Study and Implementation Task Force (ADS-B TF/3)**

Bangkok, 23-25 March 2005

Agenda Item 5: Review result of ADS-B Working Group Meeting

AIRBUS TRANSPONDER STATUS

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SUMMARY

Some concerns have been raised about the ability for Airbus transponders to provide the integrity parameter NUCp, coded by HIL value to ground stations. This paper gives the current Airbus transponder status, and the principle of encoding NUCp value in BDS 0.5 (Airborne position) and BDS 0.6 (Surface position).

This paper concludes that Airbus Enhanced Surveillance wiring provisions provide HIL parameters to the transponders, that ACSS transponder –10005 mod A uniquely uses HIL to compute NUCp, and that the Service Bulletin for this modification is FOC (Free Of Charge) to customers that have a –10005 transponder. To continue supporting ADS-B programmes, Airbus is asking other vendors to provide a statement on their transponders functionality.

1. Airbus certification status

To comply with Eurocontrol requirements, in 2003 Airbus has certified three new mode S transponders, capable of ELS (Elementary Surveillance), EHS (Enhanced Surveillance) and 1090ES (Extended Squitter, initial implementation of ADS-B out).

These three mode S transponders with ELS/EHS/ES capability are:

- ACSS XS-950, P/N 7517800-10005
- Honeywell TRA-67A, P/N 066-01127-1402
- Collins TPR-901, P/N 822-1338-021

Basically, Airbus aircraft are equipped with Honeywell transponder P/N: 066-01127–1101, which is not ELS-EHS capable. However, through the RFC process, new Airbus customers have the possibility to install on their aircraft an ELS-EHS capable transponder from the list above. This RFC is free of charge for customers, and the installation of a new transponder capable of Extended Squitter does not imply additional costs to customers.

The wiring to activate EHS and 1090 Extended Squitter is available for production aircraft (through RFC – Request For Change- process) and for retrofit solution through an Airbus Service Bulletin. No pin programming is necessary to activate both EHS and 1090ES functions. The wiring provisions are chargeable to airlines, as it is an Airbus option, at a cost of USD 2700.

2. Airbus transponder architecture for transmission of HIL parameter

On Airbus aircraft, the HIL (Horizontal Integrity Limit) parameter is provided by the GPS (MMR – Multi Mode Receiver- or GPSSU –GPS on Airbus aircraft) through the IRS (Inertial Reference System) bus. Indeed, current transponders are not able to receive information directly from the GPS system, so the IRS is used as a “mail box” for GPS parameters (position, velocity, and HIL). The HIL parameter is transmitted on label 130 on this IRS bus (between IRS and transponder), and is used in the transponder to compute the value of NUC_p (sent in BDS 0.5 and 0.6). All types of GPS installed on Airbus aircraft can transmit the HIL parameter on label 130. All Airbus EHS architectures provide HIL parameters to transponders.

If the aircraft is not equipped with GPS, or if the wiring provisions for EHS/ES are not installed, then the HIL value will not be provided to the transponder. The type code field will then be filled by NUC_p = 0 in BDS 0.5 (in flight), and by NUC_p = 6 in BDS 0.6 (on ground).

3. Transponder encoding of NUC_p (Navigation Uncertainty Category for Position)

During the initial certification process at Airbus, the transponder P/N: 7517800–10005 from ACSS encoded the value of NUC_p based on HFOM parameter (accuracy only). For Airservices Australia purposes, integrity rather than accuracy is required. Therefore a software modification was requested from the vendor.

Airbus has asked all its suppliers to provide the internal logic for encoding the NUC_p value on current RTCA/DO-260 transponders to verify their status with regards to the coming Australian mandate.

ACSS

Doug Guetter from ACSS indicates:

QUOTE

“The XS-950 -10005A transponder sets the “Type Code” based strictly on the received value of HIL (Label 130). For airborne position extended squitters (BDS 0,5), if Label 130 is not received, the “Type Code” will be set to 18. This “TypeCode” = 18 corresponds to a NUC_p= 0. For surface position extended squitters (BDS 0,6), if Label 130 is not received, the “Type Code” will be set to 8. This “Type Code” = 8 corresponds to a NUC_p = 6. This “Type Code” / NUC_p translation is illustrated in Section 2.3.1 of Appendix to Chapter 5, Part I, Volume III, ICAO Annex 10 (Amendment 77). It can also be found in Table 2-11 of RTCA/DO-260 and RTCA/DO-260A. In the XS-950 -10005A transponder, for both airborne and surface position extended squitters, Label 247 [HFOM] is not processed or used.”

UNQUOTE

Honeywell

Honeywell was requested to indicate how the transponder TRA-67A P/N 066-01127-1402, ehs capable, encoded NUC_p value. The answer from Tam Chun from Honeywell is:

QUOTE

“The answer to your question is that we follow Arinc 718A. Thus, for calculating the NUC_p value used in BDS 05 and 06, if HIL label 130 is unavailable, then the transponder will use HFOM label 274.”

UNQUOTE

Collins

Rockwell Collins also answered to Airbus query by indicating that the transponder TPR-901 822-1338-021 uses HIL (label 130) as an initial source for computation of NUCp, and HFOM (label 274) if HIL is not available.

Honeywell and Collins transponders have the same behaviour concerning the encoding of NUCp. HIL is the primary source, HFOM is used if HIL is not available. This is compliant with Arinc 718A and OACI, annex 10, amendment 77.

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Note : In DO-260A, to avoid confusion the NUCp parameter in the BDS has been replaced by NIC parameter (Navigation Integrity Category). It is clearly indicated that the NIC value shall be encoded by the value of HIL available from GPS (label 130). DO-260A has been written to keep backward compatibility with DO-260 transponders.

4. Application of mod A on ACSS transponders.

It has been agreed between Airbus and ACSS that the software modification shall be free of charge for airlines already equipped with -10005 transponders.

Desi Stelling from ACSS has indicated that:

QUOTE

“[ACSS has] very clear direction given to [its] order administration to provide this s/w 'free of charge' to Airbus customers that took delivery of the -10005 initially. This is in accordance with the agreement as indicated in the service bulletin [ref 8002827-001].

Some customers believe that since they purchased an A320 6 years ago with a -10002, they are entitled to the upgrade to -10005 A, free of charge. In addition, some Airbus customers also operate Boeing aircraft and they feel their Boeing -10004 should be upgraded to -10005 A, free of charge.”

UNQUOTE

For operators that took delivery of their aircraft and have -10005 already installed, the modification to apply the mod A is FOC. For the change from P/N -10002 to -10005A, the change is chargeable to customer, in accordance with commercial agreement. P/N -10005A provides new functionalities compared to former -10002 version, that is why this change is chargeable to airlines (and is also covered by an Airbus Service Bulletin as a P/N change).
