

RTCA Special Committee 186, Working Group 3

ADS-B 1090ES MOPS Maintenance

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**Proposals for Inserting Text from the STP MOPS
into the Draft of DO-260B
Revision 1**

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Summary
This Working Paper addresses Action Item 28-06 whereby the matrix produced by the SC-186 STP MOPS Ad Hoc Subgroup was reviewed for identified paragraphs that should be carried forward into the drafts of the updated Link MOPS.

2.2.4.1.1.3 Conditions for Limiting the Reported $HEPU_{STP}$

The STP **shall** (R2.15.) determine the values of $HEPU_{STP}$ reported to the ADS-B transmit subsystem using $HEPU_{UL}$ as determined above, where $HEPU_{STP}=HEPU_{UL}$ as limited by the following:

In the case of a time synchronized installation, position latency is compensated with a residual latency error not greater than 100 ms. In this case, no accuracy limiting is applied.

In an unsynchronized installation, where the residual time bias in the latency compensated position exceeds 100 mS, $HEPU_{STP}$ **shall** (R2.16.) be limited as follows:

- a. If ground speed > 60 kts or unknown, limit $HEPU_{STP}$ to greater than 92.6 m (i.e., limit NAC_p to 7 or below).
- b. If ground speed \leq 60 kts, limit $HEPU_{STP}$ to greater than 10 m (i.e., limit $NAC_p \leq$ 9).

Notes:

1. *The above default limiting assumes a maximum transmit latency error from source to time of applicability of transmitted position of not more than 600 ms (0.6 s) and a maximum ground speed of no greater than 600 knots when airborne.*
2. *The MOPS for Extended Squitter (DO-260A, Figure 2-15)) includes an explicit assumption that the state vector information will arrive at the input to the ADS-B transmit function not later than 200 ms after the Time of Applicability. Subsequently it became evident that this assumption was not correct, and the amount of time that may have passed (before the data arrives at ADS-B) can be as much as 600 ms. Although that increased amount of delay is still considered to be tolerable, there is a remaining concern that the limited scope of ADS-B and the limited scope of STP do not allow for any requirements to be set for the total delay. Additional steps must be taken to control the total delay between the position source and the output of the transmit time of applicability.*
3. *An installation is said to be synchronized or unsynchronized according to the way position time of applicability information is provided from the source to the ADS-B transmit subsystem and used by the ADS-B transmit subsystem to compensate the reported position. The preferred condition is "synchronized", in which case the source provides analog or digital time marks to accurately indicate the times when the state vector information is applicable. If these time marks are provided by the source and used by the ADS-B transmit subsystem to accurately compensate the position to the reported time of applicability in the ADS-B transmit messages, the installation is said to be synchronized. Otherwise the installation is unsynchronized.*

4. For an unsynchronized installation, the ADS-B transmit system either: 1) infers the time of applicability of the state data as the time that the information was received from the source with the assumption that not much delay has occurred between time of applicability of the state data and the arrival of the data at the interface to the ADS-B transmit subsystem, or 2) infers the time of applicability of the state data knowing when the state data was received and the expected latency of the state data.

5. For more information on synchronization, see Appendix C.

Ground speed limitation on NAC reporting supposed to be accounted for by latency requirements. Not sure of this.

2.2.4.2.1.2.2.1 Changes already made to DO-260B in section 2.2.3.2.6.1.5, removal of tables 2-27 and 2-28. Does this address issue?

2.2.4.4.1 And 2.2.4.4.2 SIL encoding and requirements changes made, undoubtedly different from STP MOPS.

2.2.4.4.3 Providing SIL to the ADS-B Transmit Subsystem

Once, the SIL value has been determined, it **shall** (R2.74.) be delivered to the interface with the ADS-B transmit subsystem in the form of a SIL_{STP} format.

Notes: *Currently, there is no industry specification that defines how SIL is to be provided to the ADS-B Transmit Subsystem. That means that appropriate methods will have to be negotiated and agreed to provide SIL to the ADS-B Transmit Subsystem by one of the following preferred method:*

- a. *Define appropriate label and bit assignments to provide SIL via digital information transfer system, e.g., ARINC-429, bus.*
- b. *Define appropriate data transfer via configuration management established via methods similar to Aircraft Personality Module (APM), or*
- c. *Define appropriate data transfer of SIL information via discrete inputs to the ADS-B transmit subsystem.*

There do not appear to be words comparable to these in the MOPS.

2.2.4.5 Barometric Altitude Quality (BAQ) Level

The Barometric Altitude Quality level, BAQ, is defined to indicate the accuracy quality of the reported barometric pressure altitude.

For systems compliant with these MOPS, BAQ **shall** (R2.75.) be reported as 0 (UNKNOWN).

Note: *Future versions of these MOPS may define the requirements for reporting higher quality BAQ values. Possible future encodings for BAQ are defined in the ASA MASPS (RTCA/DO-289).*

DO-260B has reference to “BAQ” as not required, but doesn’t appear to define it.

2.2.4.7.1 Horizontal Position and Navigation Data Sources

The STP function **shall** (R2.77.) use the input source that results in the best HPL_{STP} value. Once selected, the selected navigation source **shall** (R2.78.) be used for at least 10 seconds. After the 10 second period, the STP function **shall** (R2.79.) select a new input data source when the improvement in the HPL_{STP} value between the sources is at least 0.05 NM.

Note: *The best HPL_{STP} means the smallest radius of containment.*

In the event that HPL_{STP} is UNKNOWN the following source selection priority **shall** (R2.80.) be used:

- a. Selected GNSS (Note 1)—Primary Input Data Source
- b. Alternate GNSS Input Data Source
- c. Selected Guidance Coupled RNP FMS—Alternate Input Data Source
- d. Other (Non Coupled e.g.: RNP FMS, Selected Guidance Coupled Non-RNP FMS, IRS, DME-DME, E-LORAN etc.)—Alternate Input Data Source

Notes:

1. *The Selected GNSS is the GNSS source that has been selected by the flight crew as the source for position and directional data. The determination of the Selected GNSS is performed externally to the STP function usually via a manual switch in the flight deck.*

2. *The Selected Guidance Coupled RNP FMS is the FMS that is providing the guidance data used for the aircraft flight profile. The determination of the Selected Guidance Coupled RNP FMS is performed externally to the STP function usually via a manual switch in the flight deck. The STP function will not automatically switch between multiple FMS input data sources.*

The STP function **shall** (R2.81.) use the selected data source for all the horizontal position and navigation data which includes latitude, longitude, horizontal integrity data (HIL/RNP/ANP), ground speed, true track angle, N/S velocity, E/W velocity. Mixing of data (e.g., use latitude from GNSS and longitude from FMS) is prohibited between the possible input data sources. If the position data from a navigation source is not valid, then no data from that navigation source **shall** (R2.82.) be accepted.

Cannot find words in DO-260B that detail the selection of source data from among choices as above. Same is true for altitude sources and vertical rate sources.
