

RTCA Special Committee 186

Working Group 3

ADS-B 1090ES MOPS Corrigenda

Response to and Proposal for Resolution of Action Item 32-02

**Presented by: Tom Pagano, FAA
and Gary Furr, Engility Corp**

Summary

This working paper addresses a response to and makes a proposal for the resolution of Action Item 32-02 as accepted by Tom Pagano and Gary Furr.

1.0 Introduction

In Working Paper 1090-WP32-04, in sub-bullets #4 and #5, Raymond Bayh suggested clarification for the timeout and termination of both the Target State and Status (TSS), and the Aircraft Operational Status Messages.

During the Teleconference held jointly by RTCA SC-186 WG-3 and EUROCAE WG-51, SG-1 on 17 May 2011, there was considerable discussion surrounding the proposed clarifications. There were some issues discussed related to §2.2.3.3.1.4.1, wherein it is stated that *“the Target State and Status Message shall be initiated only when the aircraft is airborne and when target state information is available and valid as a minimum.”* This requirement text remained unchanged from DO-260A, except for the removal of the expression *“vertical or horizontal”* as it related to target state information, even though the content of the Target State and Status Message completely changed between DO-260A and DO-260B when the required Message transmission switched between Subtype=0 in DO-260A to Subtype=1 in DO-260B.

The proposed clarification in 1090-WP32-04 was to add text, or a Note, to clarify that the TSS does not timeout or terminate until, and/or unless the Airborne Position Message is terminated. Specific discussion around this point again related to the fact that some information in the TSS may still be valid even if the transmission of the Airborne Position Message has terminated.

There was additional discussion related to the fact that §2.2.3.3.1.4.1.b sets forth a requirement for terminating the TSS if the required target state information becomes not available or invalid. This represents a second condition for terminating a TSS Message and one that is not accounted for in the termination section §2.2.3.3.2.12.e.

During discussion on the timeout and termination of the Operational Status Messages, it was also pointed out that in §2.2.3.3.1.4.2.a, there is a requirement for initiating the broadcast of an Operational Status Message (Type=31, Subtype=0) *“when aircraft operational status information is valid and when in the airborne state.”* In §2.2.3.3.1.4.2.b there is a similar requirement for initiating the broadcast of an Operational Status Message (Type=31, Subtype=1) *“when aircraft operational status information is valid and when in the ON-Ground state.”* The concern with these requirements relates to recent changes made in the Transponder MOPS, RTCA DO-181E and EUROCAE ED-73E wherein the condition of the aircraft could be commanded by the ground using the TCS command to broadcast surface type messages when the transponder could still be in the “airborne state.”

2.0 Analysis

The objective of Action Item 32-02 was to offer a clarifying Note(s) to be placed in one or more locations in order to help with the understanding of the connections between the requirements for initiation, broadcasting, data timeout and message termination of both of the Target State and Status, and the Aircraft Operational Status Messages.

Upon analysis of this set of needs, several things become apparent:

- A) The paragraph structure of DO-260, DO-260A and DO-260B in the area of §2.2.3.3 has never been easy to sort out since §2.2.3.3.1 has always referred to transmission rates for “Transponder-Based Transmitters,” while §2.2.3.3.2 has always referred to transmission rates for “Stand-Alone” Transmitters.

In the beginning, in DO-260, §2.2.3.3.1 the only requirements were those transmission rates that were tied directly to DO-181() and ED-73(), while §2.2.3.3.2 contained separate paragraphs for each respective ADS-B Message, along with paragraphs for “Power-on Initialization” and “Startup.”

With DO-260A, §2.2.3.3.1 introduced new subparagraphs explaining the broadcast of Event-Driven Messages, which at that time included the Target State and Status, the Aircraft Operational Status and the Extended Squitter Aircraft Status Messages, with the associated Scheduling Function, even though all of those transmission rates applied equally to a “Stand-Alone” Transmitter as outlined in subparagraphs of §2.2.3.3.2.

- B) In DO-260, DO-260A and DO-260B, the paragraph title at §2.2.3.3.2.11 for “ADS-B Message Timeout” has been somewhat misleading in that it clearly relates to the timeout of data within each Message, whereas the subparagraphs under §2.2.3.3.2.12 relate specifically to the actual termination of individual ADS-B Message transmissions.
- C) During the development of DO-260B changes, it was discussed and agreed to by the Joint Meetings of WG-3 and SG-1 that the termination of the broadcasts of the TSS would be tied to the broadcast of the Airborne Position Message, while the termination of the broadcasts of the Operational Status Message would be tied to the broadcasts of respectively the Airborne, or Surface Position Messages. To attempt to change that relationship now would constitute a major change to requirements and is not appropriate for an errata publication. Similarly, we find no inconsistency in the requirement at §2.2.3.3.2.1.2.a requiring that “*each message shall be initiated individually and independently of the other messages*” and the requirements above that tie the termination of the TSS and Operational Status to the terminations of the respective Position Messages.
- D) In DO-260, DO-260A and DO-260B references to “airborne state or condition” and/or “On-Ground state or condition” always intuitively meant that the respective airborne or surface message formats were being broadcast. With the recent changes in DO-181E and ED-73E, and the corresponding ICAO Annex 10 Vol. IV SARPs changes, it is possible for the transponder to be in the “airborne state” and be commanded to broadcast Surface Message formats. This recent change now requires that a clarification be offered in the MOPS.

3.0 Proposed Clarifications

- (A) In RTCA DO-260B and EUROCAE ED-102A, section §2.2.3.3.1.4.1.a, and also in the “Purpose/Introduction” section of §2.4.3.3.1.4.1, in order to clarify the target state information that is required to be available and valid in order to start transmission of the Target State and Status, insert the following *Note*:

Note: Target state information includes both Selected Altitude and Selected Heading data. Because only one of these may actually be available in any given installation, then in order to initiate broadcast of the Target State and Status (Subtype=1) Message, either the Selected Altitude or the Selected Heading data must be available and valid as a minimum.

- (B) In RTCA DO-260B and EUROCAE ED-102A, in section §2.2.3.3.1.4.2.a, add a clarifying expression on to the end of subparagraph “a” as follows:
- a. Airborne Aircraft Operational Status Messages (TYPE=31, Subtype=0) shall be broadcast at the rates given in the following subparagraphs when aircraft operational status information is valid and when in the airborne state (i.e., when airborne message formats are being broadcast);
- (C) In RTCA DO-260B and EUROCAE ED-102A, in section §2.2.3.3.1.4.2.b, add a clarifying expression on to the end of subparagraph “b” as follows:
- b. Surface Aircraft Operational Status Messages (TYPE=31, Subtype=1) shall be broadcast at the rates given in the following subparagraphs when aircraft operational status information is valid and when in the ON-Ground state (i.e., when surface message formats are being broadcast);
- (D) In RTCA DO-260B and EUROCAE ED-102A, in section §2.2.3.3.2.11, in order to clarify the intended purpose of this subsection, add the following *Note* #3:
3. All references in this subsection relate to the treatment of data subfields in specific ADS-B Messages after the data in that subfield has not been refreshed for some specified period of time, known as a “timeout.” The requirements for terminating the actual transmission of ADS-B Messages are specified separately in the subparagraphs of §2.2.3.3.2.12.
- (E) In RTCA DO-260B, in section §2.2.3.3.2.12, in order to clarify the intended purpose of this subsection, add a *Note* immediately after the section heading and prior to sub-bullet “a” as follows:
- Note:* The subsections below contain requirements for terminating transmission of ADS-B Messages. These requirements are in response to data timeout conditions or in response to terminating transmission of other ADS-B Messages. Requirements in the subparagraphs of §2.2.3.3.2.11 relate to the treatment of data subfields in specific ADS-B Messages after the data in that subfield has not been refreshed for some specified period of time, known as a “timeout.”
- (F) In RTCA DO-260B and EUROCAE ED-102A, in section §2.2.3.3.2.12.e, in order to clarify the fact that there are actually two defined requirements for terminating the broadcast of Target State and Status Messages, replace the existing *Note* below sub-bullet “e” with the following:
- Note:* The broadcast of Target State and Status (Subtype=1) Messages may be terminated either (1) as a result of the requirements of §2.2.3.3.1.4.1.b if the target state information is no longer available or valid, or (2) if the broadcast of the Airborne Position Message has been terminated (see §2.2.3.3.2.12.a), since the Target State and Status Messages contain various integrity, mode, or status information that is applicable to the Airborne Position Messages, data which becomes irrelevant if the broadcast of the Airborne Position Message has been terminated.

- (G) In RTCA DO-260B and EUROCAE ED-102A, in section §2.2.3.3.2.12.f, in order to clarify the requirements for terminating the broadcast of Aircraft Operational Status Messages, replace the existing *Note* below sub-bullet “f” with the following:

Note: *The broadcast of the Aircraft Operational Status Messages (either Subtype 0 or 1) may be terminated only after the termination of the respective Airborne (see §2.2.3.3.2.12.a) or Surface (see §2.2.3.3.2.12.b) Position Messages, since the Operational Status Messages contain various integrity, mode, version number, or status information that is applicable to the respective Position Messages, data which becomes irrelevant if the broadcast of that Position Message has been terminated.*

Summary

The objective of this Action Item was to suggest a way forward to clarify the intent of the various paragraphs under consideration, and not to propose new or modify existing requirements. The Working Group is asked to consider the above suggested clarifications for inclusion in the DO-260B Corrigendum.