

**RTCA Special Committee 186, Working Group 3**

**ADS-B 1090ES MOPS Maintenance**

**Meeting #24**

**Honeywell Aerospace, Phoenix AZ  
13-15 January 2009**

**The Time Synchronization Issue in 1090ES**

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**Summary**

As specified in the 1090ES MOPS, DO-260A, the Time Synchronization bit (T) can be either: (a) one (1) indicating that the Time of Applicability is synchronized to UTC time, or (b) set to zero (0) indicating that the TOA is NOT synchronized to UTC time. Additionally, there is a distinction as to whether a system can be in “precision” (NIC=10 or 11) or “non-precision” (NIC≠10 or 11) mode. Given these two “state” combinations, one might assume that four combinations might result, i.e., T=1 for both precision and non-precision OR T=0 for both precision and non-precision. However, §A.1.4.2.2 would indicate that T=1 for non-precision is forbidden. This Working Paper addresses removing that restriction.

## 1.0 Introduction

Although I was an active member of WG-3 during the development of DO-260 and DO-260A, I did not realize until later that a certain combination of synchronization (the T bit) and "Precision" (meaning the 2 highest levels of NIC) was not allowed. Specifically T=1 is not allowed together with Non-Precision. Tom Pagano pointed this out to me, and he showed me that the prohibition is only given in one place in the MOPS, which is in Appendix A. I don't know why that combination was prohibited, and I have asked others if they know. I think it would be more logical to omit the restriction. This Working Paper makes a proposal to delete the restriction, and provides specific wording suggestions.

As specified in the 1090ES MOPS, DO-260A, the Time Synchronization bit (T) can be either:

- (a) set to one (1) indicating that the Time of Applicability (TOA) is synchronized to UTC time, or
- (b) set to zero (0) indicating that the TOA is NOT synchronized to UTC time.

Additionally, there is a distinction in the 1090ES system as to whether a system can be in "precision" (NIC=10 or 11) or "non-precision" (NIC≠10 or 11) mode. Given these two "state" combinations, one might assume that four combinations might result:

- T=1 for precision,
- T=0 for precision,
- T=1 for non-precision,
- T=0 for non-precision.

However, §A.1.4.2.2 would indicate that T=1 for non-precision is forbidden, with the statement that:

"Synchronization will only be used for Airborne Position Messages having the top two horizontal position precision categories (TYPE Codes 9, 10, 20 and 21)."

This Working Paper addresses removing that restriction.

## 2.0 Background

Consider a unit that is transmitting using T=1, at a time when the lat-lon source is good, such that the transmissions are Precision (NIC=10 or 11). As time goes by, GDOP can change and cause a change into the Non-Precision mode (NIC < 10). If that combination is really forbidden, it would be necessary for the unit to change to T=0 at that time. I can't see any reason for making that combination forbidden. I have asked other members of WG-3 about this, and have not heard any reason for forbidding that combination.

For that reason, I propose changing the 1090ES MOPS to lift the restriction on that case.

The actual prohibition appears only in §A.1.4.2.2, and the change can be accomplished simply by deleting that one sentence. However, I believe that some changes should also be made in §2.2.3.2.3.7.3, because the structure of the subsections reflects the prohibition.

### 3.0 Specific Changes

Change in §A.1.4.2.2:

In the first paragraph, delete the final sentence, "Synchronization will only be used ..."

Also add a note:

*Note: Whereas in an earlier version of these MOPS T=1 was forbidden when TYPE Code is other than 9, 10, 20, or 21, in this version of these MOPS and future versions, that combination is no longer restricted.*

Change the title of §2.2.3.2.3.7.2 to the current title of §2.2.3.2.3.7.2.1.

Move the material from the current 2.2.3.2.3.7.2.1 to this section.

§2.2.3.2.3.7.2.1 section number not used.

§2.2.3.2.3.7.2.2 section number not used.

Change the title of §2.2.3.2.3.7.3 to the current title of §2.2.3.2.3.7.2.2.

Move the material from the current §2.2.3.2.3.7.2.2 to this section.

§2.2.3.2.3.7.3.1 section number not used.

§2.2.3.2.3.7.3.2 section number not used.

No change to §2.2.3.2.3.7.4

The material for longitude appears in §2.2.3.2.3.8, which should be modified in the same manner. The principles are exactly the same.