

CHANGE ISSUE – RTCA/DO-242

MASPS for ADS-B Rev. A

| Tracking Information (committee secretary only) | |
|---|-----------------|
| Change Issue Number | 14 |
| Submission Date | 1/11/01 |
| Status (open/closed/deferred) | Rev. A - CLOSED |
| Last Action Date | 02/22/02 |

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| Short Title for Change Issue: | Use of “Certified Navigation Center” with own position. (ADS-B Navigation Reference Point) |
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| MASPS Document Reference: | | Originator Information: | |
|---------------------------|---------|-------------------------|------------------------------|
| Entire document (y/n) | | Name | Rick Cassell / Rannoch Corp. |
| Section number(s) | J.3.2.2 | Phone | |
| Paragraph number(s) | | E-mail | |
| Table/Figure number(s) | | Other | |

| Proposed Rationale for Consideration (originator should check all that apply): | |
|--|--|
| <input type="checkbox"/> | Item needed to support of near-term MASPS/MOPS development |
| X | DO-260/ED-102 1090 MHz Link MOPS Rev A |
| <input type="checkbox"/> | ASA MASPS |
| <input type="checkbox"/> | TIS-B MASPS |
| <input type="checkbox"/> | UAT MOPS |
| <input type="checkbox"/> | Item needed to support applications that have well defined concept of operation |
| <input type="checkbox"/> | Has complete application description |
| <input type="checkbox"/> | Has initial validation via operational test/evaluation |
| <input type="checkbox"/> | Has supporting analysis, if candidate stressing application |
| <input type="checkbox"/> | Item needed for harmo nization with international requirements |
| <input type="checkbox"/> | Item identified during recent ADS-B development activities and operational evaluations |
| X | MASPS clarifications and correction item |
| X | Validation/modification of questioned MASPS requirement item |
| <input type="checkbox"/> | Military use provision item |
| <input type="checkbox"/> | New requirement item (must be associated with traffic surveillance to support ASAS) |

| Nature of Issue: | <input type="checkbox"/> | Editorial | X | Clarity | <input type="checkbox"/> | Performance | X | Functional |
|---|--------------------------|-----------|---|---------|--------------------------|-------------|---|------------|
| <p>Issue Description: The attached comments which state that the 1090 MOPS (DO-260) fails to specify any criteria for giving own position data (latitude and longitude) “with respect to a certified navigation center” were presented to the SC-186 plenary in reference to the ballot on DO-260. It was agreed that these issues would be deferred from consideration in DO-260 until they were first reconsidered during development of revision A of the ADS-B MASPS. Included with the attached comments is the official response from working group 3, which was charted with development of DO-260.</p> <p>Reference: Issue Paper 25, submitted by Gary Livack requesting that military in-flight refueling operations and other formation flying be added to Appendix E, “Other Applications” is cited by Mr. Livack as a application that will need antenna position or certified navigation center.</p> | | | | | | | | |

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| <u>Originator’s proposed resolution if any:</u> Proposed resolution is attached with comments from DO-260 ballot. |
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Working Group 6 Deliberations:

January 24, 2001: It was noted that “certified center of navigation” is cited in a non-informative appendix (J). This issue will remain open for consideration in DO-242A. WG#4 will be asked if they foresee their work on the ASA MASPS requiring us to change or expand the information currently in the MASPS. SC-193 and the Military also might comment on the need for this issue to be addressed in DO-242A. (See IP25.) It was also agreed to consolidate comments on the DO-260 ballot from Gary Livack regarding this issue into this IP.

May 24, 2001: This Issue Paper was discussed by the ad hoc group at their May 2001 meeting. It was agreed that the wording on this topic needs to be changed in the MASPS. (“Common Navigation Center” was proposed.) Further work on this topic is being considered by WG4. It was agreed to forward the briefing given by Ken Staub (242A-WP-5-05) on this topic to WG4 for their consideration. It was agreed that this will be addressed in Revision A.

July 19, 2001: At the July meeting it was agreed by WG6 for DO-242A the term “Navigation Reference Point” will be used instead of “Certified Navigation Center” which is found on DO-242. It was also agreed that the resolution of this IP will be closely tied to the resolution of IP04 on aircraft size characteristics.

August 30, 2001: At the August WG6 meeting, “Navigation Reference Point” was replaced with “ADS-B Position Reference Point”, and the following definition was agreed to, which will be used in DO-242A::

ADS-B Position Reference Point: A designated point ~~on an aircraft~~ that is used as a reference for reporting the horizontal components of own-ship position. ¶ The point should be common to type and located along the longitudinal axis, so that all extremities of the aircraft are contained within smallest possible rectangle. (i.e. the center of the smallest rectangle that contains all of the aircraft’s extremities and oriented along the longitudinal axis)

It was also agreed that the accuracy of this reference point will not need to be greater than 1 meter and that position will need to be broadcast relative to the ADS-B Position Reference Point when the NAC is 9 or greater.

October 26, 2001: It was agreed at the October WG6 meeting to delete the phrase “on an aircraft” in the first sentence of the definition (shown in red strike-out above), and to place this definition into the same section which discusses aircraft size codes.

February 1, 2002: This Issue Paper’s final resolution was approved by WG6 as part of the review of 242A-WP-11-01a and 242A-WP-11-11. This Issue paper is now considered CLOSED and addressed in DO-242A.

February 22, 2002: During the February meeting, WG6 approved final MASPS text for this Issue Paper as part of its review of 242A-WP-12-01. Also given a final approval at this meeting was Appendix P.

Working Group 6 Final Resolution:

Below is section 2.1.2.5 which contains text that defines the ADS-B Position Reference Point in the draft DO-242A delivered to RTCA March 4, 2002.

2.1.2.5 ADS-B Position Reference Point

The ADS-B position reference point is the position on an A/V that is broadcast in ADS-B messages as the nominal position of that A/V. For aircraft and ground vehicles, this position is normally the center of the smallest rectangle that contains all the extremities of A/V and is oriented parallel to the longitudinal axis of the A/V. Figure 2.1.2.5 illustrates the location of the ADS-B reference point.

If the length code part of an aircraft's size code (Table 3.4.4.6 in §3.4.4.6 below) is 1 or greater and its NAC_P code (§2.1.2.13 above) is 10 or greater, then the horizontal position sent by that aircraft's ADS-B transmitting subsystem **shall** (R2.17) be the position of the ADS-B position reference point.

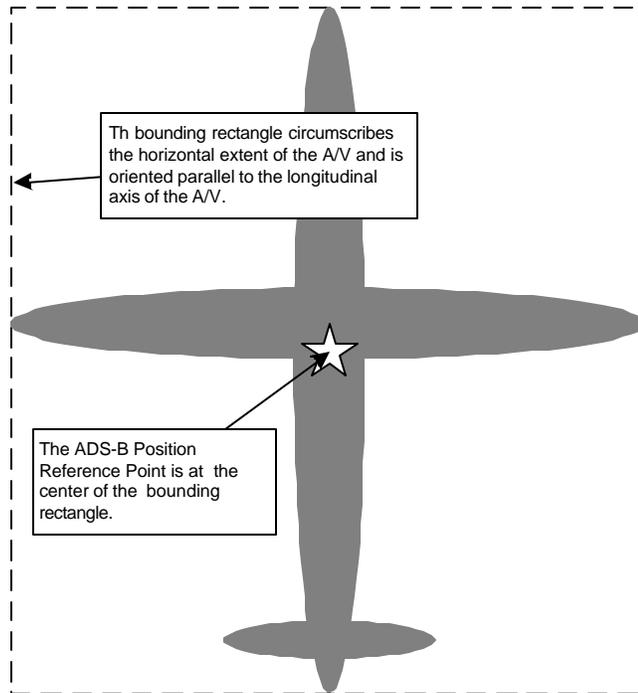


Figure 2.1.2.5: ADS-B Position Reference Point

Note: The accuracy of the location of the ADS-B position reference point with respect to the body of the A/V should be included when determining the NAC_P code to be transmitted from a transmitting ADS-B participant.

**ADS-B 1090 MHz Rev A Comments Related to MASPS Changes
RTCA SC-186 WG-3/EUROCAE WG-51 SG-1**

| # | Comment Author | DO-260 Section | Page | Comment / Rationale | Suggested Resolution |
|----|------------------|---|----------------------|--|---|
| 19 | Rick Cassell (2) | 2.2.5.1.7 | 121 | <p>The ADS-B MASPS indicated that for surface movement requirements, that the [own position latitude] reports are assumed to be given with respect to a “certified navigation center” of the aircraft (DO-242, Section J.3.2.2). This is necessary to ensure meeting the overall accuracy requirements for surface surveillance. The 1090 MOPS fails to specify anything about the reference point for the position information.</p> <p>Temporary resolution: Added a new Note after 2.2.5.1.7.c indicating that any application that uses ADS-B surface position information will have to take into account the offset of the information to the navigation reference point.</p> <p>WG#3 Position: <i>Items #19 & 20: WG#3 feels this information would be extremely difficult to include from an installation/airframe standpoint. WG#3 feels that the current buffer for transmitting of antenna is adequate.</i></p> | <p>Add language to specify that the encoded latitude is referenced to a navigation reference point.</p> <p>The recommended options are:</p> <ol style="list-style-type: none"> 1. The center of the aircraft 2. The nose of the aircraft <p>Note that there should be an associated test specified for this requirement. This should probably be included in Section 3.</p> |
| 20 | Rick Cassell (3) | 2.2.5.1.8 | 122 | <p>The ADS-B MASPS indicated that for surface movement requirements, that the [own position longitude] reports are assumed to be given with respect to a “certified navigation center” of the aircraft (DO-242, Section J.3.2.2). This is necessary to ensure meeting the overall accuracy requirements for surface surveillance. The 1090 MOPS fails to specify anything about the reference point for the position information.</p> <p>Temporary resolution: Added a new Note after 2.2.5.1.8.c indicating that any application that uses ADS-B surface position information will have to take into account the offset of the information to the navigation reference point.</p> <p>WG#3 Position: <i>See item 19 above.</i></p> | <p>Add language to specify that the encoded latitude is referenced to a navigation reference point.</p> <p>The recommended options are:</p> <ol style="list-style-type: none"> 3. The center of the aircraft 4. The nose of the aircraft <p>Note that there should be an associated test specified for this requirement. This should probably be included in Section 3.</p> |
| 3 | Livack (4) | <p>1.3.5.2 Incursion Monitoring</p> <p>3.3.3 Antenna Location</p> | <p>11</p> <p>633</p> | <p>Reference the various future surface movement applications. Several of these potential applications will require knowing the exact position (within a few feet) of an aircraft with respect to features on an airport surface. Features in this context include runway hold short markings, penalty box depictions (i.e., “holding” locations), gate areas, etc. So, the issue is how do you establish, then communicate the precise location of an antenna as installed on specific make / model aircraft.</p> <p>WG#3 Position: <i>See item 1 above.</i></p> | <p>This is a safety critical item. This item needs to be addressed in the MASPS and MOPS. As FYI, it is believed that the SICASP solution (for Mode S) was to provide a Mode S register function that contained the location of up to four antenna positions with respect to the nose of the aircraft. This data was measured from the nose and included height above the ground, to one meter accuracy. The group needs to ensure that this solution (or an equivalent) is included in the current version of the 1090 MOPS.</p> |