



THE GOLD STANDARD FOR AVIATION SINCE 1935

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**Minimum Operational Performance Standards for
the
Universal Access Transceiver (UAT)
Automatic Dependent Surveillance – Broadcast (ADS-B)
Corrigendum-1
DRAFT Version 1.0**

RTCA DO-282B, Corrigendum-1
Month XX, 20xx
Modifies RTCA/DO-282B

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Foreword

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With the publication of this document as “**Corrigendum-1 for RTCA DO-282B**” errata are being reviewed for RTCA DO-282B that have been identified as necessary since the time of the publication of RTCA DO-282B. These errata include, but are not limited to:

1. xxxxxxxxxxxx;
2. xxxxxxxxxxxx;
3. xxxxxxxxxxxx; and
4. Other changes related to correcting typographical and paragraph reference errors.

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Corrigendum-1 for RTCA DO-282B

This **Corrigendum-1 for RTCA DO-282B** prescribes the Minimum Performance Standards (MPS) for Universal Access Transceiver (UAT) Transmitting and Receiving Subsystems, modified as described in this document. The applicable standards for the corrigenda described in this document is RTCA DO-282B, “*Minimum Operational Performance Standards for the Universal Access Transceiver (UAT), Automatic Dependent Surveillance – Broadcast (ADS-B)*,” issued December 2, 2009.

Corrigenda that are being specified in this **Corrigendum-1 for RTCA DO-282B** will use numbers such as (1.1) through (1.xx).

In the following list of corrigenda, for those items where existing text is requested to change, the new text is presented in blue font color and underlined, and deleted text is presented in ~~striketrough and red font color text~~. In those corrigenda where a totally new section or text is proposed to be inserted, all the text is presented in blue font color and underlined. In some cases, a **yellow highlighting of text** may be used to emphasize a specific issue.

- (1.1) In RTCA/DO-282B, in section §2.2.4.5.2.7.2.a, in the paragraph just prior to Table 2-36, there is a typographical error in the bit reference. Replace the sentence/paragraph just before Table 2-36 as follows:

Bits ~~2 through 3~~ and 4 of Byte 17 are reserved in the lateral encoding case and shall be set to ALL ZEROs (00).

- (1.2) In RTCA/DO-282B, in section §2.2.4.5.4.12.3, the actual name of the TCAS/ACAS Operational flag was not updated properly in the current document revision to indicate the current usage of the flag, therefore, in order to correct the actual name of the flag, modify subparagraph “d” as follows:

- d. If the input for the “TCAS/ACAS Operational” flag is “unavailable” for the “Data Lifetime” value listed for this input in Table 2-63, then the “TCAS/ACAS ~~Installed and~~ Operational” flag **shall** default to a value of ZERO (0).

- (1.3) In RTCA/DO-282B, in section §2.2.4.5.6.4, the data in Table 2-60 does not define whether the Selected Heading reference orientation is true or magnetic. In order to add clarifying information, add a new Note #3 under Table 2-60 as follows:

3. Implementers of the Target State Element are encouraged whenever possible to use input parameters to populate this field that utilize Magnetic North orientation, since that is the de facto standard utilized by most users of this data. However, since many aircraft have flight decks that can operate in either True North or Magnetic North orientation, this field should be encoded with the current active value in the flight deck, regardless of orientation. Users of the Selected Heading data should be aware that there is no method defined in this version of these MOPS to indicate its reference orientation.

- (1.4) In RTCA/DO-282B, in section §2.2.7.1, inside Table 2-63, the actual name of Element #29 was not updated properly in the current document revision to indicate the current usage of the Element, and the “Relevant Paragraph” column contains an incorrect hyperlinked reference. In Table 2-63, make the following corrections:

Table 2-63: UAT ADS-B Transmitter Input Requirements

Element #	Input Data Element	Relevant Paragraph	Data Lifetime (seconds)	Applicable UAT Equipment Class						
				A0, B0	A1L, A1S, B1S	A1H, B1	A2	A3	B2	B3
29	TCAS/ACAS Installed and Operational	2.2.4.5.4.12.23	60	M	M	M	M	M	n/a	n/a

O = Optional, M = Mandatory (the equipment must have the ability to accept the data element)

- (1.5) In RTCA/DO-282B, in section §2.2.8.2.1.3, in order to correct a cut-and-paste error in subparagraph “b,” make the following corrections:

b. When the desired signal is of maximum modulation distortion allowed in §2.2.2.4, at the nominal transmission frequency ± 1 PPM, and subject to ~~air~~ground-to-air Doppler shift at ~~1200~~ 850 knots closure/opening.

- (1.6) In RTCA/DO-282B, in section §2.3.1, in Table 2-69, in the last two (2) rows of the Table, the “Y” characters should be deleted from the Test Group 1 column. The “Y” characters in the Test Group 4 column should remain. The MOPS Power Interruption test procedures specifically invoke the DO-160() Section 16 test method for power interruption. Test Group 1 also includes other DO-160() tests, such as Power Interruption and Susceptibility (see Table 2-68). It was not the intention of WG-5 to require that UAT functions be verified under simultaneous exposure to multiple environmental conditions. The Power Interruption requirements should only be a member of Test Group 4, which is already indicated in Table 2-69.

2.3.2.22.1	Power Interruption for ADS-B Transmitting Subsystem (§2.2.16)	Y			Y	NO TESTS
2.3.2.22.2	Power Interruption for ADS-B Receiving Subsystem (§2.2.16)	Y			Y	

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- (1.7) In RTCA/DO-282B, in section §2.4.4.5.2.1.1, in Step 6 of the Test Procedure, make the following changes in the specified values of Table 2-76 in order to correct errors in the original creation of the table values:

Table 2-76: Latitude Encoding Values

Latitude (degrees)	Latitude Coding (binary)
0.000000000	000 0000 0000 0000 0000 0000
0.000026822	000 0000 0000 0000 0000 0001
0.000048280	000 0000 0000 0000 0000 0010
0.000112653	000 0000 0000 0000 0000 0101
0.000219941	000 0000 0000 0000 0000 1010
0.000434518	000 0000 0000 0000 0001 0100
0.000885129	000 0000 0000 0000 0010 1001
0.001764894	000 0000 0000 0000 0101 0010
0.003545880	000 0000 0000 0000 1010 0101
0.007086396	000 0000 0000 0001 0100 1010
0.014167428	000 0000 0000 0010 1001 0100
0.028329492	000 0000 0000 0101 0010 1000
0.056653619	000 0000 0000 1010 0101 0000
0.113301873	000 0000 0001 0100 1010 0000
0.226598382	000 0000 0010 1001 0100 0000
0.453191400	000 0000 0101 0010 1000 0000
0.906377435	000 0000 1010 0101 0000 0000
1.812749505	000 0001 0100 1010 0000 0000
3.625493646	000 0010 1001 0100 0000 0000
7.250981927	000 0101 0010 1000 0000 0000
14.501958489	000 1010 0101 0000 0000 0000
29.003911614	001 0100 1010 0000 0000 0000
58.007817864	010 1001 0100 0000 0000 0000
90.000000	100 0000 0000 0000 0000 0000
-66.093739 -66.093755364	101 0001 0000 0000 0000 0000
-60.468739 -60.468755364	101 0101 0000 0000 0000 0000
-90.000000	100 0000 0000 0000 0000 0000

- (1.8) In RTCA/DO-282B, in section §2.4.4.5.2.1.1, in Step 6 of the Test Procedure, make the following changes in the specified values of Table 2-77 in order to correct errors in the original creation of the table values:

Table 2-77: Longitude Encoding Values

Longitude (degrees)	Longitude Coding (binary)
0.000018 <u>0.000000</u>	0000 0000 0000 0000 0000 0000
0.000037 <u>0.000021</u>	0000 0000 0000 0000 0000 0001
0.000073 <u>0.000064</u>	0000 0000 0000 0000 0000 0011
0.000147 <u>0.000129</u>	0000 0000 0000 0000 0000 0110
0.000294 <u>0.000279</u>	0000 0000 0000 0000 0000 1101
0.000587 <u>0.000579</u>	0000 0000 0000 0000 0001 1011
0.001175 <u>0.001159</u>	0000 0000 0000 0000 0011 0110
0.002350 <u>0.002339</u>	0000 0000 0000 0000 0110 1101
0.004699	0000 0000 0000 0000 1101 1011
0.009398	0000 0000 0000 0001 1011 0110
0.018797	0000 0000 0000 0011 0110 1100
0.037594	0000 0000 0000 0110 1101 1000
0.075188	0000 0000 0000 1101 1011 0000
0.150375	0000 0000 0001 1011 0110 0000
0.300751	0000 0000 0011 0110 1100 0000
0.601501	0000 0000 0110 1101 1000 0000
1.203003	0000 0000 1101 1011 0000 0000
2.406006	0000 0001 1011 0110 0000 0000
4.812012	0000 0011 0110 1100 0000 0000
9.624023	0000 0110 1101 1000 0000 0000
19.248047	0000 1101 1011 0000 0000 0000
38.496094	0001 1011 0110 0000 0000 0000
76.992188	0011 0110 1100 0000 0000 0000
153.984375	0110 1101 1000 0000 0000 0000
-52.031250	1101 1011 0000 0000 0000 0000
-104.062500	1011 0110 0000 0000 0000 0000
151.875000	0110 1100 0000 0000 0000 0000
-56.250000	1101 1000 0000 0000 0000 0000
-112.500000	1011 0000 0000 0000 0000 0000
135.000000	0110 0000 0000 0000 0000 0000
-90.000000	1100 0000 0000 0000 0000 0000
180.000000	1000 0000 0000 0000 0000 0000

- (1.9) In RTCA/DO-282B, in section §2.4.4.5.2.5.1, in order to be consistent with the requirements stated in §2.2.4.5.2.5.1.f, correct an error in Test Case #1 and #2 identified in Table 2-80, modify the expected results identified in the Table with the corrections shown below:

Table 2-80: Vertical Status Determination when no Automatic AIRBORNE/ON-GROUND Indication is Available

Vertical Status Determination					
Test	Emitter Category Base-40 Digit (§2.2.4.5.4.1)	Ground Speed (knots)	Airspeed (knots)	Radio Altitude (feet)	Resulting Vertical Status (Bit 1 of Byte 13)
1	2 – 6, 15	100	100	50	AIRBORNE ON-GROUND
2	2 – 6, 15	100	50	25	AIRBORNE ON-GROUND

- (1.10) In RTCA/DO-282B, in section §2.4.4.5.2.7.2, a manufacturer has questioned the third paragraph under Step 2, wherein the test procedure directs that the stimulus be removed and then verify that the A/V L/W Code is set to ALL ZEROS. The manufacturer believes that since the Data Lifetime in Table 2-63 is set to N/A, that it is not appropriate to set the value to ALL ZEROS. → [This will have to be discussed before any change is made.](#) ←

- (1.11) In RTCA/DO-282B, in section §2.4.4.5.4.12.3, the actual name of the TCAS/ACAS Operational flag was not updated properly in the current document revision to indicate the current usage of the flag, therefore, in order to correct the actual name of the flag, modify subparagraph “d” in the “Purpose/Introduction” section as follows:

d. If the input for the “TCAS/ACAS Operational” flag is “unavailable” for the “Data Lifetime” value listed for this input in Table 2-99, then the “TCAS/ACAS ~~Installed and~~ Operational” flag defaults to a value of ZERO (0).

- (1.12) In RTCA/DO-282B, in section §2.4.4.5.4.14 in order to correct an incorrect state being specified in Step 1 of the test procedure, make the following change in the first sentence of Step 1:

Step 1: Call Sign Reporting Verification

Set up the ADS-B Transmitting Subsystem to transmit ADS-B Messages and ensure that the CSID Logic Configuration Item is set to ~~ENABLED~~ DISABLED.

(1.13) In RTCA/DO-282B, in section §2.4.4.5.4.14, the setup for Step 2 does not specify a value for the CSID Logic Configuration Item. Make the following change to the first sentence in Step 2 as follows:

Step 2: Flight Plan ID Reporting Verification

Set up the ADS-B Transmitting Subsystem to transmit ADS-B Messages and ensure that the CSID Logic Configuration Item is set to “ENABLED”.

(1.14) In RTCA/DO-282B, in section §2.4.7.1, inside Table 2-99, the actual name of Element #29 was not updated properly in the current document revision to indicate the current usage of the Element, and the “Relevant Paragraph” column contains an incorrect hyperlinked reference. In Table 2-99, make the following corrections:

Table 2-99: UAT ADS-B Transmitter Input Requirements

Element #	Input Data Element	Relevant Paragraph	Data Lifetime (seconds)	Applicable UAT Equipment Class						
				A0, B0	A1L, A1S, B1S	A1H, B1	A2	A3	B2	B3
29	TCAS/ACAS Installed and Operational	2.4.4.5.4.12.23	60	M	M	M	M	M	n/a	n/a

O = Optional, M = Mandatory (the equipment must have the ability to accept the data element)

(1.15) In RTCA/DO-282B, in section §2.4.8.2.1.3, under the “Equipment Required” section, make the following correction to the “Center Frequency” designation in order to correct an error of omission that was properly accounted for in the previous test procedures in §2.4.8.2.1.1 and §2.4.8.2.1.2, but somehow omitted in this test procedure.

- Center Frequency: 978 MHz ± 1.05 kHz ± 19.56 kHz (see Note below)

(1.16) In RTCA/DO-282B, in section §2.4.8.2.1.3, under the “Measurement Procedures” section, make the following correction to test procedure Steps 1 and 3 in order to correct an error of omission that was properly accounted for in the previous test procedures in §2.4.8.2.1.1 and §2.4.8.2.1.2, but somehow omitted in this test procedure.

Step 1: Apply Ground Uplink Input Messages at maximum negative frequency offset

Apply the Desired Message Signal with the Center Frequency set to the minimum value (978 MHz – 1.5 kHz $- 19.56$ kHz) at the UUT receiver port.

Step 2: Measure the UUT receiver sensitivity

Decrease the input power level and determine the minimum RF signal required to produce a reception rate of 90 percent by the UUT receiver, averaged over a minimum of 100 received messages. Verify that this RF signal level is in compliance with the limits specified in §2.2.8.2.1.3.

Step 3: Apply Ground Uplink Input Messages at maximum positive frequency offset

Apply the Desired Message Signal with the Center Frequency set to the maximum value (978 MHz + 1.5 kHz + 19.56 kHz) at the UUT receiver port.

- (1.17) In RTCA/DO-282B, in section §2.4.8.3.1.2, in order to correctly reference the proper term using “Ground Uplink” instead of ADS-B, make the following corrections in the second subparagraph “a” and in the sentence under the “Equipment Required” as follows:

The Corrupted Messages (Erroneous Messages) provided in the Tables are designed as follows:

- a. Table 2-107 through Table 2-115 have random burst errors that are perfectly lined up with the byte boundary of ~~ADS-B~~ Ground Uplink Message symbols. The errors in each message are at different symbol positions and the number of erroneous symbols that are induced into the ~~ADS-B~~ Ground Uplink Messages can be from 1 to 14 bytes.

Equipment Required:

Provide a method to supply controlled De-Interleaved RS blocks of Ground Uplink Messages to the appropriate ~~ADS-B~~ UAT Receiver interface.

- (1.18) In RTCA/DO-282B, in Appendix C, in order to clarify that there are examples of Reed Solomon encoding provided elsewhere in the MOPS, at the end of Appendix C, just prior to the “Appendix C References” add a new section “C.4” containing a single *Note* as follows:

C.4 Reed Solomon Encoding of Ground Uplink Message Payload

Note: An example encoding for the UAT Ground Uplink Message is not included here. However, example encodings of the individual de-interleaved RS Blocks that make up a Ground Uplink Message can be found in Table 2-107 through Table 2-114. Specifically, any rows of these Tables where the “Status (RS Blk)” column indicates “⁰Pass_R” can be used as a check on the RS encoding implementation of the Ground Uplink Message.

(1.19) In RTCA/DO-282B, in Appendix Q, section §Q.3.1.2, add the following *Note* just after the section Title:

Note: *Since this Appendix was developed, the vertical rate accuracy requirement has been decoupled from the NAC_V parameter. The test for vertical rate is not necessary to establish the $NAC_V = 1$ but remains here in the event that manufacturers want to additionally establish the vertical rate performance of their system at the 50ft/sec 95% level.*

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