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ADS-B 1090ES MOPS Maintenance

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Target State and Status Message Updates
Definition/MOPS/Procedures
In Response to Action Item 27-13

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Summary

Response to Action Item 27-13.

This working paper addresses the work tasks inferred by Action Item 27-13. As such, this document presents three parts as follows:

Part 1: Part 1 provides a minor but important update to the definition of the Target State and Status Message agreed to in 1090-WP27-04R1.

Part 2: Part 2 provides detailed MOPs for the newly defined Target State and Status Message. These MOPs should be used to replace section 2.2.3.2.7 –through- 2.2.3.2.7.3.18.

Part 3: Part 3 provides detailed Test Procedures to validate the requirements provided in Part 2. Part 3 provides new sections 2.4.3.2.7 –through- 2.4.3.2.7.3.18.

PART 1:

The following table should be used to update the last one presented in 1090-WP27-04R1 which represented the agreed to format for BDS 6,2 coming out of the Chicago meeting. The following table makes one change to correct the definition of the Status bit for Selected Heading. The change ensures that the Status bit is set to ZERO (0) for INVALID, and to ONE (1) for VALID, as is consistent with ICAO DOC. 9871 and RTCA DO-181D Appendix B.

Table_1. BDS 6,2 UPDATED PROPOSED TARGET STATE AND STATUS MESSAGE			
		"MB" FIELD DEFINITION	
1	MSB		
2			
3		**FORMAT TYPE CODE = 29**	
4			
5	LSB		
6	MSB	**SUBTYPE CODE = 1**	
7	LSB		
8		**SPARE**	
9		**SELECTED ALTITUDE TYPE** (0 = MCP/FCU, 1 = FMS)	
10	MSB	= 32,768 feet	
11		**MCP / FCU SELECTED ALTITUDE**	
12		(when Selected Altitude Type = 0)	
13		**FMS SELECTED ALTITUDE**	
14		(when Selected Altitude Type = 1)	
15		Coding: 111 1111 1111 = 65,472 feet	
16		*** **** ****	
17		000 0000 0010 = 32 feet	
18		000 0000 0001 = 0 feet	
19		000 0000 0000 = No Data or Invalid	
20	LSB	= 32 feet	
21	MSB	= 204.8 millibars	
22		**BAROMETRIC PRESSURE SETTING (MINUS 800 millibars)**	
23		Range = [0, 408.0] Resolution = 0.8 millibars	
24		Coding: 1 1111 1111 = 408.00 millibars	
25		* **** ****	
26		0 0000 0010 = 0.800 millibars	
27		0 0000 0001 = 0.000 millibars	
28		0 0000 0000 = No Data or Invalid	
29	LSB	= 0.8 millibars	
30	STATUS	(0 = Invalid, 1 = Valid)	Updated Status Bit definition to be consistent with ICAO Doc. 9871 and RTCA DO-181D Appendix B.
31	SIGN	(0 = positive, 1 = negative)	
32	MSB	= 90 degrees	
33			
34		**SELECTED HEADING**	
35		Range = [+/- 180 degrees Resolution = 0.703125 degrees	
36		(Typical Selected Heading Label = "101")	
37			
38			
39	LSB	0.703125 degrees (180/256)	
40	MSB		
41		**NAVIGATION ACCURACY CATEGORY__POSITION (NAC_P)**	
42			
43	LSB		
44		**NAVIGATION INTEGRITY CATEGORY_BARO (NIC_{BARO})**	
45	MSB	**SYSTEM INTEGRITY LEVEL (SIL)**	
46	LSB		
47		**STATUS OF MCP / FCU MODE BITS** (0 = INVALID, 1 = VALID)	
48		**AUTOPILOT ENGAGED** (0 = NOT ENGAGED, 1 = ENGAGED)	
49		**VNAV MODE ENGAGED** (0 = NOT ENGAGED, 1 = ENGAGED)	
50		**ALTITUDE HOLD MODE** (0 = NOT ENGAGED, 1 = ENGAGED)	
51		**Reserved for ADS-R Flag (ADS-B Rebroadcast) (see section 2.2.18.4.6)**	
52		**APPROACH MODE** (0 = NOT ENGAGED, 1 = ENGAGED)	
53		**TCAS OPERATIONAL** (0 = Not Operational, 1 = Operational)	
54	MSB		
55		EMERGENCY / PRIORITY STATUS	
56	LSB		

PART 2:

In RTCA DO-260A, e.g., 260B, replace section 2.2.3.2.7 through 2.2.3.2.7.1.3.15 with the following MOPS paragraphs. Note that the Target State and Status message is being moved from being an Event Driven message to being a Periodic Message. Therefore, the section needs to start at 2.2.3.2.7 and Event Driven sections will need to be moved.

Also, the existing RTCA DO-260A/B sections 2.2.3.2.7.2 through 2.2.3.2.7.2.14 will need to be moved into a new section 2.2.3.2.8 since the Aircraft Operational Status message is being moved from being an Event Driven message to being a Periodic message.

2.2.3.2.7 "Target State and Status" Message

The "Target State and Status" Message is used to provide Selected Vertical Intention information similar to that provided in BDS Register 4,0. For this version of these MOPs the Target State and Status Messaged is defined to convey information on the aircraft's Selected Altitude, Barometric Pressure Setting, and Selected Heading as well as information on the status of the navigation data being used by ADS-B, the status of the aircraft TCAS system and the aircraft's Emergency/Priority status. The general format of the Target State and Status Message **shall** be as specified in Figure 2-9, while further definition of each of the subfields **shall** be as specified in the subsequent paragraphs.

Target State and Status Message			
MSG Bit #	33 ---------- 37	38 --------- 39	40 ---------- 88
"ME" Bit #	1 ---------- 5	6 ---------- 7	8 ---------- 56
Field Name	**TYPE Code = 29 (11101) [5]**	**Subtype Code = 1 (01) [2]**	**Target State and Status Information (see §2.2.3.2.7.3.11) [49]**
	MSB LSB	MSB LSB	MSB LSB

Figure 2-9: "Target State and Status" Message General Format

2.2.3.2.7.1 "TYPE Code" Subfield in Target State and Status Message

The "TYPE Code" subfield was previously specified for the Airborne Position Message in §2.2.3.2.3.1 and **shall** use the same subfield format for the Target State and Status Message, which uses a TYPE Code of **29**.

2.2.3.2.7.2 "Subtype" Subfield in Target State and Status Messages

The "Subtype" subfield is a 2-bit ("ME" bits 6 and 7, Message bits 38 and 39) field that **shall** be used to identify if the format of the remainder of the Target State and Status Message. The "Subtype" subfield **shall** be encoded in accordance with Table 2-45.

Table 2-45: "Subtype" Subfield Encoding

Coding (Binary)	Coding (Decimal)	Meaning
00	0	Target State and Status information is provided in the subsequent subfields of the message in accordance with RTCA DO-260A
01	1	Target State and Status information is provided in the subsequent subfields of the message (see §2.2.3.2.7.3.11) in accordance with RTCA DO-260B, e.g., these MOPs.
10	2	Reserved
11	3	Reserved

2.2.3.2.7.3 Target State and Status (Subtype=1) Format

"Target State and Status" information is conveyed by the Target State and Status Message (TYPE=29) when the Subtype=ONE (01). The format of the Target State and Status Message **shall** be in accordance with Figure 2-10.

MSG Bit #	33 ----- 37	38 ----- 39	40	41	42 ----------52	53 ---------- 61
"ME" Bit #	1 ------ 5	6 ----- 7	8	9	10 ---------- 20	21 ---------- 29
Field Name	TYPE Code =29 (1 1 1 0 1) [5]	Subtype=1 (0 1) [2]	SPARE [1]	Selected Altitude Type [1]	MCP/FCU Selected Altitude ***or*** FMS Selected Altitude [11]	Barometric Pressure Setting (Minus 800 millibars) [9]
	MSB LSB	MSB LSB			MSB LSB	MSB LSB

MSG Bit #	62	63	64 ---------- 71	72 ----------75	76	77 ---------- 78
"ME" Bit #	30	31	32 ---------- 39	40 ---------- 43	44	45 ---------- 46
Field Name	Selected Heading Status [1]	Selected Heading Sign [1]	Selected Heading [8]	Navigation Accuracy Category_Position (NAC_P) [4]	Navigation Integrity Category_Baro (NIC_{BARO}) [1]	System Integrity Level (SIL) [2]
			MSB LSB	MSB LSB		MSB LSB

MSG Bit #	79	80	81	82	83	84	85	86 -------- 88
"ME" Bit #	47	48	49	50	51	52	53	54 -------- 56
Field Name	Status of MCP / FCU Mode Bits [1]	Autopilot Engaged [1]	VNAV Mode Engaged	Altitude Hold Mode [1]	Reserved For ADS-R Flag [1]	Approach Mode [1]	TCAS Operational [1]	Emergency / Priority Status [3]
								MSB LSB

<u>Figure 2-10:</u> "Target State and Status Message" (Subtype=0 Format) Detailed Format

2.2.3.2.7.3.1 SPARE

"ME" bit 8 (Message bit 40) is assigned as a SPARE bit in these MOPs until such time that it may be re-assigned.

<u>Note:</u> *Consideration had been given to assign this bit as a Backward Compatibility Flag; however, this was not necessary as the Subtype is set to "1" in order to distinguish the message from previously defined Target State and Status messages.*

2.2.3.2.7.3.2 Selected Altitude Type

a. The "Selected Altitude Type" subfield is a 1-bit ("ME" bit 9, Message bit 41) field that **shall** be used to indicate the source of Selected Altitude data that is being used to encode "ME" bits 10 –through- 20 (Message bits 42 –through- 52). Encoding of the "Selected Altitude Type" **shall** be in accordance with Table 2-46.

<u>Table 2-46:</u> "Selected Altitude Type" Subfield Encoding

Coding ("ME" bit 9)	**Meaning**
0	Data being used to encode "ME" bits 10 –through- 20 is derived from the Mode Control Panel / Flight Control Unit (MCP / FCU) or equivalent equipment.
1	Data being used to encode "ME" bits 10 –through- 20 is derived from the Flight Management System (FMS).

b. Whenever there is no valid MCP / FCU or FMS Selected Altitude data available, then the "Selected Altitude Type" subfield ("ME" bit 9, Message bit 41) **shall** be set to ZERO (0).

2.2.3.2.7.3.3 MCP/FCU Selected Altitude or FMS Selected Altitude

a. The "MCP / FCU Selected Altitude or FMS Selected Altitude" subfield is an 11-bit ("ME" bits 10 –through-20, Message bits 42 –through- 52) field that **shall** contain either MCP / FCU Selected Altitude or FMS Selected Altitude data in accordance with the following paragraphs.

b. Whenever valid Selected Altitude data is available from the Mode Control Panel / Flight Control Unit (MCP / FCU) or equivalent equipment, such data **shall** be used to encode "ME" bits 10 –through- 20 (Message bits 42 –through- 52) in accordance with Table 2-47 provided in paragraph "d". Use of MCP / FCU Selected Altitude **shall** then be

declared in the "Selected Altitude Type" subfield as specified in §2.2.3.2.7.3.11.2, Table 2-46.

c. Whenever valid Selected Altitude data is **NOT** available from the Mode Control Panel / Flight Control Unit (MCP / FCU) or equivalent equipment, but valid Selected Altitude data is available from the Flight Management System (FMS), then the FMS Selected Altitude data **shall** be used to encode "ME" bits 10 –through- 20 (Message bits 42 –through- 52) in accordance with Table 2-47 provided in paragraph "d". Use of FMS Selected Altitude **shall** then be declared in the "Selected Altitude Type" subfield as specified in §2.2.3.2.7.3.11.2, Table 2-46.

d. Encoding of Selected Altitude data in "ME" bits 10 –through-20 (Message bits 42 –through- 52) **shall** be in accordance with Table 2-47. Encoding of the data **shall** be rounded so as to preserve accuracy of the source data within +/- ½ LSB.

Table 2-47: "MCP / FCU Selected Altitude or FMS Selected Altitude" Subfield Encoding

Coding ("ME" bits 10 ---- 20)		**Meaning**
(Binary)	**(Decimal)**	
000 0000 0000	0	**NO Data *or* INVALID Data**
000 0000 0001	1	0 feet
000 0000 0010	2	32 feet
000 0000 0011	3	64 feet
*** **** ****	***	*** **** ****
*** **** ****	***	*** **** ****
*** **** ****	***	*** **** ****
111 1111 1110	2046	65,440 feet
111 1111 1111	2047	65,472 feet

e. Whenever there is NO valid MCP / FCU or FMS Selected Altitude data available, then the "MCP / FCU Selected Altitude or FMS Selected Altitude" subfield ("ME" bits 10 –through- 20, Message bits 42 –through- 52) **shall** be set to ZERO (0) as indicated in Table 2-47 of paragraph "d".

2.2.3.2.7.3.4 Barometric Pressure Setting (Minus 800 millibars)

a. The "Barometric Pressure Setting (Minus 800 millibars)" subfield is a 9-bit ("ME" bits 21 –through- 29, Message bits 53 –through- 61) field that **shall** contain Barometric Pressure Setting data that has been adjusted by subtracting 800 millibars from the data received from the Barometric Pressure Setting source.

b. After adjustment by subtracting 800 millibars, the Barometric Pressure Setting **shall** be encoded in "ME" bits 21 –through- 29 (Message bits 53 –through- 61) in accordance with Table 2-48.

Table 2-48: "Barometric Pressure Setting (Minus 800 millibars)" Subfield Encoding

Coding ("ME" bits 21 ---- 29)		Meaning
(Binary)	(Decimal)	
0 0000 0000	0	**NO Data *or* INVALID Data**
0 0000 0001	1	0 millibars
0 0000 0010	2	0.8 millibars
0 0000 0011	3	1.6 millibars
* **** ****	***	*** **** ****
* **** ****	***	*** **** ****
* **** ****	***	*** **** ****
1 1111 1110	510	407.2 millibars
1 1111 1111	511	408.0 millibars

c. Encoding of Barometric Pressure Setting data in "ME" bits 21 –through-29 (Message bits 53 –through- 61) **shall** be in accordance with Table 2-48. Encoding of the data **shall** be rounded so as to preserve a reporting accuracy within +/- ½ LSB.

d. Whenever there is NO valid Barometric Pressure Setting data available, then the "Barometric Pressure Setting (Minus 800 millibars) subfield ("ME" bits 21 –through- 29, Message bits 53 –through- 61) **shall** be set to ZERO (0) as indicated in Table 2-48 of paragraph "b".

e. Whenever the Barometric Pressure Setting data is greater than 1209.5 or less than 800 millibars, then the "Barometric Pressure Setting (Minus 800 millibars) subfield ("ME" bits 21 –through- 29, Message bits 53 –through- 61) **shall** be set to ZERO (0).

2.2.3.2.7.3.5 Selected Heading Status

a. The "Selected Heading Status" subfield is a 1-bit ("ME" bit 30, Message bit 62) field that **shall** be used to indicate the status of Selected Heading data that is being used to encode "ME" bits 32 –through- 39 (Message bits 64 –through- 71) in accordance with Table 2-49.

Table 2-49: "Selected Heading Status" Subfield Encoding

Coding ("ME" bit 30)	Meaning
0	Data being used to encode "ME" bits 32 –through- 39 (Message bits 64 –through- 71) is either **NOT** Available or is **INVALID**. See Table 2-51.
1	Data being used to encode "ME" bits 32 –through- 39 (Message bits 64 –through- 71) is Available and is **VALID**. See Table 2-51.

2.2.3.2.7.3.6 Selected Heading Sign

a. The "Selected heading Sign" subfield is a 1-bit ("ME" bit 31, Message bit 63) field that **shall** be used to indicate the arithmetic sign of Selected Heading data that is being used to encode "ME" bits 32 –through- 39 (Message bits 64 –through- 71) in accordance with Table 2-50.

Table 2-50: "Selected Heading Sign" Subfield Encoding

Coding ("ME" bit 31)	**Meaning**
0	Data being used to encode "ME" bits 32 –through- 39 (Message bits 64 –through- 71) is Positive in an angular system having a range between +180 and – 180 degrees. (For an Angular Weighted Binary system which ranges from 0.0 to 360 degrees, the sign bit is positive or Zero for all values that are less than 180 degrees). See Table 2-51.
1	Data being used to encode "ME" bits 32 –through- 39 (Message bits 64 –through- 71) is Negative in an angular system having a range between +180 and – 180 degrees. (For an Angular Weighted Binary system which ranges from 0.0 to 360 degrees, the sign bit is ONE for all values that are greater than 180 degrees). See Table 2-51.

2.2.3.2.7.3.7 Selected Heading

a. The "Selected Heading" subfield is an 8-bit ("ME" bits 32 –through- 39, Message bits 64 –through- 71) field that **shall** contain Selected Heading data encoded in accordance with Table 2-51.

Table 2-51: "Selected Heading Status, Sign, and Data" Subfield Encoding

"ME" Bit Coding			**Meaning**
30	31	32 -------- 39	
Status	**Sign**	**Data**	
0	0	0000 0000	**NO Data *or* INVALID Data**
1	0	0000 0000	0.0 degrees
1	0	0000 0001	0.703125 degrees
1	0	0000 0010	1.406250 degrees
*	*	**** ****	**** **** ****
*	*	**** ****	**** **** ****
*	*	**** ****	**** **** ****
1	0	1111 1111	179.296875 degrees
1	1	0000 0000	180.0 or -180.0 degrees
1	1	0000 0001	180.703125 or -179.296875 degrees
1	1	0000 0010	181.406250 or -178.593750 degrees
*	*	**** ****	**** **** ****
*	*	**** ****	**** **** ****
*	*	**** ****	**** **** ****
1	1	1000 0000	270.000 or -90.0000 degrees
1	1	1000 0001	270.703125 or -89.296875 degrees
1	1	1000 0010	271.406250 or -88.593750 degrees
1	1	1111 1110	358.593750 or -1.4062500 degrees
1	1	1111 1111	359.296875 or -0.7031250 degrees

b. Encoding of Selected Heading data in "ME" bits 31 –through-39 (Message bits 63 –through- 71) **shall** be rounded so as to preserve accuracy of the source data within +/- ½ LSB.

c. Whenever there is NO valid Selected Heading data available, then the Selected Heading Status, Sign, and Data subfields ("ME" bits 30 –through- 39, Message bits 62 –through- 71) **shall** be set to ZERO (0) as indicated in Table 2-51 of paragraph "a".

2.2.3.2.7.3.8 Navigation Accuracy Category_Position (NAC_P)

The Navigation Accuracy Category for Position (NAC_P) subfield is a 4-bit ("ME" bits 40 through 43, Message bits 72 through 75) subfield of the Target State and Status Message that **shall** announce 95% accuracy limits for the horizontal position (and for some NAC_P values, the vertical position) that is being currently broadcast in Airborne Position and Surface Position Messages. Table 2-71 specifies the accuracy limits for each NAC_P value. If an update has not been received from an on-board data source for NAC_P within the past 5 seconds, then the NAC_P subfield **shall** be encoded as a value of ZERO (0) indicating "Unknown Accuracy."

Note: *The Navigation Accuracy Category for Position (NAC_P) is reported so that surveillance applications may determine whether the reported geometric position has an acceptable level of accuracy for the intended use. See §2.1.2.13 of the ADS-B MASPS, RTCA DO-242A, for a fuller description of NAC_P.*

2.2.3.2.7.3.9 Navigation Integrity Category_Baro (NIC_{BARO})

The "NIC_{BARO}" (Barometric Altitude Integrity Code) subfield is a 1-bit ("ME" bit 44, Message bit 76) field that **shall** be used to indicate whether or not the barometric pressure altitude being reported in the Airborne Position Message (§2.2.3.2.3) has been crosschecked against another source of pressure altitude. The "NIC_{BARO} " subfield **shall** be encoded in accordance with Table 2-73, as specified in the Aircraft Operational Status Message. If an update has not been received from an on-board data source for NIC_{BARO} within the past 5 seconds, then the NIC_{BARO} subfield **shall** be encoded as a value of ZERO (0).

2.2.3.2.7.3.10 System Integrity Level (SIL)

The "SIL" (Surveillance Integrity Level) subfield is a 2-bit ("ME" bits 45 and 46, Message bits 77 and 78) field that **shall** be used to define the probability of the integrity containment region described by the NIC subfield being exceeded for the selected geometric position source, including any external signals used by the source. The "SIL" subfield **shall** be encoded in accordance with Table 2-72, as specified in the Aircraft Operational Status Message. If an update has not been received from an on-board data source for SIL within the past 5 seconds, then the SIL subfield **shall** be encoded as a value of ZERO (0), indicating "Unknown."

2.2.3.2.7.3.11 Status of MCP / FCU Mode Bits Target State and Status (Subtype=1 Format)

The "Status of MCP / FCU Mode Bits" subfield is a 1-bit ("ME" bit 47, Message bit 79) field that **shall** be used to indicate whether the mode bits ("ME" bits 48, 49, 50 and 52, Message bits 80, 81, 82 and 84) are actively being populated (e.g., set) in the Target State and Status message in accordance with Table 2-52.

Table 2-52: "Status of MCP / FCU Mode Bits" Subfield Encoding

Coding ("ME" Bit 47)	**Meaning**
0	No Mode Information is being provided in "ME" bits 48, 49, 50 or 52 (Message bits 80, 81, 82, or 84)
1	Mode Information is deliberately being provided in "ME" bits 48, 49, 50 or 52 (Message bits 80, 81, 82, or 84)

Essentially, if information is provided to the ADS-B transmit subsystem to set either "ME" bit 48, 49, 50, or 52 (Message bit 80, 81, 82 or 84) to either "0" or "1", then bit 47 **shall** be set to ONE (1). Otherwise, bit 47 **shall** be set to ZERO (0).

2.2.3.2.7.3.12 Autopilot Engaged

The "Autopilot Engaged" subfield is a 1-bit ("ME" bit 48, Message bit 80) field that **shall** be used to indicate whether the autopilot system is engaged or not.

a. The ADS-B transmit subsystem **shall** accept information from an appropriate interface that indicates whether or not the Autopilot is engaged.

b. The ADS-B transmit subsystem **shall** set "ME" bit 48 (Message bit 80) in accordance with Table 2-53.

Table 2-53: "Autopilot Engaged" Subfield Encoding

Coding ("ME" Bit 48)	**Meaning**
0	Autopilot is NOT Engaged (e.g., not actively coupled and flying the aircraft)
1	Autopilot is Engaged (e.g., actively coupled and flying the aircraft)

2.2.3.2.7.3.13 VNAV Mode Engaged

The "VNAV Mode Engaged" subfield is a 1-bit ("ME" bit 49, Message bit 81) field that **shall** be used to indicate whether the Vertical Navigation Mode is active or not.

a. The ADS-B transmit subsystem **shall** accept information from an appropriate interface that indicates whether or not the Vertical Navigation Mode is active.

b. The ADS-B transmit subsystem **shall** set "ME" bit 49 (Message bit 81) in accordance with Table 2-54.

Table 2-54: "VNAV Engaged" Subfield Encoding

Coding ("ME" Bit 49)	**Meaning**
0	VNAV Mode is NOT Active
1	VNAV Mode is Active

2.2.3.2.7.3.14 Altitude Hold Mode

The "Altitude Hold Mode" subfield is a 1-bit ("ME" bit 50, Message bit 82) field that **shall** be used to indicate whether the Altitude Hold Mode is active or not.

a. The ADS-B transmit subsystem **shall** accept information from an appropriate interface that indicates whether or not the Altitude Hold Mode is active.

b. The ADS-B transmit subsystem **shall** set "ME" bit 50 (Message bit 82) in accordance with Table 2-55.

Table 2-55: "Altitude Hold Mode" Subfield Encoding

Coding ("ME" Bit 50)	**Meaning**
0	Altitude Hold Mode is NOT Active
1	Altitude Hold Mode is Active

2.2.3.2.7.3.15 Reserved for ADS-R Flag

The "Reserved for ADS-R Flag" Subfield is a 1-bit ("ME" bit 51, Message bit 83) field that **shall** be used as specified in section §2.2.18.4.6.

2.2.3.2.7.3.16 Approach Mode

The "Approach Mode" subfield is a 1-bit ("ME" bit 52, Message bit 84) field that **shall** be used to indicate whether the Approach Mode is active or not.

a. The ADS-B transmit subsystem **shall** accept information from an appropriate interface that indicates whether or not the Approach Mode is active.

b. The ADS-B transmit subsystem **shall** set "ME" bit 52 (Message bit 84) in accordance with Table 2-56.

Table 2-56: "Approach Mode" Subfield Encoding

Coding ("ME" Bit 52)	**Meaning**
0	Approach Mode is NOT Active
1	Approach Mode is Active

2.2.3.2.7.3.17 TCAS Operational

The "TCAS Operational" subfield is a 1-bit ("ME" bit 53, Message bit 85) field that **shall** be used to indicate whether the TCAS System is Operational or not.

a. The ADS-B transmit subsystem **shall** accept information from an appropriate interface that indicates whether or not the TCAS System is Operational.

b. The ADS-B transmit subsystem **shall** set "ME" bit 53 (Message bit 85) in accordance with Table 2-57.

Table 2-57: "TCAS Operational" Subfield Encoding

Coding ("ME" Bit 53)	**Meaning**
0	TCAS System is NOT Operational
1	TCAS System is Operational

Note: *As a reference point, RTCA DO-181D Mode-S Transponders consider that the TCAS System is operational when "MB" bit 16 of BDS 1,0 is set to "ONE" (1). This occurs when the transponder / TCAS interface is operational and the transponder is receiving TCAS RI=2, 3 or 4. (Refer to RTCA DO-181D, Appendix B, Table B-3-16.*

2.2.3.2.7.3.18 Emergency / Priority Status

The "Emergency/Priority Status" subfield is a 3-bit ("ME" bits 54 through 56, Message bits 86 through 88) field that **shall** be used to provide additional information regarding aircraft status. The "Emergency/Priority Status" subfield **shall** be encoded in accordance with Table 2-57. If an update has not been received from an on-board data source for the "Emergency/Priority Status" within the past 5 seconds, then the "Emergency/Priority Status" subfield **shall** be encoded with a value of ZERO (0) indicating "No Emergency."

Table 2-57: "Emergency/Priority Status" Subfield Encoding

Coding		Meaning
(Binary)	(Decimal)	
000	0	No emergency
001	1	General emergency
010	2	Lifeguard/medical emergency
011	3	Minimum fuel
100	4	No communications
101	5	Unlawful interference
110	6	Downed Aircraft
111	7	Reserved

PART 3:

The following sections provide test procedures for the requirements sections provided in Part 3. Effectively, in RTCA DO-260A, e.g., 260B, replace section 2.4.3.2.7 through 2.4.3.2.7.1.3.15 with the following section 2.4.3.2.7 through 2.4.3.2.7.3.18.

2.3

2.4

2.4.3.2.7 Verification of "Target State and Status" Messages (§2.2.3.2.7)

No specific test procedure is required to validate §2.2.3.2.7.1.

2.4.3.2.7.1 Verification of "TYPE" Subfield in Target State and Status Messages (§2.2.3.2.7.1)

Purpose/Introduction:

These test procedures verify that the ADS-B Transmitting Subsystem correctly outputs Target State and Status Messages with the correct TYPE subfield data content in Message Bits 33 through 37 in DF=17 Messages for Transponder-Based Systems and DF=18 Messages for Non-Transponder-Based Systems. The TYPE subfield for the Target State and Status Messages should contain the value "29."

The ADS-B Transmitting Subsystem determines and outputs the "TYPE" subfield based upon the input it receives from the type of Navigational System source that may interface to the system. The ADS-B Transmitting Subsystem may receive the "TYPE" subfield directly through an external interface instead of dynamically determining the "TYPE" subfield.

Measurement Procedure:

Configure the ADS-B Transmitting Subsystem to transmit Target State and Status Messages by providing valid Selected Vertical Intention information at the nominal update rate. Provide the data externally at the interface to the ADS-B system. Set the ADS-B Transmitting Subsystem to Airborne status.

Verify that the "TYPE" subfield in the ADS-B Message correctly matches the "TYPE" subfield value of 29 (binary 11101). See Table 2-16.

2.4.3.2.7.2 Verification of the "Subtype" Subfield in Target State and Status Messages (§2.2.3.2.7.2)

Purpose/Introduction:

The "Subtype" subfield is a 2-bit ("ME" bits 6 and 7, Message bits 38 and 39) field that **shall** be used to identify if the format of the remainder of the Target State and Status Message. The "Subtype" subfield **shall** be encoded in accordance with Table 2-45.

Measurement Procedure:

Configure the ADS-B Transmitting Subsystem to transmit Target State and Status Messages by providing valid Selected Vertical Intention information at the nominal update rate. Provide the data externally at the interface to the ADS-B system. Set the ADS-B Transmitting Subsystem to Airborne status.

Verify that the "TYPE" subfield in the ADS-B Message is set to a value of 29 (binary 11101) and that the "Subtype" subfield is set to a value of ONE (binary 01).

2.4.3.2.7.3 Verification of the Target State and Status (Subtype=1) Format (§2.2.3.2.7.3)

Appropriate test procedures required to validate the requirements of §2.2.3.2.7.3 are included in §2.4.3.2.7.3.1 through §2.4.3.2.7.3.18.

2.4.3.2.7.3.1 Verification of the "SPARE" Subfield in Target State and Status Messages (§2.2.3.2.7.3.1)

Purpose/Introduction:

"ME" bit 8 (Message bit 40) is assigned as a SPARE bit in these MOPs until such time that it may be re-assigned.

Measurement Procedure:

Configure the ADS-B Transmitting Subsystem to transmit Target State and Status Messages by providing valid Selected Vertical Intention information at the nominal update rate. Provide the data externally at the interface to the ADS-B system. Set the ADS-B Transmitting Subsystem to Airborne status.

Verify that the "SPARE" subfield in the ADS-B Message is set to a value of ZERO (0).

2.4.3.2.7.3.2 Verification of the "Selected Altitude Type" Subfield in Target State and Status Messages (§2.2.3.2.7.3.2)

Appropriate procedures to verify setting of the Selected Altitude Type are provided in §2.4.3.2.7.3.3.

2.4.3.2.7.3.3 Verification of the "MCP / FCU Selected Altitude or FMS Selected Altitude" Subfield in Target State and Status Messages (§2.2.3.2.7.3.3)

Purpose/Introduction:

The purpose of the following procedure is to verify that Selected Altitude data is properly reported in accordance with §2.2.3.2.7.3.3.

Measurement Procedure:

Step 1: Setup of MCP / FCU Selected Altitude Data:

For each line Item # in the following table (Table 2-144), via the appropriate interface, provide the ADS-B transmit subsystem with Mode Control Panel Selected Altitude having a value as indicated in the "Data Value" (feet) Column in the table.

Table 2-144: Target State and Status Message MCP / FCU Selected Altitude (ARINC Label "102")

Item #	Generic MCP / FCU Selected Altitude Input (BNR)			Target State and Status Encoding of MCP / FCU Selected Altitude		
	Type of Value	Status	Data Value (feet)	TYPE (bit 9)	Decimal Value (feet)	Binary Value (bit 10 ------ 20)
1	Basic	Valid	43,648.00	0	43,648.00	101 0101 0101
2	Basic	Valid	21,792.00	0	21,792.00	010 1010 1010
3	Basic	Valid	23,352.00	0	23,352.00	011 0111 0111
5	Basic	Valid	65,472.00	0	65,472.00	111 1111 1111
6	Basic	Rounded (1/4 LSB)	52,392.00	0	52,384.00	110 0110 0110
7	Basic	Rounded (1/2 LSB)	52,400.00	0	52,416.00	110 0110 0111
8	Invalid	Invalid	21,792.00	0	0.00	000 0000 0000

Step 2: Setup of FMS Selected Altitude Data:

For each line Item # in the following table (Table 2-145), via the appropriate interface, provide the ADS-B transmit subsystem with FMS Selected Altitude having a value as indicated in the "Data Value" (feet) Column in the table. Provide at least one data value from Table 2-145 while provided the data for Line Item #1 through 7 in Table 2-144. Do not provide any data from Table 2-145 when providing data for Line Item #8 in Table 2-144.

Table 2-145 Target State and Status Message FMS Selected Altitude (ARINC Label "102")

Item #	Generic FMS Selected Altitude Input (BNR)			Target State and Status Encoding of FMS Selected Altitude		
	Type of Value	Status	Data Value (feet)	TYPE (bit 9)	Decimal Value (feet)	Binary Value (bit 10 ------ 20)
1	Basic	Valid	37,088.00	1	37,088.00	100 1000 1000
2	Basic	Valid	13,600.00	1	13,600.00	001 1010 1010
3	Basic	Valid	22,880.00	1	22,880.00	010 1100 1100
5	Basic	Valid	60,032.00	1	60,032.00	111 0101 0101
6	Basic	Rounded (1/4 LSB)	25,640.00	1	25,632.00	011 0010 0010
7	Basic	Rounded (1/2 LSB)	25,648.00	1	25,664.00	011 0010 0011
8	Invalid	Invalid	13,600.00	1	0.00	000 0000 0000

Step 3: Verification of MCP / FCU Selected Altitude Data:

For each line Item # given in Table 2-144 in subparagraph a, verify that Target State and Status Messages are properly transmitted having:

(1). Selected Altitude Type, (bit 9), set as indicated in the "TYPE" (bit 9) Column of Table 2-144.

(2). Selected Altitude Binary Value, set as indicated in the "Binary Value" (bit 10 --- 20) Column of Table 2-144.

Step 4: Discontinue MCP / FCU Selected Altitude data:

Discontinue the provisioning of all MCP / FCU Selected Altitude data as was provided in Step 1, e.g., Table 2-144.

Step 5: Verification of FMS Selected Altitude Data:

For each line Item # given in Table 2-145 in subparagraph b, verify that Target State and Status Messages are properly transmitted having:

(1). Selected Altitude Type, (bit 9), set as indicated in the "TYPE" (bit 9) Column of Table 2-145, and

(2). Selected Altitude Binary Value, set as indicated in the "Binary Value" (bit 10 --- 20) Column of Table 2-145.

Step 6: Discontinue FMS Selected Altitude data:

Discontinue the provisioning of all MCP / FCU Selected Altitude data as was provided in Step 1, e.g., Table 2-144.

Step 7: Verification of Selected Altitude Data_ Data Lifetime:

At least 5 seconds after the execution of step "f", verify that Target State and Status Messages are properly transmitted having:

(1). Selected Altitude Type, (bit 9), set to ZERO (0).

(2). Selected Altitude Binary Value, set to ZERO (0).

2.4.3.2.7.3.4 Verification of the "Barometric Pressure Setting (Minus 800 millibars)" Subfield in Target State and Status Messages (§2.2.3.2.7.3.4)

Purpose/Introduction:

The purpose of the following procedure is to verify that Selected Altitude data is properly reported in accordance with §2.2.3.2.7.3.4.

Measurement Procedure:

Step 1: Setup of Barometric Pressure Setting Data:

For each line Item # in the following table (Table 2-146), via the appropriate interface, provide the ADS-B transmit subsystem with Barometric Pressure Setting data having a value as indicated in the "Data Value" (millibars) Column in the table.

Table 2-146 Target State and Status Message Barometric Pressure Setting (ARINC Label "234")

Item #	Barometric Pressure Setting Data Input			Target State and Status Encoding of Barometric Pressure Setting	
	Type of Value	Status	Data Value (millibars)	Decimal Value (millibars) (minus 800)	Binary Value (bit 21 ------ 29)
1	Basic	Valid	942.7	142.4	0 1011 0001
2	Basic	Valid	923.2	123.2	1 0101 0101
3	Basic	Valid	1208.0	408.0	1 1111 1111
5	Basic	Valid	927.2	127.2	0 1010 1010
6	Basic	Rounded (1/4 LSB)	1099.4	299.2	1 0111 0111
7	Basic	Rounded (1/2 LSB)	1099.6	300.0	1 0111 1000
8	Invalid	Valid	1209.6	0.000	0 0000 0000
9	Invalid	Valid	799.6	0.000	0 0000 0000
10	Invalid	Invalid	927.2	0.00	0 0000 0000

Step 2: Verification of Barometric Pressure Setting Data:

For each line Item # given in Table 2-146 in subparagraph a, verify that Target State and Status Messages are properly transmitted having Barometric Pressure Setting Binary Value set as indicated in the "Binary Value" (bit 21 --- 29) Column of Table 2-146.

Step 3: Discontinue Barometric Pressure Setting data:

Discontinue the provisioning of all Barometric Pressure Setting data as was provided in Step 1, e.g., Table 2-146.

Step 4: Verification of Barometric Pressure Setting Data_ Data Lifetime:

At least 5 seconds after the execution of step "f", verify that Target State and Status Messages are properly transmitted having Barometric Pressure Setting Binary Value (bit 21 --- 29) set to ZERO (0)..

2.4.3.2.7.3.5 Verification of the "Selected Heading Status" Subfield in Target State and Status Messages (§2.2.3.2.7.3.5)

Appropriate procedures to verify setting of the Selected Heading Status are provided in §2.4.3.2.7.3.7.

2.4.3.2.7.3.6 Verification of the "Selected Heading Sign" Subfield in Target State and Status Messages (§2.2.3.2.7.3.6)

Appropriate procedures to verify setting of the Selected Heading Sign are provided in §2.4.3.2.7.3.7.

2.4.3.2.7.3.7 Verification of the "Selected Heading" Subfield in Target State and Status Messages (§2.2.3.2.7.3.7)

Purpose/Introduction:

The purpose of the following procedure is to verify that Selected Heading data is properly reported in accordance with §2.2.3.2.7.3.5 –through- §2.2.3.2.7.3.7.

Measurement Procedure:

Step 1: Setup of Selected Heading Data:

For each line Item # in the following table (Table 2-147), via the appropriate interface, provide the ADS-B transmit subsystem with Selected Heading data having a value as indicated in the "Data Value" (degrees) Column in the table.

Table 2-147 Target State and Status Message Selected Heading (ARINC Label "101")

Item #	Generic Selected Heading Input (degrees) [binary (BNR)]				Target State and Status Encoding of Selected Heading				
	Type of Value	Status	Sense (Note 1)	Data Value (degrees)	Sense (Note 1)	Decimal Value (degrees)	Status (bit 30)	Sign (bit 31) (Note 2)	Binary Value (bits 32 --- 39)
1	Basic	Valid	West (CCW)	-120.234375 (239.765625)	Left	-120.234375 (239.765625)	1	1	0101 0101
2	Basic	Valid	East (CW)	119.53125	Right	119.53125	1	0	1010 1010
3	Basic	Valid	West (CCW)	-24.609375 (335.390625)	Left	-24.609375 (335.390625)	1	1	1101 1101
4	Basic	Valid	West (CCW)	-90.000 (270.000)	Left	-90.000 (270.000)	1	1	1000 0000
5	Basic	Valid	East (CW)	135.000	Right	135.000	1	0	1100 0000
6	Rounded (1/4 LSB)	Valid	West (CCW)	-120.0585937 (239.94140625)	Left	-120.234375 (239.765625)	1	1	0101 0101
7	Rounded (1/2 LSB)	Valid	West (CCW)	-119.8828125 (240.1171875)	Left	-119.53125 (240.46875)	1	1	0101 0110
8	Invalid	Invalid	East (CW)	119.53125	Not Applicable	0.000	0	0	0000 0000

Notes:

1. *Input data Sense refers to (a) Positive, being Clockwise (CW), commonly meaning East of North, or (b) Negative, being Counter-Clockwise (CCW), commonly meaning West of North.*
2. *The Sign Bit is "1" for Negative, West of North, or Counter-Clockwise (CCW). The Sign Bit is "0" for Positive, East of North, or Clockwise (CW).*

Step 2: Verification of Selected Heading Status, Sign, and Data:

For each line Item # given in Table 2-147 in subparagraph a, verify that Target State and Status Messages are properly transmitted having:

(1). Selected Heading Status ("ME" bit 30, Message Bit 62) set as indicated in the "Status (bit 30)" Column of Table 2-147,

(2). Selected Heading Sign ("ME" bit 31, Message Bit 63) set as indicated in the "Sign (bit 31)" Column of Table 2-147, and

(3). Selected heading Data ("ME" bits 32 –through- 39, Message bits 64 –through- 71) set as indicated in the "Binary Value (bits 32---39)" Column of Table 2-147.

Step 3: Discontinue Selected Heading data:

Discontinue the provisioning of all Selected Heading information (e.g., Status, Sign, Data) as was provided in Step 1, e.g., Table 2-147.

Step 4: Verification of Selected Heading_ Data Lifetime:

At least 5 seconds after the execution of step "c", verify that Target State and Status Messages are properly transmitted having all Selected Heading information ("ME" bits 30 –through- 39, Message bits 62 –through- 71) set to ZERO (0)..

2.4.3.2.7.3.8 Verification of the "Navigation Accuracy Category_Position (NAC_P)" Subfield in Target State and Status Messages (§2.2.3.2.7.3.8)

The "NAC_P " subfield in the Target State and Status Message is encoded in accordance with Table 2-71.

Measurement Procedure:

Step 1: Verification of NAC_P Transmission

Configure the ADS-B Transmitting Subsystem to transmit Target State and Status Messages by providing valid trajectory information at the nominal update rate. Provide the data externally at the interface to the ADS-B system.

Verify that for each input NAC_P parameter that is specified by the EPU value in Table 2-71, that the system generates ADS-B Messages with the NAC_P subfield set equal to the corresponding binary coding value shown in Table 2-71.

Step 2: Verification of NAC_P – Data Lifetime

Rerun the Test Procedure in Step 1. Remove the data source input for valid trajectory information for a period of at least 5 seconds. Verify that ME bits 40 through 43 in the Target State and Status Message are set to a value of ZERO (binary 0000).

2.4.3.2.7.3.9 Verification of the "Navigation Integrity Category_Baro (NIC_{BARO})" Subfield in Target State and Status Messages (§2.2.3.2.7.3.9)

Purpose/Introduction:

The "NIC_{BARO}" (Barometric Altitude Integrity Code) subfield in the Target State and Status Message is used to indicate whether or not the barometric pressure altitude being reported in the Airborne Position Message (§2.2.3.2.3) has been cross checked against another source of pressure altitude. The "NIC_{BARO} " subfield is encoded in accordance with Table 2-73, as specified in the Aircraft Operational Status Message.

Measurement Procedure:

Step 1: Verification of NIC_{BARO} Transmission

Configure the ADS-B Transmitting Subsystem to transmit Target State and Status Messages by providing valid trajectory information at the nominal update rate. Provide the data externally at the interface to the ADS-B system.

Operationally select Barometric Pressure Altitude as the Primary Altitude information and verify that the "ALTITUDE TYPE" field in ME bit 10 is set to ZERO (0).

Input to the ADS-B Transmitting Subsystem the condition that signifies that the barometric pressure altitude has been crosschecked against another source of pressure altitude. Verify that the NIC_{BARO} field ME bit 44 is set to ONE (1).

Input to the ADS-B Transmitting Subsystem the condition that signifies that the barometric pressure altitude has NOT been crosschecked against another source of pressure altitude. Verify that the NIC_{BARO} field ME bit 44 is set to ZERO (0).

Step 2: Verification of NIC_{BARO} – Data Lifetime

Rerun the Test Procedure in Step 1. Remove the data source input used in step 1 for a period of at least 5 seconds. Verify that ME bit 44 in the Target State and Status Message is set to a value of ZERO (0).

2.4.3.2.7.3.10 Verification of the "System Integrity Level (SIL)" Subfield in Target State and Status Messages (§2.2.3.2.7.3.10)

Purpose/Introduction:

The "SIL" (Surveillance Integrity Level) subfield is used to define the probability of the integrity containment region described by the NIC subfield being exceeded for the selected geometric position source, including any external signals used by the source. The "SIL" subfield is encoded in accordance with Table 2-72, as specified in the ADS-B Aircraft Operational Status Message.

Measurement Procedure:

Step 1: Verification of SIL Transmission

Configure the ADS-B Transmitting Subsystem to transmit Target State and Status Messages by providing valid trajectory information at the nominal update rate. Provide the data externally at the interface to the ADS-B system.

Verify that for each "SIL" parameter input condition that is specified by the probability of exceeding the R_C Integrity Containment Radius without detection (i.e., the value in Table 2-72), that the system generates ADS-B Messages with the "SIL" subfield set equal to the corresponding binary coding value shown in Table 2-72.

Step 2: Verification of SIL– Data Lifetime

Rerun the Test Procedure in Step 1. Remove the data source input in step 1 for a period of at least 5 seconds. Verify that ME bits 45 and 46 in the Target State and Status Message are set to a value of ZERO (binary 00).

2.4.3.2.7.3.11 Verification of the "Status of MCP / FCU Mode Bits" Subfield in Target State and Status Messages (§2.2.3.2.7.3.11)

Purpose/Introduction:

The purpose of the following procedure is to verify that "Status of MCP / FCU Mode Bits" information is properly reported in accordance with §2.2.3.2.7.3.11.

Measurement Procedure:

Step 1: Initialization with NO Status:

Ensure that No information is being provided to the ADS-B transmit subsystem that would indicate the status of Autopilot Engaged, VNAV Mode Engaged, Altitude Hold Mode, or Approach Mode.

Step 2: Verification of NO Status:

Verify that Target State and Status Messages are properly transmitted having the "Status of MCP / FCU Mode Bits" subfield ("ME" bit 47, Message bit 79) set to ZERO (0).

Step 3: Initialization with Status:

Via the appropriate interface(s), provide the ADS-B transmit subsystem with the status of Autopilot Engaged, VNAV Mode Engaged, Altitude Hold Mode and Approach Mode with the status indicating "Not Engaged" for each of the status parameters.

Step 4: Verification of Provided Status:

Verify that Target State and Status Messages are properly transmitted having the "Status of MCP / FCU Mode Bits" subfield ("ME" bit 47, Message bit 79) set to ONE (1).

2.4.3.2.7.3.12 Verification of the "Autopilot Engaged" Subfield in Target State and Status Messages (§2.2.3.2.7.3.12)

Purpose/Introduction:

The purpose of the following procedure is to verify that "Autopilot Engaged" information is properly reported in accordance with §2.2.3.2.7.3.12.

Measurement Procedure:

Step 1: Initialization with Autopilot Not Engaged:

Via the appropriate interface, provide the ADS-B transmit subsystem with the information necessary to establish that the Autopilot is Not Engaged.

Step 2: Verification of Autopilot Not Engaged:

Verify that Target State and Status Messages are properly transmitted having the "Autopilot Engaged" subfield ("ME" bit 48, Message bit 80) set to ZERO (0).

Step 3: Initialization with Autopilot Engaged:

Via the appropriate interface, provide the ADS-B transmit subsystem with the information necessary to establish that the Autopilot is Engaged.

Step 4: Verification of Autopilot Engaged:

Verify that Target State and Status Messages are properly transmitted having the "Autopilot Engaged" subfield ("ME" bit 48, Message bit 80) set to ONE (1).

2.4.3.2.7.3.13 Verification of the "VNAV Mode Engaged" Subfield in Target State and Status Messages (§2.2.3.2.7.3.13)

Purpose/Introduction:

The purpose of the following procedure is to verify that "VNAV Mode Engaged" information is properly reported in accordance with §2.2.3.2.7.3.13.

Measurement Procedure:

Step 1: Initialization with VNAV Mode Not Engaged:

Via the appropriate interface, provide the ADS-B transmit subsystem with the information necessary to establish that the VNAV Mode is Not Engaged.

Step 2: Verification of VNAV Mode Not Engaged:

Verify that Target State and Status Messages are properly transmitted having the "VNAV Mode Engaged" subfield ("ME" bit 49, Message bit 81) set to ZERO (0).

Step 3: Initialization with VNAV Mode Engaged:

Via the appropriate interface, provide the ADS-B transmit subsystem with the information necessary to establish that the VNAV Mode is Engaged.

Step 4: Verification of VNAV Mode Engaged:

Verify that Target State and Status Messages are properly transmitted having the "VNAV Mode Engaged" subfield ("ME" bit 49, Message bit 81) set to ONE (1).

2.4.3.2.7.3.14 Verification of the "Altitude Hold Mode" Subfield in Target State and Status Messages (§2.2.3.2.7.3.14)

Purpose/Introduction:

The purpose of the following procedure is to verify that "Altitude Hold" information is properly reported in accordance with §2.2.3.2.7.3.14.

Measurement Procedure:

Step 1: Initialization with Altitude Hold Mode Not Engaged:

Via the appropriate interface, provide the ADS-B transmit subsystem with the information necessary to establish that the Altitude Hold Mode is Not Engaged.

Step 2: Verification of VNAV Not Engaged:

Verify that Target State and Status Messages are properly transmitted having the "Altitude Hold" subfield ("ME" bit 50, Message bit 82) set to ZERO (0).

Step 3: Initialization with Altitude Hold Mode Engaged:

Via the appropriate interface, provide the ADS-B transmit subsystem with the information necessary to establish that the Altitude Hold Mode is Engaged.

Step 4: Verification of Altitude Hold Mode Engaged:

Verify that Target State and Status Messages are properly transmitted having the "Altitude Hold" subfield ("ME" bit 50, Message bit 82) set to ONE (1).

2.4.3.2.7.3.15 Verification of the "Reserved for ADS-R Flag" Subfield in Target State and Status Messages (§2.2.3.2.7.3.15)

Purpose/Introduction:

These test procedures verify that the ME Field of the Rebroadcast Target State and Status Message is formatted as specified in Figure 2-10, **except** that ME bit 51 is redefined to be the ICAO/Mode A Flag (IMF).

Measurement Procedure:

Step 1: Establish Initial Conditions

Configure the ADS-B Transmitting Subsystem to transmit Target State and Status Messages by providing valid Selected Vertical Intention information at the nominal rate. Provide the data externally at the interface to the ADS-B system. Set the ADS-B Transmitting Subsystem to Airborne status.

Step 2: Valid Message Contents When Selecting ICAO 24-Bit Address

Input an IMF value of ZERO (0) into ME Bit 51 of the Target State and Status Message to be transmitted. Input AAAAAA {HEX} for the ICAO 24-Bit Address. Select "ICAO 24-Bit Address" at the Address Qualifier input to the ADS-B Transmitting Subsystem. Verify the following ADS-R Message content upon decode of the transmitted data:

DF field (Message Bits 1 – 5) equals decimal 18
CF field (Message Bits 6 – 8) equals decimal 6
AA field (Message Bits 9 – 32) equals AAAAAA {HEX}
TYPE Code field (Message Bits 33 – 37) equals decimal 29
Subtype Code field (Message Bits 38 – 40) equals decimal 0
IMF field (Message Bit 83) equals ZERO (0)

Verify the remaining fields of the ADS-R Target State and Status Message, by correlating the decoded Message to the stimulus data provided by the test equipment.

Step 3: Valid Message Contents When Selecting Anonymous Address

Reinitialize the unit under test as in Step 1 above. Input an IMF value of ONE (1) into ME Bit 51 of the Target State and Status Message to be transmitted. Input 555555 {HEX} for the Anonymous Address. Select "Anonymous Address" at the Address Qualifier input to the ADS-B Transmitting Subsystem. Verify the following ADS-R Message content upon decode of the transmitted data:

DF field (Message Bits 1 – 5) equals decimal 18
CF field (Message Bits 6 – 8) equals decimal 6
AA field (Message Bits 9 – 32) equals 555555 {HEX}
TYPE Code field (Message Bits 33 – 37) equals decimal 29
Subtype Code field (Message Bits 38 – 40) equals decimal 0
IMF field (Message Bit 83) equals ONE (1)

Verify the remaining fields of the ADS-R Target State and Status Message, by correlating the decoded Message to the stimulus data provided by the test equipment.

2.4.3.2.7.3.16 Verification of the "Approach Mode" Subfield in Target State and Status Messages (§2.2.3.2.7.3.16)

Purpose/Introduction:

The purpose of the following procedure is to verify that "Approach Mode" information is properly reported in accordance with §2.2.3.2.7.3.16.

Measurement Procedure:

Step 1: Initialization with Approach Mode Not Engaged:

Via the appropriate interface, provide the ADS-B transmit subsystem with the information necessary to establish that the Approach Mode is Not Engaged.

Step 2: Verification of Approach Mode Not Engaged:

Verify that Target State and Status Messages are properly transmitted having the "Approach Mode" subfield ("ME" bit 52, Message bit 84) set to ZERO (0).

Step 3: Initialization with Approach Mode Engaged:

Via the appropriate interface, provide the ADS-B transmit subsystem with the information necessary to establish that the Approach Mode is Engaged.

Step 4: Verification of Approach Mode Engaged:

Verify that Target State and Status Messages are properly transmitted having the "Approach Mode" subfield ("ME" bit 52, Message bit 84) set to ONE (1).

2.4.3.2.7.3.17 Verification of the "TCAS Operational" Subfield in Target State and Status Messages (§2.2.3.2.7.3.17)

Purpose/Introduction:

The purpose of the following procedure is to verify that "TCAS Operational" information is properly reported in accordance with §2.2.3.2.7.3.17.

Measurement Procedure:

Step 1: Initialization with TCAS Not Operational:

Via the appropriate interface, provide the ADS-B transmit subsystem with the information necessary to establish that TCAS is Not Operational.

Step 2: Verification of TCAS Not Operational:

Verify that Target State and Status Messages are properly transmitted having the "TCAS Operational" subfield ("ME" bit 55, Message bit 85) set to ZERO (0).

Step 3: Initialization with TCAS Operational:

Via the appropriate interface, provide the ADS-B transmit subsystem with the information necessary to establish that TCAS is Operational.

Step 4: Verification of TCAS Operational:

Verify that Target State and Status Messages are properly transmitted having the "TCAS Operational" subfield ("ME" bit 53, Message bit 85) set to ONE (1).

2.4.3.2.7.3.18 Verification of the "Emergency / Priority Status" Subfield in Target State and Status Messages (§2.2.3.2.7.3.18)

Purpose/Introduction:

The "Emergency/Priority Status" 3-bit subfield in the Target State and Status Message is used to provide additional information regarding aircraft status. The "Emergency/Priority Status" subfield is encoded in accordance with Table 2-57.

Measurement Procedure:

Step 1: Verification of Emergency/Priority Status Transmission

Configure the ADS-B Transmitting Subsystem to transmit Target State and Status Messages by providing valid trajectory information at the nominal update rate. Provide the data externally at the interface to the ADS-B system.

Verify that for each input "Emergency/Priority Status" parameter that is specified by the value in Table 2-57, that the system generates ADS-B Messages with the "Emergency/Priority Status" subfield set equal to the corresponding binary coding value shown in Table 2-57.

Step 2: Verification of Emergency/Priority Status – Data Lifetime

Rerun the Test Procedure in Step 1. Remove the data source input for Emergency/Priority information for a period of at least 5 seconds. Verify that ME bits 54 through 56 in the Target State and Status Message are set to a value of ZERO (binary 000).