

RTCA Special Committee 186, Working Group 3

ADS-B 1090 MOPS, Revision A

Meeting #6

ACTION ITEM 5-6

Initial Draft of TIS-B MOPS Material for Section 2.2

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SUMMARY

At the fifth meeting, an action item was identified to begin drafting TIS-B MOPS material for Section 2.2.

This working paper presents a an initial draft of TIS-B MOPS material intended for insertion as paragraph 2.2.17 as agreed at an earlier meeting.

Introduction

At the fifth meeting, it was noted that TIS-B Appendix MOPS material was maturing to the point where work should begin on drafting TIS-B materials for Section 2.2 for DO-260A. At a previous meeting, it was agreed that TIS-B materials should start in subparagraph 2.2.17

Proposed Materials

The proposed draft material for subparagraph 2.2.17 is presented on the following pages in the form of an annotated outline.

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- 2 **Equipment Performance Requirements and Test Procedures**
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 - 2.2.16 **Compatibility with Other Systems**

2.2.17 Traffic Information Service Broadcast

2.2.17.1 Introduction

TBD

2.2.17.2 TIS-B Format Structure

DF:5=18	CF:3	AA:24	ME:56	PI:24
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Figure 2-18: TIS-B Format Definition

Table 2-77 “CF” Field Code Definitions in DF=18 ADS-B and TIS-B Messages.

CF Value	ICAO/Mode A Flag (IMF)	Meaning
0	N/A	ADS-B message from a non-transponder device, AA field holds 24-bit ICAO aircraft address
1	N/A	Reserved for ADS-B message in which the AA field holds anonymous address or ground vehicle address or fixed obstruction address
2	0	Fine TIS-B message, AA field contains the 24-bit ICAO aircraft address
	1	Fine TIS-B message, AA field contains the 12-bit Mode A code followed by a 12-bit track file number
3	0	Coarse TIS-B airborne position and velocity message, AA field contains the 24-bit ICAO aircraft address
	1	Coarse TIS-B airborne position and velocity message, AA field contains the 12-bit Mode A code followed by a 12-bit track file number.
4	N/A	Reserved for TIS-B management message AA field holds TIS-B service volume ID + other information (e.g., MSB of reference position for the service volume)
5 – 7	N/A	Reserved for other uses (e.g., for FIS-B messages)

2.2.17.2.1 "DF" Downlink Format

This field shall be set to DF=18 to indicate that this transmission is not from a Mode S transponder. See subparagraph 2.2.3.2.1.1.4.

2.2.17.2.2 "CF" control Field

This field shall be set to 2, 3 or 4 depending upon the TIS-B message as specified in Table 2-77.

2.2.17.2.3 "AA" Address Announced

As specified in Table 2-77, the AA field shall contain either:

- (1) the ICAO 24-bit aircraft address as specified in subparagraph 2.2.3.2.1.1.1, or
- (2) the 12-bit Mode A code followed by a 12-bit track number.,

2.2.17.2.4 "ME" Message Extended Squitter

This field shall be set as specified in subparagraph 2.2.3.2.1.1.5.

2.2.17.2.5 "PI" Parity/Identify

This field shall be set as specified in subparagraph 2.2.3.2.1.1.6.

2.2.17.3 TIS-B Messages

2.2.17.3.1 TIS-B Fine Airborne Position Message

TIS-B Fine Airborne Position Message Format								
MSG BIT #	33 --- 37	38 ----- 39	40	41 ----- 52	53	54	55 ----- 71	72 ----- 88
"ME" BIT #	1 ----- 5	6 ----- 7	8	9 ----- 20	21	22	23 ----- 39	40 ----- 56
Field Name	TYPE [5]	Surveillance Status [2]	IMF [1]	Pressure Altitude [12]	Reserved [1]	CPR Format (F) [1]	CPR Encoded Latitude [17]	CPR Encoded Longitude [17]
	MSB LSB	MSB LSB		MSB LSB			MSB LSB	MSB LSB

Note: “[#]” provided in the Field Name column indicates the number of bits in the specific field.

Figure 2-19: TIS-B Fine Airborne Position Message Format

2.2.17.3.1.1 Relationship to ADS-B Format

The following fields shall be coded as specified for the ADS-B Airborne Position Message defined in subparagraph 2.2.3.2.3:

Type, Surveillance Status, Altitude, CPR Format, Encoded Latitude and Encoded

Longitude.

2.2.17.3.1.2 ICAO/Mode A Flag (IMF)

This one-bit field (bit 8) shall indicate the type of identity associated with the aircraft data reported in the TIS-B message. IMF equal to ZERO (0) shall indicate that the TIS-B data is identified by an ICAO 24-bit address. IMF equal to ONE (1) shall indicate that the TIS-B data is identified by a “Mode A” code. A “Mode A” code of all zeroes shall indicate a primary radar target.

Note: *The AA field is coded differently for 24-bit addresses and Mode A codes as specified in Table A-21*

2.2.17.3.2 TIS-B Fine Surface Position Message

TIS-B Fine Surface Position Message Format								
MSG BIT #	33 -- 37	38 ----- 44	45	46 ----- 52	53	54	55 ----- 71	72 ----- 88
“ME” BIT #	1 ----- 5	6 ----- 12	13	14 ----- 20	21	22	23 ----- 39	40 ----- 56
Field Name	TYPE [5]	Movement [7]	Ground Track Status [1]	Ground Track [7]	IMF [1]	CPR Format (F) [1]	CPR Encoded Latitude [17]	CPR Encoded Longitude [17]
	MSB LSB	MSB LSB		MSB LSB			MSB LSB	MSB LSB

Note: “[#]” provided in the Field Name column indicates the number of bits in the specific field.

Figure 2-20: TIS-B Fine Surface Position Message Format

2.2.17.3.2.1 Relationship to ADS-B Format

The following fields shall be coded as specified for the ADS-B Surface Position Message defined in subparagraph 2.2.3.2.4:

Type, Movement, Ground Track Status, CPR Format, Encoded Latitude and Encoded Longitude.

2.2.17.3.2.2 ICAO/Mode A Flag (IMF)

This one-bit field (bit 21) shall be set as specified in subparagraph 2.2.17.3.1.2.

2.2.17.3.3 TIS-B Identification and Category Message

TIS-B Identification and Category Message Format										
MSG BIT #	33-37	38 ----- 40	41 -46	47-52	53 -58	59 -64	65 -70	71 -76	77 -82	83 -88
"ME" BIT #	1 --- 5	6 ----- 8	9 -- 14	15 -20	21--26	27- 32	33 -38	39 -44	45 -50	51 -56
FIELD NAME	TYPE [5]	ADS-B EMITTER CATEGORY [3]	Ident Char. #1 [6]	Ident Char. #2 [6]	Ident Char. #3 [6]	Ident Char. #4 [6]	Ident Char. #5 [6]	Ident Char. #6 [6]	Ident Char. #7 [6]	Ident Char. #8 [6]
	MSB LSB	MSB LSB	MSB LSB	MSB LSB	MSB LSB	MSB LSB	MSB LSB	MSB LSB	MSB LSB	MSB LSB

Note: “[#]” provided in the Field Name column indicates the number of bits in the specific field.

Figure 2-21: TIS-B Identification and Category Message Format

2.2.17.3.3.1 Relationship to ADS-B Format

All of the message fields shall be coded as specified for the ADS-B Identification and Type Message defined in subparagraph 2.2.3.2.5.

2.2.17.3.3.2 Application

This message shall only be used for aircraft identified with an ICAO 24-bit address.

2.2.17.3.4 TIS-B Airborne Velocity Message

TIS-B VELOCITY INFORMATION MESSAGE - SUBTYPES "1" and "2"												
MSG BIT #	33-37	38 ----- 40	41	42 ----- 45	46	47 --- 56	57	58 --- 67	68	69	70 -- 78	79 ----- 88
"ME" BIT #	1 --- 5	6 ----- 8	9	10 ----- 13	14	15 --- 24	25	26 --- 35	36	37	38 -- 46	47 ----- 56
FIELD NAME	TYPE [5]	SUBTYPE [3]	IMF [1]	Reserved [4]	E/W Direction Bit [1]	E/W Velocity [10]	N/S Direction Bit [1]	N/S Velocity [10]	Reserved [1]	Vert. Rate Sign [1]	Vert. Rate [9]	Reserved [10]
	MSB LSB	MSB LSB		MSB LSB		MSB LSB		MSB LSB			MSB LSB	MSB LSB

Note: “[#]” provided in the Field Name column indicates the number of bits in the specific field.

Figure 2-22: TIS-B Airborne Velocity Information Message

2.2.17.3.4.1 Relationship to ADS-B Format

The following fields shall be coded as specified for the ADS-B Airborne Velocity Message with Subtype equal to 1, as specified in subparagraph 2.2.3.2.6.1, or Subtype equal 2, as

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specified in subparagraph 2.2.3.2.6.2:

Type, Subtype, E/W Direction Bit, E/W Velocity, N/S Direction Bit, N/S Velocity, Vertical Rate Sign and Vertical Rate.

2.2.17.3.4.2 ICAO/Mode A Flag (IMF)

This one-bit field (bit 9) shall be set as specified in subparagraph 2.2.17.3.1.2.

2.2.17.3.5 TIS-B Coarse Position Message

TIS-B Coarse Position Message Format											
MSG BIT #	33	34 ----- 35	36 ----- 39	40 -- 51	52	53 --- 57	58 -- 63	64	65 ----- 76	77 ----- 88	
“ME” BIT #	1	2 ----- 3	4 ----- 7	8 --- 19	20	21 --- 25	26 -- 31	32	33 ----- 44	45 ----- 56	
Field Name	IMF [1]	Surveillance Status [2]	Service Volume ID (SVID) [4]	Pressur e Altitude [12]	Ground Track Status [1]	Ground Track Angle [5]	Ground Speed [6]	CPR Format (F) [1]	CPR Encoded Latitude [12]	CPR Encoded Longitude [12]	
		MSB LSB	MSB LSB	MSB LSB			MSB LSB	MSB LSB		MSB LSB	MSB LSB

Note: “[#]” provided in the Field Name column indicates the number of bits in the specific field.

Figure 2-23: TIS-B Coarse Position Message Format

2.2.17.3.5.1 ICAO/Mode A Flag (IMF)

This one-bit field (bit 1) shall be set as specified in subparagraph 2.2.17.3.1.2.

2.2.17.3.5.2 Service Volume ID (SVID)

The 4-bit SVID field shall identify the TIS-B site that delivered the surveillance data.

Note: In the case where TIS-B messages are being received from more than one TIS-B ground stations, the SVID can be used to select coarse messages from a single source. This will prevent the TIS-B track from wandering due to the different error biases associated with different sources

2.2.17.3.5.3 Pressure Altitude

This field shall be coded as specified in subparagraph 2.2.3.2.3.4.1.

2.2.17.3.5.4 Encoded Latitude

This field shall be encoded as specified in subparagraph 2.2.3.2.3.7, except that the 12-bit CPR coding specified in **TBD** shall be used.

2.2.17.3.5.5 Encoded Longitude

This field shall be encoded as specified in subparagraph 2.2.3.2.3.8, except that the 12-bit CPR coding specified in **TBD** shall be used.

2.2.17.3.6 TIS-B Management Messages

TBD

2.2.17.4 TIS-B Message Processing

2.2.17.4.1 TIS-B Message Decoding

2.2.17.4.2 TIS-B Message-to-Track Correlation

2.2.17.4.2.1 TIS-B Messages with an ICAO 24-Bit Address

Attempt correlation only with tracks with 24-bit addresses.

Correlation is successful if 24-bit addresses match and a reasonableness test is satisfied. Reasonableness test is applied to position and velocity messages.

If TIS-B message correlates with ADS-B track, only accept TIS-B message if track has coasted more than **TBD** seconds.

TIS-B message is accepted if there is a successful correlation with a TIS-B track.

2.2.17.4.2.2 TIS-B Messages with a Mode A Code and Track Number

Attempt correlation only with Mode A identified TIS-B tracks and 24-bit address identified non-transponder device (NTD) tracks.

For a Mode A TIS-B track, correlation is successful if Mode A code, and track number match and a reasonableness test is satisfied. Reasonableness test is applied to position and velocity messages.

For an NTD track, initial association of TIS-B Mode A code and track number is performed by position correlation. Once established, future correlations are based on Mode A code and track number.

2.2.17.4.3 Track Update

2.2.17.4.4 Track Initiation

2.2.17.4.5 Track Drop

2.2.17.5 TIS-B Report Generation