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RTCA Special Committee 186, Working Group 3

ADS-B 1090 MOPS, Revision B

Meeting #28

Definition of TYPE 24 Surface System Status Messages
Revision 1

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SUMMARY
Recommended requirements and test procedures for TYPE = 24 Surface System Status Messages are presented.

1 Background

Message Type 24 is reserved for surface system status in DO-260 and DO-260A. Neither version of the MOPS defines the content or format of Type 24 messages. This working paper proposes content and format requirements for Type 24 Surface System Status messages.

1.1 Application Description

Type 24 messages are used by multilateration systems to convey the health status of Reference Transmitters to the central processing function. Reference Transmitters are used in multilateration systems worldwide.

Multilateration systems determine the origin of a transmission by measuring the time difference of arrival (TDOA) of that transmission at 3 or more geographically dispersed receivers. Squitters from reference transmitters are detected and timestamped by receivers. Since the locations of the reference transmitters and receivers are known to the system, the system will expect a specific TDOA for the reference transmitter squitter at each pair of receivers. The system uses the measured reference transmitter squitter TDOA and the expected TDOA to determine the offset between the clocks for each pair of receivers. This offset is applied to the measured TDOAs of messages from aircraft and ground vehicles to determine the true TDOAs. The true TDOA is used to determine the position of the transmitting aircraft or ground vehicle.

The 1090ES datalink was chosen for delivering reference transmitter status information to minimize cost and maximize availability. The status could be delivered over a wired communications link, a wireless link other than 1090ES or on the 1090ES link. The 1090ES link was chosen because all of the equipment necessary to transmit and receive the status messages is already built into the multilateration system.

The status messages are broadcast by each Reference Transmitter at a rate of 1 message every 10 seconds.

2 Proposed Requirements and Analysis

2.1 Proposed Requirements

Replace 2.2.3.2.7.4 with the following

(2.2.3.2.7.4) “Surface System Status” Messages

The Surface System Status Message is used to provide the status of certain elements of surface surveillance systems. This message is intended to be used only by the surface surveillance system that generated it and should be ignored by other systems. The format of the Surface System Status Message **shall** be as specified in Figure 2-1, while further definition of each of the subfields is provided in the subsequent paragraphs.

Surface System Status Message "ME" Field Format			
MSG Bit #	33 - 37	38 - 40	41 - 88
"ME" Bit #	1 - 5	6 - 8	9 - 56
FIELD NAME	TYPE = 24 [5]	SUBTYPE [3]	System Status [48]
	MSB LSB	MSB LSB	MSB LSB

Figure 2-1 "Surface System Status" ADS-B Message "ME" Field Format

(2.2.3.2.7.4.1) "TYPE" Subfield in Surface System Status Messages

The "TYPE" subfield was previously specified for the Airborne Position Message in §2.2.3.2.3.1 and remains the same for the Surface System Status Message that uses TYPE Code 24.

(2.2.3.2.7.4.2) "SUBTYPE" Subfield in Surface System Status Messages

The "SUBTYPE" subfield is a 3-bit ("ME" bits 6 through 8, Message bits 38 through 40) subfield that **shall** be used to indicate the source of the Surface System Status Message as specified in Table 2-1.

Table 2-1 "SUBTYPE" Subfield in Surface System Status Messages

Coding	Meaning
0	Reserved
1	Sensis System
2-7	Reserved

(2.2.3.2.7.4.3) "System Status" Subfield in Surface System Status Messages

The System Status subfield is a 48 bit ("ME" bits 9 through 56, Message bits 41 through 88) subfield that may be defined by the system equipment manufacturer.

(2.2.8.4) Receiving Installation Time Processing

Renumber §2.2.8.4 and subsections to §2.2.8.5. Insert new §2.2.8.4 as follows:

(2.2.8.4) Processing of Reserved Message Types

Receivers **shall** meet the requirements of §2.2.8.1 through §2.2.8.3 when receiving any valid combination of messages with "TYPE" codes 0 through 31 including TYPE Codes 24, 25, 26, 27 and 30.

Note: This requirement ensures that the receipt of messages with reserved "TYPE" codes will not adversely affect the processing of other messages.

2.2 Requirements Analysis

The requirement for SUBTYPE is derived from the following note in the Sensis internal Interface Description Document for the Reference Transmitter:

“An ADS-B Type Code of 24 is currently defined as “Reserved for Surface System Status” in the 1090 MHz ADS-B MOPS (DO-260). This message type was included at the request of Sensis. However, the detailed bit structure has not yet been defined in the MOPS. The MOPS committee, namely Vince Orlando, decided to use a three bit sub-type field immediately following the ADS-B Type Code. The Sensis Health Message will be assigned a sub-type code of 1. Sensis has permission to define the remaining 48-bit payload to meet their needs.”

Sensis has included a “System Type Code” in the 48 bit “System Status subfield” to discriminate between different Sensis systems. Sensis does not expect to need additional SUBTYPE values for future systems. Therefore, SUBTYPE = 1 is defined as “Sensis System” instead of “Sensis Health Message.”

Leaving the contents of the “System Status” subfield to be manufacturer defined should not create an interoperability problem because only the manufacturer’s related equipment will need to read the status data.

The transmission rate for Type 24 messages is already defined in §2.2.3.3.2.8 so no new requirements for transmission rate are necessary.

During the first review of this working paper, the committee asked that requirements be added to ensure that receiving systems not be adversely affected by the receipt of Messages with reserved “TYPE” codes. Section 2.2.4 was moved to section 2.2.5 and 2.2.4 was changed to specify that reserved type codes not affect message processing.

The committee also said that test procedures for transmitting Type 24 are not necessary because airborne systems will not transmit surface system status messages. Test procedures for TYPE 24 messages were deleted from the first version of this working paper and test procedures for non-erroneous processing of reserved message types were added.

3

Recommended Test Procedures

~~(2.4.3.2.7.4) Verification of Surface System Status Messages (§2.2.3.2.7.4)~~

~~The test procedures required to verify §2.2.3.2.7.4 are contained in §2.4.3.2.7.4.1 through §2.4.3.2.7.4.3.~~

~~(2.4.3.2.7.4.1) Verification of “TYPE” Subfield in Surface System Status Messages (§2.2.3.2.7.4.1)~~

Purpose/Introduction:

~~This test procedure verifies that the ADS B Transmitting Subsystem outputs Surface System Status Messages with the correct TYPE subfield data content in Message Bits 33 through 37~~

Measurement Procedure:

~~Configure the ADS B Transmitting Subsystem to transmit Surface System Status Messages. Verify that the output Surface System Status Messages have a TYPE subfield which contains the value “24.”~~

~~(2.4.3.2.7.4.2) Verification of “SUBTYPE” Subfield in Surface System Status Messages (§2.2.3.2.7.4.2)~~

Purpose/Introduction:

~~This test procedure verifies that the ADS-B Transmitting Subsystem outputs Surface System Status Messages with the correct SUBTYPE subfield data content in Message Bits 37 through 40~~

Measurement Procedure:

~~Configure the ADS-B Transmitting Subsystem to transmit Surface System Status Messages. Verify that the output Surface System Status Messages have a SUBTYPE subfield which contains the appropriate value from Table 2-1.~~

~~(2.4.3.2.7.4.3) Verification of “System Status” Subfield in Surface System Status Messages (§2.2.3.2.7.4.3)~~

~~No specific test procedure is required to validate §2.2.3.2.7.4.3.~~

Add subsections under §2.4.3.2.7.4 specifying that no tests are required

(2.4.3.2.7.4.1) Verification of “TYPE” Subfield in Surface System Status Messages (§2.2.3.2.7.4 .1)

No specific test procedure is required to validate §2.2.3.2.7.4..1

(2.4.3.2.7.4.2) Verification of “SUBTYPE” Subfield in Surface System Status Messages (§2.2.3.2.7.4 .2)

No specific test procedure is required to validate §2.2.3.2.7.4..2

(2.4.3.2.7.4.3) Verification of “System Status” Subfield in Surface System Status Messages (§2.2.3.2.7.4 .3)

No specific test procedure is required to validate §2.2.3.2.7.4..3

(2.4.8) Verification of ADS-B Report Characteristics (§2.2.8)

Add the following before the existing text:

All §2.4.8 tests using ES messages as input must include messages with “TYPE” codes 24-27 and 30 to verify that these message types do not adversely impact report assembly. At least 35% of the “TYPE” 24-27 and 30 messages shall have addresses (AA) that are the same as at least one of the simulated target addresses in any one test. At least 35% of the “TYPE” 24-27 and 30 messages shall have addresses (AA) that are NOT the same as the addresses of the simulated targets used in a test. At least one of the “TYPE” 24-27 and 30 messages shall be scheduled to arrive during each Report Assembly State (ref §2.2.10.1.1) achieved during the test.

Renumber §2.4.8.4 and subsections to §2.4.8.5

Add new 2.4.8.4 as follows:

(2.4.8.4) Verification of Processing of Reserved Message Types (§2.2.8.4)

Verification of the processing of reserved message types is accomplished by including messages with TYPE codes 24, 25, 26, 27 and 30 is the tests for State Vector (§2.4.8.1), Mode Status (§2.4.8.2) and On-Condition (§2.4.8.3) reports. See §2.4.8 for test scenario requirements.