

**RTCA Special Committee 186, Working Group 3, Meeting #28
EUROCAE WG-51, SG-1, Meeting #5**

ADS-B 1090ES MOPS Maintenance

**EUROCAE Headquarters at Malakoff, near Paris, France
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The Implementation of Multilateration System Reference Transmitters

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Summary
This Working Paper presents an example of an operational implementation of 1090 MHz transmitters used for Multilateration (MLAT) system synchronization and stimulation of a system-wide Built-In-Test functionality. The ICAO SARPs identifies the DF=18 message with TYPE Code=24 for this function, however the Subtype field is not defined. A definition to be added to Doc 9871 is proposed, as the Subtype code is required for the safe operation of the system.

1. Introduction

Legacy Mode A and Mode C cooperative radar systems utilize a transponder reply in order to monitor system performance. Multilateration (MLAT) systems also have a requirement to use an external transmission to monitor system performance. For systems capable of decoding 1090ES Messages, the transponder can be replaced with a transmitter, as the necessity of the calibration device to be interrogated no longer exists. The DF=18 with format TYPE Code=24 is identified in RTCA MOPS (DO-260A) and ICAO SARPs as reserved to serve the function of reporting surface system status, however the Subtype Code is not defined. In order to prevent the assigning of the same Subtype Code to transmitters that serve different ground systems, the Subtype Code should be standardized. The U.S. Federal Aviation Administration has implemented Reference Transmitters (RefTrans) as a component of the Airport Surface Detection Equipment – Model X (ASDE-X) program. These RefTrans operate with Subtype Code=1, indicating that the transmitter is servicing the ASDE-X MLAT sub-system.

2. Implementation

The ASDE-X MLAT sub-system utilizes RefTrans that transmit 1090ES DF=18 messages in accordance with RTCA DO-260A and the ICAO SARPs. The RefTrans perform two functions in the MLAT sub-system of the ASDE-X system. First, they are used to synchronize the free-running clocks located within each of the Remote Units (RUs). This clock synchronization is necessary in order to perform multilateration on surface and airborne targets. Second, they are used as a Built-In-Test (BIT) stimulator. The system continually multilaterates on the fixed beacon and declares a fault if it drops this target.

In the ASDE-X system the RefTrans are configured to transmit the following two types of Mode S messages:

Message Name	Length	DF Type	Type Code	Rate
System Status Message	long	18	24, Subtype 1	0.1 messages/sec.
Identification Message	long	18	2	1 message/sec.

The System Status Message has Subtype Code=1, which the surface MLAT system recognizes as belonging to its own system. This Subtype Code is not currently defined in either DO-260A or the ICAO SARPs. The Identification Message is a Category C DF=18 TYPE Code=2, which is already well defined.

3. Proposed Addition

This Working Paper proposes to allocate a Subtype Code under TYPE Code=24 “for national use.” The proposed Subtype Code=1 has been selected for this function. The remaining Subtype Codes will remain reserved for future definition as requirements develop. The Attachment includes the sections in DO-260A that require the addition.

4. Recommendation

The Working Group is invited to review the proposed addition to DO-260B and discuss the need for a change proposal.

Attachment – Proposed addition to DO-260B

2.2.3.2.2 Determining ADS-B and TIS-B Message Types

Table 2-14: Determining ADS-B Message Type

TYPE Code ("ME" bits 1-5)	SUBTYPE Code ("ME" bits 6-8)	ADS-B Message Type
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24	0	Reserved
	1	Surface System Status (Allocated for National Use)
	2 - 7	Reserved
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2.2.3.2.3.1 "TYPE" Subfield in ADS-B Airborne Position Messages

Table 2-16: "TYPE" Subfield Code Definitions (DF=17 or 18)

TYPE code	Subtype code	NIC supplement	Format (message type)	Horizontal containment radius limit (R _c)	Navigational integrity category (NIC)	Altitude type	Notes
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23	0	Not applicable	Test message				
	1-6		Reserved				
	7		Allocated for national use				
24	0	Not applicable	Reserved for surface system status				
	1		Allocated for national use				
	2		Reserved				
25 26			Reserved				

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2.2.3.2.7.4 TYPE "24" ADS-B Messages for Surface System Status

TYPE "24" ADS-B Messages shall be **Reserved** used for **future-expansion** Surface System Status. Subtype Code=1 shall be allocated for National Use.

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