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ATCRBS/Mode S Transponder MOPS
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Requirements & Register Formats for Event Driven Squitter

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SUMMARY

During the revision of DO-181C to DO-181D, a new section (2.2.23.2) was provided for Event-Driven Squitters. This paper provides the definition of the register content, scheduling and priority of Event -Driven squitters as extracted from ICAO Doc 9871:

1.0 Introduction

During the Table of Contents revision from DO-181C to DO-181D, a new subsection was defined for Event Driven squitters. This paper provides the content of the two Aircraft Status event driven squitters as defined in ICAO Doc 9871.

2.0 Proposed Change: add the following words to Section 2.2.23.2

2.2.23.2 Event Driven Squitter

2.2.23.2.1 Aircraft Status

2.2.23.2.1.1 EMERGENCY/PRIORITY STATUS

2.2.23.2.1.1.1 *Format*

The aircraft status squitter that conveys emergency/priority status information shall be formatted as specified in the definition of transponder register 61₁₆, Table B-2-97a.

2.2.23.2.1.1.2 *Transmission rate*

This message shall be broadcast at random intervals that are uniformly distributed between 0.7 and 0.9 second for the duration of the emergency.

2.2.23.2.1.1.3 *Message delivery*

Message delivery shall be accomplished using the event-driven protocol 2.2.23.1.3 (f). The broadcast of this message shall not take priority over the ACAS RA broadcast but shall take priority over all other event-driven message types, as specified in 2.2.23.2.2.

2.2.23.2.1.2 ACAS RA BROADCAST

2.2.23.2.1.2.1 *Format*

The aircraft status squitter that conveys ACAS RA broadcast information shall be formatted as specified in the definition of transponder register 61₁₆, Table B-2-97b.

2.2.23.2.1.2.2 *Transmission rate*

This message shall be broadcast at random intervals that are uniformly distributed between 0.7 and 0.9 second for the duration of the emergency.

2.2.23.2.1.2.3 *Message delivery*

Message delivery shall be accomplished using the event-driven protocol 2.2.23.1.3(f). The broadcast of this message shall take priority over the emergency/priority status broadcast and all

other event-driven message types, as specified in 2.2.23.2.2.

2.2.23.2.2 *EVENT-DRIVEN MESSAGE TRANSMISSION SCHEDULING* Function

The event-driven message scheduling function shall ensure that the total event-driven message rate does not exceed 2 transmitted messages per second.

The event-driven message scheduling function shall apply the following rules as a means of prioritizing the event-driven message transmissions and limited the transmission rates and shall reorder, as necessary, pending event-driven messages according to the following message priorities, listed below in descending order from highest to lowest priority.

When an extended squitter aircraft status message is active for the broadcast of an emergency/priority condition (type=28 and subtype=1), or an ACAS RA broadcast (type=28, subtype=2), that message shall continue to be transmitted at random intervals that are uniformly distributed over the range of 0.7 to 0.9 seconds, relative to the previous aircraft status message for the duration of the emergency or RA condition if the target state and status message is not being broadcast. If the target state and status message with subtype=zero (0) is being broadcast, then the aircraft status shall be broadcast at random intervals that are uniformly distributed over the range of 2.4 to 2.6 seconds relative to the previous aircraft status message for the duration of the emergency conditions established in accordance with Tables B-2-97a and B-2-97b.

The following register definition for the Extended Squitter Event Driven information, register O,A, shall be added to Appendix B as Table B-3-10.

Table B-3-10. BDS code 0,A — Extended squitter event-driven information

MB FIELD

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PURPOSE: Provide a flexible means to squitter messages other than position, velocity and identification.

- 1) A message inserted in this register (or an equivalent transmit buffer) shall be broadcast once by the transponder at the earliest opportunity.
- 2) Formats for messages using this protocol shall be specified in transponder registers 61₁₆ to 6F₁₆.
- 3) The Event-Driven Message Scheduling function shall be responsible for ensuring pseudo-random timing and for observing the maximum transmission rate for this register of 2 per second (2.2.23.).
- 4) Read-out (if required) of this register shall be accomplished by extracting the contents of the appropriate transponder registers 61₁₆ to 6F₁₆.

Note.— The data in this register is not intended for extraction using the GICB or ACAS cross-link protocols.

The following register definition for the event driven squitters shall be added to Appendix B, after the definition of register 6,0. These two definitions will be become Table B-3-97(a) and (b).

**Table B-2-97a BDS code 6,1 Aircraft status
(Subtype 1: Emergency/priority status)**

MB Field

1	MSB
2	
3	
4	FORMAT TYPE CODE = 28
5	LSB
6	MSB
7	SUBTYPE CODE = 2
8	LSB
9	MSB
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15	ACTIVE RESOLUTION ADVISORIES
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22	LSB
23	MSB
24	RACs RECORD
25	
26	LSB
27	RA TERMINATED
28	MULTIPLE THREAT ENCOUNTER
29	MSB THREAT-TYPE INDICATOR
30	LSB
31	MSB
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43	THREAT IDENTITY DATA
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56	LSB

Purpose: To report resolution advisories (RAs) generated by ACAS equipment.

Subtype shall be coded as follows:

- 0 = No information
- 1 = Emergency/priority status
- 2 = ACAS RA Broadcast
- 3 to 7 = Reserved

Emergency state shall be coded as follows:

The coding of bits 9 to 56 of this register shall conform to the corresponding bits of register 3,0 as specified in Annex 10, Volume IV, section 4.3.8.4.2.2.

- 1) Message delivery shall be accomplished once per 0.8 second using the event-driven protocol.
- 2) RA broadcast shall begin within 0.5 seconds after transponder notification of the initiation of an ACAS RA.
- 3) RA broadcast shall be terminated 10 seconds after the RAT flag (4.3.8.4.2.2.1.3) transitions from ZERO to ONE.
- 4) Subtype 2 message broadcast shall take priority over subtype 1 message broadcast.

**Table B-2-97b BDS code 6,1 Aircraft status
(Subtype 2: Extended squitter ACAS RA broadcast)**

MB Field

1	MSB	
2	FORMAT TYPE CODE = 28	
3		
4		
5		LSB
6	MSB	
7	SUBTYPE CODE = 2	
8		LSB
9	MSB	
10	ACTIVE RESOLUTION ADVISORIES	
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17	RACs RECORD	
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22		LSB
23		MSB
24		
25	RA TERMINATED	
26		LSB
27	MULTIPLE THREAT ENCOUNTER	
28		MSB
29	THREAT-TYPE INDICATOR	
30		LSB
31	MSB	
32	THREAT IDENTITY DATA	
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41	THREAT IDENTITY DATA	
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56	LSB	

Purpose: To report resolution advisories (RAs) generated by ACAS equipment.

Subtype shall be coded as follows:

- 0 = No information
- 1 = Emergency/priority status
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- 3 to 7 = Reserved

Emergency state shall be coded as follows:

The coding of bits 9 to 56 of this register shall conform to the corresponding bits of register 3,0 as specified in Annex 10, Volume IV, section 4.3.8.4.2.2.

- 1) Message delivery shall be accomplished once per 0.8 second using the event-driven protocol.
- 2) RA broadcast shall begin within 0.5 seconds after transponder notification of the initiation of an ACAS RA.
- 3) RA broadcast shall be terminated 10 seconds after the RAT flag (4.3.8.4.2.2.1.3) transitions from ZERO to ONE.
- 4) Subtype 2 message broadcast shall take priority over subtype 1 message broadcast.