

RTCA Special Committee 209

Mode S Transponder MOPS Maintenance

Working Group #1, Meeting #6

**Engility Corporation, Washington DC
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**Proposed Changes to ED-73C and DO-181D
in Response to Action Item WG1-5-2
Rev 2 after review by WG-49**

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SUMMARY

This Working Paper proposes changes to both ED-73C and DO-181D with regard to the resolution of Action Item WG1-5-2, which relates to potential test procedures for Extended Squitter.

Reviewing the SC-209 Action Items, I see AI, WG1-5-2 which states “Write Additional test procedures for ED-73C for Extended Squitters”. I have reviewed ED-73C Version H and DO-181D Version 1-4 and noted the following:

- a. ED-73C has already added section 5.4.3.2.4 for basic Extended Squitter Testing and DO-181D has added the same material in section 2.3.2.13.

Also, ED-73C has already updated all of section 5.5.8.6 (Procedure #6) to be consistent with DO-181D Section 2.5.4.6 and all subsections through 2.5.4.6.3.

These tests are sufficient to demonstrate Extended Squitter functions at the transponder level. Therefore, additional tests need not be developed as further detailed (bit for bit type) testing should be referred to the appropriate ADS-B MOPS. Therefore, the current ED-73C and DO-181D versions are consistent.

However, during the review, other issues with both documents became apparent and need to be resolved as provided in the following paragraphs.

- b. ED-73C shows section 5.4.3.2.3 as a Test Procedure for Acquisition Squitter which is TBD:
 - 1. As there needs to be a minimal test of the Acquisition Squitter function during Ambient and Environment conditions, **the following procedure needs be added to ED-73C:**

5.4.3.2.3 Test Procedure (Acquisition Squitter Generation) (Paragraph 3.16.7.2 and 3.22.2.6)

- a. Establish the appropriate conditions where the transponder is in the airborne state and provides Acquisition Squitter transmissions
- b. Verify that the transponder provides Acquisition Squitter transmissions that:
 - (1). are transmitted at average intervals of 0.8 to 1.2 seconds.
 - (2). are alternated between the top and bottom antenna for diversity transponders
 - (3). contain the appropriate message content
- c. Establish the appropriate conditions where the transponder is in the on-ground state and provides Acquisition Squitter transmission
- d. Verify that the transponder provides Acquisition Squitter transmissions that
 - (1). are transmitted at average intervals of 0.8 to 1.2 seconds
 - (2). are transmitted from the top antenna
 - (3). contain the appropriate message content

2. Likewise, in order to cover environmental test conditions, **the procedure just given needs to be added to DO-181D section 2.3.2.13 as follows:**

2.3.2.13 Acquisition Squitter (§2.2.12.5.1 and 2.2.18.2.6)

- a. Establish the appropriate conditions where the transponder is in the airborne state and provides Acquisition Squitter transmissions
- b. Verify that the transponder provides Acquisition Squitter transmissions that:
 1. are transmitted at average intervals of 0.8 to 1.2 seconds.
 2. are alternated between the top and bottom antenna for diversity transponders
 3. contain the appropriate message content
- c. Establish the appropriate conditions where the transponder is in the on-ground state and provides Acquisition Squitter transmission
- d. Verify that the transponder provides Acquisition Squitter transmissions that
 1. are transmitted at average intervals of 0.8 to 1.2 seconds
 2. are transmitted from the top antenna for diversity transponders
 3. contain the appropriate message content

3. Likewise, in order to cover ambient test conditions, **the procedure just given needs to be added to DO-181D section 2.4.2.13 as follows:**

2.4.2.13 Acquisition Squitter (§2.2.12.5.1 and 2.2.18.2.6)

- a. Establish the appropriate conditions where the transponder is in the airborne state and provides Acquisition Squitter transmissions
- b. Verify that the transponder provides Acquisition Squitter transmissions that:
 1. are transmitted at average intervals of 0.8 to 1.2 seconds.
 2. are alternated between the top and bottom antenna for diversity transponders
 3. contain the appropriate message content
- c. Establish the appropriate conditions where the transponder is in the on-ground state and provides Acquisition Squitter transmission
- d. Verify that the transponder provides Acquisition Squitter transmissions that
 1. are transmitted at average intervals of 0.8 to 1.2 seconds
 2. are transmitted from the top antenna for diversity transponders
 3. contain the appropriate message content

c. **Problems that exist or remain are as follows:**

1. The existing DO-181D section 2.3.2.13 needs to be **renumbered to 2.3.2.14** as a new section 2.3.2.13 has been inserted above for Acquisition Squitter Testing.
2. DO-181D Table 2.3.1.2 provides no call-out of section 2.3.2.13 or 14 so the test will never be performed. **Therefore, the following addition needs to be made to Table 2.3.1.2 of DO-181D.**

Test Procedure Paragraph	DESCRIPTION	REQUIRED ENVIRONMENTAL TEST GROUPS (See Table 2.3.1.1)					
		1	2	3	4	5	6
§2.3.2.13	Acquisition Squitter	x	x	x	x	x	
§2.3.2.14	Extended Squitter	x					

3. ED-73C provides no call-out of section 5.4.3.2.3 or 5.4.3.2.4, so the test will not be performed under environmental condition. **Therefore, the following addition needs to be made to Table 4.2**

EUROCAE ED-73c								
Specifications	Test	Topic	Group					
			1	2	3	4	5	6
3.16.7.2 and 3.22.2.6	5.4.3.2.3	Acquisition Squitter Generation	x	x	x	x	x	
3.28	5.4.3.2.4	Extended Squitter Generation	x	x	x	x	x	

Note: The top line of Table 4.2 currently reads as “EUROCAE /ED73 B”. This should be changed to “EUROCAE ED-73C”

4. DO-181D has already added the Extended Squitter test material in section 2.3.2.13. This section needs to be renumbered to 2.3.2.14 as discussed in “c.1” above. This testing cannot be performed only in section 2.3 for environmental purposes. It must also be performed in section 2.4 under ambient conditions. **Therefore, the same material that is currently provided in section 2.3.2.13 (newly renumbered to 2.3.2.14) needs to be repeated in Section 2.4 as section 2.4.2.14.**

Summary:

This should complete my action item in regards to Extended Squitter. As best I can tell, this completes all of my assigned action items. Gary, please review and let me know if I have more for SC-209. Likewise, Antoine, let me know what I have left for WG-49.

Best Regards,

Bob Saffell