WG49N11-08 SC209/WG49 Joint meeting in Brussel

SC209-WG49 Action 6-6

Harmonization of ED73C and DO181D regarding the list of functional test required in environmental conditions

This Working paper has been modified for the Joint Meeting

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1. List of the Different Environmental conditions tests

I have “grouped” the ED 73C functional tests in order to ease the comparison between DO181 and ED 73. This working paper does not handle with the functional test content itself but with the functional test list associated with each environmental conditions test.
Main differences between ED73B and DO 181D regarding “functional test list” are underlined in “orange”. Note that Group 5 in RTCA and WG49-group 5 are not the same and not used to in same environmental conditions.

	Environmental Conditions	ED 14 D/ DO 160 D chapters	ED-73B	DO 181.D
4a	Temperature	4.5	Group 1	Group 1
4b	Altitude	4.6.1	Group 4	Group 4
4c	Decompression	4.6.2	If required, Group 4	When required, group 4
	Overpressure Test	4.6.3	If required, Group 4	When required, group 4
5	Temperature Variation	5.0	Group 3	Group 3
6	Humidity	6.0	Group 2	Group 2
7	Operational Shocks		Group 2	**When required**, group 2
	Crash Safety Shocks		Group 6	group 6
8	Vibration	8.0	Group 1	Group 3 during Group 1 after,
9	Explosion Proofness	9.0	if required	group 6
10	Water Proofness	10.0	if required, Group 2	When required, group 2
11	Fluids Susceptibility	11.0	if required, Group 2	When required, group 2
12	Sand and Dust	12.0	if required, Group 2	When required, group 2
13	Fungus Resistance	13.0	if required, Group 2	When required, group 2
14	Salt Spray	14.0	if required; Group 2	When required, group 2
15	Magnetic Effect	15.0	Group 6	group 6
16	Power Input (Normal / Abnormal Operating Conditions)		Group 2	Group 5 for normal Group 3 during group 2 after for abnormal
17	Voltage spike conducted test		Group 2	Group 2
18	Audio Frequency Conducted Susceptibility	18.0	Group 1	Group 1
19	Induced Signal Susceptibility	19.0	Group 1	Group 1
20	Radio Frequency Susceptibility (Radiated and Conducted)	20.0	Group 1	Group 1
21	Emission of Radio Frequency Energy	21.0	Group 6	**No Xpder tests**, group 6
22	Lightning Induced Transient Susceptibility	22	Group x	**Procedure Not Yet defined, none**
23	Lightning Direct Effects	23	Not applicable	(Not in the table 2.3.1.1)
24	Icing	24	Not applicable	(Not in the table 2.3.1.1)
25	Electrostatic Discharge (ESD)	25	Group 1	**(Not in the table 2.3.1.1)**

Comment [AH1]: During vibration tests, group 1 functional test cannot be realized. Therefore I propose to support DO 181D position. That is Group 3 during the test and Group 1 once the test has been realized in order to check that nothing has been broken after the vibration application.

Comment [AH2]: The Group 5 could be probably limited to Sensitivity tests, power and frequency

Comment [AH3]:

Comment [AH4]: Propose to test only Fixed Direct Data, Variable Direct Data since this test seems to support the HMI (injection de static par l'opérateur)

Group 6: *Tests in Group 6 determine the effects of the transponder on other equipment (mounts, compass needles, explosive gasses, and other RF equipment) and therefore do not involve the transponder performance requirements of this document.*

2. EUROCAE ED 73B / RTCA DO 181 D Functional Test Groups

a. establish compliance with the following paragraphs of this document:

EUROCAE /ED 73B									RTCA DO 181 D							
Specifications	Test	Topic	Group				x	6	Test Procedure Paragraph	DESCRIPTION	Group					
			1	2	3	4					1	2	3	4	5	6
3.2.2	5.4.1.2 a	Sensitivity Variation with Frequency	✓	✓	✓		✓		§2.3.2.1	Receiver Characteristics	✓	✓	✓			
3.2.4	5.4.1.2 b through g	Sensitivity and Dynamic Range	✓	✓	✓		✓									
3.3.1	5.4.2.1	Reply Transmission Frequency	✓	✓	✓	✓	✓		§2.3.2.2.1	Reply Transmission Frequency	✓	✓	✓	✓		
3.3.3	5.4.2.2	RF Peak Power Output	✓	✓		✓	✓		§2.3.2.2.2	RF Peak Power Output	✓	✓		✓		
3.4	5.4.2.5	Reply Rate Capability	✓						§2.3.2.2.3	Reply Rate Capability	✓					
3.5	5.4.3.1	Mode A/C Replies	✓			✓	✓		§2.3.2.3	Reply Pulse Characteristic	✓					
3.6	5.4.3.2	Mode S Replies				✓	✓									
3.7	5.4.3.3 through 5.4.3.4	Reply Delay and Jitter	✓													
3.8	5.4.4	Side Lobe Suppression	✓	✓			✓		§2.3.2.4	Side Lobe Suppression	✓	✓				
3.9	5.4.5	Pulse Decoder Characteristics	✓	✓			✓		§2.3.2.5	Pulse Decoder Characteristic	✓	✓				
3.10	5.4.6	Transponder Desensitisation and Recovery	✓				✓		§2.3.2.6	Transponder Recovery & Desens.	✓					
3.12	5.4.7	Response to Interference	✓						§2.3.2.7	Standard Interference Pulse	✓					
3.13	5.4.8	Undesired Replies	✓		✓		✓		§2.3.2.8	Undesired Replies	✓		✓		✓	
3.14	5.4.9.1	Self Test and Monitors	✓	✓	✓	✓	✓		§2.3.2.9	Self-Test and Monitors	✓	✓	✓	✓	✓	
3.14	5.4.9.2	Squitter Monitor	✓	✓	✓	✓	✓									
3.15	5.4.10	Mutual Suppression Capability	✓				✓			???						
3.16	5.4.11	Diversity Operation	✓	✓			✓		§2.3.2.10	Diversity Operation	✓	✓				
3.17.1 a	5.4.12.1	Fixed Direct Data	✓	✓			✓		§2.3.2.11	Data Handling & Interfaces	✓	✓				
3.17.1 b	5.4.12.2	Variable Direct Data	✓	✓			✓									
3.17.3	5.4.12.3	Standard Transaction Interfaces	✓	✓			✓									
3.17.4	5.4.12.4	ELM Service Interfaces	✓	✓												
3.17.2 b	5.4.13	Interface Integrity Testing	✓	✓			✓									
3.24	5.4.14	Power Interruption	✓	✓			✓		§2.3.2.12	Restoration of Power	✓	✓			✓	

Comment [AH5]: Group 5 in ED 73 B is associated with Lightning induced transient susceptibility. Not yet defined in DO 181D. Group 5 in DO is not used.

Comment [AH6]: It matches with "Receiver Characteristics"

Comment [AH7]: It should also include the 5.4.3.4 Mode S Reply rate and Jiter. Those tests are more explicited in ED 73B

Comment [AH8]: This test is more complete in ED 73 B. The DO 181 D equivalent test matches only with the step 1 of ED 73B

Comment [AH9]: This test is being completed by the WG 49

Comment [AH10]: Invalid AA is being inserted by WG 49

Comment [AH11]:

b. ensure that mechanical devices operate satisfactorily.

3. Conclusion/Proposal

Item 8: Vibration Test
During vibration tests, group 1 functional test cannot be realized. Therefore WG49 proposes to support DO 181D position. That is Group 3 during the test and Group 1 once the test has been realized in order to check that vibrations did not impact the transponder functions. Agreed during the Preparation meeting in July.

- ⇨ ED73C should be harmonized with DO181D (group 3 during, group 1 after)

Item 22: Lightning Induced Transient Susceptibility
The Group x could be probably limited to Sensitivity tests, power and frequency and Fixed and Variable Data
Group x in ED 73 B is associated with Lightning induced transient susceptibility. Not yet defined in DO 181D, Group x in DO181 is not used.

- ⇨ ED 73C: Limit the Group x to Sensitivity, power and frequency tests
- ⇨ DO181 should be harmonized with ED73C

WG49 and SC209 agreed

- ⇨ To use Group 3

Item 25 ESD:
Propose to test only Fixed Direct Data and Variable Direct Data since this test is dedicated to HMI (injection de static par l'opérateur)

- ⇨ ED 73C: Limit the test to Fixed Direct Data and Variable Direct Data
- ⇨ DO 181D should be harmonized with ED73C

Agreed position : WG49 and SC209 : Group 2 after

Item 16 Power Input:

- ⇨ To be harmonized

SC209 : Test 16 :
WG49 : To review this item taken into account ED102 at the September meeting.

Item 8 Operational Shocks:

- ⇨ To be harmonized

WG 49 : to add “when required”

Item discussed during the meeting

Lightning Direct Effects: group 3 when required
Icing: group 2 when required