

**Public Comment Log**

**TSO-C10c "Pressure Altimeter System"**

#	Commenter	Page Number	Paragraph Number	Comment/Rationale or Question	Proposed Resolution	Comment Type (Conceptual, Editorial, or Format)	Disposition
1	Xavier Audouze, EASA	1, 2	3.c and d.	The TSO-C10c features an appendix amending the AS8009C, however, there is no text introducing this appendix and it seems that it is required to comply with the unmodified AS8009C.		Editorial	<b>Accepted.</b> Added "as modified by appendix 1 of this TSO."
2	Xavier Audouze, EASA	A-1	1	Appendix 1 Section 1 reinforces AS8009C section 1 statement that the tests procedure apply to "mechanical type instruments". We see no reason why the procedures exposed in AS8009C would not apply to solid-state sensors. The use of "mechanical" is also confusing as the solid-state MEMS sensors are also mechanical and that, on another hand, the electronic displays addressed in AS8009C cannot be considered as "mechanical"		Conceptual	<b>Accepted.</b> Added "providing alternate or equivalent means of compliance to each requirement or test, if required" to the end of the last sentence.
3	Xavier Audouze, EASA	3	Header	Header contains Appendix 1 while being the main body of the TSO.		Editorial	<b>Accepted.</b>
4	Xavier Audouze, EASA			Our understanding of the AS8009C section 5 INDIVIDUAL PERFORMANCE TESTS is that the tests it contains shall be performed on each individual equipment before leaving the production line. However, TSO-C10c Appendix 1 adds a section 5.11 to the AS8009C to address the electronic display characteristics. These tests should be either inserted in another section of the AS8009C, or be explicitly permitted to be demonstrated once as part of a standard condition qualification			<b>Accepted.</b> Amended TSO paragraph 3.c to read: "This TSO does not define the test procedures to verify functional performance. The manufacturer must define the appropriate tests to verify compliance with SAE/AS8009C as modified by appendix 1 of this TSO."
5	Xavier Audouze, EASA		5.(1)	The altitude and barometric range (AS 8009C section 3.4) should be announced in the installation instructions (TSO C10c Section 5 (1)).			<b>Accepted.</b> Added new final sentence to 5.a.(1) as follows: "State the maximum calibrated altitude." Also added under marking requirements to 4.a as follows: "Mark the maximum calibrated altitude on both the nameplate and dial."
6	Xavier Audouze, EASA	App 1		Appendix 1 should modify AS8009C section 3.4 and 3.12 to permit not to display the altitude range as this is a frequent deviation for altimeters using a tape-type display. Similarly, the requirement to display "ALTITUDE" or "ALT" should be removed as the type of indication is obvious and not used in most integrated stand by instruments approved with C10.			<b>Accepted.</b> In Appendix 1, added new change for 3.4 to read: "Add a note following the paragraph to read: Note: Markings for the altitude range many be omitted for altimeters using a tape-type display." In Appendix 1 added new change for 3.12 to read: "Change the 3rd sentence to read: The word ALTITUDE or ALT may be marked on the dial in capital letters and may be in the same finish as the numerals." In Appendix 1, added new change for 3.12 to read: "Add a note following the paragraph to read: Note: Markings for the altitude range many be omitted for altimeters using a tape-type display."
7	Xavier Audouze, EASA	App 1		Appendix 1 should modify AS8009C section 3.12 to permit the use of tapes with tic marks every 100 ft and more prominent mark every 500 ft when using tape display, in agreement with ARP 4102/7 Appendix A symbol 39 and 40.			<b>Accepted.</b> In Appendix 1, added new change for 3.11 to read: Add new 3rd paragraph to read: Instruments using a tape-type display or presenting altitude with a digital readout are permitted to use tic marks every 100 feet with a more prominent mark every 500 feet in agreement with ARP 4102/7, Appendix A, Symbols 39 and 40.
8	Xavier Audouze, EASA	App 1		Appendix 1 section 3.10: The latest release of DO-236 is DO-236 change 1.			<b>Accepted.</b>

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9	Garmin	2	3f	<p>Including this specific DO-254 reference is redundant to the rest of the paragraph in this section.</p> <p>For custom airborne electronic hardware determined to be simple, RTCA/DO-254, paragraph 1.6 applies.</p> <p>DO-254 makes it clear how to address "simple" custom airborne electronic hardware.</p>	Remove this reference to DO-254 Paragraph 1.6.		<b>Rejected.</b> This is part of the current TSO boilerplate and cannot be amended.
10	Garmin	2	4.b.(2)	<p>Paragraph 4.b.(2) states:</p> <p>Each subassembly of the article you determined may be interchangeable.</p> <p>This language is confusing.</p>	<p>The language for this requirement is confusing. This could mean that a stuffed printed circuit board needs the TSO number.</p> <p>Suggest removing the statement or if removing causes problems, work with industry to establish wording that is better understood.</p>		<b>Rejected.</b> This is part of the current TSO boilerplate and cannot be amended.
11	Garmin	4	5.f	<p>TSO paragraph 5.f and its subparagraphs include definition of non-TSO functions and the data to be submitted to the ACO for non-TSO functions. This guidance is inconsistent with Order 8110.4C CHG 4.</p>	<p>TSO paragraph 5.f states "Identify functionality or performance contained in the article not evaluated under paragraph 3 of this TSO (that is, non-TSO functions)." Use of the term "performance" in the definition of a non-TSO function is inconsistent with the Order 8110.4C CHG 4 paragraph 6-9.b.(1) and 6-9.b.(3)(a) guidance regarding how to define a non-TSO function. The issue is non-TSO should not be defined as "performance". It will create difficulty if these criteria are used. For example, if a TSO requires a minimum 10 watt transmitter and a company makes equipment that is robust at 11 watts, the performance exceeding the TSO is not called out under the TSO; consequently, by the paragraph 5.f "performance" definition, the 11 watt transmitter has a non-TSO 1 watt capability. The distinction of a "function that can be accomplished outside the TSO box" as is specified in Order 8110.4C CHG 4 paragraph 6-9 is critical to making non-TSO function work long term.</p> <p>Adjust the wording in the TSO (and template) to be consistent with the 8110.4C CHG 4 intent.</p>		<b>Rejected.</b> Order 8110.4C (Chg 5 incorporated) para 6-9.b.(1) defines a non-TSO function as "one that is not covered by a TSO-approved minimum performance standard (MPS), does not support or affect the hosting article's TSO function(s), and could technically be implemented outside of the TSO article." Furthermore, Para 6.9.b.(3)(b) of the order requires manufacturers to submit the manufacturer's declared performance requirements for the non-TSO function(s). It is these aspects of "functionality or performance" that the TSO template language refers to here. In the example the commenter gives, as the commenter identifies, an 11-watt transmitter that must output a minimum of 10 watts does not have 1 watt of "non-TSO function", since transmitter power is covered by the MPS and since that extra watt cannot be implemented outside the TSO article. Rather, it simply meets the TSO minimum performance standard, with a 1-watt margin above the minimum. As such, we do not view the referenced template language as inconsistent with Order 8110.4C requirements. No change necessary.
12	Garmin	5	7.b.	<p>TSO paragraph 7.b contains wording that is inconsistent with Order 8110.4C CHG 4.</p>	<p>TSO paragraph 7.b includes additional guidance about what furnished data should be provided to an operator or repair station when the equipment includes a non-TSO function. The problematic guidance states "include one copy of the data in paragraphs 5.f.(1) through 5.f.(4)." This guidance is inconsistent with Order 8110.4C CHG 4. Order 8110.4C CHG 4 paragraph 6-9.b.(6) defines the FAA-industry agreed data that must be provided to an installer when equipment includes a non-TSO function.</p>		<b>Rejected.</b> This is part of the current TSO boilerplate and cannot be amended.

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13	Garmin	App 1		An additional SAE AS 8009C change should be added for section 3.12 Display Markings which requires the altimeter to be labeled "ALTITUDE" or "ALT".	The additional change should exempt electronic displays from the requirement of section 3.12.  Equivalent level of safety is provided on Electronic Flight Instrumentation Systems (EFIS) which present a scrolling altitude tape with digital readout in a standardized format and location that does not need the specific label of ALTITUDE or ALT. The altitude tape is presented directly to the right of the attitude indication on the primary flight display.		<b>Previously Accepted.</b>
14	Thales	1	3	As Appendix 1 of this TSO is intended to provide amendments to SAE AS 8009 C, this amendment should be clearly mentioned	It is suggested to complement the existing text as follows : "... met the MPS and documentation requirements ... (SAE) ... (AS) 80009c, ... , <b>modified as per Appendix 1 to this TSO</b> ".		<b>Accepted.</b>
15	Thales	3, 5	top of the page	Header mentions inappropriately "Appendix 1"	Suppress "Appendix 1" in the header of those pages		<b>Previously Accepted.</b>
16	Thales	APP 1	Section 1 Page I.I	Last sentence of proposed change "applicants ... must request a deviation to the TSO" does not relate to the MPS standard, but are part of the TSO. Concern is that if the MPS are updated in the future by SAE this last sentence will not be part of the updated MPS.	It is suggested to remove this last sentence from Appendix 1 section 1 towards the main body of this TSO (e.g. in chapter 2 or 3).		<b>Rejected.</b> This appendix modifies the MPS as incorporated in this TSO. We will monitor future SAE committee activity for updates.
17	Thales	APP 1	Section 1 Page I.I	In last sentence of proposed change "applicants ... must request a deviation to the TSO", the deviation request perimeter should be clarified. Current wording may be understood in two ways: 1) Either to be interpreted in the perimeter of the test procedures  2) Either to be interpreted as a deviation to apply for the TSO is to be requested for pressure altimeter systems other than mechanical-type instrument.	For each case, the following is suggested :  1) To complement the existing text as follows: "Applicants intending ..... deviation to the TSO in case differing test procedures are foreseen to be used."  2) To better explicit the scope of this TSO in the main body of this TSO (e.g. in paragraph 2) as follows: "This TSO relates to pressure altimeter systems other than air data computers. Applicants intending to use other than mechanical-type pressure altimeter systems must request a deviation to the TSO."		<b>Rejected.</b> This appendix modifies the MPS as incorporated in this TSO. We will monitor future SAE committee activity for updates.
18	Thales	APP 1	Section 3.10 Page I.I	Last sentences of proposed change "Applicants intending ... must request a deviation to the TSO. Additionally, any instrument ... correction" does not relate to the MPS standard, but are part of the TSO. If the MPS are updated in the future by SAE this last sentence will not be part of the updated MPS.	It is suggested to remove this last sentence from Appendix 1 section 3.10 towards the main body of this TSO (e.g. in chapter 2 or 3).		<b>Rejected.</b> This appendix modifies the MPS as incorporated in this TSO. We will monitor future SAE committee activity for updates.
19	Thales	APP 1	Section 5.11 Page I.I	Table 10 is explicitly referenced in §3.18 of AS 8009c, whereas Section 4 of AS8034B is explicitly mentioned in §3.8.2.	It is suggested that the additional requirement for performance testing could directly refer to §3.8.2 and §3.18 of AS8009c as follows : "Electronic displays shall demonstrate their compliance with the requirements of §3.8.2 and §3.18 using the test procedures specified in SAE AS 8034B section 6 as applicable"		<b>Accepted.</b>

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20	Thales	APP 1	Section 6.8 of SAE AS 8009C Page I.I	<p>Section 6.8 of SAE AS 8009C states for waterproofness : "The instrument shall be subjected to waterproofness tests in accordance with RTCA DO-160G, Section 10, Category Y"</p> <p>Though not explicitly referred in this TSO as having a modification, this section should be modified to allow waterproofness minimum requirements be dependent to the installation requirements.</p>	<p>It is suggested to provide in this Appendix 1 a change to the waterproofness requirements as follows :</p> <p>"Compliance to the waterproofness tests may be required by the aircraft manufacturer. These tests are not included in this minimum performance standard because the details for performing these tests are specific to the aircraft installation. Those tests may be based on RTCA DO-160G Section 10."</p> <p>With the rest of this paragraph unchanged.</p>		<p><b>Rejected.</b></p> <p>Although this is a new environmental test for this standard, the committee applied it to address condensation effects only. We believe this requirement was obviously meant to be applied at the box-level and is a minimal test.</p>