

**Clearance Record**  
**PUBLIC REVIEW DOCUMENT COMMENT LOG**

<b>Originating Office:</b> AIR-130	<b>Document Description:</b> TSO-C160a	<b>Project Lead:</b> Thomas Mustach	<b>Reviewing Office:</b>	<b>Date of Review:</b>
---------------------------------------	---	--	--------------------------	------------------------

<b>Company &amp; Group</b>	<b>Page &amp; Paragraph</b>	<b>Comment</b>	<b>Rationale for Comment</b>	<b>Recommendation</b>	<b>Disposition</b>
Garmin	Page 2, par. 3.b	<p>Includes the statement:</p> <p style="padding-left: 40px;">Design the system to at least this failure condition classification.</p> <p>Wording needs to change to recognize the fact that failure condition classification is ultimately determined by aircraft level analysis.</p>	<p>It is reasonable to clarify the wording to ensure aircraft level analysis is the driver for determining failure classifications. EASA has recognized this using the following wording in ED Decision 2010/010/R 14/12/2010 Annex I Subpart A – General 2.4 Failure condition classification:</p> <p>“Develop the system to, at least, the design assurance level equal to the failure condition classifications provided in the ETSO. Development to a lower Design Assurance Level may be justified for certain cases and accepted during the ETSO process but will lead to installation restrictions.”</p>	<p>Re-work this section to match the EASA wording. Or work with industry to develop an agreed to wording.</p>	<p><b>Accepted</b></p> <p>Revised paragraph 3.b to specify hazard for TSO functionality is a “minor” failure condition and a note to indicate undetected corrupted messages is a “major” hazard but will be addressed with aircraft type design.</p>
Garmin	Page 3, par 4.b.(2)	<p>Paragraph 4.b.(2) states:</p> <p style="padding-left: 40px;">Each subassembly of the article that 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>	<p><b>Not Accepted</b></p> <p>A printed circuit board of a TSO article does not usually occur on the aircraft; hence, is not considered to be an interchangeable subassembly of the article. The text of TSO-C160A follows the TSO template; however, your comment will be considered for a</p>

Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
					revision to the TSO template.
Garmin	Page 3, par. 4.b.(3)	<p>Includes the statement:</p> <p style="padding-left: 40px;">Transmitter equipment class (7) or (8), as defined in Section 2.1.8 of RTCA/DO-281B.</p> <p>Wording needs to change to allow such information in the installation manual.</p>	<p>This item seems out of place in the list. Items 4.b.1(1) and 4.b.(2) seem intended to enumerate items that should be marked with the data described in paragraph 4.b, while item 4.b.(3) describes additional data that should be included.</p> <p>Additionally, simply marking the equipment class on the equipment label does not benefit the installer. The installer still needs access to additional documentation to determine what the equipment class means and if it is appropriate for a given installation.</p>	<p>Remove item 4.b.(3). Add a new item in section 5.a.(4) stating:</p> <p style="padding-left: 40px;">x. The transmitter equipment class (7) or (8), as defined in Section 2.1.8 of RTCA/DO-281B.</p>	<p><b>Accepted</b> Deleted paragraph 4.b(3) and revised paragraph 5.a(8) to have equipment and avionics architecture classes to be described in the manual for the article.</p>
Garmin	Page 3, par 5.a.(4)(d)	<p>This paragraph requires listing the “failure condition classification” in the installation manual which can be misleading to the installer and is inconsistent with the process of determining failure condition classification at the aircraft level.</p>	<p>Failure condition classification is determined by system safety assessment at the aircraft level and can vary based on installation. By providing a failure condition classification at the appliance level this creates an impression that the safety analysis for these functions is complete.</p> <p>Additionally, TSO paragraphs 5.a.(4)(a) and 5.a.(4)(b) already require the Manual(s) to contain the software and AEH design assurance levels that an installer needs to determine whether the equipment can support the aircraft</p>	<p>Remove the requirement to list “failure condition classification” in the Manual(s).</p>	<p><b>Accepted</b> Deleted paragraph 5.a(4)(d).</p>

Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
			level failure condition classification.		
Garmin	Page 4, par 5.f	TSO paragraph 5.f and its subparagraphs define required information to be supplied to the ACO for a non-TSO function. This guidance is inconsistent with Order 8110.4C CHG 4.	TSO paragraph 5.f indicates that “you must ... include the following information with your TSO application” but the TSO 5.f subparagraphs which specify the required information to be supplied to the ACO for a non-TSO function are inconsistent with the Order 8110.4C CHG 4 paragraph 6-9.b.(3) “Manufacturer Data Submittal” requirements. For example, TSO paragraphs 5.f.(5) and 5.f.(6) require submittal of “Results of test/analysis” while Order 8110.4C CHG 4 paragraph 6-9.b.(3) requires submittal of “proposed test procedures”; while both sets of guidance use the word “test”, otherwise there is no similarity.	Reword to point to Order 8110.4C CHG 4 paragraph 6-9.b.(3).	<b>Not Accepted</b> The text of TSO-C160A follows the TSO template; however, your comment will be considered for a revision to the TSO template.
Garmin	Page 5, par 5.f	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.	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	Reword to point to Order 8110.4C CHG 4 paragraph 6-9.b.(1) and 6-9.b.(3).(a) for the definition of non-TSO function.	<b>Not Accepted</b> The text of TSO-C160A follows the TSO template; however, your comment will be considered for a revision to the TSO template.

Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
			<p>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>		
Garmin	Page 6, par 7.b	TSO paragraph 7.b contains wording that is inconsistent with Order 8110.4C CHG 4.	<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 and it would be better if the TSO simply pointed to Order 8110.4C CHG 4 paragraph 6-9.b.(6).</p>	Reword to point to Order 8110.4C CHG 4 paragraph 6-9.b.(6).	<p><b>Not Accepted</b> The text of TSO-C160A follows the TSO template; however, your comment will be considered for a revision to the TSO template.</p>

Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
ANAC Aline Sousa da Silveira	Page 2 Paragraph 3c	We are not sure about RTCA DO 281 B, but we realize that there are specific tests for VDLm2 multi-frequency.	The functional qualification paragraph in TSO document does not take into account the additional tests for the multi-frequency capability that will be required only for the ATN-CPDLC.	We suggest including a subparagraph in the TSO document specifying which paragraphs of RTCA DO-281B are required for the multi-frequency capability. This can avoid request for deviation for those that are not seeking multi-frequency approval.	<b>Not Accepted</b> Multi-frequency capability is part of the minimum performance standard (MPS) of TSO-160A articles; hence, these articles are expected to demonstrate compliance to this functional capability.
Rockwell Collins	3.b	TSO-C160a (like TSO-C160) states: “Loss or malfunction of the function defined in paragraph 3.a of this TSO is a major failure condition.” While this is an appropriate condition for a VDR (classes V, X, Y), it is not appropriate for class W (CMU w/o 8208) or class Z (CMU w/ 8208) equipment.	Definitions established in DO-290 define loss of VDLm2/CMU/ATN as a “slight increase in workload”, i.e., Minor.  Other TSO’s applicable to VDR certification, e.g., TSO-C169a, categorize loss as a major failure condition, so this is valid for classes V, X and Y equipment.	Recommend establishing failure condition classifications based on equipment class.	<b>Accepted</b> Revised paragraph 3.b to specify hazard for TSO functionality is a “minor” failure condition which is applicable to all five equipment classes specified in TSO-C160a.
Rockwell Collins	3.d	Regarding the statement: “You may use a different standard environmental condition and test procedure than RTCA, Inc. document RTCA/DO-160G, Environmental Conditions and Test Procedures for Airborne Equipment, provided the standard is appropriate for the VDL Mode 2 communications	The CMU resides within the aircraft pressure vessel and does not have direct connection to the aircraft exterior, i.e., no antenna connection.	It is worth noting that this TSO is created from a radio-centric perspective and its use for class W and Z equipment will encounter some issues not currently considered.	<b>Not Accepted</b> The equipment manufacturer selects the environmental condition they wish to use for their article. The TSO provides the pass/fail performance of the article in the selected environmental condition and the equipment manufacturer to declare the environmental

Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
		<p>equipment developed under this TSO.”</p> <p>Additional guidance would be useful to identify that equipment classes W and Z (CMU) are not subject to the same aircraft conditions as classes V, X and Y (VDR).</p>			<p>condition selected in a manual, e.g. Installation Manual – see paragraph 5.a.(5).</p>
Universal Avionics	N/A	UASC does not have any comments.	N/A	N/A	N/A
Honeywell	3.b	<p>Honeywell’s only concern with the draft language is related to section 3.b., Failure Condition Classifications. In the draft, loss or malfunction of the VDL Mode 2 function is broadly defined as a “<i>major</i> failure condition”.</p>	<p>Based on prior experience with VDL Mode 2 systems approved by FAA, Honeywell believes the loss of the VDL Mode 2 function to be a <i>minor</i> failure condition and the undetected malfunction of the VDL Mode 2 function resulting in corrupted or misleading data to be a <i>major</i> failure condition. In addition, since the failure effect is seen at the end-to-end system level, it should be possible to detect the failure at the end-to-end system level, not simply within the subsystem defined by the TSO.</p>	<p><b>Current Language:</b> Loss or malfunction of the function defined in paragraph 3.a of this TSO is a <i>major</i> failure condition. Design the system to at least this failure condition classification.</p> <p><b>Proposed Language:</b> Loss of the function defined in paragraph 3.a of this TSO is a <i>minor</i> failure condition. Undetected malfunction of the function defined in paragraph 3.a of this TSO resulting in corrupted or misleading data is a <i>major</i> failure condition. Design the end-to-end system (to</p>	<p><b>Accepted</b></p> <p>Revised paragraph 3.b to specify hazard for TSO functionality is a “minor” failure condition.</p>

<b>Company &amp; Group</b>	<b>Page &amp; Paragraph</b>	<b>Comment</b>	<b>Rationale for Comment</b>	<b>Recommendation</b>	<b>Disposition</b>
				include physical, link, network, and applications layers) to at least these failure conditions.	