

**Clearance Record
DOCUMENT COMMENT LOG**

Originating Office: AIR-130	Document Description: TSO-C87a	Project Lead: Charisse Green	Reviewing Office:	Date of Review:
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Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
Boeing	General	RTCA Document DO-155, "Minimum Performance Standards Airborne Low-Range Radar Altimeters," is not referenced anywhere in proposed TSO-C87a.	We suggest adding RTCA/DO-155 to the proposed TSO as reference.	While the proposed TSO references EUROCAE document ED-30, "MPS for airborne low range radio (radar) altimeter equipment," it ignores RTCA/DO-155. Although ED-30 covers the intent of DO-155 (plus extra requirements), DO-155 has been used as a basis for complying with the original TSO-C87, and it remains a valid and applicable document.	Not Accepted: The FAA reviewed TSO-C87, RTCA DO-155, and EUROCAE ED-30 with EASA and found that all three standards incorporate similar requirements. Radar altimeter standards designed to one standard will likely meet all three standards. The FAA and EASA selected ED-30 as the minimum performance standard for TSO-C87a because ED-30 has defined requirements for radar altimeters intended for use in ground proximity warning systems as well as requirements for radar altimeters used for landing systems. Citing two standards in the TSO could be confusing, and would not provide any appreciable change in standards.

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Boeing	Page 1, Paragraph 1	The proposed text states: "...tell you what minimum performance standards (MPS)..."	We suggest changing the text as follows: "...tell you what minimum operational performance standards (MOPS)..."	This change would clarify the content of the proposed TSO, since it actually describes the minimum operational performance standards (MOPS) of the equipment. "MOPS" is the more accurate RTCA term.	Not Accepted: This language is standardized in accordance with FAA Order 8150.1C.
Garmin	Pages 1 & 2, Paragraph 3. Table 1	The Table 1 "Applicable Requirements in ED-30" column calls out ED-30 Para 3.1 for both Class A and Class B Radio Altimeters. Section 3.1 of ED-30 includes both sub-sections 3.1.1 and 3.1.2. By requiring Section 3.1, both Sections 3.1.1 and 3.1.2 are being inadvertently required for both classes of Radio Altimeters.	Para 3.1.2 is not a requirement for an approach and landing radio altimeter. Likewise, Para 3.1.1 is not a requirement for Terrain Avoidance (GPWS) radio altimeters.	Suggest removing paragraph 3.1 from the "Applicable Requirements" for both Class A and Class B Radio Altimeters.	Accepted.
Garmin	Page 3, Paragraph 4.b.(2)	Paragraph 4.b.(2) states: Each subassembly of the article that you determined may be interchangeable. This language is confusing.	The language for this requirement is confusing. This could mean that a stuffed printed circuit board needs the TSO number.	Suggest removing the statement or if removing causes problems, work with industry to establish wording that is better understood.	Not Accepted: This language is standardized in accordance with FAA Order 8150.1C.

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Boeing	Page 4, Paragraph 5.a.(4)(b)	The proposed text states: "(b) Airborne electronic hardware part number including..."	We suggest changing the text as follows: "(b) Airborne LRU part number including..." or "(b) Airborne top level LRU part number including..."	The term "electronic hardware part number" is not commonly used. Rather, "LRU part number" is used most often.	Not Accepted: This language is standardized in accordance with FAA Order 8150.1C.
Boeing	Pages 4 & 5, Paragraph 5.f	The proposed text states: "f. Identify functionality or performance contained in the article not evaluated under paragraph 3 of this TSO (that is, non-TSO functions.) Non-TSO functions are accepted in parallel with the TSO authorization. For those non-TSO functions to be accepted, you must declare these functions and include the following information with your TSO application."	Non-TSO functions and requirements should not be included as part of this TSO; these are outside the scope of the TSO and should be handled accordingly.	Per paragraph 1. (Purpose) of the TSO, applicants are to comply with the minimum required performance standards. Therefore, to include a requirement for a detailed description of non-TSO functions seems inappropriate and contradictory.	Not Accepted: This language is standardized in accordance with FAA Order 8150.1C and represents current FAA policy on non TSO functions.
Garmin	Pages 4 & 5, Paragraph 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 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	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. Or if pointing to Order 8110.4C CHG 4 causes problems, adjust the wording in the TSO (template) to be consistent with the 8110.4C CHG 4 intent.	Not Accepted: This language is standardized in accordance with FAA Order 8150.1C and represents current FAA policy on non TSO functions.

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			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.		
Garmin	Page 6, Paragraph 7.b	TSO paragraph 7.b contains wording that is inconsistent with Order 8110.4C CHG 4.	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).	Reword to point to Order 8110.4C CHG 4 paragraph 6-9.b.(6). Or if pointing to Order 8110.4C CHG 4 causes problems, adjust the wording in the TSO (template) to be consistent with the 8110.4C CHG 4 intent.	Not Accepted: This language is standardized in accordance with FAA Order 8150.1C and represents current FAA policy on non TSO functions.
Garmin	Page 8, Appendix 1, Paragraph 1.3	"A failure detection system must be incorporated in the equipment to indicate to the pilot, and to any systems utilizing the radio altimeter data, of a failure of the radio altimeter to accomplish its intended function or an	This requirement is an updated version of that found in TSO-C87, Section 2.6, which solely required that the failure warning system indicate the existence of the following conditions: (1) Loss of Power, and (2) Loss of signal or altitude sensing capability when within the manufacturer's stated operating altitude	Suggest removing the clause "or an inability to meet the performance requirements in this document", or replace this clause with all or part of the previous requirements from TSO-C87, Section 2.6.	Accepted.

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		<p>inability to meet the performance requirements in this document."</p> <p>This requirement is not feasible as currently written.</p>	<p>range. The new clause which adds "or an inability to meet the performance requirements in this document" is so all-encompassing that it cannot be realistically achieved. As written, this clause would require every Airborne Low-Range Radio Altimeter to monitor for failures of meeting requirements such as "noise" (ED-30 Section 3.2.1.3), and "time constant of height information transfer" (ED-30 Section 3.2.1.4). Such requirements are not feasible to be continually monitored in-flight.</p>		
Embraer	Page 8, Appendix 1, Paragraph 2.0	Embraer believes there is a mistake at the second line of the first column " <i>Height (ft)</i> ", which says 00 - 200.		Embraer suggests changing the rate to 100 - 200 ft.	Accepted.