

TSO-C112e PUBLIC COMMENTS

#	Name	Paragraph Section	Comment (state issue) Suggested resolution (state possible solution)	AIR-130 Disposition
	NATS UK	2.	<p>To clarify and avoid confusion with a Mode S All Call interrogation.</p> <p>To define the ATCRBS/Mode S All-Call (Long P4) interrogation as a non valid interrogation and any reply as undesired / unwanted as this terminology is used in the MOPS and transponder behavior under these conditions is defined.</p> <p>2. Replies to ATCRBS/Mode S All-Call (Long P4) Interrogations. Replies to ATCRBS/Mode S All-Call (Long P4) interrogations has been found to be a significant source of 1090 MHz interference. International Civil Aviation Organization, (ICAO) documentation requires transponder designs to not reply to ATCRBS/Mode S All-Call (Long P4) interrogations after 1 January, 2020. After this point the ATCRBS/Mode S All-Call (Long P4) Interrogation will be considered to be a invalid interrogation signal and any transponder reply will be considered as undesired. Transponder manufacturers are encouraged to implement this change into their designs as soon as possible. To comply, manufacturers should implement the changes outlined in section 2 of this appendix.</p>	Paragraph 2 of Appendix 2 was removed.
	NATS UK	General comment	<p>NATS recognizes that the scope of this TSO is restricted to the transponder itself as a standalone unit independent of the airframe. It omits the importance of the location and design of Antenna/s and the interconnecting cabling but then goes on to make a statement on antenna diversity</p> <p>None</p>	Not Accepted. Comment refers to table 2 in Appendix 1. DO-181E provides transponder marking instructions that are different from those found in 14 CFR part 43. With the permission of RTCA, portions of DO-181E are reprinted in Appendix 1 to provide a mapping between these two documents.

	NATS UK	1.4.4 – Pages 10 & 11	<p>The document lacks detail on the subject of antenna installation & location, especially on aircraft below 5700Kg where historically this has proven to be an issue</p> <p>Add further detail or a reference to any alternative documents where this is already covered.</p>	<p>Not Accepted. Comment refers to a portion of table 2 which is a reprint of a portion of DO-181E. Table 2 has been added to describe the cross-reference for ATCRBS / Mode Select (Mode S) equipment markings into the classes referenced in 14 CFR Part 43 Appendix F. Relevant portions of DO-181E regarding labeling scheme (Sections 1.4.3 through 1.4.6) are repeated in this TSO, (in table2), as a courtesy to operators and repair stations.</p>
	NATS UK	2.	<p>To clarify and avoid confusion with a Mode S All Call interrogation.</p> <p>To define the ATCRBS/Mode S All-Call (Long P4) interrogation as a non valid interrogation and any reply as undesired / unwanted as this terminology is used in the MOPS and transponder behavior under these conditions is define</p> <p>Replies to ATCRBS/Mode S All-Call (Long P4) Interrogations. Replies to ATCRBS/Mode S All Call (Long P4) interrogations has been found to be a significant source of 1090 MHz interference. International Civil Aviation Organization, (ICAO) documentation requires transponder designs to not reply to ATCRBS/Mode S All-Call (Long P4) interrogations after 1 January, 2020. After this point the ATCRBS/Mode S All-Call (Long P4) Interrogation will be considered to be a invalid interrogation signal and any transponder reply will be considered as undesired. Transponder manufacturers are encouraged to implement this change into their designs as soon as possible. To comply, manufacturers should implement the changes outlined in section 2 of this appendix.</p>	<p>Paragraph 2 of Appendix 2 was removed.</p>
	NATS UK	2.2.6.1.1 - Page 14	<p>The paper makes a statement on All Call legislation which states ground stations will not use All Call from 1/1/2020. There is a lack of clarity over the continued use of All Call in certain circumstances.</p> <p>Add an additional note to indicate that the normal All Call will remain will remain in place</p>	<p>Paragraph 2 of Appendix 2 was removed.</p>

	NATS UK	2.2.6.1.1 Notes	Note 1 could confuse the reader through reference to interrogator functionality in an aircraft transponder certification specification Suggest modifying the Note to state that this change prevents the Mode S transponder from replying to an ATCRBS/Mode S All Call interrogation in Mode S All Call reply format.	Paragraph 2 of Appendix 2 was removed.
	NATO HQ		The proposed U.S. FAA TSO would expedite and change transponders immediately and prior to the ICAO proposed draft convention of 1 January 2020; therefore NATO members, in some cases, will not be able to get Mode S addresses, if U.S. registered aircraft will not be able to respond to Long P4.	Accepted. Paragraph 2 of Appendix 2 modifying the use of the Long P4 pulse has been removed. See note 1 at the end of this table for full discussion
	NATO HQ	Draft TSO	NATO can understand and support the intent to reduce spurious Mode S replies due to transponders incorrectly decoding some interrogations as Intermode Mode A/C/S All-Call interrogations.	Noted
	NATO HQ	Draft TSO	The proposed TSO would begin to phase out replies to Intermode interrogations earlier than ICAO requires and therefore it is recommended that the dates be aligned	Accepted. Paragraph 2 in Appendix 2 has been removed.
	NATO HQ	Draft TSO	Long P4 Interrogations should be allowed at least till 1 January 2020.	Accepted. Paragraph 2 in Appendix 2 has been removed.
	NATO HQ	Draft TSO	Long P4 capability should remain in transponders at least till 1 January 2020 or until it is determined that there are not and will be no longer any users of these interrogators prior to this date. As such, any intended change of national regulation which impact Long P4 transponders shall only be effective for equipment that has not been commissioned prior to that date.	Accepted. Paragraph 2 in Appendix 2 has been removed.
	NATO HQ	Draft TSO	Numerous NATO nations' platforms or systems will not be able to get Mode S addresses from transponders that do not reply to Mode A/C/S All-Calls. (Not being able to use Long P4. interrogations will result in an increase of interrogations by military platforms or systems which may have a greater impact on interference on 1090MHz.)	Noted
	NATO HQ	Draft TSO	That U.S. FAA with ICAO could investigate methods to address the transponders that are not correctly decoding interrogations and thereby identify specific areas where these problems have occurred.	Accepted. The US plans to restrict ATCRBS/Mode S All-Call (intermode), interrogations and replies 1 Jan, 2020. The FAA is also investigating the use of Lockout to prevent transponders from replying to intermode interrogations.

	Honeywell	Page 1, para. 2(a)	<p>The six month window for accepting previous revisions of the TSO is too short of a time frame for manufacturers who have products already in development and targeted for certification in late 2014/early 2015. This new TSO revision does not address specific safety issues associated with its MPS to warrant immediate compliance to the new TSO for major TSO changes to existing products.</p> <p>Increase the compliance window from six months to eighteen months to allow manufacturers enough time to incorporate these changes into their products without impacting current commitments.</p>	Accepted. This comment impacts the TSO template and has been passed on to the TSO template manager. Para 2 and para 2 a have been revised.
	Honeywell	Page 5, para. 6	<p>Items b, c, d, and e are covered in paragraph 5.</p> <p>Since those items are required to be provided to the ACO it is redundant to state that they must be “available for review”. Remove them.</p>	<p>Partially accepted.</p> <p>Accepted. Para 6 b removed.</p> <p>Not Accepted. Paragraph 5 c discusses the plan for software aspects for certification (PSAC). Schematic drawings may or may not be in the PSAC. If they are not part of the PSAC, para 6 c indicates applicants should have applicable schematics available for review by the FAA if requested.</p> <p>Not Accepted. Paragraph 5 d discusses the plan for hardware aspects for certification (HSAC). Wiring diagrams may or may not be in the HSAC. If they are not part of the HSAC, para 6 c indicates applicants should have applicable wiring diagrams available for review by the FAA if requested.</p> <p>Not Accepted. Paragraph 5 e discusses the design of the unit nameplate. Para 6 e indicates applicants should have any unique material and process information available for review by the FAA if requested.</p>
	Honeywell	Appendix 2, para. 2	<p>“Replies to ATCRBS/Mode S All-Call interrogations has been found...” should be “Replies to ATCRBS/Mode S All-Call interrogations have been found...”</p> <p>Change per comment</p>	Paragraph 2 of Appendix 2 was removed.

	Honeywell	Appendix 2, para. 2	<p>The final two sentences of this section make it appear that it is optional to implement this, but the next section seems to make it mandatory. Which is it?</p> <p>Clarify the final two sentences.</p>	Paragraph 2 of Appendix 2 was removed.
	Honeywell	Appendix 2, paragraphs 2.1, 2.2 and 2.3	<p>These paragraphs are meant to list <u>all</u> changes to DO-181E regarding not replying to ATCRBS/Mode S All-Call interrogations...but they are incomplete.</p> <p>Requirements in 2.2.23.1.7.1, 2.2.23.1.7.1.1(b) and 2.2.23.1.7.1.2(b) <u>and their associated tests (PR#6, others?)</u> should be modified to reflect that TCS no longer controls replies to ATCRBS/Mode S All-Calls</p>	Paragraph 2 of Appendix 2 was removed.
	Honeywell	Appx 2, paragraphs 2.1, 2.2 and 2.3	<p>These paragraphs are meant to list <u>all</u> changes to DO-181E regarding not replying to ATCRBS/Mode S All-Call interrogations...but they are incomplete.</p> <p>Requirement 2.2.18.2.3 <u>and its associated tests (PR#1, PR#2, others?)</u> should be modified to remove both ATCRBS Mode A/Mode S All-Call and ATCRBS Mode C/Mode S All-Call.</p>	Paragraph 2 of Appendix 2 was removed.
	Honeywell	Appx 2, paragraphs 2.1, 2.2 and 2.3	<p>These paragraphs are meant to list <u>all</u> changes to DO-181E regarding not replying to ATCRBS/Mode S All-Call interrogations...but they are incomplete.</p> <p>Requirement 2.2.18.2.9 <u>and its associated tests (PR #8, others?)</u> should be modified to remove the part regarding ATCRBS/Mode S All-Call interrogations.</p>	Paragraph 2 of Appendix 2 was removed.
	Honeywell	Appx 2, paragraphs 2.1, 2.2 and 2.3	<p>These paragraphs are meant to list <u>all</u> changes to DO-181E regarding not replying to ATCRBS/Mode S All-Call interrogations...but they are incomplete.</p> <p>Requirement 2.2.19.1.4 <u>and its associated tests (PR#2, others?)</u> should be modified to remove ATCRBS/Mode S All-Calls.</p>	Paragraph 2 of Appendix 2 was removed.

	Honeywell	Appx 2, paragraphs 2.1, 2.2 and 2.3	<p>These paragraphs are meant to list <u>all</u> changes to DO-181E regarding not replying to ATCRBS/Mode S All-Call interrogations...but they are incomplete.</p> <p>Appendix D requirement 2.1.7.b(1) <u>and its associated test (PR#40)</u> should be modified to reflect fact that replies to ATCRBS/Mode S All Call interrogations no longer expected.</p>	Paragraph 2 of Appendix 2 was removed.
	Honeywell	Appx 2, paragraphs 2.1, 2.2 and 2.3	<p>These paragraphs are meant to list <u>all</u> changes to DO-181E regarding not replying to ATCRBS/Mode S All-Call interrogations...but they are incomplete.</p> <p>Requirement 2.2.14.4.30 <u>and its associated tests (PR#8, others?)</u> should be modified to reflect fact that replies to ATCRBS/Mode S All-Calls are no longer expected.</p>	Paragraph 2 of Appendix 2 was removed.
	Honeywell	Appx 2, paragraphs 2.1, 2.2 and 2.3	<p>These paragraphs are meant to list <u>all</u> changes to DO-181E regarding not replying to ATCRBS/Mode S All-Call interrogations...but they are incomplete.</p> <p>Requirement 2.2.18.2.2.c, 2.2.18.2.2.f and Figure 2-12 <u>and their associated tests (PR#4, others?)</u> should be modified to reflect fact that replies to ATCRBS/Mode S All Calls are no longer expected.</p>	Paragraph 2 of Appendix 2 was removed.
	Honeywell	Appx 2, paragraphs 2.1, 2.2 and 2.3	<p>These paragraphs are meant to list <u>all</u> changes to DO-181E regarding not replying to ATCRBS/Mode S All-Call interrogations...but they are incomplete.</p> <p>Requirement 2.2.6.2 and 2.2.6.3 <u>and their associated tests</u> should be modified to reflect fact that replies to ATCRBS/Mode S All Calls are no longer expected.</p>	Paragraph 2 of Appendix 2 was removed.
	Honeywell	Appendix 2, para. 2.1	<p>Part g (with sub-parts 1 and 2) is missing from the modified section 2.2.2.4. Was that intentional?</p> <p>If intentional, put it in with “strike-throughs”. If not intentional, add the sections here.</p>	Paragraph 2 of Appendix 2 was removed.
	Honeywell	Appendix 2, para. 2.1	Do DO-181E, sections 2.3.2.1 and 2.4.2.1 need to be modified due to this TSO change?	Paragraph 2 of Appendix 2 was removed.

	Honeywell	Appendix 2, para. 2.2	Part a of the modified 2.2.6.1.1 text should highlight and underline (per appendix 2, 1.1) the word “ignore” and the new letter “s” at the end of the word “Interrogations”. Change per comment	Paragraph 2 of Appendix 2 was removed.
	Honeywell	Appendix 2, para. 2.2	The new “Notes” section should be underlined (along with the highlighting) to comply with appendix 2, 1.1 Change per comment	Paragraph 2 of Appendix 2 was removed.
	Honeywell	Appendix 2, para 2.3	In the modified “Step 1”, underline and highlight the new text “reaching the”. Remove the strikethrough word “the”. Change per comments	Paragraph 2 of Appendix 2 was removed.
	Honeywell	Appendix 2, para. 2.3	Does DO-181E, section 2.3.2.5 need to be modified due to this TSO change?	Paragraph 2 of Appendix 2 was removed.
	Honeywell	Appx 2, paragraph 2.3	Seems like, in addition to test 2.4.2.5, several other HW tests should be reworded to reflect fact that replies to ATCRBS/Mode S All Calls are no longer expected. 2.4.2.1, 2.4.2.2.1, 2.4.2.2.2, 2.4.2.3.3, 2.4.2.4, 2.4.2.6, 2.4.2.11	Paragraph 2 of Appendix 2 was removed.
	Honeywell	Appendix 2, para. 3.2	Add “(§2.2.19.1.12.5 protocol)” to the end of the new test section header. Change per comment	Accepted.
	Honeywell	Appendix 2, para. 3.2	Be consistent in the usage of “Comm-B” (see the various usages in the new parts 1-4). Use “Comm-B”.	Accepted. Entire document checked for consistency, corrections made where needed.
	Honeywell	Appendix 2, para. 3.2	New test procedure states “...and 2 more flight identification changes in less than 18 seconds”. Since the timer is 18+/-1 seconds, shouldn’t the new text read “...and 2 more flight identification changes in less than <u>17</u> seconds”? Change per comment.	Not accepted. 18 seconds is the nominal value.

	<p>Boeing Commercial Airplanes</p>	<p>Page: 2 Paragraph: 3.b. Failure Condition Classifications.</p>	<p>The proposed text states: “b. Failure Condition Classifications. Malfunction of the function defined in paragraph 3.a of this TSO is a major failure condition. Loss of the function defined in paragraph 3.a of this TSO is a minor failure condition. ...”</p> <p>Boeing requests clarification as to whether this requirement applies to the additional features identified in DO-181E, Section 1.4.4 (as called out in paragraph 3.a. of the proposed TSO). If it does apply, then we support the text as written. If it does not apply, then we request that paragraph 3.b. define the failure classification(s) of the additional features.</p> <p>Clarification is requested to ensure the scope of the requirement is clear and correct.</p>	<p>Not Accepted. Although the point made is valid for some equipment, the failure classification for surveillance equipment cannot be mitigated at the aircraft level.</p>
	<p>Boeing Commercial Airplanes</p>	<p>Page: 2 Paragraph: 3.c. Functional Qualification.</p>	<p>The proposed text states: “c. Functional Qualification. <i>Demonstrate the required functional performance under the test conditions specified in RTCA/DO-181E, Sections 2.4 and 2.5.</i>”</p> <p>If the ATCRBS/Mode S equipment includes the additional features identified in DO-181E, Section 1.4.4 (as called out in paragraph 3.a. of the TSO), then Sections 2.6 and 2.7 should be added.</p> <p>This change is necessary in order to ensure functional testing to demonstrate all functions is included.</p>	<p>Accepted. Sentence added to para 3 c: “If Elementary or Enhanced Surveillance functions are included, demonstrate the required functional performance under the test conditions specified in RTCA/DO-181E, Sections 2.6 and 2.7.”</p>

	<p>Boeing Commercial Airplanes</p>	<p>Page: 13 Appendix 2. Modifications of the Requirements in RTCA DO-181E Paragraphs: 2 and 2.1.</p>	<p>We recommend revising the text as follows: “2. Replies to ATCRBS/Mode S All-Call Interrogations. <i>Replies to ATCRBS/Mode S All-Call interrogations have been found to be a significant source of 1090 MHz interference. International Civil Aviation Organization, (ICAO) documentation requires transponder designs to not reply to ATCRBS/Mode S All-Call interrogations after 1 January, 2020. Transponder manufacturers are encouraged to implement this change into their designs as soon as possible. To comply, manufacturers of transponders built to this TSO should must implement the changes outlined in section 2 of this appendix.</i> 2.1. RTCA DO-181E, page 20, section 2.2.2.4.f. is modified here to ensure transponders built to this TSO will not reply to ATCRBS/Mode S All-Call interrogations which will be required after 1 January, 2020. Modify section 2.2.2.4.f as follows: ...”</p> <p>The wording in paragraphs 2 and 2.1. of Section 2 of the Appendix is inconsistent. Our suggested revision would rectify this. Additionally, the wording of paragraph 2.1 could be misinterpreted to inappropriately indicate that there is a Jan. 1, 2020, FAA mandate for this capability. The January 1, 2020, date is an ICAO Standards and Recommended Practices (SARPs) date, as identified in paragraph 2.</p>	<p>Paragraph 2 of Appendix 2 was removed.</p>
	<p>AIRBUS</p>	<p>p2 §4.d</p>	<p>This section is consistent with the field loadable software technology deployed on Airbus aircraft, but the last requirement <i>“If electronic marking is used, it must be readily accessible without the use of special tools or equipment”</i> does not fit the whole set of possible design solutions.</p> <p>The possibility to use a special tool (SIS reader) allowing reading equipment marking as well as loaded software identification on un-powered equipment (even if not installed on aircraft) and the consultation through cockpit means are expected to fulfill the requirement on access to the electronic marking.</p> <p>Airbus proposes to remove this last sentence.</p>	<p>Not accepted. The requirement to id the article without the use of special tools remains. The intent is to allow line maintenance personnel the ability to determine what the article is and what is capabilities are without the use of special tools</p>

	AIRBUS	p1 §2.a	<p><i>“Generally we will not accept applications after the effective date of this TSO. However, we may do so up to six months after it, if we know that you were working against the earlier MPS before the new change became effective.”</i></p> <p>The six months period is no more adapted to existing equipment complexity and associated development duration.</p> <p>Compared to previous standalone equipment, the complexity of new systems such as AECS increases, integrating more and more functions. Complex equipment requires a significant lead time in order to :</p> <ul style="list-style-type: none"> - develop the specification taking into account all applicable TSOs and certification material, - develop the equipment and associated documentation, - and finally submit the dossier to the FAA for TSO approval. <p>From a general standpoint, for the avionics domain, the complex equipments with longer development duration will have difficulties to integrate new revision of TSO while developing.</p> <p>Currently, Airbus already works on the integration of new AECS platform to be certified next year that took into account TSO-C112d requirements.</p> <p>The six month period is not sufficient to alleviate the risk on on-going developments.</p> <p>Airbus will apply the new TSO revision to its specifications for new development after the release of the TSO-C112e.</p> <p>But for development in progress, Airbus proposes to extend the 6 months period allowing to apply for an earlier TSO version by 18 additional months in order to match the constraints linked to the development of complex equipment and associated documentation.</p>	<p>Accepted. This comment impacts the TSO template and has been passed on to the TSO template manager. Para 2 and pare 2 a have been revised.</p>
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	OSD ATL		<p>The official DoD position regarding TSO C-112e on the use of the Long P4 pulse is as follows:</p> <p>"The DoD supports the basic intent of the proposed TSO, namely, to reduce erroneous Mode S replies due to transponders incorrectly decoding some interrogations as Intermode Mode A/C/S all-calls. However, the proposed TSO would begin to phase out replies to these interrogations earlier than ICAO requires. From our discussions in NATO, we understand that several of our allies intend to continue to use these interrogations for some time, in which case lack of replies by new or upgraded transponders could present them with operational problems in tracking aircraft using Mode S, including DoD aircraft. Accordingly, the DoD position is that the phase-out of transponder replies to this mode should be aligned with the ICAO date of 2020 for cessation of these interrogations, unless it is determined that there are not, and will be no longer be, any users of these interrogations prior to that date."</p>	Accepted. Paragraph 2 removed.
	Garmin	Page 2, par. 3.b	<p>Paragraph 3.b Includes the statement:</p> <p>Malfunction of the function defined in paragraph 3.a of this TSO is a major failure condition. Loss of the function defined in paragraph 3.a of this TSO is a minor failure condition. Design the system to major 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: “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>	Not Accepted. Although the point made is valid for some equipment, the failure classification for surveillance equipment cannot be mitigated at the aircraft level.

	Garmin	Page 2-3, par 4.a	<p>Paragraph 4.a states:</p> <p>The marking must also include the transponder's functional level, minimum peak output power, and optional additional features...</p> <p>Marking the functional level, minimum peak output power and optional additional features is impractical and has little or no value. Garmin routinely requests and is granted deviations from such marking requirements to include them in the equipment installation manual as the equipment does not have sufficient space to include all required markings.</p> <p>Remove the requirement to mark transponder functional level, minimum peak output power and optional additional features.</p> <p>Additionally, strongly urge the FAA to revise its Order 8150.1B CHG 1 TSO marking policy to eliminate the need to routinely request TSO deviations from these marking requirements.</p>	Not Accepted. Providing transponder's functional level, minimum peak output power, and optional additional features is required per RTCA DO-181E, Section 1.4.6 (Transponder Labeling).
	Garmin	Page 3, par 4.b.(2)	<p>Paragraph 4.b.(2) states:</p> <p>Each subassembly of the article that you determined may be interchangeable.</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>	Not accepted. Para 4 b 1 requires the part in question be easily removed without hand tools. If a sub component is easily removable i.e. an SD card, the SD card would need to be labeled with the TSO number.

	Garmin	Page 4, par 5.d	<p>Paragraph 5.d states:</p> <p>“If the article includes complex custom airborne electronic hardware: a plan for hardware aspects of certification (PHAC), hardware verification plan, top-level drawing, and hardware accomplishment summary (or similar document, as applicable).”</p> <p>Suggest rewording to be consistent with AC 20-152, which applies to complex custom micro-coded components only.</p> <p>Recommend changing Paragraph 5.d to:</p> <p>If the article includes a complex custom micro-coded electronic hardware: a plan for hardware aspects of certification (PHAC), hardware verification plan, top-level drawing, and hardware accomplishment summary (or similar document, as applicable).</p>	Not Accepted. Revised para to include simple electronic hardware. This requirements applies to both simple and complex electronic hardware
	Garmin	Page 4-5, par 5.f	<p>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.</p> <p>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.</p> <p>Adjust the wording in the TSO (template) to be consistent with the 8110.4C CHG 4 intent.</p>	Not Accepted. The test plans referred to are part of recommended ‘pre-coordination’ with the TSOA issuing ACO to discuss non-TSO functions. This pre-coordination is expected to be done prior to the actual final application for TSOA. The TSO itself requires the actual test results for the final TSO application to determine that the added functions don’t interfere with the articles ability to meet the TSO.

	Garmin	Page 4-5, par 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.r 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 (template) to be consistent with the 8110.4C CHG 4 intent.</p>	<p>Not accepted. The example given in this comment is NOT a non-TSO function issue. If the TSO requires a 10 watt transmitter and the applicant wants to ‘exceed’ the 10 watt requirement, then they can use test data to substantiate that they tested to the higher value, but the transmitter power requirement is a defined function in the TSO so it may not be called a non-TSO function. The TSOA only gives the article credit for the minimum requirements defined in the TSO. The use of the term ‘performance’ and the associated comment in that regards will be forwarded to the FAA point of contact for consideration in future revisions to non-TSO function policy</p>
	Garmin	Page 6, par 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> <p>Adjust the wording in the TSO (template) to be consistent with the 8110.4C CHG 4 intent.</p>	<p>Not Accepted. The data 8110.4 refers to is data for the ‘installer’ to use when evaluating against regulatory requirements for installation on a particular aircraft. The data required by 8150.1 must be provided to operators and others who own and use the articles in order for them to properly operate and maintain the article.</p>

	Garmin	Page 13, Appendix 2 Section 2.1	<p>Specifying an MTL for an interrogation that will no longer be accepted (ATCRBS/Mode S All-Call) does not make sense.</p> <p>For DO-181E section 2.2.2.4 paragraph a should be modified to remove ATCRBS/Mode S all-call.</p>	Paragraph 2 of Appendix 2 was removed.
	Garmin	Page 13, Appendix 2 Section 2.1	<p>It is unclear whether DO-181E section 2.2.2.4 paragraph g still applies.</p> <p>Clarify whether DO-181e section 2.2.2.4 paragraph g still applies.</p>	Paragraph 2 of Appendix 2 was removed.

Garmin	Page 13-16, Appendix 2	<p>There are several more paragraphs of DO-181E section 2 that should be considered for change as they are no longer applicable in a transponder that does not accept ATCRBS/Mode S All-call interrogations:</p> <ol style="list-style-type: none"> 1. 1.4.3.1 paragraph b 2. 2.2.4.2.5 paragraph b 3. 2.2.6.2 paragraph a, second paragraph (there is no way to verify that equipment is differentiating between a valid and invalid interrogation) 4. 2.2.6.2 paragraph c (there is no way to verify that equipment is differentiating between a valid and invalid interrogation) 5. 2.2.6.3 paragraph a, second paragraph (there is no way to verify that equipment is differentiating between a valid and invalid interrogation) 6. 2.2.6.3 paragraph b (there is no way to verify that equipment is differentiating between a valid and invalid interrogation) 7. 2.2.18.2.2 Figure 2-12 8. 2.2.18.2.2 paragraph c 9. 2.2.18.2.2 paragraph f 10. 2.2.18.2.3 table 11. 2.2.18.2.9 second sentence 12. 2.2.19.1.4 first table, row for ATCRBS/Mode S All-Calls 13. 2.2.23.1.7.1 first paragraph 14. 2.2.23.1.7.1.1 paragraph b 15. 2.2.23.1.7.1.2 paragraph b <ol style="list-style-type: none"> 1. 1.4.3.1 paragraph b should be deleted 2. 2.2.4.2.5 paragraph b should be deleted 3. 2.2.6.2 paragraph a, second paragraph should be deleted 4. 2.2.6.2 paragraph c should be deleted 5. 2.2.6.3 paragraph a, second paragraph should be deleted 6. 2.2.6.3 paragraph b should be deleted 7. 2.2.18.2.2 Figure 2-12 should be updated or revised to indicate that ATCRBS/Mode S All-call interrogations are no longer accepted 8. 2.2.18.2.2 paragraph C should be deleted 9. 2.2.18.2.2 paragraph f should have “ATCRBS/Mode S All-Call” deleted 10. 2.2.18.2.3 table should have ATCRBS/Mode S All-Call rows deleted 11. 2.2.18.2.9 second sentence should be deleted 12. 2.2.19.1.4 first table, row for ATCRBS/Mode S All-Calls should be deleted 13. 2.2.23.1.7.1.1 paragraph b delete “ATCRBS/Mode S All-call” 14. 2.2.23.1.7.1.2 paragraph b delete “ATCRBS/Mode S All- 	Paragraph 2 of Appendix 2 was removed.
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	Cessna	Appendix 2	<p>The number of deviations from the RTCA DO-181E MOPS seems large given the concept behind consensus standards. Our understanding is that FAA has representation on the RTCA Special Committee, thus we would like to understand the reason for the deviations. In addition, we would appreciate information on plans to reduce or eliminate deviations between the consensus standards and TSOs in the future.</p>	<p>The FAA makes every effort to use RTCA DO MOPS as the basis for TSOs. Deviations from the MOPS, DO-181E, are only made after careful consideration and consultation with the public and other aviation authorities. In the case of this TSO, Appendix 1 provides information on how to map MOPS marking requirements to CFR requirements. Appendix 2 provides clarification to the MOPS based on the latest information available ahead of a change to DO-181E. The deviations provided by this TSO were deemed important enough to publish, but not important enough to reconvene RTCA SC-186. The deviations provided by this TSO will be presented and discussed the next time RTCA SC-186 meets to modify DO-181E.</p>
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NOTE 1: Reference Comment 21. Full discussion of DOD position on the removal of the Long P4 pulse.

NATO members were informed that the FAA was in the process of revising TSO-C112e to incorporate two changes to the Minimum Operational Performance Standards (MOPS) on Air Traffic Control Radar Beacon Systems/Mode Select (ATCRBS/Mode S) Airborne Equipment. These proposed changes have been discussed with members of the NATO International Staff, as well as with members of the NATO Consultation, Command and Control Board (C3B) Navigation and Identification Capability Panel (CaP2). Several nations have expressed concerns on your first proposal, to reduce 1090MHz interference by allowing manufacturers to develop transponders which do not reply to ATCRBS/Mode S All-Call interrogations (Long P4) in advance of the 1 January 2020, the effective date for change proposed by the International Civil Aviation Organization (ICAO). In this context, there is an indication that some platforms, to include tactical ground air radars, surface warfare ships and stand alone air defense systems/platforms, will be impacted by this proposal now and even post-2020. The second change, clarification on how multiple Comm-B broadcast changes are handled, is not an issue.

Given the above, it is deemed important to highlight these concerns providing a NATO response to the FAA draft TSO proposal.

Many Military platforms or systems try to acquire both Mode A/C and Mode S equipped aircraft with minimal interference. This functionality is widely spread across platforms or systems to include stand alone air defense systems such as man portable air defense systems, i.e. MISTRAL, or short/medium range air defense systems, surface ships, and tactical ground to air radars, i.e. GIRAFFE. Mobile legacy platforms are strongly relying on the use Intermode A/C/S All-Call interrogations. If NATO members continue to use an interrogator which uses ATCRBS/Mode S All-Calls (Long P4) for surveillance, any civil/military aircraft/vehicle which uses TSO-112e transponders will not be tracked. The ICAO Amendment, if approved, permits the use of these interrogations until 2020 and, based on technical discussions with NATO International Staff, several NATO nations apparently continue to interrogate with this mode for the next few years. The proposed U.S. FAA TSO would expedite and change transponders immediately and prior to the ICAO proposed draft convention of 1 January 2020; therefore NATO members, in some cases, will not be able to get Mode S addresses, if U.S. registered aircraft will not be able to respond to Long P4.

NATO Response to FAA

- NATO can understand and support the intent to reduce spurious Mode S replies due to transponders incorrectly decoding some interrogations as Intermode Mode A/C/S All-Call interrogations.
- The proposed TSO would begin to phase out replies to Intermode interrogations earlier than ICAO requires and therefore it is recommended that the dates be aligned.
- Long P4 Interrogations should be allowed at least till 1 January 2020.
- Long P4 capability should remain in transponders at least till 1 January 2020 or until it is determined that there are not and will be no longer any users of these interrogators prior to this date. As such, any intended change of national regulation which impact Long P4 transponders shall only be effective for equipment that has not been commissioned prior to that date.
- Numerous NATO nations' platforms or systems will not be able to get Mode S addresses from transponders that do not reply to Mode A/C/S All-Calls. (Not being able to use Long P4. interrogations will result in an increase of interrogations by military platforms or systems which may have a greater impact on interference on 1090MHz.)
- That U.S. FAA with ICAO could investigate methods to address the transponders that are not correctly decoding interrogations and thereby identify specific areas where these problems have occurred.

Thank you for your assistance in ensuring that NATO's military requirements are considered during the comment period of the draft TSO. If you have any further questions, please do not hesitate to either call or write me as these comments are instrumental in ensuring NATO's military capabilities.