

**Clearance Record  
DOCUMENT COMMENT LOG**

<b>Originating Office:</b> AIR-130	<b>Document Description:</b> TSO-C195a	<b>Project Lead:</b> Usmaan Javed	<b>Reviewing Office:</b>	<b>Date of Review:</b>
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<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	General	This comment is relative to the suggested comment response Excel spreadsheet provided on the FAA's draft AC website along with draft AC 43-CBAS and not with respect to draft AC 43-CBAS itself.	Excel spreadsheets are a poor method of completing comments on draft documents as there are several limitations with entering text and the ability to perform internal reviews on the comments prior to submitting them to the FAA. While we realize FAA may feel there are advantages (e.g., sorting comments using Excel), Garmin prefers to use Word tables to provide feedback as Word provides much better tools for text manipulation including spelling and grammar checking as well as the ability to track internal reviews changes/feedback on the comments prior to submitting them to the FAA.  Consequently, Garmin is providing its feedback in a Word document that has the same table columns and information as what has been used to provide review comments for many previous draft TSOs.	In the future, use Word tables rather than Excel spreadsheets as the preferred method of providing comments.	Accepted. We will use Word tables in the future.
Garmin	Page 1, par 3 (3 instances), Page 3, 3.c, Page 4, par 3.d	References "RTCA/DO-317a".	The correct reference is to "RTCA/DO-317A".	Change all instances of "DO-317a" to "DO-317A".	Accept.

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Garmin	Page 1, par 3	<p>Includes the statement:</p> <p>New models of ADS-B ASA systems and equipment identified and manufactured on or after the effective date of this TSO must meet the MPS set forth in Section 2 of RTCA Document No. (RTCA/DO-317a), <i>Minimum Operational Performance Standards for Aircraft Surveillance Applications System</i>, dated December 13, 2011.</p> <p>Reference to the entire DO-317A section 2 as providing the minimum functional and performance requirements leads to confusion because DO-317A section 2 also includes the environmental qualification and test conditions.</p>	<p>In a recent discussion on another TSO, FAA AIR-120 indicated that test sections are not part of the minimum functional and performance requirements that the equipment must meet in order to provide the intended function defined in paragraph 3.a of this TSO. In other words, TSO deviations do not need to be obtained in cases where the tests are not conducted precisely in accordance with the procedures defined within the MPS test section although the intent of the test must be followed and any modifications to the test must be validated.</p> <p>Referencing the entire DO-317A section 2 leads to this confusion. Since DO-317A section 2.4 on environmental conditions and DO-317A sections 2.5 and 2.6 on test conditions are already individually referenced in TSO paragraphs 3.d and 3.c respectively, it is sufficient to reference only DO-317A sections 2.1 through 2.3 in paragraph 3.</p> <p>Additionally, it is not required that all classes of ASA equipment meet all requirements within DO-317A sections 2.1 through 2.3.</p>	<p>Suggest changing to:</p> <p>New models of ADS-B ASA systems and equipment identified and manufactured on or after the effective date of this TSO must meet the MPS set forth in Sections 2.1 through 2.3 of RTCA Document No. (RTCA/DO-317A), <i>Minimum Operational Performance Standards for Aircraft Surveillance Applications System</i>, dated December 13, 2011 as appropriate to the functional equipment classes listed in Table 1.</p>	Accepted.
Garmin	Page 2, par 3, Table 1 and par 3.b including Table 2	<p>“Criticality Level” column.</p> <p>The Criticality Level defined in Table 1 is inconsistent with SPRs.</p>	<p>Table 1’s title is “ASA Functional Equipment Classes”. It is more appropriate to include the “Criticality Level” in paragraph 3.b, which discusses Failure Condition Classifications.</p> <p>See additional comments on paragraph 3.b with respect to the “Criticality Level” column classifications not being supported by the SPR’s for the EVAcq, AIRB, SURF or VSA applications.</p>	<p>Remove the “Criticality Level” column.</p> <p>See additional suggestions on paragraph 3.b.</p>	Reject. Aircraft Certification does not agree with the assessment of the criticality in the SPR documents. The criticality documented in Table 1 is consistent with paragraph 3b.

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Garmin	Page 2, par 3.a	<p>Includes the statements:</p> <p>Equipment authorized under this TSO must also comply with TSO-C165 when implementing Surface Applications. This TSO shall take precedence where it differs from TSO-C165. For example, databases must meet 5 meter accuracy and Essential Integrity as defined in DO-272A to be considered compliant with this TSO.</p>	<p>RTCA/DO-317A 1.5.2.6 makes specific <i>assumptions</i> about the airport surface map including 5.0 meter accuracy, 1.0 meter resolution, and RTCA/DO-200A essential data integrity but it does not make any assumption regarding the use of RTCA/DO-272A and RTCA/DO-317A. Furthermore, RTCA/DO-317A has no airport surface map database requirements. The closest it gets is the following note in Section 2.3.8.1:</p> <p><i>2. Airport surface map features and their requirements are described in Do-272B / ED-99B and are not part of this document. ...</i></p> <p>Consequently, there are no conflicting airport surface map database requirements between TSO-C165 and TSO-C195a.</p>	<p>Suggest removing the last sentence of the quoted text or at minimum change to the following wording:</p> <p>For example, RTCA/DO-317A assumes airport surface map databases meet 5 meter accuracy, 1.0 meter resolution, and RTCA/DO-200A essential data integrity quality</p>	<p>Agree that wording does not properly convey the intent of the requirement. Reword as follows: “Databases used to support moving maps integrated with the SURF application must meet at least 5 meter accuracy and 1 meter resolution. Databases used to support moving maps integrated with the SURF application must meet DO-200A Data Process Assurance Level 2 for state-provided data with Essential Integrity as defined in DO-272B.”</p>
Garmin	Page 3, par 3.b.	<p>Includes the statements:</p> <p>Failure of the function defined in paragraph 3a of this TSO has been determined to be a major failure condition for malfunctions causing the display of hazardous misleading information in airborne aircraft and aircraft on the ground greater than 80 knots. Failure of the function defined in paragraph 3a of this TSO has been determined to be a minor failure condition for malfunctions causing the display of hazardous misleading information in aircraft on the ground with groundspeed of less than 80 knots. Loss of function has been determined to be a minor failure condition. Develop the system to, at least, the design assurance level applicable to these failure condition classifications. Design assurance levels should be based upon the guidance of AC 23.1309-1E for Part 23 aircraft, AC 25.1309-1E for Part 25 aircraft, AC 27-1B for normal category</p>	<p>The Major failure condition/classification for hazardous misleading information in the quoted statements and Table 1’s “Criticality Level” column are not supported by the SPR’s for the EVAcq, AIRB, SURF or VSA applications. The EVAcq, AIRB, SURF and VSA applications were assigned a “criticality level” of Minor in their respective SPRs (DO-289 for EVAcq, DO-319 for AIRB, DO-322 for SURF, and DO-314 for VSA). Ignoring the SPRs and requiring higher failure classifications with the consequent higher design assurance levels will inappropriately stifle the installation of the safety-enhancing ASA functionality, which is in direct contradiction to the FAA’s charter.</p>	<p>Suggest:</p> <ol style="list-style-type: none"> <li>Adjust the text as follows: <ul style="list-style-type: none"> <li>“Table 2 defines the failure classifications for the function defined in paragraph 3a of this TSO. Develop the system to, at least, the design assurance level required by the anticipated installation for the functionality defined in paragraph 3a.”</li> </ul> </li> <li>Revise Table 2 to be like Table 1 with the Application and Equipment Class columns.</li> <li>Remove the “Criticality Level” column from Table 1.</li> <li>Create “Loss of Function” and “Misleading Information” columns in</li> </ol>	<p>Reject. Aircraft Certification does not agree with the assessment of the criticality in the SPR documents. The criticality documented in Table 1 is consistent with paragraph 3b.</p>

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		<p>rotorcraft, and AC 29-2C for transport category rotorcraft. To clarify this requirement for aircraft types, Table 2 indicates the minimum Design Assurance Level required for Small Aircraft, Transport Aircraft, and Rotorcraft.</p>	<p>It should also be noted that RTCA DO-317A section 2.2.4.1.2 allows traffic with SDA <math>\geq 1</math> (probability of transmitting misleading information less than or equal to <math>1e-3</math>) to be marked valid for the EVAcq and AIRB applications. This is in conflict with the stated criticality requirement of Major (probability of displaying misleading information less than or equal to <math>1e-5</math>). RTCA DO-317A section 2.2.4.2.2 allows traffic with SDA <math>\geq 1</math> to be marked valid for SURF, and RTCA DO-317A section 2.2.4.3.2 allows traffic with SDA <math>\geq 1</math> to be marked valid for VSA. These all conflict with the stated criticality requirement of Major.</p> <p>Additionally, none of these SPRs recognized a speed threshold at which the “criticality level” of the application increased. This is particularly troublesome because Table 1 indicates class A2 and A3 equipment is “Major (&gt; 80 Knots)” yet Table 2 indicates class A2 and A3 equipment requires Minor design assurance even for Part 23 Class 4, Part 25, 27, 29.</p> <p>Additionally, the FAA typically does not reference Advisory Circulars in TSOs and Garmin recommends against doing so as any of the referenced ACs may change the design assurance level guidance, which will necessitate TSO deviations and/or a revision to the TSO. For example, the current Part 23 Reorganization ARC appears to be headed in the direction of further reducing certification requirements, including design assurance level</p>	<p>Table 2. See AC 20-138B Table 8 as an example; the AC 20-138B columns would be the ASA applications rows.</p> <ol style="list-style-type: none"> <li>5. Revise the failure classifications for the EVAcq, AIRB, SURF and VSA applications to be Minor for both loss of function and misleading information to be consistent with their respective SPRs.</li> <li>6. Eliminate the 80 Knots threshold on the SURF application rows to be consistent with its SPR.</li> <li>7. Revise the title of Table 2 to “ASA Application Failure Classifications”.</li> <li>8. Add the following Note after Table 2 to address the issue that future applications may require a higher failure classification:</li> </ol> <p>“<b>Note:</b> Systems developed to the minimum design assurance level for Table 2 ASA applications failure classifications may require design assurance level upgrades for use with future ASA applications envisioned to require higher failure classifications.”</p> <p>See the suggested changes to paragraph 3.b and Table 2 at the end of this document.</p>	

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			<p>for low end Part 23 aircraft. Furthermore, the Part 23 Reorg ARC is likely to recommend that means of compliance for regulations be placed in industry standards that can be recognized by certification authorities worldwide, not just the FAA ACs.</p>		
Garmin	Page 3, par 3.b.	<p>Includes the statement:</p> <p>Develop the system to, at least, the design assurance level applicable to these failure condition classifications.</p> <p>Wording needs to change to allow failure condition to be determined at the aircraft level.</p>	<p>This statement implies the failure condition classification of an appliance is determined by the TSO regardless of mitigations employed to meet aircraft level safety requirements such as redundant appliances/systems. Unless the DAL cannot be affected by the installation, the aircraft System Safety Assessment should determine the failure classification and by extension, the design assurance level (DAL) requirement. The aircraft FHA/SSA ultimately determines the DAL requirement for a particular installation. Specifying the DAL at the appliance level without the benefit of the specific aircraft level FHA/SSA means that in some cases the DAL will undoubtedly be higher and more costly than necessary. This will have a chilling effect on the installation of new, safety enhancing technologies since the cost will be greater than necessary. It is possible to build and certify a TSOA appliance that cannot be approved for installation in one or more aircraft types because it does not have the required DAL. Similarly, just because the appliance meets a TSO DAL does not mean it can be approved for installation. We recommend that no failure classification/DAL requirement be included in a TSO</p>	<p>Suggest changing to the following wording:</p> <p>“Develop the system to, at least, the design assurance level required by the anticipated installation for the functionality defined in paragraph 3a.”</p> <p>See the suggested changes to paragraph 3.b and Table 2 at the end of this document.</p>	<p>The wording in this section creates a minimum certification level for ADS-B In equipment across aircraft types. The minimum design assurance levels were coordinated with each responsible directorate to make it clear to manufacturers and regional ACOs what the minimum bar is for this equipment. This text intentionally sets the criticality and design assurance level consistent with accepted Directorate policy. The suggested change to Table 1 to include failure criticality separate from hazardously misleading data criticality is accepted.</p>

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			<p>when the installation can affect or mitigate the hazard level and therefore consideration should be given to revising paragraph 3.b in this TSO to the general guidance in the Recommendation column. (Note that TSO-C112c is an example where a classification/DAL may be appropriate as a transponder output is used by the national airspace system and the installation has no ability to mitigate the safety risk.)</p>		
Garmin	Page 4, par 4.a	<p>Includes the statement:</p> <p>The marking must include the serial number and functional equipment class(es) in accordance with Table 1 of paragraph 3.</p> <p>The Order 8150.1B Chg 1 TSO template does not include the “functional equipment class(es)” phrase.</p>	<p>Garmin is routinely granted deviations from TSO requirements to mark the “functional equipment class(es)” as the equipment does not have sufficient space to include this as well as all other required markings (e.g., multiple TSOs and SW level, etc. that appear in other TSOs). This deviation is granted through use of a marking similar to the example in Order 8150.1B ¶ 12.f (“See Inst Mnl for Addtl TSO’s”).</p>	<p>Remove “and functional equipment class(es) in accordance with Table 1 of paragraph 3” from the quoted text.</p> <p>Add a new paragraph under 5.a requiring the equipment class(es) to be included in the “Manual(s)”.</p>	<p>Modify language to allow Classes to be marked in a manual. Put language here in section 4 not in section 5 as proposed.</p>
Garmin	Page 5, 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>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>No Change. TSO Template language. Refer to Rich and AIR-120.</p>
Garmin	Page 6, 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</p>	<p>Remove the requirement to list “failure condition classification” in the Manual(s).</p>	<p>No Change. TSO Template language. Refer to Rich and AIR-120.</p>

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			needs to determine whether the equipment can support the aircraft level failure condition classification.		
Garmin	Page 6, 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).	No Change. TSO Template language. Refer to Rich and AIR-120.
Garmin	Page 6, 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 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	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.	No Change. TSO Template language. Refer to Rich and AIR-120.

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			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 8, par 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).	No Change. TSO Template language. Refer to Rich and AIR-120.
Garmin	Page 8, par 8.b	This paragraph describes how to "Order SAE documents".	There are no SAE documents referred to within this TSO.	Suggest removing this paragraph.	Accept. Remove SAE reference.
Friedhelm Runge, EASA		The mentioned TCAS TSO-C119 is already at revision <i>c</i> and not at revision <i>b</i> any more.		Change TSO-C119 to TSO C-119C	Accepted. Change has been made.

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L-3	Page 2, Table 1.	SURF Major criticality levels should be required when $\geq 80$ Kts		Change from "Major ( $> 80$ Knots)" to "Major ( $\geq 80$ Knots)"	This issue does not appear to warrant a change as the exposure to exactly 80 knots is not expected to be operationally significant.
L-3	Page 2, Table 1.	AIRB is the minimum/foundational application for all other applications. For a CDTI Surface Only equipment class (e.g. Class 2 EFB), AIRB is required to support the SURF application given all displayed data on the Class 2 EFB is minor (i.e. TCAS no alerts) and own-ship is $< 80$ kts.		Add a class A5 for AIRB. The criticality levels should be similar to SURF (Major $\geq 80$ kts, Minor $< 80$ kts).	Applicants building Class A equipment do need to meet AIRB requirements but may not implement an airborne display. Therefore, there are no class markings needed for AIRB in Class A.
L-3	Page 2, last sentence.	Clarify that this TSO must interface with TSO-C154c or TSO-C166b "In" and "Out" equipment. TSO-C119c for TCAS 7.1/Hybrid Surveillance and TSO-C147 for TAS should also be listed.		Change to "TSO-C154c or TSO-C166b (both transmit and receive equipment) and TSO-C119b or TSO-C119c (if TCAS installed) or TSO-C147 (if TAS installed)."	Accept and modified as follows. "Equipment authorized under this TSO must contain or interface with equipment complying with TSO-C154c or TSO-C166b ADS-B receive equipment. When TAS or TCAS equipment is installed, equipment authorized under this TSO must contain or interface with equipment complying with TSO-C147, TSO-C118, or TSO-C119c."

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L-3	Page 3, last note.	Installations also with a TAS processor are not required to implement TIS-B for airborne traffic.		Change to "... TCAS or TAS processor..."	Accept.
L-3	Page 3, Section 3.b.	Reference to Part 25 aircraft AC is incorrect.		Change AC reference for Part 25 aircraft in last sentence of paragraph in Section 3.b. from "AC 25.1309-1E" to AC "25.1309-1A"	Accept. Change to -1A
L-3	Page 3, Section 3.c. states that "All equipment authorized under this TSO must demonstrate interoperability with an FAA ADS-R or TIS-B service broadcast". Does this imply a flight test at a service volume that provides this capability??	This section states that "All equipment authorized under this TSO must demonstrate interoperability with an FAA ADS-R or TIS-B service broadcast". Does this imply a flight test at a service volume that provides this capability?		Provide clarification to the comment question.	Modify text to clarify intent as follows: "Manufacturers may propose a method to demonstrate interoperability with FAA ADS-R and TIS-B services. This method must include operation with live data within an ADS-R and/or TIS-B service volume."
L-3	Page 3, Table 2.	Based on SC-186 WG4 discussions, EV Acq was only permitted to be installed on small GA aircraft. This table shows that Classes B1 and C1 are allowed for more than just small GA aircraft?		If EV Acq is not allowed for installation in 14 CFR § 23 Class 4, 14 CFR § 25, 14 CFR § 27, 14 CFR § 29 aircraft, suggest removing Classes B1 and C1 from the second column, last row of the table.	Agree but this limitation does not appear to be something that requires regulatory control. We believe this implementation will be self limiting and manufacturers will police themselves.

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Honeywell - DO	In Section 4 -	Marking, examples should be provided on how to properly list all the equipment classes that a unit complies with. For example: "C1,C4,C5" or "C-1,4,5"			Agree that an example would help. Equipment marking or manual should include Class C1, C2, C3, etc.
Honeywell - TB	Section 3(a), third paragraph.	TSO-C165 is not applicable to equipment that support Surface Applications, but do not display information (ex. ASSAP functions).		Recommend changing the first sentence to read: "Display equipment authorized under this TSO must also comply with TSO-C165 when implementing Surface Applications.:"	Accepted.
Honeywell - TB	Section 3(a), third paragraph.	TSO-C119b has been replaced with TSO-C119c.			Accepted.
Honeywell - TB	Section 3(a), Note 2.	Since this TSO covers the ASA equipment only, the position source is out of context with the requirements of the TSO itself. (In other words, the granting of the TSO has nothing to do with the pedigree of the position source).	This information belongs in the AC, not the TSO.		Modified wording to indicate what the equipment must support.
Honeywell - TB	Section 3(c), Note.	Change last sentence to "Equipment claiming Classes C2 or C3 must implement TIS-B for surface applications."			Change sentence to: "Equipment applying for Class C2 and C3 must implement TIS-B for surface applications."
Honeywell - TB	Section 3(f).	The hardware design assurance level statement is duplicated.			Accepted.

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Boeing Commercial Airplanes	Page 2 Para. 3a	The proposed text states: “... If the applicant cannot support ITP in polar regions, this limitation must be clearly stated in the installation manual and flight manual...”	Without the definition of the term “polar regions”, TSO applicants cannot determine precisely whether a statement on limitation is required in their installation manual and flight manual. Addition of this definition will facilitate compliance.	We recommend revising the text to state: “... If the applicant cannot support ITP in polar regions, <b>defined as</b> {-- insert FAA criteria, such as latitude or areas with data communication restriction--}, this limitation must be clearly stated in the installation manual and flight manual...”	Modify text: The applicant must define what the boundaries of the polar region are in the installation and flight manual.
Boeing Commercial Airplanes	Page 2 Para. 3a	The proposed text states: “... For example, databases must meet 5 meter accuracy and Essential Integrity as defined in DO-272A to be considered compliant with this TSO...”	TSO applicants may choose to be compliant with later versions of the standards. The addition will provide clarity and flexibility in implementation.	We recommend revising the text to state: “... For example, databases must meet 5 meter accuracy and Essential Integrity as defined in DO-272A, or later versions, to be considered compliant with this TSO...”	Accept.
Boeing Commercial Airplanes	Page 3 Para. 3.a. Note 2	The proposed text states: “Note 2: Position Sources interfaced to this equipment must meet one of the following TSOs: TSO-C129, TSO-C145, TSO-C146, or TSO-C196 or equivalent.”	It is unclear from the note which TSO(s) are equivalent to each other and whether later versions of the cited TSOs will meet the position source requirement. The addition we have suggested will provide clarity and flexibility in implementation.	We recommend revising the text to state: “Note 2: Position Sources interfaced to this equipment must meet one of the following TSOs: TSO-C129, TSO-C145, TSO-C146, or TSO-C196 or <b>equivalent later versions.</b> ”	Modified wording to indicate what the equipment must support.
Boeing Commercial Airplanes	Page 3 Para. 3.b.	The proposed text states: “...Design assurance levels should be based upon the guidance of AC 23.1309-1E for Part 23 aircraft, AC 25.1309-1E for Part 25 aircraft, ...”	We recommend revising the text to state: “... Design assurance levels should be based upon the guidance of AC 23.1309-1E for Part 23 aircraft, AC 25.1309-1 <b>EA</b> for Part 25 aircraft, ...”	We recommend revising the text to state: “... Design assurance levels should be based upon the guidance of AC 23.1309-1E for Part 23 aircraft, AC 25.1309-1 <b>EA</b> for Part 25 aircraft, ...”	Will verify with TAD to get the latest version of this document. Proper version is -A

**Comment [D1]:** Has this comment been overcome by a previous resolution to Garmin’s comments?

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Boeing Commercial Airplanes	Page 3 Para. 3.b. Table 2	We recommend revising the text to state:		The minimum required hardware failure probability and design assurance levels should be listed for both above and below 80 knots. This addition that we have suggested will ensure consistency with the criticality level on in Table 1 on Page 2, Para. 3.	Reject. Refer to resolution to Garmin Table 1 comment.					
		<table border="1"> <tr> <td data-bbox="390 217 464 540">ASA Equipment Classes for installation in 14 CFR § 23 Class 1,2, and 3 (per AC 23-1309-1E)</td> <td data-bbox="470 217 554 540">ASA Equipment Classes for installation in 14 CFR § 23 Class 4, 14 CFR § 25, 14 CFR § 27, 14 CFR § 29</td> <td data-bbox="560 217 644 540">Minimum Required Hardware Failure Probability</td> <td data-bbox="651 217 735 540">Minimum Required DO-178B Software Design Assurance Level</td> <td data-bbox="741 217 800 540">Minimum Required DO-254 Complex Hardware Design Assurance Level</td> </tr> </table>				ASA Equipment Classes for installation in 14 CFR § 23 Class 1,2, and 3 (per AC 23-1309-1E)	ASA Equipment Classes for installation in 14 CFR § 23 Class 4, 14 CFR § 25, 14 CFR § 27, 14 CFR § 29	Minimum Required Hardware Failure Probability	Minimum Required DO-178B Software Design Assurance Level	Minimum Required DO-254 Complex Hardware Design Assurance Level
		ASA Equipment Classes for installation in 14 CFR § 23 Class 1,2, and 3 (per AC 23-1309-1E)				ASA Equipment Classes for installation in 14 CFR § 23 Class 4, 14 CFR § 25, 14 CFR § 27, 14 CFR § 29	Minimum Required Hardware Failure Probability	Minimum Required DO-178B Software Design Assurance Level	Minimum Required DO-254 Complex Hardware Design Assurance Level	
<table border="1"> <tr> <td data-bbox="390 545 464 787">A2 (&lt;80 kts), A3 (&lt;80 kts), B1, B2, B3, B4, B5, C1, C2, C3, C4, C5</td> <td data-bbox="470 545 554 787">A2 (&lt;80 kts), A3 (&lt;80 kts)</td> <td data-bbox="560 545 644 787">10E-3</td> <td data-bbox="651 545 735 787">Level D</td> <td data-bbox="741 545 800 787">Level D</td> </tr> </table>	A2 (<80 kts), A3 (<80 kts), B1, B2, B3, B4, B5, C1, C2, C3, C4, C5	A2 (<80 kts), A3 (<80 kts)	10E-3	Level D	Level D					
A2 (<80 kts), A3 (<80 kts), B1, B2, B3, B4, B5, C1, C2, C3, C4, C5	A2 (<80 kts), A3 (<80 kts)	10E-3	Level D	Level D						
<table border="1"> <tr> <td data-bbox="390 792 464 1052">A2 (&gt;80 kts), A3 (&gt;80 kts), B6, C6</td> <td data-bbox="470 792 554 1052">A2 (&gt;80 kts), A3 (&gt;80 kts), B1, B2, B3, B4, B5, B6, C1, C2, C3, C4, C5, C6</td> <td data-bbox="560 792 644 1052">10E-5</td> <td data-bbox="651 792 735 1052">Level C</td> <td data-bbox="741 792 800 1052">Level C</td> </tr> </table>	A2 (>80 kts), A3 (>80 kts), B6, C6	A2 (>80 kts), A3 (>80 kts), B1, B2, B3, B4, B5, B6, C1, C2, C3, C4, C5, C6	10E-5	Level C	Level C					
A2 (>80 kts), A3 (>80 kts), B6, C6	A2 (>80 kts), A3 (>80 kts), B1, B2, B3, B4, B5, B6, C1, C2, C3, C4, C5, C6	10E-5	Level C	Level C						
Boeing Commercial Airplanes	Page 3 Para. 3.c. Note	The proposed text states: “Note: Equipment designed for installations that include a TCAS processor are not required to implement TIS-B for airborne applications. All equipment must implement TIS-B for surface applications.”	The proposed requirement to implement TIS-B for surface applications is not clearly supported by the SBS Description Document SRT-047, Rev 01. In particular, Figure A-3 in the document shows that the	We recommend revising the text to state: “Note: Equipment designed for installations that include a TCAS processor are not required to implement TIS-B for airborne applications. All equipment must implement	This section is already reworded above. It does not directly address this comment. The FAA does provide TIS-B in surface service volumes.					

Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
			<p>lowest 1090 MHz end-state service coverage only goes down to 1800 ft AGL. There is no defined or guaranteed service coverage for TIS-B on the surface at airports. Implementing TIS-B for surface applications without any guarantee increases risks and costs for TSO applicants. Also, without surface coverage, TSO applicants will be unable to test the TIS-B features for surface applications.</p>	<p><i>TIS-B for surface applications only if the FAA provides guaranteed service coverage for the surface service volume.</i></p>	
Boeing Commercial Airplanes	Page 7 Para. 5.g.	<p>The proposed text states:  <i>“The quality system description required by 14 CFR 21.608, including functional test specifications and each applicant must provide a document required by 14 CFR 21.605 describing how the applicant’s organization will ensure compliance with the provisions of 14 CFR Subpart O...”</i></p>	<p><b>EDITORIAL COMMENT:</b>  The proposed paragraph as written contains a long run-on sentence that is difficult to read and understand. The revision that we have suggested will improve clarity and readability.</p>	<p>We recommend revising the text to state:  <b><i>“The following documentation is required:</i></b>  <i>quality system description required by 14 CFR §21.608, including functional test specifications; and</i>  <i>a document required by 14 CFR §21.605 describing how the applicant’s organization will ensure compliance with the provisions of 14 CFR Subpart O.”</i></p>	<p>No Change. TSO Template language. Refer to Rich and AIR-120.</p>
Boeing Commercial Airplanes	Page 7 Para. 5g	<p>The proposed text states:  <i>“... The quality system should ensure that you will detect any change to the approved design that could adversely affect compliance with the TSO MPS, and reject the article accordingly. (Not required for LODA applicants.)”</i></p>	<p>It should be clear that the quality system will ensure that non-TSO functions that are included in the TSO article per paragraph 5.f. are also not adversely affected.</p>	<p>We recommend revising the text to state:  <i>“... The quality system should ensure that you will detect any change to the approved design that could adversely affect compliance with the TSO MPS (and non-TSO function performance specifications, if non-TSO</i></p>	<p>No Change. TSO Template language. Refer to Rich and AIR-120.</p>

Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
				<i>functions are installed), and reject the article accordingly. (Not required for LODA applications.)”</i>	