

**Clearance Record
DOCUMENT COMMENT LOG**

Originating Office: AIR-130	Document Description: TSO-113a	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	We note that HIRF and lightning protection components are not discussed in the TSO.	Neither this TSO nor the referenced SAE AS 8034B mentions FAA requirements for adequately maintaining HIRF and lightning protection components as a unit (i.e., line replaceable unit, LRU) ages over time. We recommend that the TSO contain a section titled, "Maintenance, Protection Assurance, and Modifications." This section should require that an applicant address the latent failures of HIRF and lightning protection components in accordance with SAE ARP 5415A (lightning) and ARP 5583A (HIRF).	Continued airworthiness of HIRF and lightning protection should be included in the TSO in order to make it more comprehensive and complete.	Not Accepted: Paragraph 5.b requires instructions on maintenance, calibration, and repair for continued airworthiness of the equipment. It also requires the inclusion of recommended inspection intervals, and service life of the equipment. This requirement covers all continuing airworthiness requirements, including HIRF and lightning.
Rockwell Collins	General	Rockwell Collins, perhaps like other manufacturers, has a product offering that effectively buffers, translates and merges multiple sources of data into concentrated streams for processing, symbol generation and presentation on displays. These sources of data include discrete, analog and digital bus data forms that are conditioned (e.g, voltage-level shifted, A-D converted) and multiplexed onto data buses.		Rockwell Collins had also considered proposing creation of a fourth class to accommodate the data concentrator function, but we believe that inclusion within Class 2 would be an equally acceptable and more straight forward approach.	Acknowledged: It is acceptable to include data concentrator and analog-to-digital conversion functionality with the MPD. If the data concentrator, analog-to-digital converter, and MPD are included in the same package this is straight forward. It is also straight forward if the data concentrator, analog-to-digital converter, and MPD are separate packages, but are all included in the TSO

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		<p>Additionally, these data concentrator products support display of engine instrument information and crew alerting functions. In past applications, Rockwell Collins has applied for and been granted approval for these products under TSO-C113.</p> <p>It is Rockwell's current interpretation that these data concentrators would continue to be eligible for consideration under TSO-C113a as Class 2 units (i.e., symbol generators). In support of this interpretation, Rockwell Collins cites SAE AS8034B Section 1 paragraph 3, wherein it stated that:</p> <p>"Electronic Displays can include one or more of the following interconnected components. Other configurations are possible.</p> <p>Symbol Generator/Processor Unit (SG) containing display processing and symbol generation processing and symbol generation capability, power supplies, interface logic/buffer circuits and</p>			<p>authorization. This issue is not as straight forward if the applicant intends to seek TSO authorization for the data concentrator or analog-to-digital converter separately from the MPD. In this instance, if the data concentrator or analog-to-digital converter must either meet all the requirements of the MPD, or qualify for an incomplete system TSO authorization. AC 21-46 Chapter 5 provides additional guidance on incomplete system TSO authorizations.</p>

Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
		<p>Display Unit interface capability. The SG receives data from external sources, produces symbols as electronic signals, and transmits the symbols to the Display Unit(s)."</p> <p>Rockwell Collins asserts that the yellow highlighted text above related to interface logic/buffer circuits and display unit interface accurately describes the data concentrator functionality, and that therefore AS8034B would be an appropriate MPS for these data concentrator product offerings, thus making them eligible for consideration under TSO-C113a Class 2</p>			
Rockwell Collins	General SAE AS 8034	5.30 Define what high voltage is in the TSO.	AS8034B Section 5.30 only provides a numeric value of 200V DC. It is not clear whether 20 V DC should be construed as the threshold above which voltages would be considered "high". Please provide a definition, clarifying language or threshold for "high voltage.		Response: SAE AS8034B Section 5.30 requires CRT displays and other display components with high voltages to meet the specific dielectric test. Although SAE AS8034B does not define "high" voltage, it does define the context, which is CRT

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					displays. If the system has high voltages comparable to the voltages of a CRT display, the system needs to pass the Section 5.30 dielectric test. TSO-C113 and TSO-C113a do not modify the SAE AS 8034B requirement.
Garmin	General	Significant issues with TSO-C113a and SAE AS 8034B.	Garmin has identified several significant issues in its comments below. These issues warrant another public comment period in order to ensure the final TSO-C113a does not contribute to causing FAA and industry other problems in the form of overhead associated with deviation requests.	Given that Garmin has identified significant issues with TSO-C113a and SAE AS 8034B, FAA should make a new draft of TSO-C113a available for another public comment period prior to its final publication.	Not Accepted: We feel that we have addressed all issues in the current version of the document and the FAA does not believe that the TSO-C113a needs further public comment.
Aspen Avionics	Page 2 Paragraph 3. a.	Language is confusing with respect to requirements of AS8034B	<p>This paragraph says that the TSO addresses only "basic display standards" and that it "does not include specific application requirements."</p> <p>However, AS8034B, section 4.1 includes two SHALL requirements that the displayed information must conform to appropriate standards and it must perform its intended function.</p> <p>Therefore if the MFD is presenting information that has a TSO or appropriate standards, it must comply with those requirements or a deviation would be required. Requiring applicants to seek multiple partial TSOs for</p>	<p>Reword this paragraph as follows:</p> <p>Functionality. This TSO's standards apply to equipment intended for use as an electronic display in the flight deck by the flight crew in 14 CFR Part 23, 25, 27, and 29 aircraft. This TSO addresses detailed display hardware requirements, and further requires that display functions conform to applicable standards, but does not directly include the specific application</p>	Not Accepted: Applicants must apply for each applicable TSO. The FAA is exploring the potential of creating an Electronic Flight Information Systems TSO that would partially address this comment.

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			<p>equipment creates additional work for both the FAA and the applicant, and should be discouraged. The SAE standard is clear that functions must comply to standards, and perform intended function, to be eligible to be marked with <u>this</u> TSO.</p>	<p>functional requirements. Specific applications could include, for example, flight instrumentation, navigation, engine and system status, alerting, surveillance, communication, terrain awareness, weather, and other displays. When such functions are included they must conform to the applicable TSO, or to accepted standards, for the equipment to be eligible to be marked with this TSO C113a. Applicants are encouraged to coordinate with the FAA early in the development process to secure agreement on the standards applicable to the displayed data. When marked with this TSO, the equipment need not seek partial TSO for each display function it performs.</p>	
Garmin	Page 2 Paragraph 3.b.	<p>Includes the statement:</p> <p>Document the failure condition classification for loss of function and erroneous or misleading output from the airborne multipurpose electronic</p>	<p>As acknowledged in paragraph 3.b:</p> <p>The failure condition classification appropriate for the equipment will depend on the intended use of the equipment in a specific aircraft.</p> <p>Failure condition classification is</p>	<p>Remove this statement or revise it to state:</p> <p>Document the design assurance levels for the airborne multipurpose electronic display in accordance with</p>	<p>Not Accepted: The manufacturer of the equipment must specify the failure condition classification for loss of function and erroneous or misleading output at the equipment level, and not just</p>

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		display in accordance with paragraph 5.a.(4) of this TSO.	<p>determined by system safety assessment at the specific aircraft level and can vary based on aircraft and installation characteristics (e.g., single display v. dual display). By providing a failure condition classification at the appliance level this creates an impression that the safety analysis for the intended functions is complete when it is not.</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 level failure condition classification.</p> <p>See related comment on paragraph 5.a.(4)(d).</p>	paragraph 5.a.(4) of this TSO.	at installation.
Honeywell	Page 2 Paragraph 3.b.	This should not apply to a TSO	Failure classifications are at the aircraft level and addressed in the appropriate regulatory material (e.g. AC 25-11A for Part 25). A display unit may support multiple aircraft types, with multiple functions, which means that no single "failure classification" will apply. In fact the beginning of the paragraph acknowledges that point.	Remove the paragraph.	Not Accepted: The paragraph was re-word for clarity. Though a failure condition classification is not provided in the TSO, it is still required that the failure condition classification be documented at the equipment level.

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EASA	Page 2 Paragraph 3	No requirements regarding the use of colors are included. Is this intentional or been overlooked?	TSO-C113 a.2.ii contained a specific color coding guidance reflecting 25.1322(e), (f) requirements.	Add requirements for color coding convention.	Accepted. SAE AS 8034B requires color use to conform with the appropriate 2x.1322 requirement. Additionally, the color guidance from TSO-C113 was added as additional guidance in the TSO appendix.
EASA	Page 2 & 3 Paragraph 3 and 4	SAE AS 8034B has marking requirements in paragraph 3.10, which are more demanding than the marking requirements given in the TSO section 4. It is not clear if those requirements are mandatory or not.	TSO section 3 calls the complete SAE AS 8034B, which include e.g. the 3.10 f weight and 3.10 g environmental categories marking requirements. Section 4 partly supersedes the AS 8034B 3.10 marking requirements especially the 3.10.d AS 8034 approval identification requirement. It can be interpreted that the whole AS 8034 3.10 marking requirements are superseded by the TSO section 4 or that they are mainly applicable.	Either clearly exclude paragraph 3.10 as well as the non-testable 3.1 Material and 3.2 Workmanship paragraphs from the TSO requirements in section 3 or at least clarify that TSO section 4 supersedes the whole AS 8034B 3.10 or only AS 8034B 3.10.d.	Accepted: The Section 3 requirements are general requirements versus specific performance requirements and have been removed from the TSO.
Rockwell Collins	Page 2 Paragraph 3.d.	No guidance is provided regarding DO-160 E and F. However there is a clear position on DO-160 D and G.	Please fill the gap regarding the use of DO-160E and F. It would be helpful for the TSO to point to AC21-16G or subsequent that provides illumination of the FAA's intent.		Not Accepted: The FAA's policy on environmental standards is that any appropriate standard may be used. The note in 3.d. clarifies that older versions of DO-160 (prior to DO-160D Change 3) are not appropriate without a deviation. Use of DO-160D Change 3, DO-160E, DO-160F, and DO-160G are acceptable.

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Garmin	Page 2 Paragraph 3.d AS8034B Para 5.4.1	The maximum warm up time in AS8034B is listed as 10 minutes to meet full performance. The same paragraph states that the manufacturer shall specify the time.	This seems to conflict, 10 minutes is very restrictive if the manufacturer selects a category that requires -40C short-term operation for example. The warm up time is installation dependent and category selection dependent, so allowing the manufacturer to specify something longer is important.	Either remove the max 10 minute warm up time, or if the FAA feels a maximum is needed, extend it to 30 minutes or more.	Not Accepted: The requirement allows for warm-up times up to 10 minutes. If the manufacturer believes that it should be extended based on its equipment functionality, a deviation request should be applied for stating the reason and the equivalent level of safety.
Honeywell	Page 2 Paragraph 3.d.	<u>Environmental Qualification</u> I understand this paragraph as an attempt to allow different versions of DO-160 without a deviation. But what has resulted is the statement that the earlier versions of DO-160, which were considered not only appropriate for airborne equipment are no longer appropriate. And the FAA may not accept future versions of DO-160, based on issues they may have with them. How does the applicant determine which versions, other than G are acceptable? Is the intent to allow military qualification standards as well? Is the intent to allow the ACO to approve a different standard without a deviation?	The appropriateness of the level of DO-160 to be used should not be specified in a TSO. The TSO should state to use the latest version effective at the time of application. The deviation process established by 14 CFR 21.618 along with FAA Order 8150.1B can determine if a different level is appropriate.	Reword paragraph to use open bracket for the revision level of DO160. Revise note to indicate latest revision at time of application.	Not Accepted: The FAA's policy on environmental standards is that any appropriate standard may be used. The note in 3.d. clarifies that older versions of DO-160 (prior to DO-160D Change 3) are not appropriate without a deviation request. Use of DO-160D Change 3, DO-160E, DO-160F, and DO-160G are acceptable. Military environmental qualification standards are acceptable if they are appropriate for airborne equipment.

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Boeing	Page 2 Paragraph 3.e & Page 6 Paragraph 6.g	Both of these paragraphs reference RTCA/DO-178B; however, that is not the latest version of this standard.	We recommend changing the reference to RTCA/DO-178C.	Reference the latest standard. **Current policy of TSO	Not accepted: The FAA is carefully considering use of DO-178C. At this time, DO-178B remains the software requirement for TSOs. If a manufacturer would prefer to use RTCA/DO-178C a deviation request can be submitted for review to the ACO.
Aspen Avionics	Pg 2 paragraph 3.e. and 3.f.	Do not call out a specific revision of invoked standards.	Invoking a specific revision letter of a standard creates a requirement to seek a deviation when the standard is subsequently revised.	Suggest calling out DO-178(B), " <i>or later FAA accepted revision.</i> " Then, when the FAA later decides that DO-178(C) can be used, applicants will not need to seek a deviation to use a later FAA accepted version of the standard.	Not accepted: The FAA is carefully considering use of DO-178C. At this time, DO-178B remains the software requirement for TSOs. If a manufacturer would prefer to use RTCA/DO-178C a deviation request can be submitted for review to the ACO.
Eurocopter	Page 2 Paragraph 3. e	<p>The TSO asks for developing the SW, if any, according to DO-178B.</p> <p>However, FAA approval is based on FAA Order 8110.49, which includes complements related for example to field loadable SW, user-modifiable SW, previously developed SW, changes in legacy systems.</p> <p>Not explicitly quoting these complements in the TSO raises the risks that a TSO</p>	<p>Trying to show compliance to these complements for a TSOA component at the time of installation in aircraft may be very difficult, because the design and verification of the component is already complete and the design data are the property of the TSOA holder, not of the TC applicant.</p> <p><u>NOTE 1:</u> Also notice that recent EASA Certification Memorandum SWCEH - 002 (Software Aspects of Certification) includes some other considerations, also at equipment development level, which might be asked to the TC applicant,</p>	<p><u>Short term</u> Add a note indicating FAA Order 8110.49 (Software Approval Guidelines) as the basis for the approval of the SW included in the TSOA equipment.</p> <p><u>Mid/long term</u> There should be an effort to harmonize the guidance for software approval:</p> <ul style="list-style-type: none"> - between TSOA and TC/STC, - among Certification 	Not Accepted: Software in the TSO article must be developed in accordance with RTCA DO-178B. Applicants for TSO authorization must certify that they have met the appropriate DO-178B requirements. The data, including the DO-178B software data, generated for the TSO authorization may be used during airworthiness approval, as outlined in AC 21-50,

Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
		applicant may miss to apply these complements and, if not detected in the frame of the TSOA, complementary justification may be asked to a TC applicant willing to install the TSOA article in its aircraft.	whereas not applied by the TSOA holder. <u>NOTE 2:</u> The same comment obviously applies to all TSOs related to equipment likely to contain SW.	Authorities (FAA, EASA, ...).	<i>"Installation of TSOA Articles and LODA Appliances."</i> As a general policy, the FAA does not reference Orders or Advisory Circulars in TSOs.
Garmin	Page 2 Paragraph 3.f	The term "complex custom airborne electronic hardware" for DO-254 applicability is not consistent with FAA Order 8110.105 and AC 20-152.	DO-254 was written for all level of airborne electronic hardware, but the scope has been narrowed in documents that define its applicability. As written, "complex custom airborne electronic hardware" could expand DO-254 to devices that are purposely excluded from Order 8110.105 and AC 20-152.	Suggest to use "complex custom micro coded devices" as the applicability".	Not Accepted: Complex custom electronic hardware for TSO articles must be developed in accordance with RTCA DO-254.
Eurocopter	Page 2 Paragraph 3.f	When the article contains complex custom electronic HW, and the failure condition classification is major or greater, the TSO asks for developing this HW according to DO-254. However, FAA approval is based on FAA Order 8110.105, which includes complements related for example to COTS IP, changes in legacy systems, modifiable custom micro-coded components. Not explicitly quoting these complements in the TSO raises the risks that a TSO	Trying to show compliance to these complements for a TSOA component at the time of installation in aircraft may be very difficult, because the design and verification of the component is already complete and the design data are the property of the TSOA holder, not of the TC applicant. <u>NOTE 1:</u> Also notice that recent EASA Certification Memorandum SWCEH - 001 (Development Assurance of Airborne Electronic Hardware) still includes other significant complements, also at equipment development level, which might be asked to the TC applicant, whereas not applied by the TSOA holder, especially: - extension of the scope of DO-254	<u>Short term</u> Add a note indicating FAA Order 8110.105 (Simple and Complex Electronic Hardware Approval Guidance) as the basis for the approval of the SEH/CEH included in the TSOA equipment. <u>Mid/long term</u> There should be an effort to harmonize the guidance for electronic hardware approval: - between TSOA and TC/STC, - among Certification Authorities (FAA,	Not Accepted: Complex custom electronic hardware in the TSO article must be developed in accordance with RTCA DO-254. Applicants for TSO authorization must certify that they have met the appropriate DO-254 requirements. The data, including the DO-254 hardware data, generated for the TSO authorization may be used during airworthiness approval, as outlined in AC 21-50, <i>"Installation of TSOA Articles and LODA Appliances."</i> As a general

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		<p>applicant may miss to apply these complements and, if not detected in the frame of the TSOA, complementary justification may be asked to a TC applicant.</p>	<p>to circuit board assembly and equipment levels,</p> <ul style="list-style-type: none"> - single event effects, - COTS components (processors, graphic processors), - Guidelines for SEH. <p><u>NOTE 2:</u> The same comment obviously applies to all TSOs related to equipment likely to contain electronic HW.</p>	<p>EASA, ...).</p>	<p>policy, the FAA does not reference Orders or Advisory Circulars in TSOs.</p>
Garmin	Page 3 Paragraph 4.a	<p>Includes the statement:</p> <p style="padding-left: 40px;">The marking must include the serial number and the applicable equipment class(es) defined in paragraph 3.</p> <p>The Order 8150.1B Chg 1 TSO template does not include the "applicable equipment class(es)" phrase.</p>	<p>Garmin is routinely granted deviations from TSO requirements to mark the "applicable 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 the applicable equipment class(es) defined in 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>Accepted: Component classification has been removed from the TSO, and from the marking requirements.</p>
Garmin	Page 3 Paragraph 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>Not Accepted: Paragraph 4.b.(2) does not to require TSO marking of circuit boards. This language is part of Order 8150-1B Change 1 and was not changed in this TSO, however we forwarded this comment to the appropriate office for consideration in future revisions of Order 8150-1B.</p>

Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
Honeywell	Page 4 Paragraph 5a.(4)(b)	Clarify if it is the highest DAL or it is all the DALs for various portions of the hardware or software that must be listed			Response: All design assurance levels for the various portions of hardware and software should be listed.
Garmin	Page 4, par 5.a.(4)(d)	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>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 level failure condition classification.</p>	Remove the requirement to list "failure condition classification" in the Manual(s).	Partially Accepted: The statement was removed from 5.a.(4). However, the applicant is still responsible for documenting the failure condition classification in accordance with section 3.b. of the TSO.
Honeywell	Page 4 Paragraph 5a.(4)(d)	This should not apply to a TSO. Failure condition classification - The functionally failure classification is installation dependent - the TSO process is established to be independent of the installation. Leave that documentation to the PSAC/PHAC. They should explain the hazard assumptions that drive the	Failure classifications are at the aircraft level and addressed in the appropriate regulatory material (e.g. AC 25-11A for Part 25). A display unit may support multiple aircraft types, with multiple functions, which means that no single "failure classification" will apply.	Remove 5a(4)(d)	Partially Accepted: The statement was removed from 5a.(4). However, the applicant is still responsible for documenting the failure condition classification in accordance with section 3.b. of the TSO.

Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
		DAL's			
Boeing	Page 4 Paragraph 5.b	The proposed text states: <i>"b. Instructions covering periodic maintenance, calibration, and repair, for the continued airworthiness of airborne multipurpose electronic displays. Include recommended inspection intervals and service life, as appropriate."</i>	In addition to the operating limit information, non-operating storage recommendations should be provided as well. Storing avionic parts in too high, too low, or too moist an environment can result in damage or early failure. We therefore suggest the following revision: <i>"b. Instructions covering periodic maintenance, calibration, and repair, for the continued airworthiness of airborne multipurpose electronic displays. Include recommended inspection intervals and service life, <u>and storing</u>, as appropriate."</i>	Provide the equipment owner with all the relevant information for operation and storage of equipment.	Not Accepted: Storage requirements do not need to be identified in the technical standard order. OEMs and systems integrators should work with the TSO authorization holders for storage requirements.
Aspen Avionics	Pg 4 Paragraph 5.f.	This section is potentially confusing in light of paragraph 3.a.	If a display conforms to a TSO or standards document functional requirements, but that TSO is not marked on the unit, is that function TSO or non-TSO? Per 8034B paragraph 4.1, there is a clear requirement to be compliant with accepted standards, therefore such functionality should be considered TSO functionality despite not being marked with those functional TSOs. For example, a display that shows attitude	Clarify that the non-TSO function provision may only be used if the function does not have a corresponding TSO or accepted standards document, or if a deviation from those TSO or accepted standards has been approved. Those functions where there are corresponding TSO or accepted standards	Response: TSO-C113a articles with functionality covered by other TSOs must apply for separate TSO authorization for the other functions.

Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
			information in accordance with the marking requirements of TSO C4c, and the functional requirements of ARP 4102/7, should consider the displayed attitude information as a TSO function, without requiring the equipment to carry a partial TSO C4c marking.	must adhere to those requirements under this TSO, unless deviation has been approved.	
Garmin	Page 4-5, Paragraph 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).	Not Accepted: The language in paragraph 5.f. 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	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.	Not Accepted: The language in paragraph 5.f. represents current FAA policy on non TSO functions.

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			<p>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>		
Honeywell	Page 4, Paragraph 5.f	The statement that we need to include performance specifications might lead to the inclusion of SRS level info in the TSO package. I don't think we want that. How do we limit the amount of info required			Not Accepted: The language in paragraph 5.f. represents current FAA policy on non TSO functions.
Honeywell	Page 4 Paragraph 5.f	Requirements for non-TSO functions are not appropriate for a TSO.	These functions often are aircraft dependent and covered by a TC/STC.	Add 5.f (7) Non-TSO functions may be aircraft dependent and defined by a TC/STC.	Not Accepted: The language in paragraph 5.f. represents current FAA policy on non TSO functions.
Honeywell	Page 5/Para 5f(2), (3), (4), and (6)	An explanation of non-TSO functions does not seem appropriate for a TSO document.	<p>The non-TSO function should be addressed at the aircraft (TC/STC) level, and the functionality may vary across aircraft types for the same TSO equipment (or same type).</p> <p>Only sub-para (1) and sub-para (5) may</p>	Remove 5.f (2), (3), (4), and (6) but retain (1) and (5)	Not Accepted: The language in paragraph 5.f. represents current FAA policy on non TSO functions.

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			be appropriate, to show that the TSO functions will not be affected.		
Aspen Avionics	Pg 5 Paragraph 5.i.	Drawing list is not a historically submitted item. Language has changed from that used previously.	<p>The drawing list can be a very large document or database that in the past was required to be available <i>for review</i>, but was not submitted.</p> <p>Furthermore, historical language limited the list to those drawings "necessary to define the design." The new language requires the list include drawings that define the design. This subtle difference is significant as it eliminates the ability to include drawings by reference, such as a top master drawing, every drawing for every component, process or assembly used anywhere in the production of the article.</p>	<p>Return to original language of past TSOs, i.e. "A drawing list, enumerating all the drawings and processes that are necessary to define the article design."</p> <p>Move this requirement from section 5 (data to be furnished) to section 6 (data available for review) of the TSO</p>	Not Accepted: The drawing list is a required submission.
Honeywell	Page 5 Paragraph 6.a	Typically the word qualify is used for tests to establish the quality of a design, not individual articles. Test (or possibly conformance) are the usual terms used to describe making sure an individual unit meets its requirements			Not Accepted. The language in TSO-C113a represents the FAA's latest approved TSO policy.

Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
Honeywell	Page 6 Paragraph 6.i	<p>Detailed artifacts for non-TSO functions do not seem appropriate for a TSO document.</p> <p>However, if the non-TSO function documentations remains, need to add a indication that the data for TSO functions does not need to be separated from the data for non-TSO functions.(also would apply to the data required for 5.f)</p>	The non-TSO function should be addressed at the aircraft (TC/STC) level, and the functionality may vary across aircraft types for the same TSO equipment (or same type).	Remove 6.i	Not Accepted: The language in paragraph 6.i. represents current FAA policy on non TSO functions
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).	Not Accepted: The language in paragraph 7.b. represents current FAA policy on non TSO functions.

Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
L-3 Communications	Appendix A	Table A1 implies that a DU and SG must meet requirements for both LCD and CRT.	Appendix A paragraph 1 states "The display must meet all requirements in AS8034B as specified in Appendix 1, Column 1 of Table A1." However, not ALL sections are applicable to LCDs or CRTs.	Appendix A should include a statement that LCDs need not meet the CRT-only requirements in AS8034B, and vice-versa.	Accepted: Concur, however the classification structure has been removed from the final version of TSO-C113a.
Garmin	Page 8, Appendix 1	TSO-C113a Appendix 1 and SAE AS8034B Display Unit and Symbol Generator definitions of classes are contradictory.	<p>Appendix 1 states (with <i>emphasis</i>):</p> <p>A Class 1 multipurpose electronic display (MPD) is a display unit <i>without</i> a symbol generator."</p> <p>"A Class 2 MPD includes a symbol generator <i>without</i> a display unit included in the unit being submitted for TSO."</p> <p>"A control panel is an optional component ... A Class 3 MPD control panel <i>does not</i> include a display unit."</p> <p>All Garmin equipment with TSO-C113 includes a display unit, a symbol generator, and a control panel. While TSO-C113a paragraph 3 ends with the statement that "Multiple classes are acceptable", the use of "<i>without</i>" and "<i>does not</i>" in the Appendix 1 class definitions make it confusing as to what classes should be claimed on equipment like Garmin's and inconsistent with the following SAE AS8034B paragraph 1 Scope statements (with emphasis):</p> <p>Electronic Displays can include one or</p>	Strongly suggest that the Appendix A definitions be revised to be consistent with those defined in SAE AS8034B paragraph 1. This will help ensure manufacturers plan for the correct classes and meet the expected requirements and tests.	Class structure has been removed from the final TSO.

Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
			<p>more of the following interconnected components. Other configurations are possible.</p> <ul style="list-style-type: none"> • Symbol Generator/Processor Unit (SG) containing display processing and symbol generation processing and symbol generation capability ... and Display Unit interface capability. The SG receives data from external sources, produces symbols as electronic signals, and transmits the symbols to the Display Units(s). • Control Panel (CP) is an optional component providing the means for manually selecting display symbology options/modes, selections, settings, brightness, etc. • Display Unit (DU) providing the visual display of SG symbology. <p>Notice that the SAE AS8034B paragraph 1 Scope statements do not include the use of "<i>without</i>" and "<i>does not</i>" in its definitions.</p>		
Garmin	Page 8, Appendix 1	The class definitions are significantly different from TSO-C113/SAE AS8034.	<p>It will make it difficult to transition existing TSO-C113 authorized equipment and the associated functional credit to TSO-C113a. Since SAE AS8034B paragraph 1 Scope retains the following:</p> <p>The requirements and recommendations in this document are intended to apply</p>	Modify the TSO-C113a classes to be consistent with the existing TSO-C113 classes.	Class structure has been removed from the final TSO.

Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
			<p>to, but are not limited to, the following types of display functions:</p> <ul style="list-style-type: none"> • Primary Flight and Primary Navigation which include vertical situation, horizontal situation, and moving map displays. • Systems display and displays that have alerting functions which may include engine instrument, aircraft systems information/control, pilot or flight crew alerting, and documentation displays. • Control Displays including communication, navigation and system control displays. • Information Displays which may include navigation displays used for situation awareness only, supplemental data displays, and maintenance displays. <p>which are consistent with the existing TSO-C113, it would seem more appropriate for the TSO-C113a classes to be similarly organized.</p>		
Honeywell	Page 8, Appendix 1	The Class definitions are inconsistent. Section 3 of the main document indicates multiple classes are acceptable - the definition in the appendix indicates class 1 units are without a symbol generator. So how do you have	<p>The 2 options are to allow different testing for different parts of a unit - so that a unit may have a Class 1 portion, a class 2 portion and a class 3 portion, and allow the class 2 and 3 portions to comply with only a portion of the MPS</p> <p>Or to rank the classes - a unit with a</p>	After "(MPD) is a display unit" Add the words " with or ". Thus, it would read, (MPD) is a display unit with or without a symbol generator.	Class structure has been removed from the final TSO.

Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
		<p>a unit that is both a class one and class 2 display</p> <p>The requirement needs to cover the case where the SG is included in the display unit.</p> <p>Regarding the Class 1 Display Unit (DU) definition in the Appendix - The Appendix information is based on information provided to Charisse by the SAE A4-ED but the TSC changed it to only cover DUs without a symbol generator. The original intent was to include all DUs, with and without an internal symbol generator. This correction is important</p>	<p>display (Class 1 capability) is class 1 regardless its control panel or symbol generation capability. No display but with symbol generation is class 2 regardless of CP capability. & class 3 is only a control panel</p> <p>You might also add an indication that the Class 1/2/3 designation as it applies only to units that are part of a display system. A control panel for an autopilot cannot be TSO'd under C113 as a class 3 device. If a CP included both display brightness control and autopilot control it could be TSO'd under C113, but the autopilot controls should be listed as non-TSO function or covered under an autopilot TSO</p>		
Rockwell Collins	Page 8, Appendix 1, Paragraph 1	Referring to Appendix 1, specifically as Item 1 provides description of "Class 1 Display Unit (DU) Requirements", Rockwell Collins has many display products that have a symbol generator (SG) as an integral part of the unit.	To accommodate displays that include an integral symbol generator we propose that the text be modified.	<p>1. Class 1 Display Unit (DU) Requirements. A display unit provides a visual display of symbol generator symbology. A Class 1 multipurpose electronic display (MPD) is a display unit with or without a symbol generator. The display must meet all requirements in AS8034B as specified in Appendix 1, Column 1 of Table A1.</p>	Class structure has been removed from the final TSO.

Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
Boeing	Page 8 Appendix 1, Paragraph 1	<p>EDITORIAL COMMENT ONLY</p> <p>The proposed text states: <i>"1. Class 1 Display Unit (DU) Requirements.</i> <i>. . . The display must meet all requirements in AS8034B as specified in Appendix 1, Column 1 of Table A1."</i></p> <p>We note that "A8034B" is spelled elsewhere in the TSO with a space after "AS".</p>	Reference to AS8034B should be corrected to <u>"AS 8034B."</u>	Consistency in spelling	Class structure has been removed from the final TSO.
L-3 Communications	Page 8, Appendix 1, Paragraph 3	There is no class for a unit with a combined DU & SG.	Some products have an integrated display/SG. Such products would need to be marked as Class 1 AND Class 2.	Either modify class 1 to be a "display unit with or without a symbol generator", or create a 4 th class for a "display unit with a symbol generator".	Class structure has been removed from the final TSO.
Garmin	Page 8, Appendix 1, Table A-1	<p>Indicates that SAE 8034B "3.1 to 3.10 ALL SECTIONS" is applicable to all classes.</p> <p>SAE AS8034B 3.8.3 includes the following requirement:</p> <p>A Failure Modes and Effects Analysis (FMEA) shall be performed to identify, isolate, and mitigate individual failures of the display. This is needed to be used in a System Safety Assessment (SSA) for Aircraft Airworthiness Determination.</p>	It is inappropriate to require an FMEA for use in an SSA for all equipment because the need for an FMEA to be used in supporting the aircraft System Safety Assessment depends upon the aircraft failure condition classification, aircraft type (Part 23, 25, etc.) and installation characteristics. For example, AC 23.1309-1E paragraph 17.c.(3) indicates that an FMEA may be required for complex systems having a major failure condition when a redundant system is not installed. But this same paragraph allows for an FTA to be used in lieu of an FMEA or the need for an FMEA may be eliminated by installing redundant equipment. Additionally, AC	Table A-1 should exclude the quoted SAE AS8034B 3.8.3 requirement.	Accepted. Class structure has been removed from the final TSO, and the section 3 requirements are not included in the final TSO.

Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
			23.1309-1E paragraphs 17.a and 17.b do not even mention FMEA with respect to the analysis to be used in assessing systems with no safety effect or minor failure conditions.		
Garmin	Page 8, Appendix 1, Table A-1	<p>Indicates that SAE 8034B "3.1 to 3.10 ALL SECTIONS" is applicable to all classes.</p> <p>SAE AS8034B 3.10 includes the following requirement:</p> <p>The following information shall be legible and permanently marked on the equipment or nameplate attached thereto.</p> <ul style="list-style-type: none"> a. Name of equipment b. Manufacturer's part number c. Manufacturer's serial number or date of manufacture d. AS8034 or equivalent approval identification e. Manufacturer's name or trademark f. Weight to the nearest 0.05 kilogram (tenth of a pound) g. Environmental categories per DO-160GF/ED-14G 	These marking requirements are not consistent with the TSO-C113a paragraph 4.a marking requirements.	Table A-1 should exclude the quoted SAE AS8034B 3.10 requirements.	Accepted. Class structure was removed from the final TSO, and the section 3 requirements are not included in the final TSO.

Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
Garmin	Page 8, Appendix 1, Table A-1	<p>Indicates that SAE 8034B 3.14 is applicable to all classes.</p> <p>SAE AS8034B 3.14 includes the following requirement:</p> <p>Except for small parts (e.g., fasteners, grommets, knobs, seals, small electrical parts), that would not contribute significantly to the propagation of a fire, all materials used must be self-extinguishing when tested in accordance with the requirements of 14 Code of Federal Regulations (CFR) 25.853 and 25.1359 (d) and Appendix F thereto, with the exception that materials tested may be configured in accordance with paragraph (b) of Appendix F or may be configured as used.</p>	<p>It is inappropriate to reference 14 CFR 25.853 and 25.1359 (d) and Appendix F in an equipment MPS. These regulations apply to the aircraft, and while the equipment may need to support these regulations, it is inappropriate to reference them in the MPS.</p> <p>Furthermore, 14 CFR 25.1359 was removed in Amdt. 25-72, eff. 8/20/90. Consequently, it is unclear why this reference would even be included.</p>	<p>Suggest substituting text more like the following, which comes from RTCA/DO-229D 2.1.1.1.3, titled Fire Resistance:</p> <p>All materials used shall be self-extinguishing except for small parts (such as knobs, fasteners, seals, grommets and small electrical parts) that would not significantly contribute to propagating a fire.</p>	Accepted. Class structure was removed from the final TSO, and the section 3 requirements are not included in the final TSO.
Garmin	Page 8, Appendix 1, Table A-1	<p>Indicates that SAE 8034B 4.0 is applicable to all classes.</p> <p>SAE AS8034B 4.0 includes the following requirement:</p> <p>The manufacturer shall conduct sufficient tests to prove compliance with this Aerospace Standard. The</p>	<p>This requirement contradicts the TSO-C113a paragraph 3.d statement that:</p> <p>You may use a different standard environmental condition and test procedure than RTCA/DO-160G, provided the standard is appropriate for the airborne multipurpose electronic displays</p>	<p>Table A-1 should exclude the quoted SAE AS8034B 4.0 requirement. Alternately, suggest amending the 4.0 requirement to be consistent with TSO-C113a paragraph 3.d.</p>	Not Accepted: The statement in TSO paragraph 3.d. supersedes the SAE 8034B requirement to use DO-160G. You may use any environmental standard appropriate for airborne equipment.

Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
		applicable standard test conditions are given in RTCA DO-160G/EUROCAE ED-14G.	It is also inconsistent with AC 21-16G, which acknowledges that DO-160D w/ changes 1, 2 and 3, DO-160E, DO-160F, and DO-160G are all acceptable environmental standards.		
Garmin	Page 8, Appendix 1, Table A-1	<p>Indicates that SAE 8034B 4.1 is applicable to all classes.</p> <p>SAE AS8034B 4.1 includes the following requirements:</p> <p>Equipment shall display information with contents as specified by the appropriate standard document. All equipment functions and mechanical devices shall perform their intended function.</p>	<p>These requirements are not testable except in the context of the instrument, TAWS, moving map, etc. functions which are not specified within SAE 8034B and are defined within other TSO MPS.</p> <p>Furthermore, the title of TSO-C113a and SAE 8034B includes the text "Airborne Multipurpose Electronic Displays" (emphasis added). Consequently, it is unclear what "mechanical devices" means within the context of this TSO.</p>	Table A-1 should exclude the quoted SAE AS8034B 4.1 requirement.	Not Accepted: If the article includes functions from other TSOs, the article must meet the applicable TSOs.
Garmin	Page 9, Appendix 1, Table A-1	<p>Indicates that SAE 8034B 4.3.4 is always applicable to the display unit and symbol generator classes.</p> <p>SAE AS8034B 4.3.4 includes the following requirements:</p> <p>Displays intended to be installed in all types of aircraft (Part 23, 25, 27, and 29) shall meet the requirements in 14 CFR 25.1322 and the guidance in AC 25.1322. Displays intended</p>	<p>It is inappropriate to apply 25.1322 requirements to equipment that will be installed only in Part 23, 27 or 29 aircraft.</p> <p>Furthermore, it is inappropriate to invoke 25.1322 requirements when they may not have any applicability to the intended function of the multipurpose electronic display when installed in a Part 25 aircraft.</p> <p>The applicability of 25.1322 must be assessed at the aircraft installation for the intended function and cannot be</p>	Table A-1 should exclude the quoted SAE AS8034B 4.3.4 requirements.	Not Accepted: The FAA sees where the language in SAE AS 8034B could be misconstrued as requiring all MPDs to meet 14 CFR § 25.1322, and agree this would be inappropriate. However, the FAA interpretation is that section 4.3.4 requires the article to meet the appropriate 14 CFR § 2x.1322 requirement for the intended installation. Equipment intended for

Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
		<p>to be installed in only in Part 23, 27, or 29 aircraft may not be required to meet 14 CFR 25.1322 and the associated AC, but shall meet the requirements in 14 CFR 2X.1322 and shall have appropriate wording in the limitations section of the installation instructions.</p>	<p>applied at the TSO equipment level. Neither TSO-C113a nor SAE 8034B specify the instrument, TAWS, moving map, etc. function requirements as these are specified within other TSO MPS documents.</p>		<p>installation in a 14 CFR § 23 aircraft would need to meet 14 CFR § 23.1322. Additional clarifying language has been added to the appendix which details additional guidance on color.</p>
Garmin	Page 10, Appendix 1, Table A-1	<p>Indicates that SAE 8034B 5.0 is applicable to all classes.</p> <p>SAE AS8034B 5.0 includes the following requirement:</p> <p>To demonstrate compliance with this document, the tests of this section shall be conducted (where applicable). All equipment, displays, display systems, and components shall meet the applicable sections of DO-160G. Unless otherwise specified, the environmental measurement procedures applicable to a determination of performance under environmental conditions are set forth in RTCA DO-160G/EUROCAE ED-14G. Performance tests which are</p>	<p>This requirement contradicts the TSO-C113a paragraph 3.d statement that:</p> <p>You may use a different standard environmental condition and test procedure than RTCA/DO-160G, provided the standard is appropriate for the airborne multipurpose electronic displays</p> <p>It is also inconsistent with AC 21-16G, which acknowledges that DO-160D w/ changes 1, 2 and 3, DO-160E, DO-160F, and DO-160G are all acceptable environmental standards.</p>	<p>Table A-1 should exclude the quoted SAE AS8034B 4.0 requirement. Alternately, suggest amending the 4.0 requirement to be consistent with TSO-C113a paragraph 3.d.</p>	<p>Not Accepted: The statement in paragraph 3.d. supersedes the SAE 8034B requirement to use DO-160G. You may use any environmental standard appropriate for airborne equipment.</p>

Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
		made after subjection to test environments may be conducted after exposure to several environmental conditions. The order of tests shall be in accordance with paragraph 3.2, of Section 3 of DO-160G/ED-14G. Unless otherwise specified in this document, the environmental test procedures contained in RTCA DO-160G/ED-14G will be used to demonstrate equipment compliance.			
Garmin	Page 10, Appendix 1, Table A-1	Indicates that SAE 8034B 5.0 is applicable to all classes. This section uses "shall".	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.	Remove this section as a requirement or reiterate that it is the intent that must be maintained and modification to the test must be validated.	Not Accepted: Section 5 is required because there are requirements embedded within the section that the equipment must meet.
Garmin	Pages 8-9, Appendix 1, Table A1	The allocation of requirements to equipment classes in Table A1 seems problematic. It is unclear how the following	The visual display properties listed pertain to a Class 1 device. Based on the definition of a Class 2 Symbol Generator in TSO-C113a, it seems that requirements for properties of a visual display may not apply to a Class 2 device	If the current equipment class definitions are retained in TSO-C113a, then the identified requirements for properties of a visual display in Table A1, Column	Class structure has been removed from the final TSO.

Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
		<p>requirements for properties of a visual display marked as "Yes" in Column 2 apply to Class 2-only equipment (i.e., a Symbol Generator without a display unit):</p> <ul style="list-style-type: none"> 3.11.6 Lighting 4.2 Viewing Characteristics 4.2.12 Multiple Images 4.3.2 Luminance Characteristics 4.3.4.1 Color Uniformity 4.4 CRT 4.5 LCD <p>The list above is intended to exemplify display-related requirements which may be inappropriate for Class 2 equipment. This list may not be exhaustive.</p>	<p>which is not also a Class 1 device. Class 2-only equipment can neither contribute to nor detract from display system conformance to such requirements.</p> <p>More generally, it is possible that particular display-related requirements marked as "Yes" for both Class 1 and Class 2 may pertain to only one component or the other, depending on the format of the "electronic signals" between these and the level of processing on the Class 1 equipment. There may also be requirements for the display of symbols for which Class 1 and Class 2 equipment conformance cannot be verified independently. That is, to demonstrate that display of a generated symbol is satisfactory in context, it may be necessary to identify the particular interfacing components of an integrated display system.</p>	<p>2 should be marked as "Optional", or, preferably, "N/A." Alternately, Appendix 1 should clarify how such requirements apply to and can be verified with Class 2-only equipment.</p>	
Rockwell Collins	Table A1	<p>Header should state AS8034B Sections and Title. Otherwise class 1 paragraph is the only paragraph to reference the source of the sections and titles. Class 2 and Class 3 paragraphs do not provide a reference. It should also provide SAE reference.</p>	<p>Please change header of Table A1 fourth column to read "SAE AS8034B Sections and Title".</p>		<p>Class structure has been removed from the final TSO.</p>

Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
Rockwell Collins	Table A1	Unclear if a control panel containing annunciators which provide visual feedback would be capable of complying with Class 1 requirements	Projects unable to show compliance may instead select Class 3 and instead only comply with project specific requirements. Is that what is intended? Please provide clarifying language.		Class structure has been removed from the final TSO.
Rockwell Collins	Table A1	Recommend removing references to Columns and instead change the reference to Class.	Please consider changing the headers for the first three columns of Table A1 to more directly align with the preceding text. Thus: Change "Column 1 DU" to "Class 1 DU" Change "Column 2 DU" to "Class 2 SG" Change "Column 3 DU" to "Class 3 CP"		Class structure has been removed from the final TSO.
Rockwell Collins	Table A1	Current Rockwell Collins projects typically do not perform specific DFMEA's and PFMEA's unless there is significantly new functionality or design characteristics.	This comment is in reference to the TSO-C113a's implication in Table A1 of "3.1 to 3.10" as applicable to all three classes, and in particular as called out in AS8034B Section 3.8.3. Please reconsider whether an FEMA or FMEA is warranted under all situations, providing relief in situations where this imposition is not necessary.		Accepted: The Section 3 requirements are general requirements versus specific performance requirements and have been removed from the TSO.
Rockwell Collins	Table A1	3.11 points to ARP document referencing font height and positioning which is associated with displays.	It is questioned whether this was intended for control panels (e.g., 3.11.4 referring to "drawn to scale"). If not, please remove requirement for 3.11, 3.11.1, 3.11.4 and 3.11.5 for Class 3 CP products or provide language that clarifies the intent.		Accepted: The Section 3 requirements are general requirements versus specific performance requirements and have been removed from the TSO.
Rockwell Collins	Table A1	4.2 and 4.2.1 Product's design eye position viewing envelope cannot be specified by the unit manufacturer. An acceptable area for the DEP can be provided by the	The TSO should override SAE document regarding DEP specification, accepting that this may have been the intent of the note in 4.2.1. Additionally, consideration should again be given to whether this is equally applicable to DUs		Not accepted: The Design Eye Position viewing envelope can be specified by a manufacturer because it represents the ideal but notional location of the

Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
		equipment manufacturer, but each airframe may have unique DEPs.	and CPs, as Table A1 implies.		operator's view. The note specifies that the installer is responsible for determining that the required aircraft viewing envelope is within the manufacturers specified display viewing envelope(s).
Rockwell Collins	Table A1	4.2.2 does not seem relevant to Class 3 products.	Please update to "Optional" or "Not Applicable". Otherwise, please provide additional rationale for applicability to Class 3 products.		Class structure has been removed from the final TSO.
Rockwell Collins	Table A1	4.3 and 4.6 do not have any text in it. It is only a header.	There is ambiguity in how certain parts of Table A1 might be interpreted from a hierarchical perspective. For example, 4.3 has no associated text so this would imply that all subordinate text would have the same Class 3 stipulation of "Optional"; however, 4.3.2.1 and others have a Class 3 stipulation of "Yes", thus an ambiguity. A similar note is made with regard to Section 4.6. Please include language that clears this ambiguity.		Class structure has been removed from the final TSO.
Aspen Avionics	Pg 1, Table 1 and pg 8, Appendix 1	Other types of MPD system components typical of modern systems should be included.	Most modern MPD systems require the use of some type of data concentrator or analog-digital, digital-digital or digital-analog converter. These components should be addressed under this TSO and included in appendix 1.	Address data concentrators and data converters in the appendix 1 equipment classes.	Class structure has been removed from the final TSO.

Company & Group	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
Aspen Avionics	Pg 1, Table 1 and pg 8, Appendix 1	The equipment classes and test requirements are confusing	In Appendix 1, the Signal Generator is described as not having a display, and the Control Panel does not have a display. Yet there are numerous sections that pertain to displays that are identified as 'yes' in Table A1 in columns 2 and 3. Specifically 3.11, 4.2, 4.3, 4.4 and 4.5 (with some optional exceptions). It is unclear how any symbol generator stand alone equipment could be evaluated without the use of a compatible display.	Delete display requirements from system components that do not include a display.	Class structure has been removed from the final TSO.
Eurocopter	Appendix 1 Table A1	<p>Table A1 indicates which section of AS8034B applies depending on the class of "display" (DU, SG or CP).</p> <p>However, some sections are quoted "yes" or "optional" for SG or CP, whereas they are typically only relevant for displays.</p> <p>Moreover, it is not clear why "optional" is used instead of "no" or "N/A".</p>	<p>Typical examples (list not limitative) of subjects only applicable to displays are:</p> <ul style="list-style-type: none"> - 4.2 (Viewing Characteristics), especially 4.2.1 (Viewing Angle), - 4.2.8.1 (Matrix Anomalies), - 4.2.11 (Defects), - 4.5.6 (Specular Reflections), - 4.5.8 (Response Time). 	Table A1 should be reviewed.	Class structure has been removed from the final TSO.