

Clearance Record
DOCUMENT COMMENT LOG

Originating Office: AIR-130	Document Description: TSO-C119d	Project Lead: Steve Plummer, 650-756-0227 x166	Reviewing Office: Consolidated comments from field review.	Date of Review: 6/5/13
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Index No.	Name of Reviewer	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
1	RG Schank	Page 1, Paragraph 2.c.	The regulatory reference for TSO major design changes to (14 CFR) § 21.611(b) is incorrect. I believe the correct reference for major design changes is (14 CFR) § 21.619(b).	Current amendment 21-92 to (14 CFR) § 21.611 is regarding TSO Issuance.	Change the reference for TSO major design changes to (14 CFR) § 21.619(b).	Adopted.
2	ACE-117C, John Raspanti, 847-294-7379	Page 1, para 2.c	21.611(b) should be changed to 21.619(b)	TSO Design Changes changed from 21.611(b) to 21.619(b) when part 21 was revised effective April 16, 2011	Revise 21.611(b) to 21.619(b)	Adopted.
3	ACE-117C, John Raspanti, 847-294-7379	Page 1, para 3	Add appropriate dates in paragraph 3. where it states [insert date].		Add applicable dates.	Dates have been added.
4	L Taylor ACE-111	Page 2 Para 3.a and Page 4 Para 5.c	Para 3.a requires the TCAS to have a memory for faults, but Para 5.c permits either a log of faults with periodic checks or an annunciation to the flightcrew. The memory for faults is required in 3.a and optional in 5.c.	Clarification and the option in 5.c is better.	Delete 3.a.	All aircraft do not have centralized warning systems or an onboard maintenance computer. Consequently a means to display logged faults is required for the units so that installations not integrated with CMC

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						or EICAS types of systems can interrogate the memory for stored faults. Recommendation not adopted.
5	R. Hirt	Page 2, Paragraph 3.f	Include language for software assurance level commensurate with the failure condition classification.	More specifically point out the software development assurance level.	If the article includes a digital computer, develop the software according to RTCA/DO-178B, <i>Software Considerations in Airborne Systems and Equipment Certification</i> , dated December 1, 1992, to at least the software level consistent with the failure condition classification defined in paragraph 3.c of this TSO.	The intent of the recommendation is contained in the second sentence of existing section 3.c, Failure Condition Classification. No change required as a result of this recommendation.
6	A.Ma ACE-119W	Page 2, Paragraph 3f	If only changed portion needs to comply with DO-178B for previously developed software, is the final software considered DO-178B compliant?	This paragraph appears to allow mixing different software development processes, e.g. DO-178B and non-DO-178B	DO-178B Section 12.1.4 provides guidance to upgrade a software development baseline to DO-178B. Applicant may request deviation from AIR-100.	The text the commenter questions does indeed allow different processes to be used but the only process specs previously allowed in the earlier TSO revisions were DO-178. No change has been made as a result of this comment.
7	A.Ma ACE-119W	Page 2, Paragraph 3g	If only changed portion needs to comply with DO-254 for previously developed airborne electronic hardware, is the final software considered DO-254 compliant?			Yes. No change resulted from this comment.

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8	RG Schank	Page 2, Paragraph 3.h.	The regulatory reference TSO deviations to (14 CFR) § 21.609 is incorrect. I believe the correct reference for TSO deviations is (14 CFR) § 21.618.	(14 CFR) § 21.609 is the regulation for location of or change to manufacturing facilities.	Change the reference for TSO deviations to (14 CFR) § 21.618.	Adopted.
9	ACE-117C, John Raspanti, 847-294-7379	Page 2, para 3.h	21.609 should be changed to 21.618	TSO Deviation requirement changed from 21.609 to 21.618 when part 21 was revised effective April 16, 2011	Revise 21.609 to 21.618	Adopted.
10	ACE-117C, John Raspanti, 847-294-7379	Page 2 & 3, para 4.a	21.607(d) should be changed to 21.616(d)	General rules for TSO Design holders changed from 21.607(d) to Responsibility of TSO Holder 21.616(d) when part 21 was revised effective April 16, 2011	Revise 21.607(d) to 21.616(d)	Recommendation not adopted but the citation has been revised from 21.607(d)(3) to 45.15(b)(2).
11	ACE-117C, John Raspanti, 847-294-7379	Page 3, para 4.a	The sentence "Use serial number in place of optional ... " should either be deleted or the reference to 14 21.607(d)(3) be changed to 45.15(b)(2)			21.607(d)(3) changed to 45.15(b)(2).
12	RG Schank	Page 3, paragraph 4.a	The regulatory reference to (14 CFR) § 21.607 is in reference to a quality system not for marking TSO articles.	(14 CFR) § 45.15 (b) includes regulatory information for marking TSO articles.	Change regulatory reference for marking TSO products from (14 CFR) § 21.607(d) to § 45.15(b). The correct reference for marking the serial number on the article is 45.15(b)(2).	Adopted both recommendations.

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13	A.Ma ACE-119W	Page 3, Paragraph 5	<ul style="list-style-type: none"> a. Change from “14 CFR § 21.605 (a) (1)”: to “14 CFR § 21.603(a)(1)” b. Change from “14 CFR § 21.617 (a) (2)”: to “14 CFR § 21.621(a)(2)(ii)” 			Adopted the first recommendation. Instead of changing 14 CFR 21.617(a)(2) to 21.621 (a)(2) the 21.621 citation has been deleted to conform with the TSO template guidance in Order 8150.1C.
14	RG Schank	Page 3, paragraph 5	The regulatory reference to (14 CFR) § 21.605(a)(1) is in reference to the TSO applicant’s organization not for application data requirements.	(14 CFR) § 21.605 includes regulatory information for the TSO applicant’s organization structure.	Change the reference for TSO application data requirements to (14 CFR) § 21.603(a)(1).	Adopted.
15	RG Schank	Page 3, paragraph 5	The regulatory reference to (14 CFR) § 21.617(a)(2) is incorrect reference for issuance of letters of TSO design approval.	(14 CFR) § 21.617 is removed in amendment 21-92.	Change the reference to (14 CFR) § 21.621(a)(2) letters of TSO design approval.	See disposition of Index No. 13.
16	ACE-117C, John Raspanti, 847-294-7379	Page 3, para 5	21.605(a)(1) should be changed to 21.603(a)(1)	Statement of Conformance requirement was changed from 21.605(a)(1) to 21.603(a)(1) when part 21 was revised effective April 16, 2011	Revise 21.605(a)(1) to 21.603(a)(1)	Adopted.
17	ACE-117C, John Raspanti, 847-294-7379	Page 3, para 5	21.617(a)(2) should be changed to 21.621(a)(2)(ii)	TSO letter of design approval requirement was changed from 21.617(a)(2) to 21.621(a)(2)(ii) when part 21 was revised effective April 16, 2011	Revise 21.617(a)(2) to 21.621(a)(2)(ii)	See disposition of Index No. 13.

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18	R. Hirt	General & Page 3, Paragraph 5	Amdt 21-92 is the current Part 21 basis. All regulations cited should be revised accordingly. Please see R. Schank's comments.	§ 21.617(a)(2) is an earlier amdt level.	Change § 21.617(a)(2) to § 21.621(a)(2)(ii).	See disposition of Index No. 13.
19	R.Hirt	Page 4, Paragraph 5.c	Rearrange 5.c text to highlight the requirements and options.	Editorial.	<p>c. To address a unique aspect associated with the hybrid surveillance functionality, the TCAS installation instructions must contain the requirements of –</p> <ol style="list-style-type: none"> 1) Failure annunciation on the flight deck when hybrid surveillance functionality has failed; <p>Or</p> <ol style="list-style-type: none"> 2) Scheduled maintenance task to verify that hybrid surveillance is (and has been) functional, including: <ol style="list-style-type: none"> a) The recommended interval for a scheduled maintenance check; and b) The recommended procedure for performing that task. 	The text as proposed is adequate to convey the requirements and the options. Recommendation not adopted.

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20	RG Schank	Page 4, Paragraph 5.i.	The regulatory reference to (14 CFR) §§ 21.143 and 21.605(a)(3) are incorrect references for a quality system requirement.	(14 CFR) §§ 21.143 is for duration requirements and 21.605(a)(3) is regarding organization requirements.	Changes references to (14 CFR) §§ 21.137 and 21.607 for the quality system requirement.	Recommendation not adopted but the regulatory citations have been corrected as follows: 21.143 changed to 21.608 but 21.605(a)(3) has been deleted to conform to the TSO template.
21	ACE-117C, John Raspanti, 847-294-7379	Page 4, para 5.i	21.143 should be changed to 21.137 and 21.605(a)(3) changed to 21.607	Quality control system requirement was changed from 21.143 to 21.137 and description of the Quality system was changed from 21.605(a)(3) to 21.607 when part 21 was revised effective April 16, 2011	Revise 21.143 to 21.137 And 21.605(a)(3) to 21.607	See disposition of Index No. 20.
22	ACE-117C, John Raspanti, 847-294-7379	Page 4, para 5.1	21.611(a) should be changed to 21.619(a)	Design change requirement was changed from 21.611(a) to 21.619(a) when part 21 was revised effective April 16, 2011	Revise 21.611(a) to 21.619(a)	Recommendation not adopted but section 5.1 has been revised by deleting the second sentence which contained an incorrect regulatory citation.
23	RG Schank	Page 4, Paragraph 5.1.	The regulatory reference for TSO minor design changes to (14 CFR) § 21.611(a) is incorrect. I believe the correct reference for major design changes is (14 CFR) § 21.619(a).	Current amendment 21-92 to (14 CFR) § 21.611 is regarding TSO Issuance.	Change the reference for TSO minor design changes to (14 CFR)§ 21.619(a).	See disposition of Index No. 22.
24	A.Ma ACE-119W	Page 4, Paragraph 51	Change from “14 CFR § 21.611 (a)”: to “14 CFR § 21.619(a)”			See disposition of Index No. 22.

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25	A.Ma ACE-119W	Page 5 Paragraph 5p	Suggest to delete	Contained in objectives of PSAC and Software Accomplishment Summary		Recommendation not adopted as the statement of s/w verification and validation levels are to be provided.
26	A.Ma ACE-119W	Page 5 Paragraph 5q	Suggest to delete			Recommendation not adopted as no rational for doing s provided by the commenter.
27	C. Henrichsen ACE-119W	Section 5 Paragraph c	The section requires the system provide a history of the hybrid surveillance health. Is there a requirement to define how long the system must retain information to which the hybrid surveillance is functional?	Computer memory has a cost associated with this function. Currently the RTCA documents do not have a requirement monitoring and storing failure data. Perhaps this is changed in the DO-300A, I don't have access to the new revision.	Verify requirement for storing hybrid surveillance failures in RTCA documents. If none exist then determine the memory requirements and provide the information in the TSO.	To ensure that the spectrum reduction benefits continue to accrue as the equipment deploys into the field and to ensure that hidden failures are not resident in airborne TCAS II units for long periods of time, failures of hybrid surveillance must be annunciated to the flight crew or the occurrence of faults and the continued airworthiness must be assessed during periodic scheduled maintenance tasks. The amount of memory required will be determined by the manufacturer.

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28	R. Hirt	General	Should electronic marking be considered?	Electronic marking may be used by the equipment manufacturers.	Please consider electronic marking and add paragraph about its usage.	Adopted but only for s/w. The Marking section now has language from the template allowing e-marking for s/w.
29	D.Millam	General	The 14 CFR references for TSO requirements have not been updated to the new part 21 references and they must be updated numerous places.			Adopted.
30	B. Verna	Page 1 Para. 2c	Reference to 21.611(b) is outdated	Reference changed under the part 21 re-write	Change reference to 21.619(b)	Adopted.
31	B. Verna	Page 2 Para. 3h	Reference to 21.609 is outdated	Reference changed under the part 21 re-write	Change reference to 21.618	Adopted.
32	B. Verna	Page 3 Para. 4a	Reference to 21.607(d) is outdated	Reference changed under the part 21 re-write	Change reference to 45.15(b)	Adopted.
33	B. Verna	Page 3 Para. 4a	Reference to 21.607(d)(3) is inappropriate	TSO template change deletes this reference because the rule trumps TSO policy. The optional date of manufacture isn't optional.	Delete second sentence beginning with "Use serial number..."	Partially adopted to correct the citation (from 21.607(d)(3) to 45.15(b)(2)) but did not delete the suggested text.
34	B. Verna	Page 4 Para. 5	Reference to 21.605(a)(1) is outdated	Reference changed under the part 21 re-write	Change reference to 21.603(a)(1)	Adopted.
35	B. Verna	Page 4 Para. 5	Reference to 21.617(a)(2) is outdated	Reference changed under the part 21 re-write	Change reference to 21.621(a)(2)	Recommendation not adopted but the incorrect citation was deleted to conform to the text in the TSO template by altering the text in the last

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						sentence.
36	B. Verna	Page 4 Para. 5i	Reference to 21.143 and 21.605(a)(3) are outdated	Reference changed under the part 21 re-write	Delete both CFR references and replace with 21.608	Adopted.
37	B. Verna	Page 4 Para. 5l	TSO template and CFR reference out of date	TSO template change	Delete second sentence starting with “For a minor change...”	Adopted.
38	B. Verna	Page 5 Para. 5r	Non-TSO function policy out of date	TSO template change	<p>Delete the existing 5r and replace with the following:</p> <p>r. Identify functionality or performance contained in the article not evaluated under paragraph 3 of this TSO (that is, non-TSO functions). Non-TSO functions are accepted in parallel with the TSO authorization. For those non-TSO functions to be accepted, you must declare these functions and include the following information with your TSO application:</p> <p>(1) Description of the non-TSO function(s), such as performance specifications, failure condition classifications, software, hardware, and environmental qualification levels. Include a statement confirming that the non-TSO function(s) don’t interfere with the article’s compliance with the requirements of paragraph 3.</p> <p>(2) Installation procedures and limitations sufficient to ensure that the</p>	Adopted.

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					<p>non-TSO function(s) meets the declared functions and performance specification(s) described in paragraph 5r(1).</p> <p>(3) Instructions for continued performance applicable to the non-TSO function(s) described in paragraph 5r(1).</p> <p>(4) Interface requirements and applicable installation test procedures to ensure compliance with the performance data defined in paragraph 5r(1).</p> <p>(5) Test plans, analysis and results, as appropriate, to verify that performance of the hosting TSO article is not affected by the non-TSO function(s).</p> <p>(6) Test plans, analysis and results, as appropriate, to verify the function and performance of the non-TSO function(s) as described in paragraph 5r(1).</p>	
39	<p>R. Derby, ANM-100D</p> <p>(same comment from ANM-110)</p>	All	No page numbers.	Readability/Reference.	Add page numbers.	Adopted.

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40	R. Derby, ANM-100D	All	Template in Order 8150.1C not used.	Standardization	Use template in Order 8150.1C Appendix G.	Adopted.
41	R. Derby, ANM-100D	P. 1 ¶ 2.c	§21.611 (b) does not exist.	14 CFR Subpart O has changed since TSO-119c was published.	Change §21.611 (b) to §21.619 (b).	Adopted.
42	R. Derby, ANM-100D	P. 1 ¶ 3	Dates missing from references to RTCA documents.	Paragraph contains placeholders “[insert date]”	Replace “[insert date]” with publication date: 1. 07-01-09 for DO-185B Change 1 2. 03-20-13 for DO-185B Change 2 3. 03-20-13 for DO-300A	Adopted.
43	R. Derby, ANM-100D	P. 2 ¶ 3 a.	“Note” should be all caps & bold.	Consistency	Change “Note” to “ NOTE ”	Adopted.
44	D. Dunford, ANM-110	Page 2 3.a.	The peer paragraphs of 3. have titles, but 3.a. does not. Recommend the title “Hybrid Surveillance.”	The requirement described in 3.a. pertains uniquely to hybrid surveillance.	Entitle paragraph 3.a. “Hybrid Surveillance”	Adopted.
45	D. Dunford, ANM-110	Page 2 3.c.	The TSO is a minimum standard for uninstalled equipment, yet a failure classification for the function is specified. The failure of a single TCAS device should not be specified unless only one could ever be installed on an airplane. If there is a dual-installation and one of the two fails, then what is the failure classification? Certainly not the	The failure classification, strictly speaking, depends on the installation configuration. A single TCAS configuration may indeed have a failure classification of <i>hazardous</i> but a multiple TCAS installation, only the complete loss of all installed TCAS in the airplane would have that failure classification.	The manufacturer should be required to identify the design assurance level of the finished product and if less than Level B, note in the installation instructions that more than one device must be installed to meet the minimum system safety requirements.	The TSO is required to have a failure classification for the functionality prescribed by the standard. Recommendation not accepted.

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			same as if only one TCAS was installed.	Perhaps the second sentence of this paragraph is addressing this point, but if so, it is very obscure.		
46	R. Derby, ANM-100D	P. 2 ¶ 3 d.	Dates missing from references to RTCA document.	Paragraph contains placeholders “[insert date]”	Replace “[insert date]” with publication date: 1. 07-01-09 for DO-185B Change 1 2. 03-20-13 for DO-185B Change 2 Alternatively, delete mention of publication date.	Date fields have been deleted from 3.d as they are superfluous.
47	R. Derby, ANM-100D	P. 2 ¶ 3 h.	§21.609 does not address deviations.	14 CFR Subpart O has changed since TSO-119c was published.	Change §21.609 to §21.618.	Adopted.
48	R. Derby, ANM-100D	P. 3 ¶ 4 a.	§21.607 (d) does not exist.	14 CFR Subpart O has changed since TSO-119c was published.	1. Change the first instance of §21.607 (d) to §45.15 (b) 2. Replace the second sentence with “The marking must include the serial number.”	Adopted recommendation 1. Adopted intent of recommendation 2.
49	R. Derby, ANM-100D	P. 3 ¶ 4 b.	Template in Order 8150.1C not used.	Standardization	1. Append “, and” to the end of ¶ 4 b.(1) 2. Delete ¶ 4 b.(1)	Adopted recommendation 1. Adopted intent of recommendation 2.
50	R. Derby, ANM-100D	P. 3 ¶ 4 b.	Template in Order 8150.1C not used.	Standardization	1. Delete ¶ 4 c., d., and e. 2. Replace them with ¶ 4 c. & d. from Order 8150.1C Appendix G.	Adopted.
51	R. Derby, ANM-100D	P. 3 ¶ 5	Template in Order 8150.1C not used.	Standardization	1. Delete ¶ 5 a. and b. 2. Replace them with ¶ 5 a. & b. from Order 8150.1C Appendix G.	Adopted.

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52	R. Derby, ANM-100D	P. 4 ¶ 5	Template in Order 8150.1C not used.	Standardization	1. Delete ¶ 5 c. thru r. 2. Replace them with ¶ 5 c. thru j. from Order 8150.1C Appendix G.	The items required by 5.c thru 5.j are a subset of the items required by 5.c thru 5.r. The difference results from reordering of other template items. No change has been made as a result of this comment.
53	D. Dunford, ANM-110	Page 4 5.c.	<p>The manufacturer has the option to provide failure annunciation for the hybrid surveillance function or scheduled maintenance task to verify that it is functional.</p> <p>For a function whose failure is classified by this TSO as <i>hazardous/sever-major</i>, it seems odd that flight crew annunciation of the failure is not the minimum requirement.</p>	Failure of the function could occur in-flight, long since the last time the maintenance task was performed and yet have hazardous consequences inflight.	The failure annunciation in the flight deck should be considered a minimum requirement.	A failure of the hybrid surveillance function will not affect the performance of the collision avoidance logic. The principal reason for addition of hybrid surveillance to the TCAS standard is to assist with mitigation of 1090 MHz congestion. A hidden failure of the hybrid function in any one aircraft should not materially contribute to 1090 MHz congestion. Recommendation not adopted.
54	R. Derby, ANM-100D	P. 5 ¶ 6	Template in Order 8150.1C not used.	Standardization	1. Delete ¶ 6 a. thru j. 2. Replace them with ¶ 6 a. thru i. from Order 8150.1C Appendix G.	The items specified in 6.a thru 6.j are the same as those in the template just in slightly different order and supplemented by one item unique to

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						TCAS. Recommendation not adopted.
55	R. Derby, ANM-100D	P. 6 ¶ 7	Template in Order 8150.1C not used.	Standardization	1. Delete ¶ 7 a. and b. 2. Replace them with ¶ 7 a. & b. from Order 8150.1C Appendix G.	While the language in sections 7. A and 7.b may be slightly different the intent is the same. No change has been made as a result of this recommendation.
56	Mahmood Shah ASW-150 817-222-5133	Section 2, APPLICABILITY.(C)	Obsolete reference called (14 CFR) § 21.611(b)	Modern amendment of (14 CFR) deleted § 21.611(b)	Change to “See Title 14 of the Code of Federal Regulations (14 CFR) § 21.611”	Adopted.
57	Mahmood Shah ASW-150 817-222-5133	Section 3(h) Deviations	Obsolete reference called (14 CFR) § 21.609.	Modern amendment of (14 CFR) § 21.609 requirement is for “Location of or change to manufacturing facilities”	Change to “Title 14 of the Code of Federal Regulations (14 CFR) § 21.618” which is for Deviations.	Adopted.
58	Mahmood Shah ASW-150 817-222-5133	Section 4(a) Marking	Obsolete reference called (14 CFR) § 21.607(d)	Modern amendment of (14 CFR) deleted § 21.607(d)	Change to “Mark at least one major component permanently and legibly with all the information in 14 CFR § 21.607”	CFR citation revised to specify 45.15(c).
59	Mahmood Shah ASW-150 817-222-5133	Section 4(a) Marking	Obsolete reference called (14 CFR) § 21.607(d)(3)	Modern amendment of (14 CFR) deleted § 21.607(d)(3)	Change to “Use serial number in place of optional date of manufacture as stated in 14 CFR § 21.607”	CFR citation revised to specify 45.15(b)(2).

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60	Mahmood Shah ASW-150 817-222-5133	Section 5 Application data requirements,	Obsolete reference called (14 CFR) § 21.605(a)(1)	Modern amendment of (14 CFR) deleted § 21.605(a)(1)	Change to “as specified 14 CFR § 21.605”	CFR citation revised to 21.603(a)(1).
61	Mahmood Shah ASW-150 817-222-5133	Section 5 Application data requirements,	Obsolete reference called (14 CFR) § 21.617(a)(2)	Modern amendment of (14 CFR) deleted § 21.617(a)(2)	Delete from the document	Adopted.
62	Mahmood Shah ASW-150 817-222-5133	Section 5(i) Application data requirements,	Obsolete reference called (14 CFR) § 21.605(a)(3)	Modern amendment of (14 CFR) deleted § 21.605(a)(3)	Change to “The quality control system (QCS) description required by 14 CFR §§ 21.143 and 21.605	CFR citation 21.143 revised to 21.608. CFR 21.605(a)(3) citation has been deleted.
63	Mahmood Shah ASW-150 817-222-5133	Section 5(l) Application data requirements,	Obsolete reference called (14 CFR) § 21.611(a)	Modern amendment of (14 CFR) deleted § 21.611(a)	Change to “For a minor change, follow the directions in 14 CFR § 21.611”	CFR citation has been deleted.
64	Silpa Uppalapati	Section 3.f, "Software Qualification"	should include the sentence, "The software DO178B design assurance level should be consistent with the failure condition classification defined in paragraph 3c of this TSO."			See disposition of Index No. 5.
65	R. Joslin	Page 2, para 3(e)	Outdated reference to RTCA document	The software qualification refers to RTCA/DO-178B, Software Considerations in Airborne Systems and Equipment Certification, dated December 1, 1992, however DO-178C was released on 12/13/2011	Change RTCA/DO 178B to RTCA/DO 178C	The commenter is correct but AIR has not updated the related Advisory Circular to invoke the newer version of DO-178. No change has been

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						made as a result of this comment.
66	R. Joslin	Page 3, para 5(c)	Incomplete statement addressing failures	The sentence mentions that an alert should be required for a “failure”, however the system may still be functioning (not failed) but operating in a degraded mode	Change the sentence to read “... <i>the requirement for either a failure annunciation on the flight deck when hybrid surveillance functionality has failed or degraded</i>”	There are no degraded modes of hybrid surveillance. Recommendation not adopted.
67	R. Joslin	Page 3, para 5(c)	Incomplete reference guidance provided for the requirement for flight deck annunciations	The TSO should specify the guidance to follow for any flight deck annunciations	Change the sentence to read “... <i>the requirement for either a failure annunciation on the flight deck, as specified in 14CFR §2X.1322, when hybrid surveillance functionality.....</i> ”	The TCAS II Airworthiness Installation provides guidance and references for flight deck annunciations. Recommendation not adopted.