

## DOCUMENT COMMENT LOG

<b>Originating Office:</b> AIR-120	<b>Document Description:</b> AC 20-115C Airborne Software Assurance	<b>Project Lead:</b> Richard Spencer	<b>Reviewing Office:</b> Consolidated Comments	<b>Date of Review:</b>
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Commenter	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
ACE-111	General	The old AC is one page. I don't know why we seem to need the volume in the updated AC.	There just seems to be pages of stuff that is redundant with the DO document. Redundant documents create future problems of keeping the various documents in sync.	Shorten the AC where possible.	Many applicants have been using DO-178B since 1993 and have processes set up accordingly. There is a lot of similarity between DO-178B and DO-178C that makes DO-178B still an acceptable means in many cases. The AC needs to provide guidance for transitioning to DO-178C where there will be use of software developed to versions prior to DO-178C. Guidance on tool qualification and use of supplements is also necessary. We have tried to keep the AC minimal, yet provide sufficient guidance.
AIR-500	Global Change	Incorrect alignment.		Align the labeling of all subsections to appear directly under the first term in the title of the preceding subparagraph. For examples refer to paragraphs 9b(1) – (3); 9d(1) _ (2); 11b(1) – (11); and 11c(1) – (10).	Accepted. The alignment is consistent throughout the document.
AIR-500	Paragraph 1a, 2 <sup>nd</sup> sentence, Page 1	Incorrect spacing.		There should be only two spaces between sentences. Remove the extra space.	Partially accepted. There should be only one space between sentences. Paragraph 2.49 of the USGPO Style Manual states: <i>“A single justified word space will be used between sentences. This applies to all types of composition.”</i>

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ACE-114	Page 1, Paragraph 1.b	Acronym “AC” is defined a second time in this paragraph.	AC was already defined in the header line of paragraph 1	Change “...wrote this advisory circular (AC)...” to “...wrote this AC...”	Accepted.
ASW-111	Page 1 Section 1.b. Purpose of this Advisory Circular (AC)	A poll of other certification authorities reveals that all of them are going to be imposing DO-331 for MBD projects. Even though there may be valid technical issues with the document, it is believed that harmonization gap would cause significant issues for industry and the FAA resulting in applicants having to prepare two data packages; one for the FAA and one for other certification authorities. However it is recognized there are some issues regarding the relaxing of review objectives of low level requirements as a result of simulation testing. This could result in Model-Based Development (MBD) approvals having lower error detection probabilities than the core DO-178C document. Therefore the guidance needs to ensure that the proper justification is provided.	Harmonization	Include Model Based Development and Verification Supplement for guidance in reference section  1. b.  <i>(3) RTCA DO-331, Model-Based Development and Verification Supplement to DO-178C and DO-278A, dated December 13, 2011</i>	Accepted.
ACE-114	Page 1, Paragraph 1.d	Acronym “TSO” was used here but not defined until paragraph 6.	Acronyms should be defined prior to their use.	Change “...for TSO authorizations...” to “...for Technical Standard Order (TSO) authorizations...”	Accepted.

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ANM-111	Page 1, bullet 1.f.	Min1: “the means” is plural.	Grammar	Restate: “If you use the means in this AC, you must follow <u>them</u> in <u>their</u> entirety.”	Not accepted. Use of “means” is in this context is not a plural. According to the dictionary, in the sense of a “way to an end,” it may take a singular or plural verb. Also, Order 1320.46C, <i>Advisory Circular System</i> , paragraph 6.a.(2), uses “it” with “means”: “if you use the means described in the AC, you must follow <b>it</b> in all important respects.”
ANM-130L	Page 1, Paragraph 1.a	The body of this AC may not support the Purpose.	This AC limits its applicability to the airborne installation because of the phrase “airworthiness regulations” as used in the Purpose. However, in addition to airworthiness approval, the AC addresses TSO authorization such as in Sections 2 and 6.b on pages 2 and 3, respectively.	The Purpose should be revised to address both the installation approval and TSO authorization.	Not accepted. Paragraph 1.d clearly states that the AC also explains the use of DO-178C for TSO authorizations.
AIR-500	Paragraph 1a, 3 <sup>rd</sup> sentence, Page 1	Missing space.		There should be two spaces between sentences.	Not accepted. Paragraph 2.49 of the USGPO Style Manual states: “ <i>A single justified word space will be used between sentences. This applies to all types of composition.</i> ”
AIR-500	Paragraph 1b, Page 1	The term “advisory circular” has already been defined.		Use the acronym “AC”.	Accepted.

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ANM-111	Page 1, bullet 1.b.	MBD1: Missing reference to DO-331, Model-Based Development Supplement.	Without reference to this supplement we will not be harmonized with EASA and other national CA. This could present problems for joint TC programs and validation programs.	Add reference to DO-331, title and publication date.	Accepted.
AIR-500	Footer Area, Page 1	Incorrect format.	Page number should not be indicated until page 2.	Remove the labeling of “1” from the footer.	Accepted.
AIR-500	Paragraph 1d, Page 1	Define the term first for “TSO”.		Use the acronyms “TSO” after the first usage.	Accepted.
ANM-111	Page 1, bullet 1.d.	MAJ1: Missing reference to DO-330, DO-331, DO-332 and DO-333 for use on TSO projects as applicable.	Missing guidance for TSO projects regarding Tool Qualification, MBDV, OOT and FM.	Add: “This AC also explains the use of DO-178C, <u>DO-330</u> and the <u>Supplements</u> for TSO authorizations.”	Partially accepted. Paragraph 1.c. was added as a blanket statement: “References to use of DO-178C in this AC include use of supplements and DO-330 as applicable.” Also, DO-178C, paragraph 1.4.o. states that supplements should be used if its use is acceptable to the certification authority.
ACE-114	Page 2, Paragraph 2	The term “amendments” as used here implies that amendments/changes alone can constitute a TC.	The actual intent is to state that the term “TC” can be used when referring to an “amended original or supplemental TC” - not just the changes as the present wording could imply.	Change “...and amendments...” to “...and amended original or supplemental TCs...”	Accepted.

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ANM-130L	Page 2, Paragraph 2	The first sentence stated "... wrote this AC for ... developers of airborne systems and equipment containing software that are installed on type certificated aircraft ...." This sentence should be revised for clarification.	1) Airborne systems and equipment are installed in type certificated airplanes, rather than on the top of airplanes.  2) Software developers should be able to use this AC for the software embedded in airborne systems and equipment regardless of their installation status — type certificated airplane or undergoing type certification.	Revise sentence.	Accepted. Revised sentence to: We wrote this AC for applicants, design approval holders, and developers of airborne systems and equipment containing software <b>for</b> type certificated aircraft, engines, and propellers.
AIR-500	Paragraph 2, Page 2	Incorrect language for paragraph title.	Delete the paragraph title "Who Should Read this AC".	Replace with "Applicability"?	Accepted.
AIR-500	Paragraph 2, 2 <sup>nd</sup> sentence, Page 2	Change wording.		Rewrite to read: The term "type certificate" (TC) applies to the original TC...	Accepted.
ANM-111	Page 2, par. 2. last sentence	Min2: Unclear statement, use of the word "consider"	"consider" is weak term – what would "consider" mean in this context?	Restate: "Developers of TSO articles should also <u>address the guidance of this AC.</u> "	Partially accepted. If a TSO states that the applicant should use DO-178B or another version for software development, then they can use that version. We cannot use this AC to force TSOA applicants to use DO-178C.  Revised to: "We recommend developers of TSO articles to use this AC for software assurance."

<b>Commenter</b>	<b>Page &amp; Paragraph</b>	<b>Comment</b>	<b>Rationale for Comment</b>	<b>Recommendation</b>	<b>Disposition</b>
AIR-500	Paragraph 3, Page 2	Clarity.		These paragraphs should be located somewhere else. It's not part of "cancellation". Please clarify.	Accepted. Moved to its own paragraph (new paragraph 5.)
ANM-100B	Page 2 Para 3	Starting with the third sentence there is an implication that DO-178C is unambiguous, correct, and complete such that issue papers will not be necessary to achieve an acceptable means of compliance.	It is doubtful that DO-178C will eliminate ambiguity and will not require issue papers. For example, issue papers will be needed for model based development and to invoke Order 8110.49 as supplemental guidance for change impact analysis, supplier management, and stage of involvement reviews.	Remove third sentence. Add caveat that issue papers may also be applied to DO-178C.	Not accepted. The paragraph has been relocated under its own paragraph heading. It addresses the continued use of DO-178B (and other previously acceptable means) and should not cause confusion regarding IPs and DO-178C.
ASW-150	Page 2, Para 3, Last sentence	Last sentence gives the impression that issue papers may not be used for DO-178C.	There might be issue papers needed for DO-178C.	Delete the last sentence and change the next to last sentence to read "Means of compliance that the FAA has previously accepted, including ones based on DO-178B, may be acceptable for certification approvals, but the FAA may need project-specific issue papers to achieve an acceptable means of compliance"	Not accepted. The paragraph has been relocated under its own paragraph heading. It addresses the continued use of DO-178B (and other previously acceptable means) and should not cause confusion regarding IPs and DO-178C.
ANM-111	Page 2, par. 4. last sentence	Min3: Add clarification for DO-330.	Clarification	Add to end of sentence: "...instead, DO-330 is a stand-alone document that contains its own complete set of objectives, activities, and life cycle data <u>for tool qualification.</u> "	Accepted.

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ASW-111	Page 2 Section 4. Background	Related to 1 <sup>st</sup> comment.  Include DO-331 as one of the supplements in the 2 <sup>nd</sup> sentence below:  <i>DO-332 and DO-333 are supplements to DO-178C that address specific software technology techniques.</i>	Harmonization and Completeness	Correct the second sentence to include DO-331.  <i>DO-331, DO-332, and DO-333 are supplements to DO-178C that address specific software technology techniques.</i>	Accepted.
ACE-119W	Page 2, Paragraph 5a	Delete, “You may either use the activities listed in DO-178C or adopt your own.”	By allowing “adopt your own” could be misleading. The activities listed in DO-178C only provide guidance to satisfy the DO-178C objectives. Software developer is expected to demonstrate a structure approach (activities involved) to satisfy the DO-178C objectives.		Not accepted. The language is consistent with DO-178C, section 1.4.d. You don’t have to use the activities in DO-178C; they are there because they have a proven track record. You can use your own equivalent activities. Also, see next comment.
ASW-150	Page 2, para 5.a, third sentence	Third sentence gives the impression that any adopted activities will do.	For example, adopted activities that would result in not properly archiving data or problem reports.	Third sentence should read “You may either use the activities listed in DO-178C or adopt your own equivalent activities.”	Accepted.
ASW-111	Page 2 Section 5.a. Using DO-178C for Type Certification	Related to 1 <sup>st</sup> comment.  Include DO-331 MBD supplement below.  <i>You should satisfy all the objectives associated with the software level assigned to the software components and produce all of the associated data as specified in the outputs listed in the DO-178C Annex A tables, DO-330 Annex A tables for tool qualification, and the DO-332 and DO-333 Annex A tables where applicable</i>	Harmonization and Completeness	Correct the first sentence in Section 5.a. to the following:  <i>You should satisfy all the objectives associated with the software level assigned to the software components and produce all of the associated data as specified in the outputs listed in the DO-178C Annex A tables, DO-330 Annex A tables for tool qualification, and the DO-331, DO-332, and DO-333 Annex A tables where applicable</i>	Accepted.

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AIR-500	Paragraph 5b, Page 2	Remove spacing.		Remove the space after the "0".	Accepted.
ANM-130L	Page 2, Paragraphs 3 & 5;  Page 3, Section 7a; and  Page 8, Section 10a	The FAA should standardize the phrase that is used to describe how to show compliance with airworthiness requirements.	The phrase "means of compliance" is used in the draft AC while Order 8110.4 uses the "methods of compliance" for demonstrating compliance with the appropriate airworthiness requirements. Also, the "Method of Compliance" is used in the Type Validation Principles agreement reached between the FAA and the EASA (formerly JAA) has used the "methods of compliance" signed in June 1997.	The FAA should standardize the phrase in order to minimize any confusion among stakeholders.	Not accepted. Order 1320.46C, <i>Advisory Circular System</i> , paragraph 6.a.(2), uses the term "means of compliance." The wording in the AC will use the same terminology as the order.
ANM-111	Page 2, par. 4. 2 <sup>nd</sup> sentence	MBD2: Missing reference to DO-331; and delete the word "technology" which implies tools.	Add missing reference.	So it reads: " <u>DO-331</u> , DO-332 and DO-333 are supplements to DO-178C that address specific software techniques."	Accepted.
ANM-100B	Page 2, 3 Para 5	Para 5c identifies software design data that satisfies 21.31. It does not identify the software verification data that could satisfy 21.33. What is the role of software verification data in regulatory compliance?	I don't understand why software verification data is omitted for each design assurance level. Is software verification data not considered to satisfy regulations for test and inspection?	Identify DO-178C verification data for each design assurance level that satisfies 21.33 or state explicitly that software verification data does not satisfy test and inspection regulations.	Not accepted. DO-178C, section 9.4 defines the life cycle data related to type design. However, there are certain life cycle data that do not apply to level D. The purpose of addressing this in the AC is to identify the applicable life cycle data in that DO-178C section by SW level. Section 9.4 is not intended to address any data other than data related to type design; this would exclude verification data.

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ANM-111	Page 2, bullet 5. a. 1 <sup>st</sup> sentence	MBD3: Missing reference to DO-331.	Completeness, add DO-331; harmonization with other CA.	So it reads: "... for tool qualification, and the <u>DO-331, DO-332 and DO-333 Annex A tables</u> where applicable."	Accepted.
ANM-111	Page 2, bullet 5. a. 3 <sup>rd</sup> sentence	MAJ2: Missing reference to supplements and to concept of "alternative activities."	Completeness /correctness	Restate as: "You may either use the activities listed in DO-178C <u>and the supplements as applicable</u> , or <u>propose alternatives</u> ." The statement is not really necessary: See DO-178C Section 1.4d. - so it could just be deleted.	Not accepted. We added the sentence 1.c, which states: "References to use of DO-178C in this AC include use of supplements and DO-330 as applicable" so that we would not have to keep mentioning "and applicable supplements". We did not use "propose alternatives" because that implies that cert authority approval is required, which is contrary to our stated position on cert liaison.
ANM-111	Page 2, bullet 5. a. last sentence	MAJ3: Unclear what this statement means or what it implies. If the applicant has developed the data then they don't need to get approval of their process? Sounds like military DID process, not design assurance.	Clarify intent.	Delete sentence. Unnecessary and misleading. Or restate: "You can consider the certification liaison process objectives and activities satisfied after the associated data ( <u>PSAC, SCI and SAS</u> ) is <u>approved by the FAA or delegated representative</u> ."	Not accepted. We have stated that the FAA is not obligated to approve any data. This is contrary to Table A-10, objective 2. This paragraph is stating that the applicant needs to produce the data, but we don't have to approve it and the applicant still gets credit for the cert liaison objectives and associated activities. The sentence has been revised to state that it is our choice whether or not to be involved in certification liaison.

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ANM-111	Page 2, bullet 5. a. last sentence	<p>I am very concerned about this sentence in the referenced section when discussing certification liaison.</p> <p>“You can consider the certification liaison process objectives and activities to be satisfied after the associated data is produced.”</p>	<p>This section, and the entire AC for that matter, mixes together who the “You” is with these types of statements. Is the “you” in this sentence referring to the applicant for the TC/STC, the applicant for a TSO, or the software developer?</p> <p>Applicants are, of course, the parties responsible for showing compliance to the regulations. However, software developers are the ones that usually state their compliance to DO-178. The users of this software, which may be an applicant or it may be some other avionics supplier, are supposed to do audits and such to ensure that they believe that the compliance statement being made has been made with some assurance. “Trust but verify.” This sentence I have noted in the Comment column seems to allow a software developer, which may be some company like Honeywell but it also might be some company like Green Hills or some company in India or Poland. This gets to the question I asked at the beginning, who is the “you” in these cases? If the “you” here is the applicant, then I would agree that this is a true statement, or at least the direction we have agreed to go. However, if the “you” here is Honeywell or a sub-tier supplier, then I would say, no, that is not what we intended. Can they say that when they have produced the artifacts in question, no further oversight is necessary by anyone, including the user of the software?</p>	<p>(continued rationale) This becomes especially true when delegated organizations are involved. Would this sentence allow the Honeywell and their sub-tier suppliers to not have to comply with any of the objectives regarding liaison with the (for example) BASOO, which is the Boeing delegated organization. Once Honeywell is completed with they have produced their “data,” it would appear that they are done with their cert liaison obligations, including those to the BASOO.</p> <p>In other words, by using this language which relieves the FAA from direct involvement during a software development and approval process, does it also remove the delegated organization from that same process?</p> <p>Additionally, I have some concerns that this may cause problems in the area of harmonization and validation programs between the FAA and EASA or TCCA. Are those CA’s going to be OK with the FAA essentially removing ourselves from this process, and possibly (as noted above) removing the delegated organization as well?</p>	<p>The sentence has been revised to state that it is the FAA’s choice whether or not to be involved in certification liaison.</p>

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ANM-100B	Page 2, bullet 5. a. last sentence	Certification liaison should not be considered complete until the software accomplishment summary has been approved by a certification authority or its delegate.	AC 5a states that cert liaison is considered complete after associated data is produced. The term “produced” is ambiguous. Is it equivalent to “configured,” “released,” or “submitted?” The statement can be misconstrued by applicants to mean they can terminate certification liaison before data is approved.	Certification liaison should be considered complete when the software accomplishment summary has been approved. This does not exclude follow-up activity associated with oversight by certification authority or ODA defined in Order 8100.15.	We have stated in paragraph 1. that we are not obligated to approve any data or perform any activities as specified within the referenced RTCA documents. DO-178C, section 9, states that the certification liaison process includes submitting the SAS to the certification authority.
AIR-120	Page 2, bullet 5. a. last sentence	The sentence “You can consider the certification liaison process objectives and activities to be satisfied after the associated data is produced” may be misconstrued by an applicant to mean that it is their choice whether or not to have the FAA participate in the certification liaison process for their project.	The FAA decides whether or not to be involved in the certification liaison process (conducting SOIs, reviewing life cycle data, etc.), and the sentence is ambiguous.	Revise to: “If the FAA has no involvement in the certification liaison process, you can consider the certification liaison process objectives and activities to be satisfied after the associated data is produced.”	Partially accepted. Recommendation revised as follows: “If the FAA chooses not to be involved in the certification liaison process, you can consider the certification liaison process objectives and activities to be satisfied after the associated data is produced.”
AFS-460	Page 2 Paragraph 5 (b)	Suggest defining who us is. “You should submit to us the life cycle data...”	Page 1 says the FAA wrote this advisory circular.	May be helpful to tell user who in the FAA to submit data to.	Accepted. Revised as follows: “You should submit the life cycle data specified in DO-178C, section 9.3, and DO-330, section 9.0.a. (as applicable for tool qualification), to the appropriate project certification office (e.g., aircraft certification office (ACO)).”

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ANM-111	Page 2. bullet 5.c	This is a quibble about semantics, but I believe it gets to an important point that not everyone understands, and I do not think we should help sustain that misunderstanding with “loose” language. 5.c states: “Table 1 identifies the applicability of software life cycle data by software level that are used to satisfy the type design data requirements of Title 14, Code of Federal Regulations (14 CFR) 21.31.” The inference that software needs to comply directly with the CFR’s is incorrect.	<b>Aircraft systems</b> need to comply with the regulations. Software, by itself, does not. Compliance to DO-178C only helps satisfy the compliance requirements for the system that is implemented in software. So, really, in a “compliance tree,” there is the aircraft systems in-between software compliance to the industry standards and having the aircraft compliant.	Revise this sentence, somewhat along the lines of the following:  Table 1 identifies the applicability of software life cycle data by software level that are used, <u>in part, to show that the aircraft system of which the software is a part, satisfies</u> the type design data requirements of Title 14, Code of Federal Regulations (14 CFR) 21.31.	Partially accepted. §21.31 is about the type certified <u>product</u> , not a system. Therefore, the recommendation was modified as follows: “Table 1 identifies the applicability of software life cycle data by software level that are used, in part, to define the configuration and design features of the type certified product as specified in Title 14, Code of Federal Regulations (14 CFR) 21.31.”
ANM-111	Pages 2 and 3, bullet 5.c. and Table 1	MAJ4: This statement is unnecessary (redundant with DO-178C Section 9.3) and the table is redundant with Table A-2 and it is missing the Software Accomplishment Summary (not compatible with DO-178C).	This bullet and the table are unnecessary and conflict with DO-178C. All projects of Level A-D require submission of the SAS, including many TSOs. The SAS among other things contains the “Compliance Statement,” and “Software Status” including “Deferred PRs” and limitations.	Delete bullet c. and Table 1.	Not accepted. Paragraph 5.c and Table 1 address DO-178C, section 9.4, not 9.3. The “data related to type design” is not the same as the data that is submitted to the FAA. The purpose of the table 1 is to specify which data is considered to be type design data in section 9.4 by SW level.
AIR-120	Page 2, 5.5.c Table 1 NOTE: This comment was added as a result of problems discovered during the comment resolution activity)	Table 1 is not in agreement with the list of type design data in section 9.4 of DO-178C. Since DO-178C has added Parameter Data Item (PDI) files as both a separately loadable configuration item and as a separate software lifecycle data item, the aircraft type design data must include the PDI files.	Table 1 excluded the software accomplishment summary (SAS). The group believed that the limitations, open problem reports, and operational restrictions section of the PSAC are necessary to define the design features of the product. Because PDI files are loaded separately, the design features of the product are partially defined by these files.	Add The SAS to Table 1 Add another row for PDI files in Table 1 with the data for each of the columns in order left to right: Parameter Data Item (PDI) Files (if any), 11.22, Applicable, Applicable.	Accepted.

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ANM-100B	Page 2 Para 5c  Page 8 Para 11a	The previous AC 20-115B only identified parts 21, 23, 25, 27, 29, 33, 35 as applicable. It did not cite 21.33 as applicable. This is new and may generate much discussion and confusion without further clarification.	For part 25, software approvals were related to 25.1301 and 25.1309 on FAA form 8110-3 or ODA form 8100-9. By stating that software data satisfies part 21.33 does this mean that software approval will cite 21.33 on forms 8110-3 and 8100-9?	Delete reference to 21.33 or expand upon applicability. Make a statement of which regulations to cite for FAA software approval or designee recommend approval.	Not accepted. The paragraph references §21.31, not §21.33. Designees make compliance findings to the airworthiness regulations, not to part 21 regulations. §21.31 states what defines the type design of a product. This should not be confusing for a designee.
ANM-100B	Page 2 Para 5c  Page 8 Para 11a	The previous AC 20-115B only identified parts 21, 23, 25, 27, 29, 33, 35 as applicable. By stating that software data satisfies part 21.33 it could be inferred that software data can satisfy specific part 25 type design data for a required system.	This could open the door to system certification plans where only the software is changing and only a PSAC, SAS, and SCI would be delivered for regulatory compliance. Any other testing (systems, ground, or flight) would be conducted by the applicant as necessary with no FAA involvement. An applicant is currently attempting this approach on a number of systems with software only changes.	Expand upon the FAA intent for regulatory applicability of software data.	Not accepted. The paragraph refers to §21.31 (type design), not §21.33 (inspection and tests). The paragraph was rewritten to make the intent more clear: "Table 1 identifies the applicability of software life cycle data by software level that are used, in part, to define the configuration and design features of the type certified product as specified in Title 14, Code of Federal Regulations (14 CFR) 21.31."
ASW-150	Page 3, para 5.d	Sentence should be reworked	Sentence is confusing.	Sentence should read "We may perform our review of the data at any site we deem necessary."	Accepted.
ACE-114	Page 3, Paragraph 6.a	First 2 sentences are not very clear.	The actual intent is to note: that many TSOs do not specify any version of DO-178(), i.e., the original/A/B/C; but some TSOs do specify a DO-178(); and where DO-178() is specified, DO-178C may be used (with such "upgrade deviations" being allowed with ACO approval only).	Change first 2 sentences to:  "Many FAA TSOs do not specify DO-178() for software assurance; in these cases, we encourage you to use DO-178C. In those TSOs where DO-178() has been specified, you may choose to use DO-178C, but should request a deviation in accordance with the requirements of 14 CFR part 21, subpart O."	Accepted with modified wording: "Many FAA TSOs do not specify DO-178C for software assurance. For TSOs that specify a version prior to DO-178C, or do not specify any version of DO-178, we encourage you to use DO-178C. If you choose to use DO-178C in lieu of the

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					specified version, you should request a deviation in accordance with the requirements of 14 CFR part 21, subpart O.”
ACE-119W	Page 3, Table 1	Should make Source Code “Applicable” in Level D column.	The source is used to generate the Executable Object Code. You cannot maintain or modified the software without the source code.		Not accepted. Source code is not a required life cycle data item for level D per Table A-2(6).
AIR-500	Paragraph 6a, Page 3	The term “Technical Standard Order” has already been defined.		Use the acronym “TSO”.	Accepted. “Technical Standard Order” removed from heading, para 6.
AIR-500	Paragraph 6b, Page 3	Improper punctuation.		Capitalize the letter “t” at the beginning of the word “table”.	Accepted. It is capitalized. Believe the intent was to change it to small case.
ANM-100B	Page 3 Para 6	Para 6 only identifies software design data. There is no mention of software verification data. What is the role of software verification data in TSOA?	It is unclear how a TSOA can be issued for a TSO article containing software without DO-178C verification data. Is software verification not considered to satisfy regulations for test and inspection?	Identify DO-178C verification data to satisfy 21.610, 21.611, and 21.616 to state explicitly that software verification data does not satisfy those regulations.	Not accepted. Paragraph 6.b is about data used to determine conformity. It is not to imply that is the only data that the applicant needs to retain, such as verification data.
ANM-100D	P. 3 ¶ 6	Add a section (similar to Section 6) for LOAs (i.e., DO-200A)	AC 20-153 & DO-200A references usage of DO-178B for Tool Qual.	Add a section (similar to Section 6) for LOAs (i.e., DO-200A).	Not accepted. Aeronautical data processes are not within the scope of this AC. It is not the intent of this AC to recognize DO-330 for processes outside of DO-178C. AC 20-153 should

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					probably be revised to recognize DO-330 for aeronautical data. Additionally, a separate AC may invoke DO-330 for other disciplines, such as AEH, aeronautical data, etc.
ANM-130L	Page 3, Paragraph 6.a	Recommend the FAA (AIR-120) should publish a one time "global deviation acceptance" for anyone who elects to use the latest software development process, no matter what the TSO states.	My main concern with AC 20-115C, is that for TSO software development projects, the AC states that the TSO holders will have to apply for a deviation to use DO-178C, since most TSOs still have DO-178B in the TSO boilerplate wording regarding software. I believe that is not good logic, unnecessary, and burdensome for the TSO applicants and the LAACO, since LAACO and not AIR-120, will be processing the deviation requests. Per the wording in the AC, AIR-120 conveniently opted out of the deviation process and put that burden squarely on the ACOs. This need for a deviation will have the effect of a needless paper work exercise for the applicants and LAACO, and will probably disrupt the overall adoption of DO-178C in the TSO community. Also, if the TSO states DO-178B, but the aircraft certification basis invokes DO-178C, there will be big disconnects, if the TSO applicant still uses DO-178B, per the strict wording in the TSO. Another good reason for some type of FAA global deviation acceptance to use DO-178C.	FAA (AIR-120) should publish a one time "global deviation acceptance" for anyone who elects to use the latest software development process, no matter what the TSO states.	Not accepted. Per 21.618, deviation requests are sent to "the appropriate aircraft certification office." That means that by regulation, the ACO is responsible for processing deviation requests. The statement "This type of deviation may be approved by the project aircraft certification office (ACO) without Aircraft Engineering Division (AIR-100) coordination" reinforces policy that has been in effect for some time that allows the ACO to approve a deviation to a later version of DO-178 than that specified in the TSO without AIR-100 involvement. This serves to streamline the deviation process and make it easier on the ACOs and applicants.  DO-178( ) is an acceptable means of compliance and therefore cannot be invoked as part of the aircraft certification basis; the certification basis is defined by the applicable regulations, special conditions, and ELOS

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					findings. Therefore, a TSO authorized article containing software developed using DO-178B or earlier could be installed without violating the aircraft's certification basis.
ANM-111	Page 3, bullet 6.a.	MAJ5: What about the use of DO-330 and the Supplements for TSO development?	Statement does not address tool qualification and use of supplements for TSO projects.	Add bullet or statement about applicability of DO-330 and supplements for TSO projects.	Not accepted. Paragraph 1.e. was added as a blanket statement: "References to use of DO-178C in this AC include use of supplements and DO-330 as applicable."  Also, DO-178C, paragraph 1.4.o. states that supplements should be used if its use is acceptable to the certification authority.
ANM-111	Page 3, bullet 6.b.	MAJ6: This is inconsistent with many of the TSO data submittal requirements that specify PSAC, SCI and SAS.	TSO data submittals are typically specified in each TSO and usually include PSAC, SCI and SAS. SAS should always be submitted for all TSO projects of all software levels.	Make a statement that TSO data submittal requirements for software are typically specified in each TSO.	Accepted. Table 1 does not refer to the data that is submitted; it refers to the data that is applicable to the type design, or in the case of TSOA, design data used to determine conformity.  Added 6.c.: "Requirements for submitting life cycle data for TSO authorization are stated in each applicable TSO."
ACE-117C	Page 3	Section 11 could be moved in front of section 8.	The supplements are a big deal, and it seems like they should be discussed before we address changes.	Move Section 11 in front of section 8.	Accepted.

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ANM-100D	P. 3 ¶ 7.a.	Eliminate the term “re-use” from the last sentence of this paragraph.	The term “re-use” has a specific connotation per AC 20-148. The use of the term “re-use” in this paragraph is not consistent with AC 20-148.	Change sentence to “... modifications to legacy system software or usage of unmodified legacy system software.”	Accepted.
ANM-130L	Page 3, Table 1	Table 1 appears to facilitate possible redundant efforts and non-compliance as well.	1) Since both the source code and the executable object code are developed for the same software, it may be acceptable to use one of them only—preferably source code.  2) Treating the software “Design Description” as part of a type design may not align with the type design definition of §21.31.		Not accepted. 1) The source code may not always result in identical executable object code depending on the compiler used, or settings on the compiler. Since the development environment is not identified in the table, both source code and EOC must be identified.  2) Design Description is included in DO-178C, section 9.4.
ASW-111	Page 4 Figure 1 – Legacy System Software Process Flow Chart	Related to 1 <sup>st</sup> comment.  When introducing new technologies in legacy systems we will need to include the MBD in addition to OOT and Formal Methods when stepping up to DO-178C.	Harmonization and Completeness	In flowchart – 7.b.(5)(a) change to:  <i>Will MBD, OOT or Formal Methods be introduced during the changes?</i>  Include the acronym MBD as part of flowchart	Accepted.
ANE-150	Page 4 Figure 1	There are 3 blocks all labeled 7.b.(1). Should these be relabeled 7.b.(1).a, 7.b.(1).b, and 7.b.(1).c or something to distinguish the steps? Same with the two blocks labeled 7.b.(2) and 7.b.(3).	Not sure this suggestion is necessary.		Not accepted. The blocks are addressed in same paragraph. It would not be practical to break out the paragraphs into subparagraphs to match the flow chart.

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ANE-150	Page 4 Figure 1, 7.b.(1)	For the software, OPRs are to be evaluated from when, just during the DO-178b certification period? What about OPRs entered during the Service time period? Perhaps the software is part of a TSO and there are OPRs which were generated after software installation?	Not sure when the applicants have to evaluate the OPRs. Are these just OPRs created during the DO-178b process or could these include OPRs generated after installation? If the latter, how would the applicant obtain the OPRs? With legacy software, there may be important OPRs created during operations with the legacy software.		The purpose of figure 1 is to show the steps that a developer needs to go through if they want to use software that they previously used in another project using a version prior to DO-178C. 7.b.1 shows that they need to evaluate, among other things, OPRs. OPRs would be generated during the previous development or in service. Since they are the developer, they should have all OPRs in their PR system.
ANE-150	Page 4 Figure 1	Could the chart of Figure 1 be a little over simplistic? What if changes to the code changed more than 50% of the original legacy code? What if the changes modified more than 90% of the legacy code. Some of our applicants would claim the code was still considered legacy code even though more than 90% of it might be new. This comment is targeted toward 7.b.(5).	Some applicants may force new functionality into legacy code modules to avoid new policy and guidance requirements. If 90% of the code is changing, it is really most likely a completely new development effort.		Applicants have the option of using a version prior to DO-178C. Given Order 8110.49 and all the issue papers that have been developed for DO-178B and earlier, applicants will not be avoiding new policy and guidance requirements unless they will be using one of the supplements or a new tool. If they are using a technology that is now covered in a supplement, they can propose to continue to use the process that they have established.
ANM-111	Page 4, Figure 1, box 7.b.(2)	Min4: Uses undefined term "development assurance level"	Incorrect	Change to "software level"	Accepted. changed to: "Establish that the DO-178/DO-178A software level satisfies the required software level." Also changed table 2 to: "Software Level Required by the Safety Assessment."

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ANM-111	Page 4, Figure 1, Acronym box	Min5: Should be made smaller or relocated for better clarity	Editorial	Make acronym box smaller or relocate.	Accepted. Made acronym box smaller and relocated.
ANM-111	Page 4, Figure 1, decision 7.b.(5)(a)	MBD4: Missing if MBD will be used.	Missing condition for if MBD will be used for the change.	Add “MBD,” to the decision.	Accepted.
ANM-100D	P. 4 Figure 1 P.5 ¶ 7.b (3)	Current placement of this check seems to assume the code is OK and did not need to be modified to upgrade software to acceptable level.	Code may need to be changed if the software level is not acceptable. If so, it doesn’t seem appropriate to use original approval as acceptable approval basis.	Reword to include code modifications that may have been required to upgrade software to acceptable level.	Not accepted. The text and the flow chart clearly show that if the software is modified, then it has to be evaluated according to the steps on the right side of the flow chart.
ANM-111	Page 4, Figure 1 boxes 7.b.(2)b. and 7.b.(2)a.	MAJ7: Unclear if upgrade would need to include upgrade to DO-330 and/or any supplements as applicable.	Its unclear if the upgrade would need to include the guidance for qualifying tools or if other techniques are used, and then the applicable supplement(s) would need to be applied to the upgrade.	Should a baseline upgrade include DO-330, -331, -332 or -333 if applicable?	Added “and applicable supplements” to block 7.b.(2)(a). Paragraph 9 of the AC explains when DO-330 should be applied. Paragraph 1.c. was added as a blanket statement: “References to use of DO-178C in this AC include use of supplements and DO-330 as applicable.” Also, DO-178C, paragraph 1.4.o. states that supplements should be used if its use is acceptable to the certification authority. If modifications to software introduce MBD, OOT, or

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					FM, then DO-178C is required, including applicable supplements. If upgrading DO-178B, upgrade can be done using DO-178B (no supplements required).
ANM-111	Page 5, bullet / (1) (very top of page)	<p>“If the software has safety-related service difficulties, airworthiness directives, or has open problem reports that have a safety impact on the proposed installation, it should not be used in a <b>new project</b> without correcting the known software and development process deficiencies.”</p> <p>The term “new project” used above needs to be defined or somehow explained.</p>	<p>This is the only place (using Word search) that the term “new project” is used. Given the amount of reuse in software development, this term is not very descriptive. Even when the term is changed to “new aircraft certification programs,” this still is confusing if a system being installed on that new aircraft is a derivative of an existing system used on another already certified aircraft. There is also the possibility of going in the other direction, i.e., a completely new aircraft system being installed in an already certified aircraft. We would want that new system to be done to DO-178C, I would assume. So, just changing this term to “new aircraft certification program” doesn’t comply cover our desires. Also, although this is covered in another section, it is unclear as to whether this term should also say anything about TSO articles.</p> <p>I can foresee much confusion about this term if left as is.</p>	<p>Unfortunately, I have no good suggestions. Perhaps it would be better to address this from purely a software perspective rather than what the software is going to be installed in. Even then, we might have a problem, as my current understanding is that there are very few complex software programs that are started completely from scratch these days. Therefore, those types of systems could fall under the banner of the “legacy systems” discussed in a previous section.</p> <p>Suggest changing “new project” with “new or modified system.”</p>	Partially accepted. Changed to “...it should not be modified or re-used in a different product without correcting the known software and development process deficiencies.”
AIR-500	Paragraph 7b(5)(a) – (d), Page 6	Incorrect format.		All text on the second line or below in the paragraph needs to be returned to the left margin.	Accepted.

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ACE-119W	Page 5, Paragraph 7b(2)	Change “to satisfy Level C and D” to “acceptable for DO-178B (or DO-178C) Level C and D”	The objective is to provide acceptable		Accepted with modification. Changed to “...can be considered to satisfy DO-178B or DO-178C software levels C and D.”
ACE-119W	Page 5, Paragraph 7b(2), item b	Delete “DO-178B or” from “baseline using DO-178B or DO-178C,”			Not accepted. The intent is to allow continued use of DO-178B, or upgrade using DO-178C.
ASW-150	Page 5, Paragraph 7.b.2.b	Table 2 should be changed.	Table 2 is confusing	I can’t suggest a change because I am not sure whether check marks are a one-to-one comparison or a cumulative comparison. For example, if a part was developed with Level 1 and Level 2 software, does table 2 find it acceptable to use only level C.	Your interpretation is based on going from DO-178B to DO-178/DO-178A, which is backwards from what the table does. For example, if the installation requires Level C software, then Level 1 or Level 2 DO-178/DO-178A software could be used. If the installation requires Level B, then Level 1 software would be needed.
ASW-111	Page 6 Section 7. Modifying and Re-using DO-178, DO-178A, or DO-178B Software (5) (a)	Related to 1 <sup>st</sup> comment. Correct to include DO-331 MBD supplement  <i>(a) The techniques described in the DO-332 (except those in Appendix OO.D.1) and DO-333 are not introduced during the modification;</i>	Harmonization and Completeness	Change section (5) (a) with the following:  <i>(a) The techniques described in the DO-331, DO-332 (except those in Appendix OO.D.1) and DO-333 are not introduced during the modification</i>	Accepted.

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ANM-111	Page 6, bullet 7.b.(5)a.	MBD5: Missing DO-331 for MBD.	Completeness	Add "DO-331, "	Accepted.
ACE-114	Page 6, Paragraph 7.b.(5)(d)	The term referred to by the phrase "parameter data item files" is not defined in this AC nor is its source referenced.	The term is not a widely recognized or standard term outside of its use in DO-178C.	Change "...Parameter data item files are not..." to "Parameter data item files (as defined in DO-178C) are not..."	Accepted.
ANM-111	Page 6, bullet (c)	Need comma after e.g. e.g. autocode generator		Correct usage is e.g., autocode generator as in For example, autocode generator	Not applicable; removed per comment below.
ANM-111	Page 6, bullet (d)	Confusing use of parenthetical statement within the following sentence.  Parameter data item files are not introduced during the modification (Modifications can be made to existing parameter data item files during the modification).	The sentence ends with a period after the close parenthesis, but the sentence within the parenthesis starts with a capital letter, which is confusing and probably not per grammatical standards. The parenthetical statements within sentences should be a continuation of the main thought of the sentence, not a complete sentence unto itself. Plus, I am very confused about what the exact meaning of this entire sentence is, as the two parts seem to contradict each other.	Make this into two separate sentences and clarify the intent of the parenthetical part of that sentence.	Deleted the second sentence.
AIR-120	Page 6, bullet (d)	Disagree with this change. "Parameter data items (as defined in DO-178C) are not introduced during modification of the system."	New parameter data items may be introduced and I would not see a need to change to DO-178C if parameter data files/config files were done under 178, 178A, 178B	Change to: "Parameter data item files (as defined in DO-178C) are not introduced during modification of the system.	Accepted.

Commenter	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
ANM-111	Page 6, bullet 7.b.(5)c.	Min6: Uses obsolete tool terminology “development tool” and “verification tool” and does not consider “Criteria 2” tools.	Correctness/completeness	Change to: “For legacy software developed using DO-178 or DO-178A, no new software tools are used.”	Accepted.
ANM-111	Page 4, Figure 1, 7.b.(6)	MAJ8: DO-178C Section 12.1.4 does not consider how the supplements should be applied to legacy system software.	Clarify	Add clarification for if supplements as applicable would be applied for legacy system software.	Accepted. Added “.and applicable supplements” to flow chart and text.
ACE-117C	Page 5, Figure 1, 8.b.(2)(a)	The word "level" is missing in the statement block 8.b.(2)(a) of the flow chart.	Missing word.	Change to: "Upgrade software <u>level</u> using DO-178C, Section 12.1.4"	Not accepted. If the previous software was developed to DO-178/DO-178A and the software level is inadequate, the entire software baseline, not just the level, needs to be upgraded using DO-178C, Section 12.1.4. Both paragraphs revised to: “Upgrade software baseline using.....” to be consistent with the respective paragraphs.
ANM-111	Page 6, bullet 7.b.(6)	MAJ9: Only looks at satisfying DO-178C guidance and does not address technology supplements.	Completeness	Change to “You may declare your entire software as having satisfied DO-178C if all software changes and your processes and procedures, including tool qualification, satisfy <u>the DO-178C guidance, and any applicable guidance of the supplements.</u> ”	Partially accepted. Changed to: “You may declare your entire software as having satisfied DO-178C if all software changes and your processes and procedures, including tool qualification, satisfy DO-178C, DO-330, and supplements, as applicable.”

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ANM-130L	Page 6, Paragraph 7b(6)	The second sentence stated : <i>“You may declare your entire software as having satisfied DO-178C if all software changes and your processes and procedures, including tool qualification satisfy DO-178C.”</i>  Do we really want to identify the modified legacy software as compliant with DO-178C without identifying more specific upgrade criteria in terms of DO-178C objectives?	After showing compliance of legacy software with less than the majority of DO-178C objectives or lines of code, software developers may request FAA approval of their upgraded legacy software as DO-178C compliant.		We wanted to make it easier for an applicant to declare DO-178C compliance without quantifying a percentage of code (which is sometimes abused). This is to encourage applicants to convert their processes to DO-178C and start making changes in accordance with DO-178C.
AIR-500	Paragraph 7d, Page 6	Missing period.		Place a period at the end of the following word “modification”.	Accepted. There already is a period at the end of the sentence.
ANM-111	Page 6, par. 8.	Min7: “must be shown to” is somewhat vague.	Ambiguous	Change to: “All changes to software must <u>comply</u> with the applicable airworthiness regulations.”	Accepted.
ANM-100B	Page 6 Para 8	Similar to the comment of para 3 sentence 2, DO-178C 12.1 by itself is inadequate to assess change impact. There is no mention of Order 8110.49 Chapter 11 Change Impact Analysis for additional guidance.	Omission of Order 8110.49 can be misconstrued to mean the order is not applicable to change impact.	Add subparagraph stating the certification authorities may use Order 8110.49 Chapter 11 to evaluate the data produced as a result of DO-178C chapter 12.1 activities.	Partially accepted. The AC should be limited to guidance for the applicant, and we cannot refer to an order for applicant guidance. However, this group of comments on the CIA paragraphs suggests that it would be prudent to elaborate on the CIA analyses, since DO-178C only mentions some of the analyses described in Order 8110.49, chapter 11.
ANM-100B	Page 6 Para 8a	Documenting how modifications to software components and associated life cycle data affect the changed components and related components and life cycle data is not sufficient.	The system requirement traceability analysis and the change affects to the system and airplane should also be included to identify the areas that could be affected by the software change. This includes the analysis of affected system requirements, design, function,	Add sentence that change impact process is approved by certification authority using Order 8110.49 Chapter 11.	

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			architecture, etc.		Therefore, the paragraphs on CIA have been strengthened by adding the types of analyses listed in Order 8110.49.
ANM-130L	Page 6 Paragraph 8b	<p>This item stated, “Conduct a change impact analysis to determine the potential impact of the change(s) on continued operational safety of the aircraft on which the system and software components are installed.”</p> <p>Do we really want to limit the CIA applicability to the type certificated airplanes only?</p>	What this sentence means to me is that any changes to the baselined-software do not need to conduct change impact analysis if it is embedded in airborne systems that are undergoing new type certification programs.		Accepted. Changed to: “Conduct a change impact analysis to determine the potential impact of the change(s) on continued operational safety of the aircraft on which the system and software components are to be installed, ...”
AIR-500	Paragraph 8b, c, Page 6	The term “change impact analysis” has already been defined.		Use the acronym “CIA”.	Accepted.
AIR-500	Paragraph 8c, Page 6	Define the term first for “SAS”.		Use the acronyms “SAS” after the first usage.	Accepted.
ACE-114	Page 6, Paragraph 8.c	The last sentence should be changed.	The current wording order makes it somewhat confusing to read, specifically “...life cycle data as a result of the changes available...”	<p>Change sentence to:</p> <p>“Make any modified or regenerated software life cycle data resulting from the changes available to the FAA when requested.”</p>	Accepted.

Commenter	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
ANM-100B	Page 6 Para 8c	The statement “document your process for change impact analysis” is ambiguous.	There is a wide range of thought on what is adequate for documenting a change impact analysis process. For Boeing Aviation Safety Oversight Office (BASOO) it has taken much effort to establish that Order 8110.49 Chapter 11 is the minimum threshold for evaluating a change impact process.	Add sentence that change impact process may be assessed by certification authority using Order 8110.49 Chapter 11.	Partially accepted. It is not appropriate to give instructions in an AC for an ASI on where to find information for assessing an applicant’s submittal, such as an order. The AC should be limited to guidance for the applicant. However, this group of comments on the CIA paragraphs suggests that it would be prudent to elaborate on the CIA analyses, since DO-178C only mentions some of the analyses described in Order 8110.49, chapter 11. Therefore, the paragraphs on CIA have been strengthened by adding the types of analyses listed in Order 8110.49.
ANM-100B	Page 6 Para 8c	The statement “summarize the results of the analysis in the SAS” is ambiguous and contradicts statements in Order 8110.49 Chapter 11 that requires a preliminary summary of change impact in the PSAC (or other document) and a final summary in the SAS (or other document).	There is a wide range of thought on what is adequate for summarizing and submitting change impact. Establishing Order 8110.49 as supplemental guidance will promote safety by requiring specific change data not identified in DO-178C. For example, impact of change on safety related requirements and operational characteristics.	Add sentence that extent of change impact summary may be assessed by certification authority using Order 8110.49 Chapter 11.	Partially accepted. The AC should be limited to guidance for the applicant, and we cannot refer to an order for applicant guidance. Additionally, we have revised the draft AC to include a listing of analyses from Order 8110.49, chapter 11.
ANM-111	Page 6, bullet 8.b.	MAJ10: JS: A software change could affect the electromagnetic susceptibility and emissions of equipment in which the changed software is installed.	Per Dave Walen, EM Interference CSTA, presentation a software change could impact EMC and RF characteristics of the system.	In section 8.b. add text as shown: “Conduct a change impact analysis to determine the potential impact of the change(s) on continued operational safety of the aircraft on which the system and software components are installed and on the environmental qualification (e.g., radio frequency susceptibility and emissions of radio	Partially accepted. A listing of the types of analyses for CIA was added to the CIA paragraph, and “Environmental qualification analysis (e.g., radio frequency susceptibility and emissions of radio frequency energy)” was included in the

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				frequency energy) of the system where the software change is installed.”	list.
ANM-130L	Page 6, Paragraph 8d	<p>This paragraph stated, “Conduct re-verification of the modified software build as indicated by the CIA.”</p> <p>While re-verification assures the applicant developed the software right, re-validation assures that it developed the right software.</p>	For evaluation completeness, re-validation (as necessary) should be included in the referenced section.		Not accepted. Order 8110.49 Chg 1, chapter 11, has been used in the past to provide guidance for conducting a CIA. Revalidation is not addressed in this guidance. Validation is generally not considered part of the software life cycle processes. DO-178C refers to validation only in the context of system processes.
ANM-100B	Page 6 Para 8d	The statement is ambiguous in the context of 8a, 8b, and 8c.	A change impact analysis performed without the minimum standard of Order 8110.49 will not yield useful re-verification.	Add a sentence that re-verification may be assessed by the certification authority using Order 8110.49 Chapter 11.	Partially accepted. We cannot refer to the order in an AC. The following sentence was added to alleviate the ambiguity: “The CIA should determine the extent of the changes, the impact of those changes, and what verification is required to ensure that the modified software performs its intended function and continues to comply with the identified means of compliance.”

Commenter	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
ANM-111	Page 6, par. 9	Is this the correct use of the term “section” when talking about an AC?  For legacy systems with DO-178B software involving tool qualification or use of legacy tools on current DO-178C projects, the following sections provide guidance.	The “sections that the referenced sentence talks about appear to be the following 9.a, 9.b., 9.c., etc. I would have thought those would be referred to as paragraphs, not sections. Sections seem to refer to something larger than what is being referred to here. It may be a small point, but we don’t want anyone to get the incorrect impression this sentence refers to the main sections or chapters following 9, i.e., 10 and 11.	Possibly check with a technical writer or consult the style guide for AC’s to see how the first sub-division underneath the main chapters are referred to.	Accepted. Order 1320.46C, <i>Advisory Circular System</i> , paragraph 6, states to organize the AC into paragraphs and subparagraphs. If the AC is long, you may need to use chapters and sections to group major blocks of material.
ASW-150	Page 7, Section 9, Table 3	Please add definitions for Tool Criteria 1, 2 & 3.	Since the Tool Criteria are new to DO178C, it is hard to understand what is meant by Tool Criteria 1, 2 & 3.	Add definitions of what is meant by Tool Criteria 1, 2 & 3.	Partially accepted. Made reference to DO-178C, section 12.2.2, along with table 12-1. Your comment seems to be requesting more elaboration than just definitions of criteria 1-3. We are trying to keep the AC streamlined with just the information necessary to establish correlation between DO-178B software level and TQL.
ANM-111	Page 6, par. 9. first sentence	Min8: “DO-178 Section 12 and DO-330” is a plural subject.	Grammar	Change “is” to “are”	Partially Accepted. Changed to: “DO-178C, section 12.2, and DO-330 <u>provide</u> an acceptable method for tool qualification.”
ANM-111	Page 6, bullet 9.a. 3rd sentence	Min9: Uses obsolete terms: “development tool” and “verification tool” and does not consider “Criteria 2” tools.	Correctness	Restate as: “For a tool previously qualified to DO-178B <u>guidance</u> , use table 3 ...”	Not accepted. There are tools that have previously been qualified as development or verification tools. Carrying over those categorizations into the context used in the AC is appropriate.

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ANM-111	Page 7, bullets b. and c.	I am concerned (but not absolutely positive) that the language used in the section regarding tool qualification and reuse would allow unlimited reuse of a previously qualified tools on a multitude of programs without additional qualifications, which is something that has not been allowed up to now, per DO-178B. The sentences in question are: “b. Development tools previously qualified to DO-178B section 12.2 may be used for software that needs to satisfy DO-178C, provided: ...” “c. Verification tools previously qualified to DO-178B section 12.2 may be used for software that needs to satisfy DO-178C, provided: ...”	It would seem that the only reason that a tool that was qualified to 178B and is now going to be used for software that uses 178C is the fact that it will be a new development program. I do not ever envision a scenario where there is this transition between 178B and 178C without having it a new development program. But the language in the highlighted portions of the sentences in Comment column seems to indicate that if the constraints of 1), 2) and 3) in each of the paragraphs have not changed, then software developers are free to use the tool per the previous qualification on new programs without any additional steps.		Accepted. Changed to: “b. If a development tool was previously qualified using DO-178B, you may continue to use the DO-178B qualification process for a DO-178C project, provided that: ...” “c. If a verification tool was previously qualified using DO-178B, you may continue to use the DO-178B qualification process for a DO-178C project, provided that: ...”
ANM-111	Page 7, bullet 9.b.(3)	Min10: Terminology isn't quite right.	Correctness	Change to: “The DO-178B software level assigned to the tool is the same level or higher (e.g., level A is higher than <u>TQL 2</u> ) as the DO-178C <u>TQL</u> .”	Accepted, but with the following change: “The DO-178B software level assigned to the tool correlates with or exceeds the required TQL established by DO-178C.”
ANM-100D	P. 7 ¶ 9.c.	Grammatical error	Grammatical error	Change “If any of these conditions are ...” to “If any of these conditions is ...”	Accepted.
AIR-500	Paragraph 9b, c, Page 7	Missing comma.		Place comma after “DO-178B”, and “12.2”.	Accepted.

Commenter	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
AIR-500	Paragraph 9b, c (3), 2 <sup>nd</sup> sentence, and 3 <sup>rd</sup> sentence. Page 7	Missing punctuation.		Needs label.	Accepted.
ANM-111	Page 7, bullet 9.d.	Min11: Missing “system”	Correctness	Change to “legacy <u>system</u> software”	Accepted.
ASW-111	Page 8, Tool Qualification (new section 10)	Tool Qual section applies to DO-178C projects and DO-178B legacy projects. Paragraphs 10 b. and c are confusing.	Not sure if these applied to DO-178B projects. If they do apply to legacy projects, they would contradict with 10.d.	Add some text to unambiguously state that 10.b. and 10.c. apply to DO-178C projects.	Accepted. Modified text as follows: <b>b.</b> If a development tool was previously qualified using DO-178B, you may continue to use the DO-178B qualification process for a DO-178C project, provided that:  <b>c.</b> If a verification tool was previously qualified using DO-178B, you may continue to use the DO-178B qualification process for a DO-178C project, provided that:  <b>d.</b> For a DO-178B project, DO-178B, section 12.2, can be used for qualifying new or modified tools in support of modifications to DO-178B legacy system software.

Commenter	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
ASW-111	Page 8 Old Section 10 – Use of Supplements	Refer to first comment	Harmonization	<p>In Section 10 change and include the following:</p> <p><b>Use of Supplements.</b> <i>You may use supplements DO-331, DO-332, and DO-333 to address issues related to the use of certain software development techniques. Use supplements in conjunction with DO-178C; they are not to be used separately.</i></p> <p><b>a.</b> When using the guidance of DO-331 for certification projects utilizing model-based development techniques, if some credit is being proposed for any objectives from the use of model simulation (<i>e.g. verifiability objectives that are normally detectable through reviews and analysis but may be detected using simulation</i>) then justification for that credit should be provided and objectives MB.14, MB.15 and MB.16 for table MB.A-4 are required and MB.8, MB.9, and MB.10 for table MB.A-3 are required as appropriate for the credit being claimed.</p>	Partially Accepted. Recommendation modified during comment adjudication as follows: “When applying DO-331, you cannot use model simulation to satisfy review and analysis objectives as described in section MB.6.8.1, unless you show that errors detected by simulation would include all errors that could be detected by review and analysis. You should also identify which objectives you propose to satisfy using model simulation.”
ANM-111	Page 8, bullet 10.a.	MBD6: Missing article; also this statement may lead to a non-harmonized position with other CA.	Grammar	Change to: “... guidance of DO-178C without <u>the</u> use of the supplement RTCA DO-331 ...”	Not accepted. Paragraph 10.a has been completely rewritten and allows the use of DO-331.
ACE-117C	Page 8, Paragraph 10 Use of Supplements	The last sentence of the paragraph states: “Use supplements in conjunction with DO-178C; they are not to be used separately.” The first question I had from a reviewer was, “Can the supplements be used with DO-178B?” Although this section implies that the supplements can only be used with DO-	Clarification. Emphasize that the supplements can only be used with DO-178C at the beginning of the paragraph.	<p>Replace the first paragraph with:</p> <p>“Supplements must be used in conjunction with DO-178C; they are not to be used separately or with earlier versions of DO-178. You may use supplements DO-332 and DO-333 to address issues related to the use of</p>	Accepted. Restated as: “...they are not to be used separately or with versions prior to DO-178C.”

Commenter	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
		178C, it could be clearer.		certain software development techniques. Additional supplements may be recognized in the future.”	
ANM-111	Page 8, par. 10. 3 <sup>rd</sup> sentence	Min12: Remove “;” add “as”	Grammar	Change to: “Use supplements in conjunction with DO-178C <u>as</u> they are not to be used separately.”	Not accepted. The sentence was rewritten and broken up into two separate sentences: “Supplements add, delete, or modify objectives, activities, and life cycle data in DO-178C and therefore should be used only in conjunction with DO-178C. The supplements are not to be used separately or with versions prior to DO-178C.”
ANE-150	Section 10.a	Does this section need to suggest that applicants contact their FAA project managers to initiate an Issue Paper?	Maybe the use of Issue Papers is obvious and does not need to be suggested?		Not accepted. Paragraph 10.a has been completely rewritten and allows the use of DO-331.
ANM-100D	P. 8 ¶ 10.a.	Incomplete phrase	Incomplete phrase	Add “of compliance” to the end of the paragraph.	Not accepted. Paragraph 10.a has been completely rewritten and allows the use of DO-331.
ANM-130L	Page 8, Paragraph 10.a	Clarification of the intent of this paragraph is necessary.	The paragraph seems to say it's okay to use some verification technique other than DO-331 for software developed using model-based techniques, but then in the last sentence DO-331 is again referenced.		Not accepted. Paragraph 10.a has been completely rewritten and allows the use of DO-331.

Commenter	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
ANM-111	Page 8, bullet 10.c.(2)	Min13: It is important to know which components are developed to different objectives and guidance.	Completeness	Change to: “How the applicable DO-178C objectives and those added or modified by the supplements will be applied, which objectives apply to <u>which</u> software <u>components</u> , and how all applicable objectives will be satisfied.”	Accepted.
ANM-111	Page 8, bullet 10.d.(2)	Min14: It is important to know which parts of the tools were developed to other guidance.	Completeness	Change to: “How the applicable DO-330 objectives and those added or modified by the supplements will be applied, which objectives apply to <u>which components of each</u> software tool, and how all applicable objectives will be satisfied.”	Accepted.
AIR-500	Paragraph 10c, 2 <sup>nd</sup> sentence, Page 8	Define the term first for “PSAC”.		Use the acronyms “PSAC” after the first usage.	Accepted.
ANM-100B	Page 8 Para 10a	This paragraph, taken together with paragraph 3, implies that DO-178C, as a standalone document, is sufficient for model based development.	DO-178C by itself does not provide sufficient guidance for model based development. Issue papers are still needed to supplement the guidance of DO-178C.	Add a statement that issue papers applied to DO-178B may also be applied to DO-178C where model based development is anticipated.	Not accepted. Paragraph 10.a has been completely rewritten and allows the use of DO-331.
AIR-500	Paragraph 10c, 2 <sup>nd</sup> sentence, Page 8	Define the term first for “PSAC”.		Use the acronyms “PSAC” after the first usage.	Accepted.

<b>Commenter</b>	<b>Page &amp; Paragraph</b>	<b>Comment</b>	<b>Rationale for Comment</b>	<b>Recommendation</b>	<b>Disposition</b>
AIR-500	Paragraph 11a, Page 8	Change wording.		Delete the word "Title". Add the word "parts" after "CFR".	Accepted.
AIR-500	Paragraph 11b, Page 8	Change wording.		Rewrite to read "FAA ACs".	Accepted.
AIR-500	Paragraph 11b (3), Page 9	Missing comma.		Place a comma after the reference "AC 20-174".	Accepted.
ANM-100D	P. 8 ¶ 11.b.(3)	Punctuation	Punctuation	Add comma after "AC 20-174"	Accepted.
ANM-111	Page 9, bullet c.	Min15: Missing reference to ARP 4761 for SSA methods.	Completeness	Add reference to SAE ARP 4761 and title.	Not accepted. ARP4754A determines the required software assurance level (feeds directly to the SW process). ARP4761 provides guidelines and methods for conducting the safety assessment and does not feed directly to the software development process.

Commenter	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
AIR-500	Paragraph c, Page 9	Improper punctuation.		Remove the period after the word "Documents".	There is no period after Documents. I think the commenter meant to replace the colons with periods in 11 b & c
AIR-500	Paragraph 11c (2), (3), Page 9	Missing period.		Place a period after the dates "1982", and "1985".	Not accepted, but change (No... to (no....
AIR-500	Paragraph 12 (a), (c), Page 10	Missing comma.		Place a comma after the zip codes "15096-0001", and "15250-7954".	Accepted.
AIR-500	Paragraph 12 (a), (b), (c), Page 10	Improper punctuation.		Capitalize the letter "t" at the beginning of the word "telephone".	"T" is capitalized. I think they mean to make them small "t"s.
AIR-500	Paragraph 12d, 1 <sup>st</sup> sentence, Page 10	Outdated information.	We do not print or stock orders or ACs anymore. The electronic distribution is the only form of distribution that we have.	Remove the distribution center address and add the FAA Orders and ACs website to this paragraph: <a href="http://www.faa.gov/regulations_policies/orders_notices/">http://www.faa.gov/regulations_policies/orders_notices/</a> and <a href="http://www.faa.gov/regulations_policies/advisory_circulars/">http://www.faa.gov/regulations_policies/advisory_circulars/</a>	Accepted.

Commenter	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
ANM-100D	P. 10 ¶ 12.c.	Wrong URL used.	<ol style="list-style-type: none"> <li>1. The website has changed and the instructions are no longer valid.</li> <li>2. The <a href="http://www.access.gpo.gov">www.access.gpo.gov</a> portal is difficult to navigate &amp; is not the most direct access to the Bookstore.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace “You can also order copies online ...” with “You can also order copies online from <a href="http://www.bookstore.gpo.gov">www.bookstore.gpo.gov</a>.”</li> <li>2. Delete the last two sentences (page navigation).</li> </ol>	Not accepted. Change made in accordance with comment from AIR-500 (see comment above).