**Disposition for Public Comments**

**Policy PS-ANM-25-08,** Application of AC 20-170, *Integrated Modular Avionics Development, Verification, Integration, and Approval Using RTCA/DO-297 and Technical Standard Order-C153*.

| | Comment | Requested Change | Rationale | Disposition |
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| **1.** | **Commenter:** Marty Gasiorowski, Worldwide Certification Services<br><br>Summary: There are quite a few part 23 airplanes and helicopters with IMA systems. Is it possible to make the applicability broader? | | | The FAA agrees that some part 23 aircraft have IMA systems. However, this is a part 25 policy statement and therefore does not include policy for part 23, 27 or 29 aircraft. See the disposition of comment 18 for more detailed information.<br><br>We did not make any changes in regard to this comment. |
| **2.** | **Commenter:** Marty Gasiorowski, Worldwide Certification Services<br><br>Summary: There are non-avionics "IMA" systems. I suggest either explaining that this applies to any aircraft systems (not just avionics). | | | The FAA agrees. We revised paragraph 2 of the "Policy" section to provide additional information. |
| **3.** | **Commenter:** Marty Gasiorowski, Worldwide Certification Services<br><br>Page 3, Policy, para. 4.d:<br><br>I suggest changing this to "which functional applications are hosted on and/or interface to." Whether the OS can be modified without affecting the hosted functions, or not, isn't really a factor. | | | This comment is no longer relevant. We revised Section 4 in response to comment 21. The revision suggested by this comment is not applicable to the new text. |

**Disposition for Public Comments**

**Policy PS-ANM-25-08,** Application of AC 20-170, *Integrated Modular Avionics Development, Verification, Integration, and Approval Using RTCA/DO-297 and Technical Standard Order-C153*.

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| **4.** | **Commenter:** Marty Gasiorowski, Worldwide Certification Services<br><br>Page 3, Policy, para. 4.f:<br><br>I recommend deleting this item. Although this type of preliminary system safety assessment is certainly required, it is something you do after you determine that you're an IMA, not as part of deciding if you're an IMA. | | | This comment is no longer relevant. We revised Section 4 in response to comment 21. The revision suggested by this comment is not applicable to the new text. |
| **5.** | **Commenter:** ANAC<br><br>Page 2, IMA system definition<br><br>"it contains enough ambiguity such that it does not provide a conclusive method of establishing if a complex, airborne system is or is not an IMA."<br><br>What is the intent to refer to the word "complex" when referring to an IMA? This seems to conflict with AC 20-170, item 1-5.c, that states "This AC should be used as an acceptable means of compliance for IMA systems that: (2) Are simple IMA systems as well as complex IMA systems". This same comment is valid to other parts of this policy that use the word "complex" when referring to an IMA. | | | The FAA agrees. We deleted "complex" when referring to IMA systems.<br><br>Note: However, we did not delete all instances of "complex." We used "complex" when discussing complex systems in general, not solely the application of the policy for an IMA system. We felt that retaining these instances was correct, as the use is generic in nature and the fact that the number of complex systems being identified as an IMA system will vastly outnumber those simple systems identified as |

| | Comment | Requested Change | Rationale | Disposition |
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| | | | | an IMA. |
| **6.** | **Commenter:** ANAC<br>Page 3, Attributes of an IMA System.<br>"b. Robustly partitioned *functionality*, usually of varying criticalities and assurance levels."<br>By "functionality" here, is it implied that the scope continues to be "aircraft level functions"? This is important due to the fact that a great number of line-replaceable units (LRUs) that use software/airborne electronic hardware have partitioning means for lower level system/item functions, such as command/monitoring functions that often have different assurance levels also. I understand that it is not the intention of this policy to characterize all those LRUs as being IMA. | | | This comment is no longer relevant. We revised Section 4 in response to comment 21. The revision suggested by this comment is not applicable to the new text. |
| **7.** | **Commenter:** ANAC<br>Page 3, Attributes of an IMA System.<br>"e. A dedicated data network—either internal to an electronics cabinet/rack or one that connects physically separated components—that allows data to be exchanged between multiple system components."<br>This item may apply for various kinds of systems whose components communicate | | | This comment is no longer relevant. We revised Section 4 in response to comment 21. The revision suggested by this comment is not applicable to the new text. |

| | Comment | Requested Change | Rationale | Disposition |
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| | through a dedicated data network (e.g., a dedicated air data system that uses a data network to provide communication between the air data computer and the individual smart probes). Is the intent of this policy to guide certification programs to apply AC 20-170 in all these cases or shouldn't it refer only to data networks that integrate data from multiple *aircraft* functions? | | | |
| **8.** | **Commenter:** ANAC<br><br>Page 3, Relevancy of Guidance.<br><br>"c. Contains any attribute(s) listed in paragraph 4 that indicates the system may be an IMA."<br><br>The paragraph 4 above states that the list provided "is not intended to be a checklist that provides a definitive 'yes' or 'no' answer (…)". However, this item c in paragraph 5 seems to consider that any attribute above, if present in the system, will drive the applicability of AC 20-170. If the IMA attributes were not strictly defined in paragraph 4 ("Applicants should use this list as a reference"), then I would suggest to modify the text here just to be clear on how the paragraph 4 is to be considered. Furthermore, I recognize the difficulties in having objective criteria to define an IMA | | | The FAA agrees. We revised this section to clarify that the key characteristics are not a checklist and that engineering judgment is required. |

| | Comment | Requested Change | Rationale | Disposition |
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| | (and the applicability of AC 20-170). | | | |
| **9.** | **Commenter:** ANAC<br><br>Page 4, "5. Relevancy of the Guidance Contained in AC 20-170."<br><br>"This is also true for previously certified part 25 aircraft that are undergoing a major update to their airborne systems."<br><br>In the case of IMA systems approved even before AC 20-145 (e.g., Honeywell Primus Epic), is the intent of FAA to request the applicants to comply with AC 20-170?<br><br>What would be a "major update" in this case (e.g., any major change according to the Change Impact Analysis process)?<br><br>For applicants that are using AC 20-145 (e.g., EMB-550/545), is it expected that they show compliance with AC 20-170 at a given time? | | | The FAA partially agrees.<br><br>It is beyond the scope of this proposed part 25 policy statement to identify the transition between the now-canceled AC 20-145 and the recently published AC 20-170. However, we revised the language in the draft policy statement in an attempt to make it more clear about when an applicant should consider when the guidance in AC 20-170 is relevant to their project, and what their course of action is if an applicant intends to propose an alternative means of compliance other than the guidance contained in AC 20-170. This would include applicants and suppliers who were previously using now-canceled AC 20-145.<br><br>Defining major updates to airborne systems is beyond the scope of this policy. |

**Disposition for Public Comments**

**Policy PS-ANM-25-08,** Application of AC 20-170, *Integrated Modular Avionics Development, Verification, Integration, and Approval Using RTCA/DO-297 and Technical Standard Order-C153*.

| | Comment | Requested Change | Rationale | Disposition |
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| **10.** | **Commenter:** ANAC<br><br>Page 4, "5. Relevancy of the Guidance Contained in AC 20-170."<br><br>"The guidance contained in AC 20-170 and RTCA/DO-297 is relevant to all components and network interconnections that comprise the airborne system, and not only to selected components."<br><br>Due to high level of integration and huge amount of information exchange between systems in modern aircraft, a strict interpretation of this sentence may render any LRU connecting to the IMA platform as being subjected to demonstrate compliance per AC 20-170. This is especially true for other aircraft units connecting to a remote data concentrator. Since ARP4754A defined system as a combination of inter-related items to perform a specific function(s), this would include both complex and simple LRUs required for that function. This approach may not be practicable (maybe not even be feasible). For instance, one should not expect that AC 20-170 should be applied to any sensor feeding data to the integrated platform. Attachment D of DO-297 provides an example for identifying bounds of a distributed complex IMA system, to | | | The FAA agrees. We revised the text to make it clear that it is not referring to network connections to other aircraft systems, only within the IMA system. |

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| | which AC 20-170 would be applicable. Due to the above comments, it seems to me that stating "AC 20-170 and DO-297 are relevant to all components" may be a too strong guidance. | | | |
| **11.** | **Commenter:** Cessna<br>The FAA Transport Airplane Directorate elected to issue a Policy Memo that clarifies how to use and apply an AC that already contains a section which states how to use and apply itself. The Policy Memo is applicable to only part 25 aircraft, and the additional definitions and criteria could be applied to part 23, 27, 29… | The FAA should consider a revision to the AC rather than a Policy Memo. | | The FAA does not agree. Part of the intent of this part 25 policy statement was to bring the decision branch for the applicability of AC 20-170 outside of RTCA/DO-297. This policy statement will highlight the issue of the relevancy of the guidance material of AC 20-170 and RTCA/DO-297 without having to get into the details of DO-297 first.<br><br>See the disposition of comment 18 for additional information. |
| **12.** | **Commenter:** Cessna<br><br>Page 4, para. 5:<br><br>"Given that most newly developed part 25 transport aircraft are equipped with IMA systems, applicants should assume that AC 20-170 does apply to a project if there is a question about whether a certain system is | Retract this policy and revise the AC if needed to clarify applicability of the AC/DO-297 for systems that are IMA. That clarification should not expand the definition of IMA without some type of rulemaking/justification activity. | | The FAA partially agrees.<br><br>We do not agree to retract the policy. We disagree that this policy overrules any previous criteria and declares all modern part 25 avionics suites as IMA. |

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| | an IMA. This is also true for previously certified part 25 aircraft that are undergoing a major update to their airborne systems. The guidance contained in AC 20-170 and RTCA/DO-297 is relevant to all components and network interconnections that comprise the airborne system, and not only to selected components"<br><br>This language appears to simply overrule any previous criteria and declare all modern part 25 avionics suites as IMA. The FAA has not provided here or elsewhere adequate justification for adding significant cost and complexity to the certification of part 25 avionics system types currently accepted as non-IMA systems. | | | We are not expanding the definition of an IMA system. We are attempting to clarify that definition so that both part 25 applicants and the FAA understand when the guidance of AC 20-170 is relevant to any particular program.<br><br>We revised this section in response to this and comments from others. See the disposition of comments 19 and 21 for more detailed information. |
| **13.** | **Commenter:** Dassault Aviation<br><br>§ 4 "Attributes of an IMA System"<br>"b. robustly partitioned functionality, usually of varying criticalities and assurance levels" | Suggest clarifying "implemented on shared resources."<br><br>Is word "functionality" to be understood as "functionalities"? | | This comment is no longer applicable. We have completely revised this section. See disposition of comment 21 for further details. |
| **14.** | **Commenter:** Dassault Aviation<br><br>§ 4 "Attributes of an IMA System"<br><br>"f. a PSSA that identifies failure modes of shared resources that have the ability to affect multiple aircraft functions." | The sentence should be clarified. Some common causes can be shared by several functions different from IMA. | | This comment is no longer applicable. We have completely revised this section. See disposition of comment 21 for further details. |
| **15.** | **Commenter:** Airbus | | | The FAA does not agree. |

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| | Comment | Requested Change | Rationale | Disposition |
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| | Airbus provided the FAA with comments on draft AC20-170, *Integrated Modular Avionics Development, Verification, Integration and Approval Using RTCA DO-297 and Technical Standard Order-C153*, through memo ref. M10029167, sent on July 27, 2010.<br><br>In this memo, Airbus commented that it regretted that past and recent concurrent experiences of Airbus and the FAA on IMA certification were not considered for the writing of the AC whereas the alternative Airbus methodology has shown it was providing an adequate level of safety. Airbus added that this methodology, also designated "incremental certification", was based on the following principles: independent qualification of the IMA components, taken benefit of components qualification in the Modular system certification process. In addition, Airbus commented that constraints put by DO-297 on module supplier role are far less stringent than the pre-qualification credit objectives reached by application of Airbus "incremental certification" process on A380.<br><br>Airbus notes that this FAA PS-ANM-25-08 aims at describing when the guidance of | | | This comment is primarily about AC 20-170 and not this part 25 policy statement. The formal disposition to that previous Airbus comment on AC 20-170 is included here.<br><br>*The FAA does not agree. The purpose of this AC is to recognize DO-297, which is an industry standard and one in which the commenter was involved in producing, as an acceptable means of compliance. The FAA is not obligated to include an additional means of compliance that has been negotiated between EASA and their applicants, even if that approach has been found to be acceptable to the FAA. Applicants are free to propose an alternative means of compliance to DO-297.*<br><br>That disposition is still valid.<br><br>We did not change the |

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| | AC20-170 is relevant to a particular certification program and should be applied. Therefore, comments and position done by Airbus on AC20-170 remain valid. Airbus also notes that this policy states that if an applicant does not choose to use the guidance in AC20-170, it should address the issues regarding compliance for IMA systems that are covered in AC20-170 and the applicant should be prepared to document this proposed approach with an issue paper. | | | policy in regard to this comment. |
| **16.** | **Commenter:** Airbus<br><br>This policy had the objective to provide criteria and resources to help applicants and aircraft certification offices to determine if the guidance in AC20-170 is applicable, meaning to refine/clarify criteria to determine when a complex airborne system is an IMA. Instead of that, this policy seems to widen the list of these criteria: indeed, when reviewing list of IMA attributes, such as currently defined in §4, Air-bus deems that several airborne systems could meet one of these criteria.<br><br>§5 “Relevancy of the Guidance Contained in AC20-170” of this policy states that “the guidance pro-vided in AC20-170 should be considered to be an acceptable means of compliance if an airborne sys-tem in | | | The FAA partially agrees. We have completely revised this section. See disposition of comment 21 for further details.<br><br>The comment is correct that the examples they provide could indeed fall into the definition of an IMA system, and therefore, the guidance of AC 20-170 is applicable. That is the intent of this policy statement. |

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| | question meets any of the following criteria :<br>- fits the definition of an IMA in §2<br>- resembles one or more of the examples of Annex D of RTCA/DO-297 in §3<br>- contains any attribute(s) listed in §4 that indicates the system may be an IMA"<br><br>Understanding of this sentence ("meets any of the following criteria") is that, if an airborne system meets one of the attributes listed in §4, the guidance provided in AC20-170 should be considered to be an acceptable means of compliance. Therefore, several airborne systems, like AFDX network as per 4e) and Class 3 EFB as per 4d) could fall into this IMA definition.<br><br>Therefore, wording should be clarified in §4 and §5 to say that an IMA could have one of the attributes defined in §4 but these attributes should not be used as the only criteria to define/determine when a complex airborne system is an IMA, as it seems to be currently specified in §5. | | | |
| **17.** | **Commenter:** Garmin<br><br>Review period of 30 days is not consistent with FAA Order 8100.16 paragraph 2-6 on Required Coordination for policy statements. It staters, "The standard period | Extend the public comment period to 60 days. | | The FAA agrees. The 30-day comment period was incorrect. We extended the deadline for comments another 30 days. |

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| | for public comment is 60 calendar days, unless otherwise required." | | | |
| **18.** | **Commenter:** Garmin<br><br>Page 1, "Summary"<br><br>"This policy statement describes FAA Transport Airplane Directorate certification policy on when the guidance of AC 20-170, *Integrated Modular Avionics Development, Verification, Integration, and Approval Using RTCA/DO-297 and Technical Standard Order-C153*, is relevant to a particular certification program and should be applied." | Issuing this policy statement from the Transport Airplane Directorate sets a poor precedent because AC 20-170 includes references to part 21, 23, 25, 27, 29, and 33 regulations. | If there is truly a need for a policy statement clarifying when AC 20-170 is to be used, such policy should be initiated and published by AIR-120 on its cover page.<br><br>This policy should also be coordinated with the other FAA organizations responsible for the regulations referenced within AC 20-170 to ensure (1) that there is truly a need for such policy, and (2) the policy is harmonized as to its application across CFR parts as it could impact avionics that are designed for installation on more than one CFR part. | The FAA does not agree. This part 25 policy statement has been closely coordinated with AIR-120, which is responsible for AC 20-170. As discussed in previous comment dispositions, the FAA recognizes that this issue is applicable across parts. However, the FAA issued the policy through TAD as it was the most expedient method to get the policy published for part 25.<br><br>Additionally, each directorate has the responsibility to determine issues and priorities of those issues at it relates to the aircraft types or engines, and pursue resolutions to those issues.<br><br>We did not change the policy in regard to this comment. |
| **19.** | **Commenter:** Garmin | The draft policy statement does not accomplish the goal | As the policy statement is ineffective in | The FAA disagrees that this policy statement "does not |

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| | Page 1, "Summary"<br><br>"This policy statement is necessary because of the wide range of complex, highly integrated systems that could be referred to by an applicant as an integrated modular avionics (IMA) system. This policy statement provides criteria and resources to help applicants and aircraft certification offices determine if the guidance in AC 20-170 is applicable, regardless of how the system is referred to or what name it has been given." | of "help[ing] applicants … determine if the guidance in AC 20-170 is applicable".<br><br>Specific examples of the ineffectiveness of this policy statement in accomplishing its goal are provided in other Garmin comments. | accomplishing its goal, it should not be published or should be considered for another public comment period after it is revised to address the substantive issues identified in these comments. | accomplish the goal of helping applicants determine the applicability of AC 20-170." The FAA's intent is to bring visibility to this issue of relevancy of AC 20-170.<br><br>As many of the comments received against this proposed policy statement highlight, the answer as to what is and is not an IMA is a subjective decision using engineering experience and judgment. An "IMA" is just a name for a particular subset of the highly integrated, highly capable systems that are being installed on today's aircraft. There may always be disagreements over what is and is not an IMA system, and in the future, this issue is likely to become more pronounced, not less, given how industry is continually innovating and developing newer, more cost effective, and more capable aircraft systems. AC 20-170 and RTCA/DO-297 provide a |

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| | | | | specific method of compliance for those systems.<br><br>DO-297 was produced by SC-200, an industry group. This acceptable method of compliance to the regulations was adopted by the FAA after SC-200 recommended this approach.<br><br>In addition, if an applicant chooses not to adopt the guidance contained in AC 20-170 as their method of compliance for a highly capable, highly integrated system, it still must be able to show compliance to the regulations. It is not a question of "follow AC 20-170 and DO-297, or don't do anything." Applicants are required to show compliance to the regulations. Therefore, if an applicant does not choose to follow the guidance in this AC, they must propose an alternative method. |

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| | | | | Additionally, the FAA recently issued AC 20-174, which recognizes SAE ARP 4754A as an acceptable means of compliance for aircraft systems. This document addresses many of the same issues as is identified by RTCA/DO-297. Therefore, regardless of whether or not an applicant adopts AC 20-170, they will still be required to address the issues covered in this guidance material. Although following this guidance material is not mandatory, it may be easier and more straightforward for an applicant to choose this method rather than come up with its own. |
| **20.** | **Commenter:** Garmin<br><br>Page 1, "Current Regulatory and Advisory Material"<br><br>"However, applicants and developers of large, complex avionics and aircraft systems may decide that the system they are developing and installing on an aircraft is not an IMA without consulting the | The need for this policy statement appears to be based on the premise that "applicants and developers of large, complex avionics and aircraft systems," which are subject to a myriad of FAA and foreign certification authority regulations, policy, and guidance, would not also | As it is far more likely that applicants and developers *are* familiar with IMA guidance and have made a conscious choice regarding its applicability to their system, the stated need for this policy statement seems inconsistent with | The FAA agrees. We revised the wording. |

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| | existing guidance. Therefore, based solely on how they refer to their airborne systems, applicants may erroneously believe that this guidance is not relevant." | be familiar with the guidance in AC 20-170 and RTCA/DO-297 and have made a conscious choice regarding the applicability of IMA guidance to their system. | industry practice.<br>Either delete the quoted statements or modify them to provide an accurate assessment of the familiarity of applicants and developers with IMA-related guidance. | |
| **21.** | **Commenter:** Garmin<br><br>Page 2, "Background"<br><br>"However, technology has advanced since those first-generation IMA systems. There are many variations, large and small, on the possible system architectures of an IMA. As a result, these systems may not resemble those first-generation IMA systems. AC 20-145 no longer fully addressed the issues encountered during the development, verification, and installation of increasingly complex IMA systems. AC 20-170 is intended to address these additional issues.<br><br>"The purpose of this policy is to help applicants determine when the guidance contained in AC 20-170 is relevant to their complex airborne systems." | The policy statement, and AC 20-170, does not acknowledge key foundational characteristics of IMA defined in RTCA/DO-297 Tables 1 and 2. Consequently, the effect of this policy is to broaden the definition of IMA beyond the original intent of RTCA Special Committee 200 and RTCA/DO-297.<br><br>As will be noted in other Garmin comments, the definitions provided within this policy are so broad that they would encompass equipment certified by the FAA decades ago.<br><br>FAA Order 8100.16 paragraph 2-2.d states | 1. To be consistent with the original intent of RTCA/DO-297, this policy statement should acknowledge the key foundational characteristics of IMA defined in RTCA/DO-297 Tables 1 and 2 so that the scope of affected equipment is appropriately limited. | The FAA agrees.<br><br>It was never the intent of this part 25 policy statement to broaden the definition of an IMA system. However, the definition and examples of IMA systems contained in DO-297 are considered by some to be either ambiguous or limited. The FAA determined another criterion was necessary, in part 25 applications, for determining when the guidance of AC 20-170 may be applicable. As noted above, this determination is driven by engineering judgment.<br><br>1. We revised the policy memo to use the key |

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| | | (emphasis added):<br><br>"Policy statements must not invalidate a method of compliance the FAA previously agreed to, unless –<br><br>"(1) It was accepted in error,<br>"(2) It is no longer in conformance with a change in the regulations, or<br>"(3) It no longer supports a finding of compliance; in which case, a justification should be included in the policy statement.<br><br>"When the policy statement contains a method of compliance that may be perceived as more stringent, the policy statement must make clear that the previously acceptable method is still acceptable."<br><br>This policy statement does not provide discussion of any of the three Order 8100.16 paragraph 2-2.d items regarding the perceived need to broaden the definition of | 2. If the scope of equipment affected by this policy is not limited per recommendation 1, then in accordance with FAA Order 8100.16 paragraph 2-2.d this policy must make clear that previously accepted methods regarding showing compliance via the other guidance referenced by AC 20-170 are sufficient and still applicable or provide justification as to why the previous method is no longer valid. | characteristics of IMA systems listed in tables 1 and 2 of DO-297 instead of having a separate list. This accomplishes the same objective as described above.<br><br>2. Recommendation 1 was accepted, so this comment is no longer relevant. |

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| | | IMA beyond the original intent of RTCA Special Committee 200 and RTCA/DO-297 and its consequent effect on previously certified equipment. This policy statement also does not make clear that that previously accepted methods regarding showing compliance via the other guidance referenced by AC 20-170 are sufficient and still applicable or provide justification as to why the previous method is no longer valid. | | |
| **22.** | **Commenter:** Garmin<br><br>Page 2, "Background"<br><br>"Please note that this policy does not make compliance to AC 20-170 mandatory. That AC, as with all ACs, documents one, but not the only, acceptable means of compliance to the applicable regulations. However, if applicants are not going to adopt the guidance contained in AC 20-170 as their acceptable means of compliance, then they should propose a method that addresses all the issues covered in that AC." | Per Policy item 5, the net effect of the quoted statements is that applicants will be left with the choice of:<br><br>• Adopting AC 20-170 with the expectation of providing compliance data associated with it,<br>• Providing FAA with supporting rationale as to why equipment is not IMA, which will be difficult due to the | 1. To be consistent with the original intent of RTCA/DO-297, this policy statement should acknowledge the key foundational characteristics of IMA defined in RTCA/DO-297 Tables 1 and 2 so that the scope of affected equipment is appropriately limited.<br><br>2. If the scope of | The FAA partially agrees. Please note that the first two of these recommendations, as well as much of the comment itself and background material, is identical to comment 21.<br><br>1. We revised the policy to use the key characteristics of IMA systems listed in tables 1 and 2 of DO-297 instead of having a separate list.<br><br>2. Recommendation 1 was |

| | Comment | Requested Change | Rationale | Disposition |
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| | | broadened definition of IMA and the Policy item 5 presumption that "most newly developed part 25 transport aircraft" and "previously certified part 25 aircraft that are undergoing a major update to their airborne systems" "are equipped with IMA systems", or<br>• Addressing "the issues regarding compliance for IMA systems" via an issue paper. Since the business case for avionics manufacturers relies on the ability to install integrated equipment on multiple aircraft models, it is probable they also would be repeatedly subjected to responding to the same issue paper on multiple installation projects.<br><br>In each of these cases, there is substantial overhead to both the applicant and the FAA without measurable safety benefit because with | equipment affected by this policy is not limited per recommendation 1, then in accordance with Order 8100.16 paragraph 2-2.d this policy must make clear that previously accepted methods regarding showing compliance via the other guidance referenced by AC 20-170 are sufficient and still applicable or provide justification as to why the previous method is no longer valid.<br><br>3. If there is AC 20-170 guidance that is not already addressed by other guidance and standards and that is more broadly applicable to non-IMA avionics that FAA believes should be addressed by an applicant, then this | accepted, so this comment is no longer relevant.<br><br>3. As noted in the disposition of comment 21, the FAA did not intend to expand the definition of an IMA. Recommendation 1 was accepted, so the FAA believes that this addresses this section of this particular comment. Also, see the disposition of comment 19 for additional information regarding methods of compliance for highly integrated airborne systems. |

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| | | the exception of:<br><br>• Those systems architectures with IMA platform key characteristics defined in RTCA/DO-297 Table 1 and applications designed to run on such IMA platforms with key characteristics defined in RTCA/DO-297 Table 2, and/or<br>• Those applicants that desire to obtain incremental certification credit for such system architectures<br><br>The guidance contained within AC 20-170 is not unique and is applicable to all types of avionics including:<br><br>• Single function LRUs<br>• Federated systems<br>• Integrated systems regardless of whether or not they are IMA architectures with key characteristics defined in RTCA/DO-297 Tables 1 | policy statement should point out that specific AC 20-170 guidance as being more broadly applicable, and only that guidance should be required to be addressed by an applicant when an integrated system does not meet the definition of IMA as appropriately limited by the recommended adjustments to Policy items 2, 3, and 4. Furthermore, FAA should plan to move that more broadly applicable guidance to one or more new ACs that, when published, will result in the cancellation of this policy. | |

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| | | and 2<br><br>For example, AC 20-170 references the following guidance that is applicable to all types of avionics:<br><br>• Software assurance is addressed by RTCA DO-178B, Order 8110.49, AC 20-115B, and AC 20-148<br>• AEH/CEH/SEH assurance is addressed by RTCA DO-254, Order 8110.110, and AC 20-152<br>• System safety assessment is addressed by SAE ARP 4754A, SAE ARP 4761, AC 25.1309-1, and AC 20-174<br>• Databus assurance is addressed by AC 20-156<br>• Configuration management including field loadable software / AEH are addressed by RTCA/DO-178B and Order 8110.49 including issues of aircraft and hardware applicability, intermixing software loads on redundant parts, | | |

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| | | electronic part marking, and post-installation checkout and record keeping<br>• Aircraft lightning and HIRF protection and other environmental qualification issues are addressed by AC 20-16G, AC 20-136A, AC 20-158, and RTCA DO-160D/E/F/G<br>• EWIS is addressed by AC 25.1701-1 | | |
| **23.** | **Commenter:** Garmin<br>Pages 2-3, Policy, "2. IMA System Definition"<br><br>"Applicants and system designers also must consider the architecture, functions, and components to determine if a complex, airborne system is or is not an IMA."<br>Per this policy's Attachment 1 the term "must" means "Refers to a regulatory requirement that is mandatory for design approval". | It is unclear what regulation requires "Applicants and system designers also must consider the architecture, functions, and components to determine if a complex, airborne system is or is not an IMA."<br><br>Furthermore, the use of the term "must" in the context of this policy statement's applicability to an applicant or system designer appears to contradict FAA Order 8100.16 paragraph 2-2.c, which quotes from OMB GGP, 72 FR 3432 as follows | Change "must" to "should" in this statement or clarify the regulatory basis for use of the term "must." | The FAA agrees. |

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| | | (emphasis added):<br><br>"Each guidance document should not include mandatory language such as ''shall,'' ''must,'' ''required'' or ''requirement,'' unless the agency is using these words to describe a statutory or regulatory requirement, or the language is addressed to agency staff and will not foreclose agency consideration of positions advanced by affected private parties. …" | | |
| **24.** | **Commenter:** Garmin<br><br>Page 3, Policy, "3. Examples of an IMA System"<br><br>Includes the statements:<br><br>To aid in the effort of providing a more definitive way of establishing an IMA system, Annex D of RTCA/DO-297 provides several examples of possible architectures. Applicants should consult these examples to determine if a complex, airborne system is an IMA and, therefore, if the guidance material in AC 20-170 is relevant. | The policy statement, and AC 20-170, does not acknowledge key foundational characteristics of IMA defined in RTCA/DO-297 Tables 1 and 2. Consequently, the effect of this policy is to broaden the definition of IMA beyond the original intent of RTCA Special Committee 200 and RTCA/DO-297.<br><br>The policy statement also repeatedly uses the term "complex". It is unclear from | To be consistent with the original intent of RTCA/DO-297, this policy statement should acknowledge the key foundational characteristics of IMA defined in RTCA/DO-297 Tables 1 and 2 so that the scope of affected equipment is appropriately limited. | The FAA agrees. We revised paragraph 4 to point to tables 1 and 2, per comment 21.<br><br>Additionally, we removed the word "complex" in most instances, except where it makes sense, per a previous comment disposition. |

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| | | the context whether the use of the term "complex" is attempting to establish a boundary between the AC 20-170 1-5.c.(2) terms "simple IMA systems" and "complex IMA systems" and thus limit the scope of affected equipment. If so, this is not obvious nor is it helpful as AC 20-170 states:<br><br>These terms are purposely left undefined, because it is difficult to make a clear distinction between them. | | |
| **25.** | **Commenter:** Garmin 9.<br><br>Page 3, Policy, "4. Attributes of an IMA System"<br><br>"The following list provides some specific attributes that should also be used to determine the applicability of the guidance in AC 20 170. This list is not intended to be a checklist that provides a definitive "yes" or "no" answer to the question of whether any particular system is indeed an IMA. Applicants should use this list as a reference when attempting to determine when a complex airborne system is an IMA and, therefore, whether AC 20-170 and | Policy item 2, IMA System Definition raises the issue that the AC 20-170 and RTCA/DO-297 IMA definition " contains enough ambiguity such that it does not provide a conclusive method of establishing if a complex, airborne system is or is not an IMA."<br><br>While the Policy item 4, "Attributes of an IMA System," appears to be meant to help remove this ambiguity, it does not | 1. To resolve the ambiguity of what is and what is not IMA, and to be consistent with the original intent of RTCA/DO-297, this policy statement should acknowledge the key foundational characteristics of IMA defined in RTCA/DO-297 Tables 1 and 2, as being prerequisites to the Policy item 4 | The FAA partially agrees.<br><br>Note that the recommendations in this comment are identical to comment 22 from Garmin.<br><br>See disposition of comment 22. |

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| | RTCA/DO-297 are applicable." | accomplish that goal. For example, if the following equipment were introduced today, each of these would be considered IMA by this policy:<br><br>• Communication Management Units (CMU)<br>• Flight Management Systems (FMS)<br>• Primary Flight Displays (PFD)<br>• Multi-Function Displays (MFD)<br>• Mode S transponders that also support ADS-B Out<br>• Audio panels that include marker beacon<br>• Data concentrators<br><br>As a more specific example, consider the panel mount Garmin GNS 430, certified in 1998, which has 6 TSO functions for GPS, COM transmit, COM receive, VOR, LOC, and GS plus MFD capabilities for moving map, traffic display, and data link weather display. The | attributes so that the scope of affected equipment is appropriately limited.<br><br>Additionally, this policy statement should provide examples of attributes that are not IMA.<br><br>2. If the scope of equipment affected by this policy is not limited per recommendation 1, then in accordance with FAA Order 8100.16 paragraph 2-2.d this policy must make clear that previously accepted methods regarding showing compliance via the other guidance referenced by AC 20-170 are sufficient and still applicable or provide justification as to why the previous | |

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| | | GNS 430 and its derivatives are broadly installed in part 25, as well as parts 23, 27, and 29 aircraft (over 116,500 units worldwide). The GNS 430 does not have the key foundational characteristics of IMA defined in RTCA/DO-297 Tables 1 and 2 but it does have Policy item 4 Attributes a, c, d, e, and f. Consequently, the effect of this policy as currently written would be to subject the GNS 430 and similar equipment that is installed in part 25 aircraft to significant additional certification burden without measurable safety benefit.<br><br>In fact, the NARCO Superhomer, certified in 1955, which included COM transmit, COM receive, VOR, LOC, and marker beacon – 5 TSO functions before the com transmit and com receive TSOs were combined; 4 TSO functions with today's TSOs –would be considered IMA by this | method is no longer valid.<br><br>3. If there is AC 20-170 guidance that is not already addressed by other guidance and standards and that is more broadly applicable to non-IMA avionics that FAA believes should be addressed by an applicant, then this policy statement should point out that specific AC 20-170 guidance as being more broadly applicable, and only that guidance should be required to be addressed by an applicant when an integrated system does not meet the definition of IMA as appropriately limited by the recommended adjustments to Policy items 2, 3, and 4. Furthermore, FAA | |

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| | | policy if it were developed at any time since the 1990s. Similarly, the 1950s/1960s-era Skycrafter Superphone, ARC C-77C, King KX-100, and Bendix M-450 COM/NAV systems, would be considered IMA if developed at any time since the 1990s.<br><br>Examples of the Policy item 4 attributes that are applicable to the preceding examples and the guidance that already addresses these attributes include:<br><br>• Attribute list item e: Dedicated data networks connecting "physically separated components that—allows data to be exchanged between multiple system components" are the primary method of communication between federated system components that have been certified since the 1980s. Many of these | should plan to move that more broadly applicable guidance to one or more new ACs that, when published, will result in the cancellation of this policy. | |

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| | | federated components have other Policy item 4 attributes that would result in them being considered IMA by Policy item 5.<br>• Attribute list items a, b, c, f: RTCA/DO-178B, whose publication predates RTCA/DO-297 and other IMA guidance by over a decade, addresses multiple functions that share computing resources (item a), partitioned functionality of varying criticalities (item b), shared I/O resources between functions (item c), and safety assessment of shared resources as follows:<br>o 11.1.b requirement for a PSAC to describe "the software functions with emphasis on the proposed safety and partitioning concepts, for example, resource sharing, redundancy, …, fault tolerance, and timing and scheduling | | |

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| | | strategies",<br>o 11.20.b requirement for a SAS to describe "the software functions with emphasis on the safety and partitioning concepts", and<br>o 6.4.3.a Requirements-Based Hardware/Software Integration Testing considerations for testing execution time requirements, data bus and other resource contention problems, memory management hardware control, and software partition violations.<br>• <u>Attribute list item d:</u> RTCA/DO-178B also addresses system architectures and/or capabilities to be "revised or updated without affecting the hosted aircraft functions" as follows:<br>o RTCA/DO-178B 2.5 System Design Considerations for | | |

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| | | Field-Loadable Software",<br>o RTCA/DO-178B 11.1.g requirement for a PSAC to describe "field-loadable software",<br>o RTCA/DO-178B 6.4.3.a Requirements-Based Hardware/Software Integration Testing considerations for testing correctness and compatibility of field-loadable software<br>Order 8110.49 Chapter 5 provides additional guidance on Approval of Field-Loadable Software (FLS). | | |
| **26.** | **Commenter:** Garmin<br><br>Page 3-4, Policy, "5. Relevancy of the Guidance Contained in AC 20-170"<br><br>"The guidance provided in AC 20-170 is relevant and should be considered to be an acceptable means of compliance if an airborne system in question meets any of the following criteria: | Given that:<br><br>a. Policy item 2 admits that the existing definition of IMA is ambiguous,<br>b. Policy item 3 does not acknowledge key foundational characteristics of IMA defined in RTCA/DO-297 Tables 1 and 2, and | 1. Address the issues previously noted for Policy items 2, 3 and 4 per the recommendations to limit the scope of affected equipment to the original intent of RTCA/DO-297.<br><br>2. Adjust Policy item 5 | The FAA partially agrees.<br><br>1. We revised paragraph 4 revised to point to tables 1 and 2, as stated previously.<br><br>2. We deleted this sentence.<br><br>3. Note, this recommendation is identical to that in comment 22. See |

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| | a. Fits the definition of an IMA in paragraph 2,<br>b. Resembles one or more of the examples of Annex D of RTCA/DO-297 in paragraph 3, or<br>c. Contains any attribute(s) listed in paragraph 4 that indicates the system may be an IMA.<br><br>"Given that most newly developed part 25 transport aircraft are equipped with IMA systems, applicants should assume that AC 20-170 does apply to a project if there is a question about whether a certain system is an IMA. This is also true for previously certified part 25 aircraft that are undergoing a major update to their airborne systems.<br><br>"It is not the name that an applicant gives to an airborne system that matters. What matters are the issues that are involved in showing compliance to the regulations when certain architectural attributes are present in an airborne system. Therefore, if an applicant believes that the guidance contained in AC 20-170 is not relevant to their system, the applicant is still responsible for providing the FAA with supporting rationale.<br><br>"As stated previously in paragraph 1, this policy statement does not require an | c. Certified equipment with attributes consistent with those listed in Policy item 4 predates the publication of this policy and RTCA/DO-297<br><br>it would be hard to disagree with the Policy's problematic conclusion that "most newly developed part 25 transport aircraft" and "previously certified part 25 aircraft that are undergoing a major update to their airborne systems" "are equipped with IMA systems". Indeed, by these definitions it would be difficult for any equipment certified in the last few decades not to be considered an IMA system and thus difficult for an applicant to "provid[e] the FAA with supporting rationale" as to why equipment is not IMA.<br><br>As noted in previous comments, this policy statement does not acknowledge that the guidance contained within | so that it does not presume that "most newly developed part 25 transport aircraft" and "previously certified part 25 aircraft that are undergoing a major update to their airborne systems" "are equipped with IMA systems".<br><br>3. If there is AC 20-170 guidance that is not already addressed by other guidance and standards and that is more broadly applicable to non-IMA avionics that FAA believes should be addressed by an applicant, then this policy statement should point out that specific AC 20-170 guidance as being more broadly applicable, and only that guidance should be required to be | disposition of that comment for details. |

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| | applicant to adopt the specific guidance in AC 20-170. If an applicant does not choose to use the guidance in AC 20-170 to show compliance, then it should address the issues regarding compliance for IMA systems that are covered in AC 20-170. The applicant should be prepared to document this proposed approach with an issue paper." | AC 20-170 addresses issues that are already addressed by other guidance with the exception of:<br><br>• Those systems architectures with IMA platform key characteristics defined in RTCA/DO-297 Table 1 and applications designed to run on such IMA platforms with key characteristics defined in RTCA/DO-297 Table 2, and/or<br>• Those applicants that desire to obtain incremental certification credit for such system architectures | addressed by an applicant when an integrated system does not meet the definition of IMA as appropriately limited by the recommended adjustments to Policy items 2, 3, and 4. Furthermore, FAA should plan to move that more broadly applicable guidance to one or more new ACs that, when published, will result in the cancellation of this policy. | |
| **27.** | **Commenter:** Garmin<br><br>Page 4, "Effect of Policy"<br><br>"The general policy stated in this document does not constitute a new regulation. Agency employees and their designees and delegations must not depart from this policy statement without appropriate justification and concurrence from the FAA management that issued this policy | For the past few years, FAA, industry, and now Congress, have been concerned with streamlining equipment certification to support NextGen modernization as evidenced by:<br><br>• *NextGen Mid-Term Implementation Task Force Report* (Appendix | Due to the substantive issues identified with this policy statement, it should not be published or should be considered for another public comment period after it is revised to address the identified issues per the recommendations. | The FAA disagrees. See dispositions of Garmin comments 18 and 19 for details that address this comment. |

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| | statement. The authority to deviate from this policy statement is delegated to the Transport Standards Staff Manager." | K, Area 4), RTCA, Inc. 2009<br>• *FAA Modernization and Reform Act of 2012* (Section 312)<br>• *A Report from the Aircraft Certification Process Review and Reform Aviation Rulemaking Committee to the Federal Aviation Administration: Recommendations on the Assessment of the Certification and Approval Process*, May 22, 2012 (entire report)<br><br>As currently written, the effect of this policy broadens the definition of IMA to the point that most, if not all, avionics will be considered IMA, resulting in additional certification overhead to both the applicant and the FAA without measurable safety benefit: This is inconsistent with the need to streamline certification. | | |