DOCUMENT COMMENT LOG

Originating Office:	**Document Description:**	**Project Lead:**	**Reviewing Office:**	**Date of Review:**
AIR-130	AC 20-XXX, AIRWORTHINESS APPROVAL OF ATTITUDE HEADING REFERENCE SYSTEM (AHRS) EQUIPMENT	Sheila I. Mariano	**Chicago ACO; Wichita ACO; and ACE-110, ANE-150, ASW-112, ASW-150, AIR-100CSTA, AIR-500, ANM-100**	12/24/2013

Commenter	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
1. W.Witzig ANE-150	General comment	Recommend clarifying whether or not the holder of TSO-C201 would also be required to hold other TSOs for flight instruments, such as TSO-C3e, TSO-CC4c, TSO-C5F, and/or TSO-C6e.	My assumption is that only one TSO would be required. TSO-C201 would apply to non-gimbaled, solid state instruments and TSO-C4c would apply to gimbaled instruments; however, this not stated in this AC or the TSO.	Include a statement in the background that clarifies whether a TSO-C201 primary flight installation would also need to have a TSOA for as TSO-C3e, TSO-CC4c, TSO-C5F, and/or TSO-C6e.	**Partially Accepted.** Agree with comment to clarify the intent of TSO-C201, but disagree with recommendation. TSO-C201 does not replace those TSOs, but should be used for systems that use RLG, MEMS and FOG to derive the attitude and heading solutions. Changes were incorporated in section 1.3.
2. R. Sova ACE-114	Page 1, Para. 1.1, Sentence 2	This sentence incorrectly lists items, which merely represent parameters of an aircraft's physical state as "functions."	Functions are performable via either hardware, software, or human component action, not mere nouns. For example, identifying "attitude" alone does not refer to an actionable function, however, the **sensing** of	Change the sentence to (used *italics text* for additions): "TSO-C201 includes performance standards for attitude, heading, bank, turn, slip and skid *sensing, computation, and indication* functions."	**Accepted.** Function might not be the right word. Replaced word with systems vs. function. Change reflected in para 1.1. Purpose.

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			pitch/ roll/yaw angles and the **computation** and/or **indication of these"** (displayed separately or combined as Attitude) are all true functions.		
3. Brady ACE-111	Page 1 Paragraph 1.1	List of documents: AC 20-167 AC23-26 AC 25.1329-1B These ACs do not add anything to the scope of this AC but industry documents need to be added such as RTCA DO-334		Delete AC 20-167 AC 23-26 AC 25.1329-1B Add RTCA DO-334	**Not Accepted.** There is a great deal of airworthiness certification guidance for attitude, heading, and other instruments already written. The list of AC's in Para 1.1 is intended to highlight the fact this AC supplements existing guidance, versus replacing or repeating it. We do not reference RTCA DO-334 in this list, because the RTCA standard forms the basis of TSO-C201 and provides design criteria for AHRS articles versus installation or airworthiness guidance. RTCA DO-334 is a standard referenced in TSO-C201. However, removed reference to AC23-26, it is superseded by AC20-167.

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4. R. Sova ACE-114	Page 1, Para. 1.1, List of ACs	Although RTCA DO-178B and DO-254 are included in the AHRS TSO-C201 and other ACs that are referenced in this AC (e.g., AC 23.1309-1E), neither DO's invoking AC is included in this list.	To avoid these DOs being overlooked, it might be wise to include their invoking ACs in this list.	For completeness, add these DO invoking ACs to the beginning of the list: "AC 20-115C, *Airborne Software Assurance,"* "AC 20-152, *RTCA, Inc., Document RTCA/DO-254, Design Assurance Guidance for Airborne Electronic Hardware,*"	**Not Accepted.** The software and AEH evaluation for the TSO'd article will be completed during the TSO process, not the installation/airworthiness process. The installer won't be developing software or AEH for the TSO-C201 article. Furthermore, the previous list of ACs focused on referencing existing guidance versus repeating or replacing it.
5. Dunford ANM-111	Pg 1	There is a whole list of advisory circulars listed, but no regulations. Assuming this AC provides a means of compliance, there must be a set of rules to which this compliance applies.	If there are no rules to list, then presumably the applicant could ignore this AC with no consequences, since an AC, alone, is not mandatory. Also, the absence of specific regulatory references increases the likelihood that this AC will be overlooked.	Provide at least the part 25 rules for which this AC is intended to provide guidance	**Accepted.** Added a new section – Related Regulations for part 23, 25, 27 and 29.

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6. REJ AIR-100 CSTA	Page 1, Paragraph 1.1d	Reference to AC 23-26 is incorrect	AC23-6 was cancelled by AC 20-167, which is listed as reference (a)	Remove reference(c) AC 23-26	**Accepted.** Removed reference.
7. Mahmood Shah ASW-150	Page 1, Paragraph 1.1d	I could not find listed AC 23-26 on FAA RGL "AC 23-26, synthetic vision and pathway depiction on the primary flight display" m) Explain FAA RGL listed AC 29-2C, Change 1-3 incorporated & this document call only Change 1		g) correct the title of AC 25-7C Flight Test Guide Certification of Transport Category Airplanes.	**Accepted.** Removed reference and added changes.
8. Dunford ANM-111	Pg 1 1.1 h)	AC 25-11B is soon ready for publication. Recommend watching for this update when it comes time to publish this AC.	See Comment	Change AC 25-11A to AC 25-11B	**Comment Noted.** All AC refer to the latest versions.
9. Roell ACE-117W	Page 1, Paragraph 1.1, 4th line	"bank" is redundant.	"bank" is a subset of attitude.	Delete "bank".	**Accepted.** Changes are reflected in the document.

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10. Witzig ANE-150	Page 1 Para 1.3	This AC makes no distinction as to the type of technology used in an AHRS. This will cause difficulty in applying to projects.	The Rotorcraft Directorate makes a distinction between MEMS and RLG AHRS- they have imposed different cert requirements by issue paper. TSO-C201 and DO-334 both state that their cert requirements apply to any "non-gimbaled"s sensor.	At a minimum, clarify the terminology or state (as DO-334 and TSO C201) that the guidance applies to all non-gimbaled sensors.	**Accepted.** Changes are reflected in 1.1 Purpose and 1.3 Background Para.
11. Dunford ANM-111	Pg 1 1.3	In line 1, change "we" to "the FAA".	This would be an official FAA publication, not a personal letter.	See comment	**Not Accepted.** This is plain language.
12. ACE-117C	Pg. 2, Para 2.	Clarity.	Clarity.	End second sentence after "errors in the attitude function". Capitalize the word "Flux" to start next sentence.	**Accepted.** Corrected in the referenced sentence.
13. Flores ACE-119W	Page 2, Para 2.1, 2.2	2.1 states "Evaluate internal aiding sources as part of the overall article's intended function evaluation." And 2.2 states "external	Suggested change for consistency.	Suggest adding the same phrase of 2.2 to 2.1 unless internal aiding is always part of the TSO approval.	**Accepted.** Clarified Para 2.1, so that internal aiding is evaluated through the TSO process.

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		aiding sources not qualified as part of the TSO C201 article's design approval." Suggest adding the same phrase to 2.1 unless internal aiding is always part of the TSO approval.			
14. Andy Shaw ASW-112	Page 2 Para 2.1	Most AHRS installations are used for "separate applications" particularly the remote LRU type. They typically feed attitude indicators, autopilots, Terrain and Traffic systems.	Understanding the internal aiding sources failure modes and their effects on the AHRS reliability and availability may be needed, Depending on the criticality of the information and what it's being used for.	Change the second sentence to: "A separate airworthiness evaluation of an aiding source, such as GNSS, maybe required, depending on what the data from the AHRS is used for. Such as Attitude display, Autopilot/SAS stability, terrain awareness, or surveillance.	**Partially Accepted.** Sentence was deleted based on other comments. The paragraph has been changed.
15. ACE-117C	Pg. 2, Para 2.2	Grammar	Grammar	Change "Sources" to "Source".	**Accepted.** Revised accordingly.
16. R. Sova ACE-114	Page 2, Para. 2.2.1	This section does not use the correct terminology of the RTCA DO's (i.e., DO-178B, and DO-254 which are referenced in the associated AHRS	For correctness and completeness, per DO-178B and DO-254 respectively, the proper terminology to use is "software level" and "electronic hardware	Change the paragraph **to** (used ~~strikethrough text~~ for deletion and *italics text* for additions): **"2.2.1 External Aiding Source Performance.** When the AHRS requires an external	**Accepted.** Revised accordingly.

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		TSO-C201) when addressing the software and electronic hardware levels. It also omits the word "electronic" thus implying the "design assurance" requirement applies to a far broader scope than intended.	design assurance."	aiding source, ensure the aiding source installed in the aircraft provides the appropriate accuracy, integrity, availability, ~~and~~ software level, *and electronic* hardware design assurance."	
17. C. Helgeson, ANM-160S, x6528	Page 2, paragraph 2.2.2	The "appropriateness of the annunciation & pilot action" should be operationally relevant to minimize effects on flightcrew workload; should be clear, unambiguous, and timely; should only be indicated while the condition exists; should be consistently located in a specific area of the electronic display; & be located in the flightcrew's primary field of view when immediate flightcrew awareness is required.	If flightcrew action is expected to cope with the effect of a failure condition (degraded mode / performance), the information available to the flightcrew should be useable for detection of the failure condition & to initiate corrective action.	Suggest including another sentence after 'Conduct ground & flight testing as necessary to ensure appropriateness of the annunciation & pilot action.' Any annunciations should be operationally relevant to minimize flightcrew workload; should be clear, unambiguous, & timely; should only be indicated while the condition exists; should be consistently located in a specific area of the electronic display; & be located in the flightcrew's primary field of view when immediate flightcrew awareness is required.	**Accepted.** Revised accordingly.

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18. Flores ACE-119W	Page 2, Para 2.2.2, Page 3 Para 3.	Both these paragraphs make reference to failure conditions. Are these instead of the normal to xx.1309 system safety analysis?	Suggest change for clarification.	Suggest adding a reference to xx.1309 system safety analysis.	**Accepted.** Revised accordingly.
19. Brady ACE-111	Page 2 Paragraph 2.4.1	Being qualified to the TSO should not be the criteria to interface with the AHRS	A TSO GNSS may or may not provide the needed inputs to a specific AHRS unit as a reference look at the ADS-B AC which outlines details that must be considered outside of the TSO	Delete the reference to the TSO re-write to: When interfacing the AHRS to an external GNSS, ensure the external GNSS provides the needed inputs with the appropriate accuracy, integrity, availability, and software and hardware design assurance.	**Accepted.** If the GNSS meets the listed TSO, than they are qualified interfaces to the AHRS with the performance and integrity needed for an AHRS. The actual interfaces used for installation should still be demonstrated to check for any installation anomalies.
20. ACE-117C	Pgs. 2 to 3, Para 2.4 to 2.7	Renumber sections.	Missing section 2.3	Renumber sections 2.4, 2.4.1, 2.4.2, 2.4.3 through 2.7 to 2.3, 2.3.1, 2.3.2, 2.3.3 through 2.6	**Accepted.** Changed numbers accordingly.
21. ACE-114 R. Hirt	Page 3 Paragraph 2.4.2	Clarification – re-phrase the 3rd, 4th, 5th, 6th sentences where it isn't the overall "GNSS" is being evaluated, only the aircraft GNSS source data.	Clarification	Recommend to add the red-inked to the following sentences – 3rd – "…you should ensure the GNSS source data meets the minimum velocity accuracy requirement prescribed by the AHRS."	**Accepted.** Incorporated changes.

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				4th – "….ensure the GNSS source passes the velocity accuracy tests prescribed in AC 20-138C…" 5th – "Typically, the GNSS source equipment manufacturer will accomplish these GNSS tests." 6th – "You should ensure the velocity accuracy of the GNSS data is adequate for the AHRS you installed.".	
22. Brady ACE-111	Page 3 Paragraph 2.5	Similar to comment above	Similar to comment above	When interfacing the AHRS to an external ADC, ensure the ADC provides the needed inputs with the appropriate accuracy, integrity, availability, and software and hardware design assurance.	**Accepted.** The TSO is just an example of a certified source. Changes are reflected in the paragraph.
23. Andy Shaw ASW-112	Page 3 Para 2.5 and 2.6	Helicopters don't fly like airplanes. When pitot/static information is used to stabilize the AHRS solution, the rotorcraft directorate has seen significant problems with the information provided to the aircraft during helicopter specific maneuvers.	Whether or not the ADC or Pitot Static probes meet their respective TSO requirements does not help with the fact that any information derived from those systems was never meant to represent a helicopters attitude or heading,	Add this statement: "Operational rotorcraft maneuvers involve roll, pitch, and yaw rates that couple with translations in all directions to a stationary hover, which is entirely difference than fixed wing airplanes. AHRS performance may be adversely impacted by these differences when relying on the use of pitot/static information to help	**Accepted.** Added statements to the paragraphs. Also added a paragraph to address unique helicopter issues.

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				correct and stabilize the accelerometer-derived attitude/heading solution. “	
24. ACE-111 Brady	Page 3 Paragraph 2.6	Similar to comment above	Similar to comment above	When interfacing the AHRS to a Pitot system, ensure the system provides the needed inputs with the appropriate accuracy, integrity, and availability.	**Accepted.** The TSO is just an example of a certified source. Changes are reflected in the paragraph.
25. REJ AIR-100 CSTA	Page 3 Paragraph 2.6	Incorrect name for TSO-C16,	TSO-16 is incorrectly titled as Electrical Heated Pitot and Pitot Static Tubes	Change “Electrical” to “Electrically”	**Accepted.** Changes are reflected in the paragraph.
26. Brady ACE-111	Page 3 Paragraph 2.7	Magnetic Aiding: Delete the first sentence in this paragraph.		2.7 **Magnetic Aiding**. When interfacing a magnetic sensor, ensure the sensor’s location is selected to avoid interference from the aircraft structure and systems. For interference associated with known aircraft magnetic anomalies, a compensator may be required to ensure accurate magnetic heading information. Ensure continuous operation of all heading instruments in all foreseeable operating	**Accepted.** Deleted first sentence. It was just a modifying sentence to the paragraph.

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				conditions.	
27. ACE-117C	Pg. 4, Para 3.	Add reference to AHRS manufacturer's Installation Manual.	Add reference to AHRS manufacturer's Installation Manual so that the installer is aware of the unit's operating modes and performance characteristics.	Add "Refer to the AHRS manufacturer's Installation Manual for specific information regarding AHRS operating modes and equipment performance."	**Accepted.** Added sentence to the paragraph.
28. Brady ACE-111	Page 4 Paragraph 3.1	Degraded Mode Suitability: Delete the last sentence		**3.1 Degraded Mode Suitability**. Determine if the degraded mode performance is an acceptable method of compliance for aircraft usage. The TSO-C201 degraded mode was intended for smaller lower performance Title 14 of the Code of Federal Regulations (14 CFR) parts 23 and 27 aircraft and would not typically be suitable for larger higher performance 14 CFR parts 25 or 29 aircraft which require redundant primary attitude functions installed as part of the type certificate. The degraded mode is an in-flight backup	**Partially Accepted.** Changed sentence for clarification.

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				application only.	
29. ACE-117C	Pg. 4, Para 3.1	Reword last sentence.	Emphasize that AHRS should not enter degraded mode while on ground.	Reword last sentence to "The system may not enter degraded mode while on ground either during initial system start up or after engine start."	**Accepted.** Changed sentence accordingly.
30. Andy Shaw ASW-112	Page 4, Para 3.1	The second sentence does not accurately reflect the differences in rotorcraft certification requirements.	Part 27 rotorcraft certification requirements can vary greatly depending on whether or not it is an Appendix "B" approval. An Appendix" part 27 rotorcraft would have the same certification and airworthiness requirements as its Par 29 rotorcraft counterpart.	Change the sentence to state:"… parts 23 and non-appendix "B" 27 aircraft and would not typically be suitable for larger/higher performance 14 CFR parts 25 and 27 Appendix "B" and 29 aircraft and would require redundant primary attitude functions installed as part of the type certificate.	**Accepted.** Changed sentence to include Appendix "B" 27 aircraft
31. Petik ACE-117W	Page 4, Paragraph 3.2, 3rd sentence	Grammar could be corrected for clarity; "…where the degraded can be disabled…"			**Accepted.** Clarified sentence.

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32. ACE-117C	Pg. 4, Para 3.2	Missing word	Clarity	In third sentence, add "mode". Reword "where the degraded can be disabled" to "where the degraded mode can be disabled".	**Accepted.** Added "mode" to sentence.
33. ACE-117C	Pg. 4, Para 3.2	Grammar	Grammar	In fourth sentence, change "than the applicant" to "then the applicant".	**Accepted.** Changed accordingly.
34. ACE-117C	Pg. 4, Para 3.2	Add reference to flight maneuvers to be evaluated for degraded mode.	Provide installers a reference to the recommended flight maneuvers in RTCA DO-334 that should be evaluated when installing AHRS units that implement degraded mode.	Add following sentence "Refer to Table 2-9 in RTCA DO-334 for a list of flight maneuvers that should be evaluated for degraded mode operation" after sentence "… standard rate turns and instrument approaches."	**Not Accepted.** Table 2-9 provides dynamic performance testing for the design testing. It's not a minimum test for the aircraft. The aircraft will need to be tested to a much broader envelope. Although the min 2-9 testing is probably sufficient for the degraded mode, the 2-9 tests are for the full operational modes for TSO testing.

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35. C. Helgeson, ANM-160S, x6528	Page 4, paragraph 3.2	"mode" should be added to the third sentence between degraded and can.	Incomplete sentence	Sentence should read: "For initial AHRS installations, where the degraded mode can be disabled in-flight…."	**Accepted.** Sentence changed.
36. C. Helgeson, ANM-160S, x6528	Page 4, paragraph 3.2	The testing reference should include effects on the flightcrew's ability to control the airplane in flight.	Effects on the flightcrew's ability to control the airplane in flight could potentially result in: controlled flight into terrain, loss of obstacle clearance, exceeding the flight envelope or structural integrity of the aircraft, etc.	Suggest including another sentence after 'Testing should include pilot workload, acceptability of degraded mode through normal IFR maneuvers, including climbs, descents, standard rate turns, & instrument approaches.' Testing should also evaluate any effects on the flightcrew's ability to control the airplane in flight.	**Accepted.** Sentence added.
37. C. Helgeson, ANM-160S, x6528	Page 4, paragraph 3.2	The analysis reference should include effects on the flightcrew's ability to control the airplane in flight.	Effects on the flightcrew's ability to control the airplane in flight could potentially result in: controlled flight into terrain, loss of obstacle clearance, exceeding the flight envelope or structural integrity of the aircraft, etc.	Suggest including another sentence after 'Applicants using analysis should ensure the degraded mode will safely perform its intended function & it will not significantly affect pilot workload or aircraft operations.' This analysis should also take into account any effects on the flightcrew's ability to control the airplane in flight.	**Accepted.** Changes are reflected in the paragraph.

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38. REJ AIR-100 CSTA	Various: Page 4/Para 3.2, Page 6, Para 5.2.2 and 5.3,5.4 Page 7, Appendix A	Missing/Incorrect description of Flight Manual Supplement	The AC is applicable to all aircraft, that is both rotorcraft and airplanes, hence the reference to a Flight Manual Supplement of Flight Manual should be inclusive to preclude any misinterpretation as to the applicability of the guidance	Change all instances of AFMS to A/RFMS and AFM to A/RFM	**Accepted.** Changed references.
39. C. Helgeson, ANM-160S, x6528	Page 4, paragraph 3.4	Clarification needed for "…including a description of when errors will occur & to what degree." Suggest making this sentence specific enough to define errors as it applies to what (system, display, pilot, etc.) & examples of what is meant by "to what degree."	What is meant by "errors?" Flightcrew errors? System errors? Errors in the display of information?	Clarify	**Comment Noted.** After reviewing the sentence, the description did not add any value, so it was deleted.
40. ACE-117C	Pg. 4, Para 4	Add reference to the descriptions of equipment categories for attitude, heading and turn and slip.	Provide installers reference for categories descriptions.	Add sentence to end of paragraph, "Refer to RTCA DO-334 Para 2.2 for descriptions of the attitude, heading and turn and slip categories."	**Accepted.** Added reference to paragraph.

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41. Brady ACE-111	Page 4 Paragraph 4	Add where to find the category or give a table of explanation.		Add a reference to DO-334 or a table that explains the categories.	**Accepted.** Added reference to paragraph.
42. Brady ACE-111	Page 5 Paragraph 4.1	Re-write the last sentence		Refer to the interfacing systems attitude performance and airworthiness requirements and ensure your AHRS installation meets those requirements	**Accepted.** Sentence changed.
43. ACE-117C	Pg. 4, Para 4.1	Make it clearer to potential installers the number of potential AHRS attitude categories.	Clarification for installer.	Rephrase first sentence, "The five attitude categories, A1 through A5, primarily …"	**Accepted.** Commas added.
44. ACE-117C	Pg. 4, Para 4.2	Make it clearer to potential installers the number of potential AHRS heading categories.	Clarification for installer.	Rephrase first sentence, "There are eleven (11) potential heading categories …"	**Accepted.** Added information.
45. ACE-117C	Pg. 4, Para 4.3	Make it clearer to potential installers the number of potential AHRS turn and slip categories.	Clarification for installer.	Rephrase first sentence, "The seven turn and slip categories, T1 through T7, relate to …"	**Accepted.** Added information.

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46. R. Sova ACE-114	Page 5, Para. 4.1, Sentence 4	There is a minor grammatical error in this sentence.	It is missing a word within the phrase "…and ensure the AHRS your installation meets those requirements."	Change the phrase to (used *italics text* for addition): "…and ensure the AHRS *in* your installation meets those requirements."	**Accepted.** Changed sentence.
47. Petik ACE-117W	Page 5, Paragraph 4.1, last sentence	Grammar could be corrected for clarity; "…ensure the AHRS your installation meets those requirements."			**Accepted.** Changed sentence.
48. W. Witzig ANE-150	Page 5, para 4.1	This sentence contains a typo: "Refer to the interfacing systems attitude performance and airworthiness requirements and ensure the AHRS your installation meets those requirements."	Typo	Delete the word "your"	**Accepted.** Changed sentence.
49. W. Witzig ANE-150	Page 5, Para 5	Operational considerations should include rotorcraft considerations	ASW-111 requires an issue paper for the use of MEMs AHRS in rotorcraft. The current issue paper states, "Pursuant to §27.1301 and the lack of certification guidance for attitude indicators employing MEMS technology, the	Coordinate with the rotorcraft directorate.	**Accepted.** Added flight test profile in Appendix C and added a paragraph to address rotorcraft limitations. Update: We removed Appendix C after the Public review and then added a rotorcraft

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			applicant will be required to demonstrate that the installation meets the installed performance requirements for the maneuvers listed in Table 1."		consideration section to address its unique profile.
50. Brady ACE-111	Page 5 Paragraph 5.1	We do not certify aircraft to operate in polar regions; we do certify ETOPS in part 25 that includes polar transitions.		5.1 **Polar operations**. The Polar Region is typically defined within 5º to 30º of the north or south pole. Anomalies with the earth's magnetic field in the Polar Region can provide erroneous magnetic heading indications. Aircraft will typically use true heading information when flying in Polar Regions.	**Accepted.** Changes are reflected in the paragraph.
51. Brady ACE-111	Page 5 Paragraph 5.1.1	We do not certify aircraft to operate in polar regions; we do certify ETOPS in part 25 that includes polar transitions.		**5.1.1** If the aircraft does not include a limitation prohibiting operating in the Polar Regions, a flight test demonstration should be conducted in the applicable region for first of type installations.	**Accepted.** Changes are reflected in the paragraph
52. Dunford ANM-111	Pg 5 5.1.1	Not sure what is meant by "first of type installation" nor how much can differ between one such installation and another – such different	Each system configuration and architecture, as installed, should be demonstrated since the interfaces and interactions between multiple	Append the following phrase to the end of the sentence: "for each system configuration and architecture to be approved."	**Partially Accepted**. A first of type is normal nomenclature for new designs and significant changes. Each system configuration and

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		model airplane, different avionics interfaces, etc.	subsystems can significantly affect the results.		architecture could cause an undue burden. Changed the text to –new installations, which is not follow-on.
53. C. Helgeson, ANM-160S, x6528	Page 5, paragraph 5.1.3	The flightcrew should be able to determine when the system is referencing magnetic or true headings if the system switches between them automatically.	If automatic switching between magnetic/true heading is not sufficiently self-evident, a suitable alerting or other annunciation should accompany the automatic switching.	Suggesting including another sentence after 'Evaluate any automatic switching from magnetic to true heading or vice versa while entering & exiting Polar Regions.' If the automatic switching between magnetic/true heading is not sufficiently self-evident, a suitable alerting or other annunciation should accompany the automatic switching.	**Accepted.** Sentence added to paragraph.
54. C. Helgeson, ANM-160S, x6528	Page 5, paragraph 5.1.5	Suggest this section include the annunciation characteristics such as: should be clear, unambiguous, and timely; should only be indicated while the condition exists; should be consistently located in a specific area of the electronic display; & be located in the flightcrew's primary	If flightcrew action is expected to cope with the effect of a failure condition (degraded performance/mode), the information available to the flightcrew should be useable for detection of the failure condition & to initiate corrective action.	Suggest including another sentence after 'If AHRD performance degrades in the Polar Region an annunciation, both aural & visual, should be provided to the flight crew.' Any annunciations should be clear, unambiguous, timely & attention getting; should only be indicated while the condition exists; should be consistently located in a specific area of the electronic display; & be located	**Accepted.** Sentence added to paragraph.

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		field of view when immediate flightcrew awareness is required.		in the flightcrew's primary field of view when immediate flightcrew awareness is required.	
55. ACE-117C	Pg. 6, Para 5.2	A limitation may be needed for potential magnetic disturbances and a reference added to procedures to address this.	Add statement to alert installer that a limitation might be needed for potential magnetic disturbances with a reference to procedures for rapid alignment, manual or automatic reversion included in the AFMS or POH.	Add section (create 5.2.3): "Ensure a limitation is added to the AFMS or POH identifying the potential for magnetic disturbances". Add reference in AFMS or POH to procedures for rapid alignment, manual or automatic reversion.	**Accepted.** Added section and changed word from limitation to instructions..
56. Dunford ANM-111	Pg 6 5.4	It is not clear why AHRS could be sensitive to changes in wind speed and directions.	If the FAA wants the applicant to establish acceptable AHRS performance under changing wind conditions, the mechanism for AHRS sensitivity needs to be at least briefly described so that the applicant knows what to look for and what kind of data needs to be submitted for compliance. Chances are, even the certification engineer may not understand this.	Add an explanation/description of the mechanisms for AHRS sensitivity to changes in wind speed and direction. Provide an outline or list of items to demonstrate and the corresponding kind of data needed to establish compliance.	**Accepted.** This section is in regards to operational considerations. The demonstration will depend on the type of sensor and the data used. We have seen issues with wind conditions due to some bias and location of the sensors on the aircraft. This condition should be universally applied because we don't know if there are issues with just certain ones or in general.

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					It is good practice to ensure safe operation in all operating conditions and particularly looking at areas such as wind speed issues.
57. Roell ACE-117W	Page A-1, Acronyms	"ADS" should be "ADC".	Acronym for Air Data Computer is ADC.	Replace "ADS" with "ADC".	**Accepted.** Changed acronym
58. Roell ACE-117W	Page A-1, Acronyms	The following acronyms should be deleted: ILS, NM, PFD, and PFI.	These acronyms are not used in the document.	Delete the following acronyms: ILS, NM, PFD, and PFI.	**Accepted.** Deleted acronyms.
59. REJ AIR-100 CSTA	Page 7, Appendix A-1	Missing/Incorrect acronym	Missing/Incorrect acronym	Correct the acronym list to read A/RFMS for Airplane/Rotorcraft Flight Manual Supplement	**Accepted.** Changed acronym.
60. AIR-500	Header Area Page 1	Incorrect formatting		Remove the date and AC number from the page 1 header.	**Accepted.** Change reflected in document.
61. AIR-500	Header Area Pages 2 though end	Incorrect formatting	Only the AC number should be listed.	Remove "AHRS" from the AC number in the header.	**Accepted.** Change reflected in document.

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62. AIR-500	Header Page 1	Incorrect template used	Font type and size incorrect	Use Univers (W1) size 37 for the words "Advisory Circular"	**Accepted.** Change reflected in document.
63. AIR-500	Global	Incorrect format used.	Need to use standard outline and paragraph justification for advisory circulars. See other AIR ACs for correct format.	Replace decimal outline to: 1. Text a. Text b. Text (1) Text (a) text 2. Text Note the alignment and the spacing.	**Not Accepted.** Talked to AIR-510 in May 2013 for approval to adopt this type of numbering system. It is also consistent with TAD policy on AC writing.
64. AIR-500	Global	Incorrect spacing. Adjust tabs and spacing.		There should be only two spaces between the paragraph label and the text. For example, 1. Purpose. This advisory circular….	**Comment Noted**. Reviewed all areas and could not find any sentences out of compliance
65. AIR-500	Subject Area, Page 1	Incorrect case used		Use title case for the title of the AC.	**Accepted.** Changed format.

Commenter	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
66. AIR-500	Line under the Subject Area, Page 1	Incorrect AC template used		Replace the line with a 1 point line. (It should be thicker.)	**Accepted.** Changed format.
67. AIR-500	Paragraph 1-1, 1st sentence, Pg. 1	Incorrect use of capitalization	These words should not be capitalized just because they define acronyms.	Rewrite to read: "…advisory circular (AC)…guidance for attitude heading reference system (AHRS)…under technical standard order (TSO)-C201…"	**Accepted.** Changed sentence.
68. AIR-500	Paragraph 1-1, 3rd sentence, Pg. 1	Insert acronym.	Acronym already defined	Change "advisory circulars" to "ACs"	**Accepted.** Changed sentence.
69. AIR-500	Paragraph 1.1, last sentence and a) - m) Pg. 1	Recommend inserting a note that directs the reader to use the latest revision level of the documents listed.	This would extend the currency of this AC.	Add note and remove the revision levels from the list of ACs.	**Accepted.** Changed sentence.
70. AIR-500	Paragraph 1.1a) –m), Pg. 1	Incorrect spacing.	All paragraphs should be double-spaced.	Insert a space between each line (i.e., between a), b), c), etc.)	**Accepted.** Changed sentence.
71. AIR-500	Paragraph 1.1a) –l), Pg. 1	Incorrect Punctuation for list.		Use semi-colons (not colons) at the end of each line. For l), end the line with "; and".	**Accepted.** Changed sentence.
72. AIR-500	Paragraph 1.1m) Pg. 1	Incorrect reference	No need to indicate "change 1 incorporated". It's officially part of the AC 29-2C.	Delete "Change 1 incorporated".	**Accepted.** Changed sentence.

Commenter	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
73. AIR-500	Paragraph 1.3a) – d), Pg. 1-2	Incorrect Punctuation for list. Incorrect spacing		Use semi-colons (not colons) at the end of each line. For c), end the line with "; and". Insert a space between each line (i.e., between a), b), and c)	**Accepted.** Changed sentence.
74. AIR-500	Paragraph 2, Pg. 2	Incorrect formatting	Always start the text of the paragraph immediately after the paragraph label.	Move paragraph up so that it starts on the same line, two spaces after the paragraph title. .	**Accepted.** Changed sentence.
75. AIR-500	Paragraph 2.2, Pg. 2	Refer to paragraph 2.2. as a paragraph, not a section.	Consistency with other documents	Replace "section" with "paragraph".	**Accepted.** Changed sentence
76. AIR-500	Paragraph 2.4, Pg. 2	Acronym already defined		Remove "Global Navigation Satellite System…" leaving only "GNSS Aiding."	**Accepted.** Changed sentence
77. AIR-500	Paragraph 2.4, Pg. 2	Need to define acronyms		Define NAVSTAR and GLONASS	**Accepted.** Spelled out acronyms in sentence.
78. AIR-500	Paragraph 2.4, 2nd sentence Pg. 2	Missing comma		Insert comma after "include"	**Accepted.** Changed sentence

Commenter	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
79. AIR-500	Paragraph 2.4.1, Pg. 2	Incorrect punctuation.		Replace the colon with a period at the end of the paragraph title.	**Not Accepted.** The sentence is not complete without referencing the TSOs.
80. AIR-500	Paragraph 2.4.1, Pg. 2	Incorrect formatting	Each paragraph needs to have a label for reference purposes.	The text in paragraph 2.4.1 should be labeled as a. Paragraphs a), b), and c) should be relabeled as (1), (2), and (3). The unlabeled paragraph below c) should be labeled as b.	**Not Accepted.** See comment #63.
81. AIR-500	Paragraph 2.4.1a), Pg. 2	Missing Punctuation.		Insert semicolon after at the end of the line.	**Accepted.** Changed sentence
82. AIR-500	Paragraph 2.4.2, 4th sentence Pg. 3	Missing word		Insert "revision" at the end of the sentence so it reads "or subsequent revision."	**Accepted.** Changed sentence
83. AIR-500	Paragraph 2.5 Title and 1st sentence Pg. 3	Acronym has already been defined.		Replace "air data computer" with "ADC" in both the title and the first sentence.	**Accepted.** Changed sentence
84. AIR-500	Paragraph 3, Pg. 3	Incorrect formatting	Always start the text of the paragraph immediately after the paragraph label.	Move paragraph up so that it starts on the same line, two spaces after the paragraph title. .	**Accepted.** Changed sentence

Commenter	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
85. AIR-500	Paragraph 3.1, 2nd Sentence, Pg. 4	Acronym already defined		Insert TC for "type certificate"	**Accepted.** Changed sentence
86. AIR-500	Paragraph 3.2, 3rd Sentence, Pg. 4	Missing word?		Insert "mode" between "degraded" and "can."	**Accepted.** Changed sentence
87. AIR-500	Paragraph 3.2, 4th sentence, Pg. 4	Typo		Change "than" to "then."	**Accepted.** Changed sentence
88. AIR-500	Paragraph 3.2, 4th sentence, Pg. 4	Incorrect use of capitalization	These words should not be capitalized just because they define acronyms.	Rewrite to read: "…instrument flight rules (IFR)…"	**Accepted.** Changed sentence
89. AIR-500	Paragraph 3.2. Last sentence, Pg.4	Need to define acronym.		Define AFMS	**Accepted.** Changed sentence

Commenter	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
90. AIR-500	Paragraph 3.3, 2nd sentence, Page 4	Incorrect use of capitalization	These words should not be capitalized just because they define acronyms.	Rewrite to read: "…head up display (HUD)…"	**Accepted.** Changed sentence
91. AIR-500	Paragraph 3.4, 1st sentence, Page 4	Insert acronym.		Insert (AFM) after "aircraft flight manual."	**Accepted.** Changed sentence
92. AIR-500	Paragraphs 5.1, 5.1.1, 5.1.3, 5.1.4, 5.1.5 and 5.1.6. Pg. 5	Incorrect capitalization	Each word of the title should be capitalized. However, afterwards, lowercase should be used.	Subtitle should read: Polar Operations. In the paragraph text, replace "Polar Region" with "polar region" in all circumstances.	**Accepted.** Changed sentence
93. AIR-500	Paragraph 5.1.1, Pg. 5,	Acronym already defined.		Insert TC for "type certificate"	**Accepted.** Changed sentence
94. AIR-500	Paragraph 5.1.6, Pg. 6	Insert acronym defined earlier. Missing comma		Replace "aircraft flight manual" for AFM. Insert comma after "region"	**Accepted.** Changed sentence
95. AIR-500	Paragraph 5.2, Pg. 6	Incorrect capitalization	Each word of the title should be capitalized.	Rewrite to read: "Areas of High Magnetic Disturbances"	**Accepted.** Changed sentence
96. AIR-500	Paragraph 5.2a), Pg. 6	Acronym already defined.		Replace "Directional Gyro	**Accepted.** Changed sentence

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				(DG)" with DG.	
97. AIR-500	Paragraph 5.3, Pg. 6	Incorrect capitalization	Each word of the title should be capitalized.	Rewrite to read: "Low Power Setting"	**Accepted.** Changed sentence
98. AIR-500	Paragraph 5.4, Pg. 6	Incorrect capitalization	Each word of the title should be capitalized.	Rewrite to read: "Wind Speeds"	**Accepted.** Changed sentence
99. AIR-500	Page 6	Missing required feedback template in accordance with August 30, 2013 policy memo		Add explanation and feedback template to the AC.	**Accepted.** Added feedback form.
100. AIR-500	Appendix A, Title, Pg. A-1	The font style is not consistent with the rest of the document.		Change the font of title to match the font of other titles in document.	**Accepted.** Changed sentence
101. AIR-500	Appendix A, Pg. A-1	Incorrect acronym definition		AFMS = Airplane Flight Manual Supplement (not supplemental)	**Accepted.** Changed sentence
102. AIR-500	Appendix A, Pg. A-1	Incorrect formatting		Double space acronyms for improved readability. Also, label each line for reference purposes.	**Accepted.** Changed spacing for readability.
103. AIR-500	Appendix B, Pg. B-1	The font style is not consistent with the rest of the document.		Change the font of this appendix to match the font used in the rest of the document.	**Accepted.** Changed sentence

Commenter	Page & Paragraph	Comment	Rationale for Comment	Recommendation	Disposition
104. AIR-500	Appendix B, paragraph 3 Pg. B-1	Use acronyms and reword for clarity.		Rewrite to read: "A current list of TSOs and ACs can be found on the FAA Regulatory and Guidance Library at http://rgl.faa.gov/...." Also add official FAA website for ACs.	**Accepted.** Changed sentence