

EASA Proposed CM-AS-002 Issue 01 – Clarifications to AMC 20-27 - Comment Response Document

Comment				Comment summary	Suggested resolution	Comment is an observation or is a suggestion	Comment is substantive or is an objection	EASA comment disposition	EASA response
NR	Author	Section, table, figure	Page						
1	Cessna Aircraft Company	---	---	Cessna Aircraft Company has no comment on this issue at this time.				Noted	
2	Garmin	5.3.1.1	10	Refers to "ETSO-C145c class Beta, operational class 3." Operational Class 2 or Class 3 is sufficient for LNAV/VNAV operations. For reference, see FAA AC 20-138B paragraph 8-4.c.(2).	Change "class 3" to "Class 2 or Class 3."	No	Yes	Accepted	The text has been revised accordingly.
3	Garmin	5.3.1.2	10	Refers to "ETSO-C145c class Beta, operational class 3." Operational Class 2 or Class 3 is sufficient for LNAV/VNAV operations. For reference, see FAA AC 20-138B paragraph 8-4.c.(2).	Change "class 3" to "Class 2 or Class 3."	No	Yes	Accepted	The text has been revised accordingly.
4	Garmin	5.3.1.2	10	Contains the following Note: "Aircraft that have previously been demonstrated to comply with FAA AC 20-130A and ETSO C-115b (or subsequent versions), should only comply with the performance requirements of Chapter 2.3 of RTCA DO-229C." Chapter 2.3 of RTCA DO-229C covers Operational Class Delta-4 equipment that do not provide LNAV/VNAV capability and are therefore outside the scope of this memorandum. It is not clear what this is trying to state. For reference, see FAA AC 20-138B paragraph 8-4.c.(2)(b).	Reword this note to clarify the intent.	No	Yes	Accepted	Note has been removed. In addition, and in line with the spirit of this comment, paragraph 5.3.1.3 has been removed as well.
5	Garmin	5.3.1.2	10	The wording in the Note "should only comply with..." implies that aircraft cannot comply with other requirements.	Depending on the outcome to Garmin item NR 3, suggest changing "should only comply with..." To "need only comply with..."	Yes	No	Partially Accepted	The suggestion made by commenter is acceptable to EASA, but the note has been removed in response to the previous comment.
6	Garmin	5.3.1.2	10	The Note refers to "RTCA DO-229C."	Depending on the outcome to Garmin item NR 3, suggest changing "RTCA DO-229C." To "RTCA DO-229C or later revision."	Yes	No	Not Accepted	The CM refers to the minimum acceptable standard. Furthermore, since EASA has no control over the content of RTCA documents, the proposed addition 'or later revision' should not be used, since later revisions could contain standards which are deemed not acceptable by EASA.
7	Garmin	5.3.2.1	11	Reference to "paragraph 5.2.2.2" is not clear since there is no such section in either CM-AS-002 or AMC 20-27.	Review and correct this reference.	Yes	No	Accepted	Referenced paragraph revised to 5.3.3.1

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8	Garmin	5.3.3.2	11	The statement "the flight crew should only be able to retrieve an approach to LNAV/VNAV minima when the approach has been appropriately coded" could be misinterpreted to mean that the pilot should not be able to retrieve LNAV minima on the same approach. The pilot may be able to retrieve either LNAV or LNAV/VNAV minima for an approach.	Suggest changing "the flight crew should only be able to retrieve an approach to LNAV/VNAV minima when the approach has been appropriately coded" To "the flight crew should only be able to select LNAV/VNAV minima for an approach when the approach has been appropriately coded"	Yes	No	Partially Accepted	The comment is accepted, but the suggestion provided by commenter does not adequately reflect EASA's position. The text has been reworded as indicated below: "the flight crew should be able to select an approach to LNAV/VNAV minima only when the approach has been appropriately coded"
9	Garmin	5.3.3.2	11	The wording "i.e. and indication 'A' in the ARINC 424" includes a typo and is also ambiguous.	Suggest changing "i.e. and indication 'A' in the ARINC 424" To "i.e. a GNSS/FMS indicator of 'A' in the ARINC 424"	Yes	No	Accepted	The text has been revised accordingly.
10	Garmin	5.3.3.2 Note	11	Reference to "the character 'A' in the ARINC 424 coding" is ambiguous.	Suggest changing "the character 'A' in the ARINC 424 coding" To "the character 'A' in the ARINC 424 GNSS/FMS indicator field "	Yes	No	Accepted	The text has been revised accordingly.
11	Garmin	5.3.3.2 Note	11	The statement at the end of the Note "the flight crew should not be able to retrieve the approach from the Navigation Database." does not account for the capability for pilots and/or equipment to retrieve the approach with LNAV minima when LNAV/VNAV is not available.	Suggest changing "the flight crew should not be able to retrieve the approach from the Navigation Database." To "the flight crew should not be able to select the LNAV/VNAV minima for the approach when using SBAS/GNSS geometric altitude. "	No	Yes	Partially Accepted	The comment is accepted, but the suggestion provided by commenter does not adequately reflect EASA's position. The text has been reworded as indicated below: "However, if the coding of the approach indicates that the approach to LNAV/VNAV minima cannot be flown with angular guidance, the flight crew should not be able to retrieve the approach with associated LNAV/VNAV minima from the Navigation Database"
12	Garmin	5.3.6	12	The proposed AFM statement "The aircraft complies with the criteria of AMC 20-27 for RNP approaches to LNAV/VNAV minima, with the exception that VNAV is based on SBAS/GNSS geometric altitude." implies that VNAV is always based on SBAS/GNSS altitude. However, it is possible for a system to provide LNAV/VNAV based on either SBAS/GNSS (when the ARINC 424 GNSS/FMS indicator is 'A') or baro (when the ARINC 424 GNSS/FMS indicator is not 'A'). See AC 20-138B Chapter 3, paragraph 3-2.e.(3), and Chapter 17-5.	Suggest changing "The aircraft complies with the criteria of AMC 20-27 for RNP approaches to LNAV/VNAV minima, with the exception that VNAV is based on SBAS/GNSS geometric altitude." To "The aircraft complies with the criteria of AMC 20-27 for RNP approaches to LNAV/VNAV minima, with the exception that VNAV may be based on SBAS/GNSS geometric altitude."	No	Yes	Partially Accepted	EASA understands then intent of the comment but considers that the number of systems which can provide either barometric VNAV or VNAV based on GNSS/SBAS geometric altitude is limited. Since the CM provides an alternative to an Acceptable Means of Compliance (AMC), the wording in the CM is not binding and an applicant may suggest alternative wording in the situation described by commenter.

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13	Garmin	6.3	13	<p>The statement</p> <p>"The angular deviation complies with a Full Scale Deflection (FSD) of ±0.25° from the glide path, as defined in RTCA DO-229D."</p> <p>is not correctly translated from the DO-229D requirement and could be interpreted to mean the FSD is ±0.25°. The FSD is defined in RTCA DO-229D section 2.2.4.4.4 as:</p> $\alpha_{vert,FS} = \pm 0.25(\text{FAS glidepath angle})$ <p>For a standard 3.00° glide path angle, this results in ±0.75° FSD, similar to the standard ILS glide slope beam width of ±0.7°.</p>	<p>Suggest changing</p> <p>"The angular deviation complies with a Full Scale Deflection (FSD) of ±0.25° from the glide path, as defined in RTCA DO-229D."</p> <p>To</p> <p>"The angular deviation complies with a Full Scale Deflection (FSD) of ±0.25 X (glide path angle), as defined in RTCA DO-229D."</p>	No	Yes	Accepted	The text has been revised accordingly.
14	Garmin	6.3.1	13	<p>The statement</p> <p>"Obviously, the requirement to monitor that deviation above and below the vertical path must not exceed ± 75 feet cannot be applied with angular deviations."</p> <p>is not necessarily true since the applicant could propose some alternate means to meet this requirement.</p>	<p>Suggest changing</p> <p>"Obviously, the requirement to monitor that deviation above and below the vertical path must not exceed ± 75 feet cannot be applied with angular deviations."</p> <p>To</p> <p>"Obviously, the requirement to monitor that deviation above and below the vertical path must not exceed ± 75 feet cannot be met by maintaining the VDI within half of full-scale deflection."</p>	No	Yes	Partially Accepted	<p>The comment is understood, but the suggestion provided by commenter does not adequately reflect EASA's position. The text has been reworded as indicated below:</p> <p>"Obviously, the requirement to monitor that deviation above and below the vertical path must not exceed ± 75 feet cannot readily be applied with angular deviations. The applicant should therefore propose an alternate means of monitoring to the EASA for review and acceptance"</p>
15	Garmin	6.3.2	13	<p>The title</p> <p>"The angular deviation complies with a Full Scale Deflection (FSD) of ±0.25° from the glide path, as defined in RTCA DO-229D."</p> <p>is not correctly translated from the DO-229D requirement and could be interpreted to mean the FSD is ±0.25°. The FSD is defined in RTCA DO-229D section 2.2.4.4.4 as:</p> $\alpha_{vert,FS} = \pm 0.25(\text{FAS glidepath angle})$ <p>For a standard 3.00° glide path angle, this results in ±0.75° FSD, similar to the standard ILS glide slope beam width of ±0.7°.</p>	<p>Suggest changing</p> <p>"The angular deviation complies with a Full Scale Deflection (FSD) of ±0.25° from the glide path, as defined in RTCA DO-229D."</p> <p>To</p> <p>"The angular deviation complies with a Full Scale Deflection (FSD) of ±0.25 X (glide path angle), as defined in RTCA DO-229D."</p>	No	Yes	Accepted	The text has been revised accordingly.
16	Garmin	7.3	14	A value in the table is incorrect	<p>Change the value listed for EASA AMC 20-27 TSE_z for ≥ 10,000 ft. (MSL)</p> <p>from 298 ft.</p> <p>to 296 ft.</p> <p>in order to be consistent with AMC 20-27.</p>	Yes	No	Accepted	The text has been revised accordingly.
17	Garmin	7.4	15	<p>Correct the grammar for the phrase</p> <p>"resulting from the inconsistency between FAA AC 20-129"</p>	Change "inconsistence" to "inconsistency".	Yes	No	Accepted	Typo corrected.

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18	Swedish Transport Agency – Civil Aviation Department (CAA Sweden)	5.3.4 Integrating SBAS/GNSS VNAV	11	The following text is misleading: "Because BARO/VNAV will be in use for most flight phases, including missed approach, there will be a need to transition from BARO-VNAV to SBAS/GNSS-VNAV and vice versa during the final and missed approach segments." An approach is always designed for only one type of procedure. It is not allowed to change type of procedure during an approach phase.	Rewrite the text completely!	Suggestion	Objection	Partially Accepted	The intent of the referred text was to state that there will be transitions from vertical navigation based on barometric altitude to vertical navigation based on GNSS/SBAS geometric altitude and that these transitions need to be smooth. The reference to approach segments has been removed, in particular because the transitions should be completed before the final approach segment.
19	Swedish Transport Agency – Civil Aviation Department (CAA Sweden)	7.4 AIRWORTHINESS APPROVAL	15	The text "The aircraft should be equipped with a suitably scaled indicator. . . ." is too vague.	The proposed text should be replaced by the following text: "The aircraft should be equipped with an indicator that clearly indicates the limiting boundary, inside which the aircraft must be flown in order to comply with the requirements of +/- 75 ft in the final approach segment."	Suggestion	Substantive	Not Accepted	The suitability of a display depends on a number of considerations, including systems design and flight deck procedures as well as the two options provided in section 6.3 of the CM. The text proposed by the commenter is considered too prescriptive in this regard.
20	Airbus	5.3.2.1	11	Reference to paragraph 5.2.2.2 is incorrect, since this paragraph doesn't exist	Introduce correct reference	Yes	No	Accepted	Referenced paragraph revised to 5.3.3.1
21	Airbus	5.3.3.2	11	Meaning of indication "A" in ARINC 424 is not the one supposed in § 5.3.3.2. "A" mentioned in the field "Level of Service" stands for "Authorized" with regard to the considered parameter (and not "Angular" as it seems to be suggested in § 5.3.3.2). So, the only way for the flight crew to be sure that the approach has been designed taking into account an obstacle clearance compatible with an angular guidance (like GNSS/SBAS), would be an "A" associated to "LPV" parameter. Contrary to what is proposed in § 5.3.3.2, an "A" associated to "LNAV" (resp. LNAV/VNAV) just means that this approach provides LNAV (resp. LNAV/VNAV) minima. In no way this "A" ensures that angular guidance has been studied for this approach. In addition, through the discussions held between Airbus and EASA regarding compliance with AMC 20-27 on A380 (cf. CRI F-59), agreement was reached on the fact that thanks to adequate HMI and crew monitoring, FLS angular guidance mode could be used to fly RNP APCH approaches at LNAV/VNAV minima, with no need to redesign the existing procedures. Obstacle clearance area would not have to be adapted to FLS angular guidance. Same demonstration agreed for FLS should be applicable to SLS as well, and allow flying RNP APCH approaches with only LNAV/VNAV published minima.	Delete reference to indication 'A' in § 5.3.3.2: The requirements of AMC 20-27 paragraph 7.1 item 3 remain applicable, with the additional requirement that for systems that provide VNAV based on SBAS/GNSS geometric altitude, the flight crew should only be able to retrieve an approach to LNAV/VNAV minima when the approach has been appropriately coded, i.e. and indication 'A' in the ARINC 424 coded Navigation Database (see note below).	No	Yes	Not Accepted	The reference to character 'A' in the ARINC 424 coding indicates that a procedure is an RNAV (GPS) or RNAV (GNSS) procedure whose use of GNSS/SBAS geometric altitude is specifically authorized. This implies that the angular nature of the guidance provided has been considered in the procedure design. Other possible indications include an indication of "B" when a procedure is an RNAV (GPS) or RNAV (GNSS) procedure whose use of GNSS/SBAS geometric altitude is specifically not authorized and "C" when a procedure is an RNAV (GPS) or RNAV (GNSS) procedure whose use of GNSS/SBAS geometric altitude is not specified. For the FLS system, commenter opted for a different application of angular guidance, based on the principle that the angular deviation is provided within the vertical boundaries of the 'standard' linear approach to LNAV/VNAV minima. This option has the advantage that it may be applied on all existing approached to LNAV/VNAV minima, not just those which have been specifically authorised for use with GNSS/SBAS geometric altitude. This principle has been accepted by EASA as indicated in the CRI, as well as in section 6 of this CM.
22	Airbus	5.3.2.1	11	Reference to paragraph 5.2.2.2 is incorrect, since this paragraph doesn't exist	Introduce correct reference	Yes	No	Accepted	Referenced paragraph revised to 5.3.3.1

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23	Boeing Commercial Airplanes	6.3	13	<p>Section 6.3, CONDITIONS FOR ACCEPTANCE OF ANGULAR VERTICAL DEVIATION, is overly prescriptive in terms of specifying system requirements based on GPS WAAS.</p> <p>The additional requirements point to a specific type of design implementation with the implication that alternative means of compliance consistent with other VNAV guidance are not acceptable. The criteria should state a functional or performance objective and cite examples as appropriate as one means.</p>	<p>In lieu of the text proposed in CM-AS-002, Issue 01, section 6, we recommend revising the text as follows:</p> <ol style="list-style-type: none"> 1) Add the statement below to AMC 20-27, section 6.1 2) Add the same statement below to the end of the first paragraph of CM-AS-002, Issue 01, section 6.3 <p>“In lieu of following the guidance in this section of the AMC without deviation, airworthiness approval may be obtained using an alternative method, provided the alternative method is found to be acceptable by the EASA.”</p> <p>In addition, add the following statement:</p> <p>“Such methods include the use of previously operationally accepted methods for monitoring vertical path deviations on a display accessible to the pilot in conjunction with the use of flight director or autopilot modes.”</p>	Yes	Yes	Not Accepted	<p>EASA disagrees: The conditions for acceptance of angular deviation in section 6.3 are based on experience with recent applications or compliance with a widely recognised standard. It should be noted that the CM provides additional guidance on solutions which EASA has found acceptable, but this does not preclude an applicant from proposing alternate means of compliance.</p>
24	Boeing Commercial Airplanes	7.3	14	<p>The rationale for more stringent baro VNAV requirements, as presented in proposed section 7.3, is to ensure consistency with the obstacle clearance of 246 feet above 5000 feet for Baro VNAV procedures.</p> <p>The proposed CM notes that even this criterium does not comply for high altitudes.</p>	<p>Rather than enforce restrictions on aircraft or for re-certifications that are costly, we recommend revising the procedure design criteria (which are much easier and less costly to change) and establish obstacle clearance margins that allow the conduct of Baro VNAV procedures, e.g., allow the use of Baro VNAV but with higher minima.</p> <p>Disallowing Baro VNAV would only lead to the conduct of procedures using conventional means, such as step down altitudes, that are less desirable than VNAV.</p> <p>Revision of the procedure design criteria could be performed more immediately and would ensure that all Baro VNAV applications have acceptable obstacle clearance margins</p>	Yes	Yes	Not Accepted	<p>AMC 20-27 and proposed CM contain airworthiness standards associated with Baro VNAV procedures, and provide means of compliance and additional guidance for new applications for EASA approval.</p> <p>As such, the documents neither invalidate existing airworthiness approvals nor do they invalidate operational approvals or disallow Baro VNAV operations.</p> <p>The CM provides guidance with regards to application for credit for aircraft previously approved to comply with FAA AC 20-129. Additionally, the CM provides a recommendation to operators and competent authorities responsible for oversight over the operators to consider the potential effects on safety when conducting Baro VNAV approaches at altitudes above 5000 ft.</p> <p>Revising the procedure design criteria, although currently being considered by ICAO, may not be as cost effective as commenter suggest, and could lead to Baro VNAV operations being prohibited at specific locations due to infringement of the obstacle clearance margins. EASA is of the opinion that most modern aircraft could meet the more stringent criteria of AMC 20-27 with ease and notes that the FAA have introduced even more stringent criteria in their AC 20-138C.</p>

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25	Boeing Commercial Airplanes	7.3	14, 15	<p>Section 7.3 contains technical issues regarding the proposed vertical total system error (TSE) requirements.</p> <p>The altimetry system assumptions appear to be based on RNP with Authorization Required (RNP AR).</p> <p>The proposed RNP horizontal coupling error (HCE) is more stringent than RNP AR at RNP 0.1, instead of reflecting the RNP 0.3 of RNP APCH.</p> <p>The other errors are less stringent than RNP AR, but the rationale is not clear. With the HCE scaled to RNP 0.3, it appears that TSE would be 229 feet vs 199, 264 feet vs 238, and 317 feet vs 296. These results would indicate that the restrictions identified in the current text would be insufficient for RNP APCH, requiring more than currently stated (including mandatory use of autopilot).</p> <p>This would limit Baro VNAV even more than stated.</p>	A change to the procedure design criteria that would, in effect, raise the obstacle clearance altitude would be the better remedy to allowed operations.	Yes	Yes	Not Accepted	The CM is not being issued with the intention to revise the criteria of AMC 20-27. Rather it is aimed to inform applicants and operators of possible alternate means of compliance with these requirements, which have been considered acceptable by EASA.
26	UK CAA	---	---	Please note that there are no comments from UK CAA on the subject matter.				Noted	