CERTIFICATION SPECIFICATIONS
AND
ACCEPTABLE MEANS OF COMPLIANCE
FOR
AIRBORNE COMMUNICATIONS, NAVIGATION AND SURVEILLANCE

CS-ACNS ISSUE 4 – CHANGE INFORMATION

The European Union Aviation Safety Agency (EASA) publishes issues of the Certification Specifications and Acceptable Means of Compliance for Airborne Communications, Navigation and Surveillance (CS-ACNS) as consolidated documents. These documents are used for establishing the certification basis for applications submitted after the date of entry into force of the applicable issue.

Consequently, except for a note, e.g. '[Issue: CS-ACNS/4]', under the amended certification specification (CS), acceptable means of compliance (AMC), or guidance material (GM), the consolidated CS-ACNS Issue 4 (the Annex to ED Decision 2022/008/R) does not highlight the amendments introduced. To show these amendments, this 'Change information' document was created, using the following format:

— deleted text is ~~struck through~~;

— new or amended text is highlighted in blue; and

— an ellipsis '[…]' indicates that the rest of the text is unchanged.

Note to the reader

In amended, and in particular in existing (that is, unchanged) text, 'Agency' *is used interchangeably with* 'EASA'. *The interchangeable use of these two terms is more apparent in the consolidated versions. Therefore, please note that both terms refer to the* 'European Union Aviation Safety Agency (EASA)'.

SUBPART A – GENERAL

CS ACNS.A.GEN.001 Applicability

These certification specifications provide standards for the certification and approval of designs, or changes to designs of aircraft, allowing aircraft operators to comply with the applicable airspace requirements or mandatory equipage requirements in the areas of:

— Communication, Navigation and Surveillance (CNS);

— Terrain Awareness and Warning Systems (TAWS);

— Reduced Vertical Separation Minima (RVSM); and

— Location of an Aircraft in Distress (LAD / GADSS).

~~These certification specifications are intended to be applicable to aircraft for the purpose of complying with the communications, navigation and surveillance carriage requirements.~~

~~Compliance with the relevant sections of CS-ACNS ensures compliance with the following European regulations:~~

~~(a) Commission Regulation (EU) No 965/2012 of 5 October 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council;~~

~~(b) Commission Implementing Regulation (EU) No 1207/2011 of 22 November 2011 laying down requirements for the performance and the interoperability for surveillance for the single European sky;~~

~~(c) Commission Implementing Regulation (EU) No 1206/2011 of 22 November 2011 laying down requirements on aircraft identification for surveillance for the single European sky;~~

~~(d) Commission Regulation (EC) No 29/2009 of 16 January 2009 laying down requirements on data link services for the single European sky;~~

~~(e) Commission Implementing Regulation (EU) No 1079/2012 of 16 November 2012 laying down requirements for voice channels spacing for the single European sky.~~

[Issue: CS-ACNS/2]

[Issue: CS-ACNS/4]

GM1 ACNS.A.GEN.001 Applicability

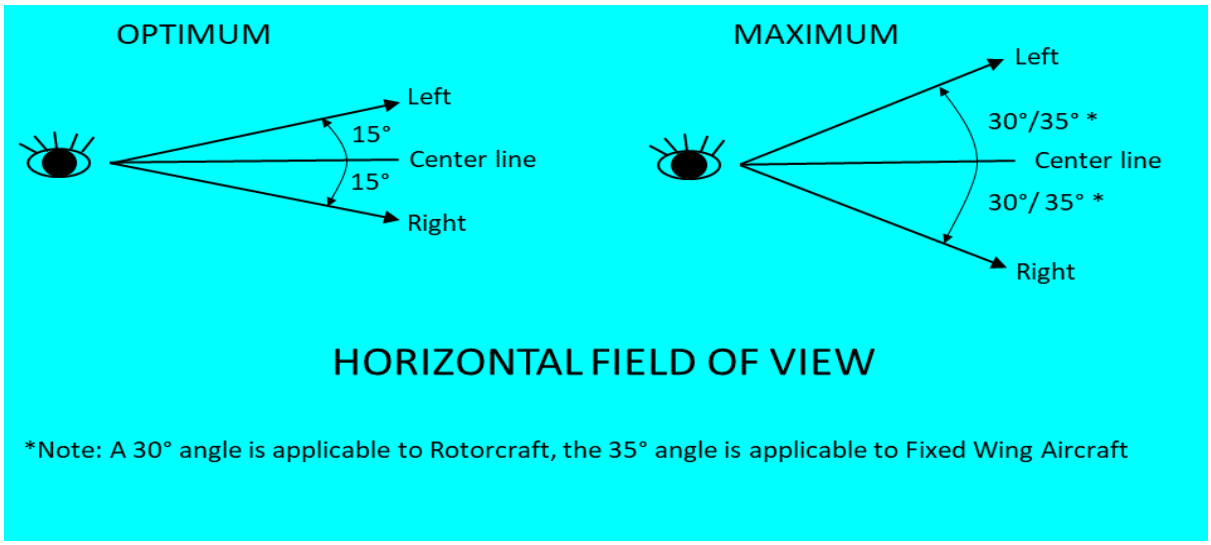
A reference to compliance with the relevant section(s) of CS-ACNS in the aircraft flight manual (AFM) or other approved document may be used by operators to demonstrate compliance with the applicable airspace rules.

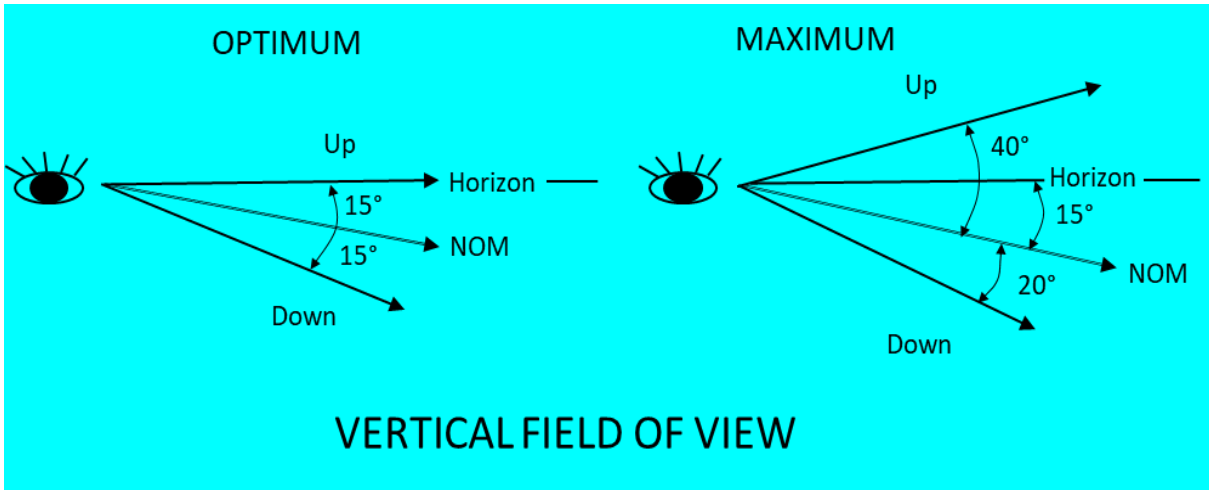
[Issue: CS-ACNS/4]

CS ACNS.A.GEN.005 Definitions

[…]

Field of view refers to either the optimum or maximum vertical and horizontal visual fields from the design eye reference point that can be accommodated with eye rotation only, as described in the figure below.





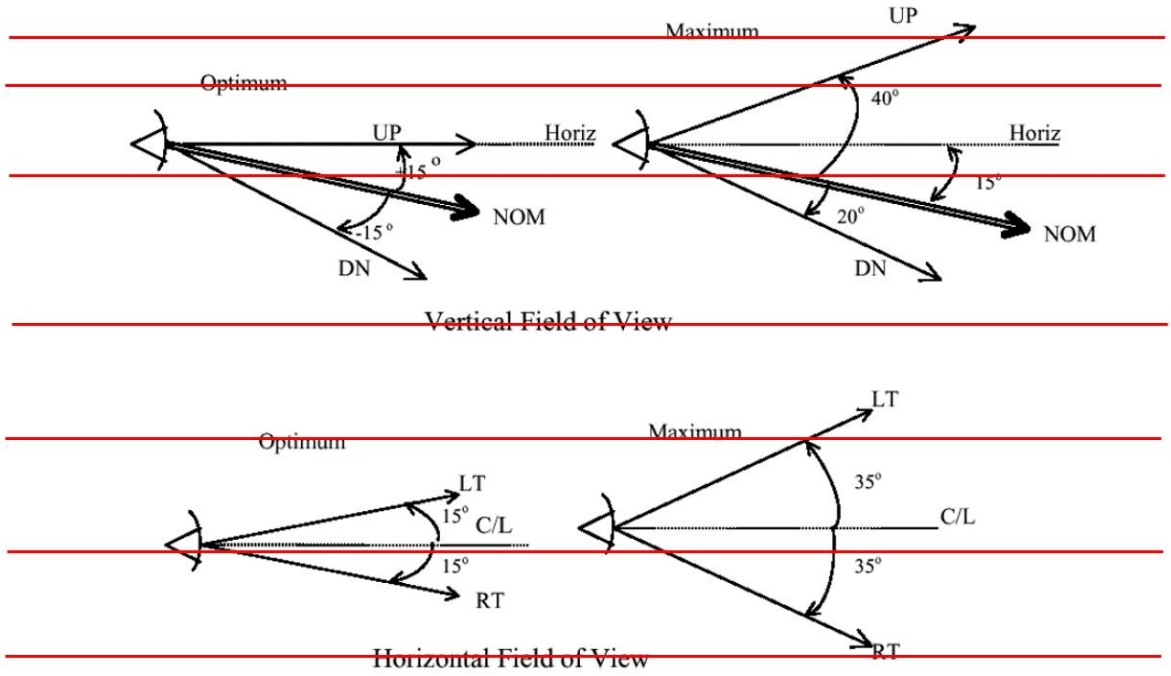


Figure 1 – Optimum and maximum fields of view

Note: This CS defines the optimum and maximum fields of view. As the Federal Aviation Administration (FAA) defines primary and secondary fields of view in its Advisory Circular (AC) 29-2C, 'optimum' should be read as primary and 'maximum' as secondary fields of view.

Flight plan is, in the context of PBN operations, a set of route segments and flight procedures defined and activated by the flight crew in the required navigation performance (RNP) system, relative to an intended flight or a portion of a flight of an aircraft.

[…]

[Issue: CS-ACNS/2]

[Issue: CS-ACNS/4]

SUBPART B – COMMUNICATIONS (COM)

SECTION 1 – VOICE CHANNEL SPACING (VCS)

GENERAL

CS ACNS.B.VCS.001 Applicability

(See GM1 ACNS.B.VCS.001)

[…]

[Issue: CS-ACNS/4]

GM1 ACNS.B.VCS.001 Applicability

Background information on voice communication systems is provided in Appendix A – Background information on voice communication systems.

[Issue: CS-ACNS/4]

SYSTEM PERFORMANCE REQUIREMENTS

CS ACNS.B.VCS.020 Performance ~~R~~requirements

~~The v~~Voice communication systems conform~~s~~ to the performance requirements of the following sections of ICAO Annex 10, Volume III, Part 2 (Second Edition ~~—~~ July 2007 incorporating Amendment No 90), Chapter 2, 'Aeronautical Mobile Service':

(a) Section 2.1 'Air-ground VHF communication system characteristics'~~.~~;

~~(b) Section 2.2 'System characteristics of the ground installation'.~~

(~~c~~b) Section 2.3.1 'Transmitting function'~~.~~; and

(~~d~~c) Section 2.3.2 'Receiving function' excluding sub-section 2.3.2.8 'VDL ~~—~~ Interference Immunity Performance'.

[Issue: CS-ACNS/2]

[Issue: CS-ACNS/4]

SECTION 2 – DATA LINK SERVICES (DLS)

GENERAL

GM1 ~~.~~ACNS.B.DLS.B1.001 Applicability

Controller–pilot communications through the data link ~~is~~are used ~~in different airspaces~~ worldwide. Different technologies ~~are~~may be used, and ~~this~~ CS ACNS.B.DLS.B1.001 is intended to provide the airworthiness standard for such installations. Additionally, controller–pilot communications over the ATN B1 data link technology ~~has~~have been mandated in Europe~~,~~ through ~~the~~ Regulation (EC) No 29/2009. Installations intended to operate within EU ~~A~~airspace, defined in the above-mentioned ~~r~~Regulation, should fully comply with all the requirements of the 'DATA LINK SERVICES' section~~, in its entirety~~.

Installations not intended to operate within EU ~~A~~airspace~~,~~ are not required to comply with the above-mentioned ~~section~~Regulation.

Note 1: ~~*Requirements*~~ *CS ACNS.B.DLS.B1.010 and CS ACNS.B.DLS.B1.015 are also applicable for CPDLC installations where, in addition~~*~~ally~~*~~ to ATN B1 over VDL M2, other means of communication~~*~~s~~*~~ and other services are also provided*.

Note 2: further background information on data link systems is provided in Appendix B – Background information on data link systems.

[Issue: CS-ACNS/4]

FLIGHT DECK CONTROL AND INDICATION CAPABILITIES

AMC1 ACNS.B.DLS.B1.010 Flight ~~D~~deck ~~I~~interface

[…]

When CPDLC messages are displayed:

(a) such location should be in the maximum field of view~~Primary Field of View~~.

[…]

[Issue: CS-ACNS/4]

ATN B1 DATA LINK

GM1 ACNS.B.DLS.B1.020 Data ~~L~~link ~~S~~services

Community Specification EN 303 214 'Data Link Services (DLS) System' provides a set of test scenarios to be~~that~~ demonstrated using a verified ground data link system or a ground data link system simulator.

[Issue: CS-ACNS/4]

~~GM1 ACNS.B.DLS.B1.020 Data Link Services~~

(a) **Data ~~L~~link ~~i~~initiation ~~C~~capability (DLIC) ~~S~~service**

The DLIC service enables the exchange of information between aircraft and ground data link equipment, necessary for the establishment of data link communications. It ensures:

[…]

[Issue: CS-ACNS/4]

SYSTEM PERFORMANCE REQUIREMENTS

CS ACNS.B.DLS.B1.035 DLS system c~~C~~ontinuity

(See AMC1 ACNS.B.DLS.B1.035 and GM1 ACNS.B.DLS.B1.035)

The data link system is designed to provide a level of continuity that supports the intended operation.

~~The data link system continuity is designed to an allowable qualitative probability of 'probable'.~~

[Issue: CS-ACNS/4]

AMC1 ACNS.B.DLS.B1.035 DLS system continuity

The loss of the data link system function is considered to be a minor failure condition.

[Issue: CS-ACNS/4]

GM1 ACNS.B.DLS.B1.035 DLS system continuity

The definition of continuity in CS-ACNS is different from the definition of continuity in EUROCAE ED-120. Throughout CS-ACNS, continuity (system continuity) refers to 'the probability that a system will perform its required function without unscheduled interruption'. In the context of ED-120, this would be commensurate with the term 'availability'.

[Issue: CS-ACNS/4]

DATA LINK INITIATION CAPABILITY (DLIC) SERVICE MESSAGES

CS ACNS.B.DLS.~~B.~~B1.060 DLIC ~~i~~initiation when in 'CPDLC ~~i~~nhibited' ~~S~~state (~~U~~uplink)

When the data link system is in the 'CPDLC inhibited' state, a DLIC Contact Request is processed but the system ~~is~~ remains~~ing~~ in the 'CPDLC inhibited' state.

[Issue: CS-ACNS/4]

CPDLC MESSAGES

CS ACNS.B.DLS.B1.070 CPDLC ~~U~~uplink ~~M~~messages

(See AMC1 ACNS.B.DLS.B1.070, ~~AMC2 ACNS.B.DLS.B1.070,~~ GM1 ACNS.B.DLS.B1.070 and GM2 ACNS.B.DLS.B1.070)

[…]

[Issue: CS-ACNS/4]

AMC1 ACNS.B.DLS.B1.070 CPDLC ~~U~~uplink ~~M~~messages

The data link system should comply with EUROCAE Document ED-110B, ~~s~~Section 2.2.3, and ~~comply~~ with the CPDLC message syntax in ICAO Doc 9705 (Edition 2), ~~s~~Section 2.1.4.

~~For the sole exception of UM117, t~~The data link system should prepare the appropriate response downlink message to a received uplink message in compliance with EUROCAE Document ED-110B, ~~s~~Section 2.2.3.3, Table 2-4. Received uplink messages with the response type 'A/N' ~~as~~ indicated in the 'Response' column should be responded to with either DM2 (STANDBY), DM4 (AFFIRM) or DM5 (NEGATIVE). Received uplink messages with the response type 'R' ~~as~~ indicated in the 'Response' column should be responded to with either DM2 (STANDBY), DM3 (ROGER) or ~~with~~ DM1 (UNABLE). ~~When UM117 CONTACT is received, no DM89 MONITORING message should be sent.~~

The aircraft data link ~~aircraft~~ system should also handle unsupported messages (i.e. uplink messages not referenced in CS ACNS.B.DLS.B1.050) as specified in EUROCAE Document ED-110B, ~~s~~Section 3.3.7.6.

[Issue: CS-ACNS/4]

~~AMC2 ACNS.B.DLS.B1.070 CPDLC Uplink Messages~~

~~EUROCAE Document ED-110B requires (in Table 4-3, item 6a) aircraft to send the DM89 (MONITORING [unitname] [frequency]) CPDLC message upon receipt of a UM117 (CONTACT) or UM120 (MONITOR) CPDLC message. The sending of DM89 could manually prepared and sent by the flight crew in response to UM120 but not for UM117.~~

[Issue: CS-ACNS/4]

CS ACNS.B.DLS.B1.075 CPDLC ~~D~~downlink ~~M~~messages

(See AMC1 ACNS.B.DLS.B1.075, GM1 ACNS.B.DLS.B1.075, GM2 ACNS.B.DLS.B1.075 and GM3 ACNS.B.DLS.B1.075)

The data link system is capable of preparing and sending the following downlink message elements:

ID	Message
DM0	WILCO
DM1	UNABLE

ID	Message
DM2	STANDBY
DM3	ROGER
DM4	AFFIRM
DM5	NEGATIVE
DM6	REQUEST [level]
DM18	REQUEST [speed]
DM22	REQUEST DIRECT TO [position]
DM32	PRESENT LEVEL [level]
DM62	ERROR [errorInformation]
DM63	NOT CURRENT DATA AUTHORITY
DM65	DUE TO WEATHER
DM66	DUE TO AIRCRAFT PERFORMANCE
DM81	WE CAN ACCEPT [level] AT [time]
DM82	WE CANNOT ACCEPT [level]
~~DM89~~	~~MONITORING [unitname] [frequency]~~
DM98	[freetext]
DM99	CURRENT DATA AUTHORITY
DM100	LOGICAL ACKNOWLEDGEMENT
DM106	PREFERRED LEVEL [level]
DM107	NOT AUTHORIZED NEXT DATA AUTHORITY
DM109	TOP OF DESCENT [time]

[Issue: CS-ACNS/4]

AMC1 ACNS.B.DLS.B1.075 Downlink ~~M~~messages

The data link system should comply with EUROCAE Document ED-110B, ~~s~~Section 2.2.3, and ~~comply~~ with the CPDLC message syntax in ICAO Doc 9705 (Edition 2), ~~s~~Section 2.1.4.

~~For the sole exception of UM117,~~The data link aircraft equipment should prepare the appropriate response downlink message to a received uplink message in compliance with EUROCAE Document ED-110B, ~~s~~Section 2.2.3.3, Table 2-4. ~~When UM117 CONTACT is received, no DM89 MONITORING message should be sent.~~

[Issue: CS-ACNS/4]

GM1 ACNS.B.DLS.B1.075 Downlink ~~M~~messages

The following table associates downlink messages with~~to the~~ data link services.

ID	Message	ACM	ACL	AMC
DM0	WILCO	x	x	
DM1	UNABLE	x	x	
DM2	STANDBY	x	x	
DM3	ROGER		x	
DM4	AFFIRM		x	
DM5	NEGATIVE		x	
DM6	REQUEST [level]		x	
DM18	REQUEST [speed]		x	
DM22	REQUEST DIRECT TO [position]		x	
DM32	PRESENT LEVEL [level]		x	
DM62	ERROR [errorInformation]	x	x	
DM63	NOT CURRENT DATA AUTHORITY	x		
DM65	DUE TO WEATHER		x	
DM66	DUE TO AIRCRAFT PERFORMANCE		x	
DM81	WE CAN ACCEPT [level] AT [time]		x	
DM82	WE CANNOT ACCEPT [level]		x	
~~DM89~~	~~MONITORING [unitname] [frequency]~~	~~x~~		
DM98	[freetext]	x	x	
DM99	CURRENT DATA AUTHORITY	x		
DM100	LOGICAL ACKNOWLEDGEMENT	x	x	
DM106	PREFERRED LEVEL [level]		x	
DM107	NOT AUTHORIZED NEXT DATA AUTHORITY	x	x	
DM109	TOP OF DESCENT [time]		x	

[Issue: CS-ACNS/4]

DATA LINK SERVICES REQUIREMENTS

CS ACNS.B.DLS.B1.080 Data ~~L~~link ~~I~~initiation ~~C~~capability (DLIC) ~~S~~service

(See AMC1 ACNS.B.DLS.B1.080 and GM1 ACNS.B.DLS.B1.080)

The data link system for DLIC conforms with ~~s~~Section 4.1, 4.2.2 and 4.3.2 of EUROCAE Document 'ED-120 Safety and Performance Requirements Standard For Initial Air Traffic Data Link Services In Continental Airspace', ~~including change 1 and change 2~~ and ~~s~~Section 2.2.1 and 4.1 of EUROCAE Document ED-110B 'Interoperability Requirements Standard for Aeronautical Telecommunication Network Baseline 1'.

[Issue: CS-ACNS/4]

CS ACNS.B.DLS.B1.085 ATC Ccommunications Mmanagement (ACM) Sservice

(See AMC1 ACNS.B.DLS.B1.085 and GM1 ACNS.B.DLS.B1.085)

The data link system for ACM conforms with sSection 5.1.1, 5.1.2.3 (excluding requirements relating to downstream clearance) and 5.1.3.2 of EUROCAE Document ED-120 'Safety and Performance Requirements Standard For Initial Air Traffic Data Link Services In Continental Airspace', ~~including change 1 and change 2~~.

[Issue: CS-ACNS/4]

CS ACNS.B.DLS.B1.090 ACL Sservice Ssafety Rrequirements

(See AMC1 ACNS.B.DLS.B1.090 and GM1 ACNS.B.DLS.B1.090)

The data link system for ACL conforms with sSection 5.2.1, 5.2.2.3 and 5.2.3.2 of EUROCAE Document ED-120 'Safety and Performance Requirements Standard For Initial Air Traffic Data Link Services In Continental Airspace', ~~including change 1 and change 2~~.

[Issue: CS-ACNS/4]

CS ACNS.B.DLS.B1.095 ATC Mmicrophone Ccheck (AMC) Sservice

The data link system for AMC conforms with sSection 5.3.1, 5.3.2.3 and 5.3.3.2 of EUROCAE Document 'ED-120 Safety and Performance Requirements Standard For Initial Air Traffic Data Link Services In Continental Airspace', ~~including change 1 and change 2~~.

[Issue: CS-ACNS/4]

INTEROPERABILITY REQUIREMENTS

CS ACNS.B.DLS.B1.115 Presentation Llayer Rrequirements

(See AMC1 ACNS.B.DLS.B1.115)

The ATN Presentation protocol is capable of supporting the presentation protocol data units (PPDUs) listed in the following table:

[…]

[Issue: CS-ACNS/4]

APPENDICES

Appendix A – Background information ~~for~~on ~~V~~voice ~~C~~communication ~~S~~systems

[…]

[Issue: CS-ACNS/4]

Appendix B – Background information ~~for~~on ~~D~~data ~~L~~link ~~S~~systems

[…]

(b) Related ~~R~~references

[…]

(6) EUROCAE

i. ED-110B, December 2007, 'Interoperability Requirements Standard for Aeronautical Telecommunication Network Baseline 1' (Interop ATN B1),

ii. ED-120, May 2004, 'Safety and Performance Requirements Standard For Initial Air Traffic Data Link Services In Continental Airspace (SPR IC)', including change 1, change 2, and change 3,~~2.~~

[…]

[Issue: CS-ACNS/4]

SUBPART C – NAVIGATION (NAV)

SECTION 1 – PERFORMANCE-BASED NAVIGATION (PBN)

SUBSECTION 2 – GENERIC SPECIFICATIONS FOR PERFORMANCE-BASED LATERAL NAVIGATION

FUNCTIONAL CRITERIA

RNP system

CS ACNS.C.PBN.255 Magnetic variation

(See AMC1 ACNS.C.PBN.255 ~~and GM1 ACNS.C.PBN.255~~)

(a) The required navigation performance (RNP) system has the capability to assign a magnetic variation at any location within the region where flight operations are conducted, using the magnetic ~~N~~north as reference.

(b) For paths defined by a course, the RNP system uses the appropriate magnetic variation value available in the navigation database.

(c) The conditions under which the magnetic variation table (MAGVAR table), certified as part of the aircraft configuration, is updated are included in the aircraft's instructions for continued airworthiness (ICAs).

[Issue: CS-ACNS/2]

[Issue: CS-ACNS/4]

SUBSECTION 5 – SUPPLEMENTARY SPECIFICATIONS FOR VERTICAL NAVIGATION IN FINAL APPROACH

APPLICABILITY

GM1 ACNS.C.PBN.501 Applicability

Subsection 5 sets out the certification specifications for systems that use either a barometric VNAV (BARO-VNAV) or a GNSS space-based augmented source of vertical position (SBAS-VNAV) ~~on~~for procedures where vertical guidance is based on a published vertical path to LNAV/VNAV or Localizer Performance with Vertical guidance (LPV) minima respectively.

The vertical performance of systems that comply with ~~CS ACNS.C.PBN.575~~CS ACNS.C.PBN.555 is not adequate to support required navigation performance (RNP) authorisation required approach (AR APCH) operations, but the requirements contained in ~~CS ACNS.C.PBN.675~~CS ACNS.C.PBN.670 should be applied instead.

[Issue: CS-ACNS/2]

[Issue: CS-ACNS/4]

SUPPLEMENTARY FUNCTIONAL CRITERIA

Display of navigation data

AMC1 ACNS.C.PBN.535 Resolution and full-scale deflection of the vertical deviation display

Compliance with CS ACNS.C.PBN.535 can be demonstrated with one of the following ways:

(1) Installation of equipment with an ETSO authorisation against ETSO-C115d or ETSO-C146c supports the requirement of the CS, provided that the applicant ensures that the display characteristics comply with the CS.

(2) Required navigation performance (RNP) systems that provide fixed vertical scaling should provide a non-numerical vertical deviation display with a full-scale deflection of ± 150 ft. In addition, the display should provide the flight crew with an easy way to readily identify a path deviation of 75 ft using the vertical deviation display alone, i.e. provide clear markings at + 75 ft and at – 75 ft.

Note: Subject to EASA's agreement, the use of a scale of other than ± 150 ft may be accepted, provided that the scaling is suitable to control the aircraft on the intended path, and the 75-ft deviation can be easily identified by the flight crew. The applicant should provide a human factors and workload assessment, as well as relevant operating procedures that ensure that the aircraft's deviation from the path can be monitored and bounded within the ± 75-ft interval, supporting this deviation.

(3) Systems that use a type of angular vertical scaling other than the scaling defined in RTCA DO-229D should meet the following:

(a) The deviation scaling suitably supports the flight technical error (FTE) monitoring and bounding (± 75-ft deviation);

(b) The deviation limits are equivalent to the operational limits for glideslope deviations during an ILS approach.

~~In order t~~To meet the primary safety objective of not exceeding an FTE of 75 ft below the path to maintain obstacle clearance, it may be required to put a limitation on the length of the approach that the RNP system is able to support.

A vertical situation display is not considered to satisfy the requirements.

[Issue: CS-ACNS/2]

[Issue: CS-ACNS/4]

SUPPLEMENTARY PERFORMANCE CRITERIA

Vertical performance

AMC1 ACNS.C.PBN.555 Vertical accuracy when using barometric VNAV

[…]

(d) Vertical path steering error (PSE_Z)

The vertical path steering performance varies depending on how operations are conducted (manual, flight director or autopilot). The use of a flight director or autopilot may be required to support the PSE_Z requirement in certain conditions. In this case, the required navigation performance (RNP) system coupling to the flight director and/or autopilot should be unambiguously displayed in the flight crew's ~~primary~~optimum field of view. This should also be documented in the AFM.

[Issue: CS-ACNS/2]

[Issue: CS-ACNS/4]

SUBSECTION 6 – SUPPLEMENTARY SPECIFICATIONS FOR RNP AUTHORISATION REQUIRED (RNP AR)

SUPPLEMENTARY FUNCTIONAL CRITERIA

RNP system

CS ACNS.C.PBN.615 Autopilot/Flight director

(a) Means are provided to couple the required navigation performance (RNP) system with the autopilot or flight director.

(b) The RNP system, the flight director system and the autopilot must be capable of commanding a bank angle of up to ~~25~~30 degrees above 121 m (400 ft) AGL and up to 8 degrees below 121 m (400 ft) AGL.

[Issue: CS-ACNS/2]

[Issue: CS-ACNS/4]

SUPPLEMENTARY PERFORMANCE CRITERIA

CS ACNS.C.PBN.675 RNP system design ~~–~~ RNP AR integrity

(See AMC1 ACNS.C.PBN.675 and GM1 ACNS.C.PBN.675)

The integrity of the ~~lateral~~ guidance provided by the aircraft required navigation performance (RNP) system supports the intended RNP AR operations.

[Issue: CS-ACNS/2]

[Issue: CS-ACNS/4]

GM1 ACNS.C.PBN.675 RNP system design – RNP AR integrity

The criterion of CS ACNS.C.PBN.675 applies to the integrity of the design of the system(s) that provide(s) guidance on lateral navigation (LNAV) and vertical navigation (VNAV), e.g. the design assurance level (DAL). It does not apply to the integrity of the VNAV performance.

[Issue: CS-ACNS/4]

CS ACNS.C.PBN.680 RNP system design – RNP AR continuity

(See AMC1 ACNS.C.PBN.680 and GM1 ACNS.C.PBN.680)

The continuity of the ~~lateral~~ guidance provided by the required navigation performance (RNP) system supports the intended RNP AR operations.

[Issue: CS-ACNS/2]

[Issue: CS-ACNS/4]

GM1 ACNS.C.PBN.680 RNP system design – RNP AR continuity

The criterion of CS ACNS.C.PBN.680 applies to the continuity of the design of the required navigation performance (RNP) system(s) that provide(s) guidance on lateral navigation (LNAV) and vertical navigation (VNAV). It does not imply recognition of, or a step towards, vertical RNP or similar concepts.

[Issue: CS-ACNS/4]

SUBPART D – SURVEILLANCE (SUR)

SECTION 1 – MODE A/C ONLY SURVEILLANCE

GENERAL

CS ACNS.D.AC.001 Applicability

(See GM1 ACNS.D.AC.001)

[…]

[Issue: CS-ACNS/4]

GM1 ACNS.D.AC.001 Applicability

Background information on Mode A/C surveillance systems is provided in Appendix A – Background information on Mode A/C surveillance systems.

[Issue: CS-ACNS/4]

INSTALLATION REQUIREMENTS

CS ACNS.D.AC.040 Dual/multiple transponder installation

(See AMC1 ACNS~~D~~.D.AC.040)

[…]

[Issue: CS-ACNS/4]

AMC1 ACNS~~D~~.D.AC.040 Dual/multiple transponder installation

[…]

[Issue: CS-ACNS/4]

SECTION 2 – MODE S ELEMENTARY SURVEILLANCE

GENERAL

AMC1 ACNS.D.ELS.001 Applicability

Background information on Mode S ELS systems is provided in Appendix B – Background information on Mode S ELS.

Provided that the differences listed in Appendix D – Differences between CS ACNS.D.ELS and JAA TGL 13 Rev1 have also been addressed, then previous declarations of compliance ~~declarations~~

with JAA TGL 13 Revision 1 (Certification of Mode S Transponder Systems for Elementary Surveillance), supplemented with the additional assessments ~~is another~~, are also ~~A~~acceptable ~~M~~means of ~~C~~compliance.

Note ~~1~~: A list of Mode S ELS-related documents is provided in ~~Book 2~~ Subpart D, Appendix B, ~~s~~Section (b).

~~*Note 2: More information on how the ELS information will be extracted and used by ground surveillance is available in Book 2 Subpart D Appendix B section (c).*~~

~~*Note 3: In accordance with EU Regulation No 1207/2011, aircraft operating flights as general air traffic in accordance with instrument flight rules in the airspace within the ICAO EUR and AFI regions where EU Member States are responsible for the provision of air traffic services are to be compliant with CS ACNS Book 1 Subpart D section 2.*~~

[Issue: CS-ACNS/4]

SYSTEM FUNCTIONAL REQUIREMENTS

AMC1 ACNS.D.ELS.015 Data transmission

Data transmission verifications

(a) Table 1 below provides the parameters that should be verified for Mode S ~~E~~elementary ~~S~~surveillance.

[…]

Note 1: Information about how Mode S ELS data ~~are~~is used by Mode S ground systems can be found in ~~Book 2~~Subpart D, Appendix B ~~to this CS~~.

Note 2: Downlink ~~F~~formats (DFs) are defined in ICAO Annex 10, Volume IV and EUROCAE ED-73E. A summary can also be found in ~~Book 2~~Subpart D, Appendix B.

[…]

(h) Transmission of other parameters

When one or more other airborne data items are transmitted, they should be verified as proposed in AMC1 ACNS.D.EHS.015.

[…]

[Issue: CS-ACNS/4]

CS ACNS.D.ELS.025 Altitude source

(See AMC1 ACNS.D.ELS.025)

(a) The reported pressure altitude is obtained from an approved source.

(b) The altitude resolution is less than or equal to ~~or less than~~ 30.48 m (100 ft~~.~~).

(c) The altitude source connected to the active transponder is consistent with the source being used to fly the aircraft.

[Issue: CS-ACNS/4]

AMC1 ACNS.D.ELS.025 Altitude source

(a) ~~Altimeters compliant~~Compliance with JAA TGL No 6 is~~are~~ an approved ~~and A~~acceptable ~~M~~means of ~~C~~compliance for an altimeter as an~~the~~ altitude source.

(b) ~~Altimeters with a~~A pressure altitude resolution ~~lower~~of less than or equal to 7.62 m (25 ft) is~~are~~ an approved ~~and A~~acceptable ~~M~~means of ~~C~~compliance for an altimeter.

Note: An a~~A~~ltitude source resolution ~~lower~~of less than or equal to 7.62 m (25 ft) is required for aeroplanes intended to be used for international air transport, as defined in ICAO Annex 6, Part 1, ~~—~~Section 6.19.

(c) ~~An altimeter with a~~A pressure altitude resolution ~~lower~~of less than or equal to 30 m (100 ft) and greater than 7.62 m (25 ft) is an approved ~~and A~~acceptable ~~M~~means of ~~C~~compliance for an aircraft altimeter, provided that the following ~~provisions~~conditions are ~~implemented~~met:

(1) There is no conversion of the Gillham-~~-~~encoded data to another format before it is input~~ting~~ to the transponder unless failure detection can be provided, and the resolution (quantisation) is set in the transmitted data to indicate 30 m (100 ft).~~;~~

Note 1: It is not recommended to install altimeters with a Gillham altitude encoder interface, as it supports a resolution of only 30 m (100 ft).

Note 2: Losses or errors of pressure altitude have an impact on the provision of separation by the air traffic control (ATC). It is, therefore, important to design the altitude pressure source to minimise the loss of this data or the provision of erroneous data.

Note 3: Further guidance on altitude measurement and coding systems ~~may~~can be found in EUROCAE ~~d~~Document ED-26.

(2) Altitude source comparison:~~;~~

For aircraft equipped with ACAS II, where the available source of pressure altitude information is only in Gillham-~~-~~encoded format, the requirement for detection of an altitude source or encoder failure can be satisfied by means of dual independent altitude corrected sensors, together with an altitude data comparator (which may be incorporated and enabled in the transponder). Similar provisions are~~is~~ also acceptable for alternative altitude information sources that do not signal erroneous data.

The flight deck interface should provide a means to inhibit the transmission of pressure altitude information for aircraft equipped with a Gillham-~~-~~encoded altitude interface.

(d) If it is impractical to connect the transponder to the altitude source used to fly the aircraft, consistency may be achieved by:

(1) connecting the pressure altitude source directly (e.g. via a T-junction) to the same pitot/static-pressure line(s) as the altitude source being used to fly the aircraft; and

(2) ensuring that the pressure altitude source has built-in test equipment (BITE) that permanently or frequently runs an automatic system self-test and triggers a 'FAIL' annunciator/indicator (e.g. an amber light) in the pilot's normal field of view upon detection of a failure; and

(3) ensuring that the altitude source meets design and performance standards that achieve an adequate level of integrity of its output, to mitigate the risk of a possible inconsistency between the output of the altitude source and the altimeters used by the flight crew to fly the aircraft.

The altitude source may be integrated into the transponder if the above-mentioned requirements are met.

(e) The provision of ~~M~~manual or automatic selection of the altitude source ~~are~~is an acceptable means of compliance.

[Issue: CS-ACNS/4]

SYSTEM PERFORMANCE REQUIREMENTS

CS ACNS.D.ELS.045 Continuity

(See AMC1 ACNS.D.ELS.045)

The Mode S ELS airborne surveillance system ~~continuity~~ is designed to provide a level of continuity that supports the intended operation with a remote probability of failure~~to an allowable qualitative probability of 'remote'~~.

[Issue: CS-ACNS/4]

AMC1 ACNS.D.ELS.045 Continuity

The allowable quantitative probability of loss of the Mode S functionality per flight hour should be less than or equal to 2×10^{-4} (i.e. the mean time between failures, which is equal to or greater than 5 000 flight hours).

[Issue: CS-ACNS/4]

SECTION 3 – MODE S ENHANCED SURVEILLANCE

GENERAL

AMC1 ACNS.D.EHS.001 Applicability

Background information on Mode S EHS systems is provided in Appendix C – Background information on Mode S EHS.

Provided that the differences listed in Appendix E – Differences between CS ACNS.D.EHS and EASA AMC 20-13 have also been addressed, then previous declarations of compliance ~~declarations~~ with

EASA AMC 20-13 (Certification of Mode S Transponder Systems for Enhanced Surveillance), supplemented with the additional assessments ~~is another~~,are also ~~A~~acceptable ~~M~~means of ~~C~~compliance.

Note: In accordance with ~~EU~~ Regulation (EU) No 1207/2011, fixed-~~-~~wing aircraft having a maximum take-~~-~~off mass greater than 5 700 kg or a maximum cruising true airspeed greater than 128.6 m/s (250 knots) and operating flights as general air traffic in accordance with instrument flight rules in the airspace within the ICAO EUR and AFI regions where EU Member States are responsible for the provision of air traffic services (ATS) are to be compliant with CS-~~-~~ACNS, ~~Book 1~~ Subpart D, ~~s~~Section 3.

[Issue: CS-ACNS/4]

SYSTEM FUNCTIONAL REQUIREMENTS

CS ACNS.D.EHS.015 Data transmission

(See AMC1 ACNS.D.EHS.015)

(a) The surveillance system provides in the Mode S reply the following downlink aircraft parameters, where available on a digital bus, in addition to those specified in CS ACNS.D.ELS.015:

[…]

[Issue: CS-ACNS/4]

SECTION 4 – 1090 MHZ EXTENDED SQUITTER ADS-B

GENERAL

GM1 ACNS.D.ADSB.001 Applicability

[…]

The approval of on-board systems receiving and processing ADS-B messages in support of air-to-air applications is outside the scope of Subpart D, ~~s~~Section 4.

Note: In accordance with ~~EU~~ Regulation (EU) No 1207/2011, aircraft having a maximum take-~~-~~off mass greater than 5 700 kg or a maximum cruising true airspeed greater than 128.6 m/s (250 knots) and operating flights as general air traffic in accordance with instrument flight rules in the airspace within the ICAO EUR and AFI regions where EU Member States are responsible for the provision of air traffic services (ATS) are to be compliant with CS-~~-~~ACNS, ~~Book 1~~ Subpart D, ~~s~~Section 4.

[Issue: CS-ACNS/4]

ADS-B OUT DATA

CS ACNS.D.ADSB.025 Provision of ~~D~~data

(See AMC1 ACNS.D.ADSB.025(a) and (c))

[…]

[Issue: CS-ACNS/4]

OTHER DATA SOURCES

AMC1 ACNS.D.ADSB.080 Data ~~S~~sources as defined by Mode S ~~E~~elementary and ~~E~~enhanced ~~S~~surveillance

(a) General ~~R~~requirements

For the requirements and general guidance on the data sources providing the Mode S ~~E~~elementary and ~~E~~enhanced surveillance parameters, the following references to CS ACNS.D.ELS and CS ACNS.D.EHS apply:

(1) Aircraft Identification: CS ACNS.D.ELS.030(a)(3);

(2) Mode A Code: CS ACNS.D.ELS.030(a)(1);

(3) SPI: CS ACNS.D.ELS.030(a)(2);

(4) Emergency Mode/Status: CS ACNS.D.ELS.030(a)(1);

(5) Pressure Altitude: CS ACNS.D.ELS.025;

(6) MCP/FCU Selected Altitude: ~~:~~AMC1 ACNS.D.EHS.015~~-~~(c)(1);

(7) Barometric Pressure Setting: AMC1 ACNS.D.EHS.015(c)(3);

[…]

(e) Selected ~~A~~altitude (and related ~~M~~modes)

With respect to the various status and mode fields contained in ~~r~~Register 6216 (~~s~~Subtype 1), the respective provisions of AMC1 ACNS.D.EHS.015~~-~~(c)(1) apply to the 'Selected Altitude Type', 'Status of MCP/FCU Mode Bits', 'VNAV Mode Engaged', 'Altitude Hold Mode', and 'Approach Mode' information.

[…]

[Issue: CS-ACNS/4]

FLIGHT DECK CONTROL AND INDICATION CAPABILITIES

AMC1 ACNS.D.ADSB.090(a) Flight Ddeck ~~I~~interface

(a) Installations

(1) Data ~~T~~transmission and ~~D~~display ~~C~~consistency

The data transmitted by the active ADS-B transmit unit should be consistent with the data displayed to the flight crew ~~should be consistent~~.

Consistency may be demonstrated by using a compliant GNSS sensor connected to the transponder and the navigation equipment (i.e. the transponder and navigation equipment receive the same data from the GNSS source).

Where this is not practical, compliance may be demonstrated by installing a stand-alone GNSS receiver connected (only) to the transponder, provided that the GNSS receiver is approved in accordance with ETSO-C145c or ETSO-C146c (or later amendments).

Note 1: Operational Classes 1, 2 or 3 of RTCA DO-229D satisfy the 'consistency' criteria.

Note 2: The horizontal position data displayed to the flight crew ~~might~~may be based on data from more ~~than the~~ position sources than the one~~that~~ used for ADS-B transmissions.

(2) Single ~~P~~point of ~~F~~flight ~~C~~crew ~~E~~entry

[…]

(b) ADS-B ~~O~~off ~~S~~switch

[…]

[Issue: CS-ACNS/4]

SYSTEM PERFORMANCE REQUIREMENTS

CS ACNS.D.ADSB.105 Continuity

(See AMC1 ACNS.D.ADSB.105)

~~(a)~~ The ADS-B Out system ~~continuity~~ is designed to provide a level of continuity that supports the intended operation with a remote probability of failure ~~to an allowable qualitative probability of 'remote'~~.

[Issue: CS-ACNS/4]

AMC1 ACNS.D.ADSB.105 Continuity

The allowable quantitative probability of loss of the ADS-B Out functionality per flight hour should be less than or equal to 2×10^{-4} (i.e. the mean time between failures, which is equal to or greater than 5 000 flight hours).

[Issue: CS-ACNS/4]

HORIZONTAL POSITION AND VELOCITY DATA REFRESH RATE AND LATENCY

CS ACNS.D.ADSB.110 Horizontal Pposition and Vvelocity Ddata Rrefresh Rrate

(See AMC1 ACNS.D.ADSB.110)

[…]

[Issue: CS-ACNS/4]

APPENDICES

Appendix A – Background information foron Mode A/C surveillance systems

(ae) General

This aAppendix provides additional references, background information, and guidance for maintenance testing, as appropriate to Mode A/C surveillance installations.

(bd) Related Rreferences

(1) EASA

ETSO-C74d, Minimum Performance Standards for Airborne ATC Transponder Equipment.

(2) ICAO

(i) ICAO Annex 10, Volume IV, Aeronautical Communications (Surveillance Radar and Collision Avoidance Systems), — Amdt 85;

(ii) ICAO Document 8168-OPS/611 Volume I, Procedures for Air Navigation Services, Aircraft Operations;

(iii) ICAO Document 4444-ATM/501, Procedures for Air Navigation Service, Air Traffic Management; and

(iv) ICAO EUR Regional Air Navigation Plan, Part IV, CNS Supplement SSR Code Allocation List for the EUR region, current edition.

[…]

(ce) Background information

Airborne surveillance system

[…]

[Issue: CS-ACNS/4]

Appendix B – Background information on Mode S ELS

[…]

(b) Related ~~M~~material

[…]

(c) Background ~~i~~information

[…]

[Issue: CS-ACNS/4]

Appendix C – Background information on Mode S EHS

[…]

(b) Related ~~M~~material

[…]

(c) Background ~~i~~information

[…]

(d) Existing ~~i~~installed ~~T~~transponders

[…]

[Issue: CS-ACNS/4]

Appendix D – Differences between CS ACNS.D.ELS and JAA TGL 13 Rev1

To demonstrate compliance with the CS ~~-~~ACNS ~~E~~elementary ~~S~~surveillance requirements, the following additional points need to be addressed for aircraft previously compliant with Joint Aviation Authorities (JAA) Temporary Guidance Leaflet (TGL) 13 Revision 1:

(a) ~~V~~verification that the ~~A~~aircraft identifications sent in '~~E~~extended ~~S~~squitter' messages and in the Mode S replies are identical~~,~~ (~~S~~see CS ACNS.D.ELS.015(b)~~-~~(2));

(b) ~~V~~verification that the pressure altitudes provided in '~~E~~extended ~~S~~squitter' messages and in Mode S replies are identical if the installation sends 'extended ~~S~~squitter' messages ~~are identical~~ (~~S~~see CS ACNS.D.ELS.015~~-~~(b)~~-~~(2)); and

(c) ~~O~~other parameters provided by the airborne surveillance system are verified as correct and are correctly indicated, as available~~.~~ (~~S~~see CS ACNS.D.ELS.015~~-~~(b)~~-~~(1)).

[…]

[Issue: CS-ACNS/4]

Appendix E – Differences between CS ACNS.D.EHS and EASA AMC 20-13

To demonstrate compliance with the CS ACNS ~~E~~enhanced ~~S~~surveillance requirements, the following additional points need to be addressed for aircraft previously compliant with EASA AMC 20-13:

(a) ~~A~~all transmitted parameters are correct and are correctly indicated, as available (see CS ACNS.D.EHS.015(c)); and

(b) ~~B~~barometric pressure setting is provided (~~S~~see CS ACNS.D.EHS.015(a)(8) and (c)).

[Issue: CS-ACNS/4]

Appendix H – Guidance on 1090 ~~-~~MHz ~~E~~extended ~~S~~squitter ADS-B Out

[…]

Definition 10: Emergency Status

The provision of the 'Emergency Status' values that do not have a corresponding Mode A value (see CS ACNS.D.ELS.015(a)(6)), denoting the other emergency conditions defined in 61_{16}, is optional. This applies to the decimal values 2, 3, 6 and 7 in Table 11.

[…]

Definition 21: Selected Altitude/Barometric Pressure Setting

Refer to AMC1 ACNS.D.EHS.015 ~~-~~(c) ~~-~~(1) and (c) ~~-~~(3) for detailed guidance.

[…]

(a) Horizontal Position Integrity (HPL)

Horizontal Position Integrity ~~—~~ – AMC1 ACNS.D.ADSB.070(a)(1) and (a)(2)(ii) ~~.1.2(a)~~

[…]

Integrity Fault – Time to Alert ~~—~~ – AMC1 ACNS.D.ADSB.070(a)(1) and (a)(2)(iii) ~~.1.2(b)~~

[…]

With reference to the mode ~~-~~dependent time to alert in Table 3-5 of EUROCAE ED-72A, ~~s~~Section 3.2.1 (Table 2-1 of RTCA DO-208, Section 2.2.1.13.1), GNSS equipment manufacturers should provide information describing the equipment integrity fault output latency, along with interface instructions and/or any limitations for meeting the 10-second latency requirement of AMC1 ACNS.D.ADSB.070(a)(1) and (a)(2)(iii) ~~.1.2(b)~~.

Note 1: The latency of reporting nominal ADS-B 'Quality Indicator' changes, such as in response to changing GNSS satellite constellations or due to switching between position sources, is bounded by AMC1 ~~CS~~ ACNS.D.ADSB.070(a)(2)(iii) ~~.1.2(c)~~ as well.

[…]

Mode Output ~~—~~ – AMC1 ACNS.D.ADSB.070(a)(1) and (a)(3) ~~.1.3~~

[…]

(b) Horizontal Position Accuracy (HFOM) — AMC1 ACNS.D.ADSB.070(a)(1) and (a)(2)(v) ~~1.2(d)~~

[…]

(c) Horizontal Position Latency — AMC1 ACNS.D.ADSB.070(a)(1) and (a)(2)(vi) ~~1.2(e)~~

[…]

(d) Horizontal Velocity Accuracy — AMC1 ACNS.D.ADSB.070(a)(1) and (a)(2)(vii) ~~1.2(f)~~

[…]

(e) Geometric Altitude Accuracy (VFOM) — AMC1 ACNS.D.ADSB.085

[…]

[Issue: CS-ACNS/4]

SUBPART E – OTHERS

SECTION 1 – TERRAIN AWARENESS AND WARNING SYSTEM (TAWS)

GENERAL

GM1 ACNS.E.TAWS.001 Applicability

CS ACNS.TAWS airworthiness requirements are not suitable to allow the use of TAWSs for navigation or for mitigation of navigation system failures.

Background information on terrain awareness and warning systems (TAWSs) is provided in Appendix C – Background information on terrain awareness and warning systems (TAWSs).

[Issue: CS-ACNS/4]

SYSTEM FUNCTIONAL REQUIREMENTS

AMC1 ACNS.E.TAWS.010 Required functions

Note: An example of an acceptable TAWS installation is provided in~~at~~ Appendix ~~2~~B – Example of an acceptable TAWS installation. Guidance on testing a TAWS is provided in Appendix A – TAWS installations testing guidance material.

(a) For the voice call~~-~~-out, a predetermined altitude of 150 m (500 ft~~.~~) has been found acceptable. However, another altitude may be allowed when a call-out at 150 m (500 ft~~.~~) would interfere with other operations.

[…]

[Issue: CS-ACNS/4]

AMC1 ACNS.E.TAWS.030 Terrain information display

(a) Terrain data should be displayed in the ~~normal~~maximum field of view. Terrain that is more than 600 m (2000 ft~~.~~) below the aeroplane's elevation need not be depicted.

[…]

[Issue: CS-ACNS/4]

SYSTEM PERFORMANCE REQUIREMENTS

CS ACNS.E.TAWS.040 Integrity

(See AMC1 ACNS.E.TAWS.040)

The terrain awareness and warning system (TAWS), including its position sensors, displays, and other associated components, is designed to provide a level of integrity that supports the intended operation.

~~(a) Integrity of the TAWS (including un-enunciated loss of the terrain alerting function) is designed commensurate with a major failure condition.~~

~~(b) False terrain alerting is designed commensurate with a minor failure condition.~~

~~(c) Failure of the installed TAWS does not degrade the integrity of any critical system interfacing with the TAWS.~~

[Issue: CS-ACNS/4]

AMC1 ACNS.E.TAWS.040 Integrity

A functional hazard assessment (FHA) applied to the specific design should be included in the certification dossier of the system. Elsewhere, failure conditions that result in false terrain warning and caution alerts, a non-annunciated loss of function, or the presentation of misleading information, should be considered major failure conditions.

Note: In this case, 'misleading information' is considered to be an incorrect depiction of the terrain threat relative to the aircraft under alert conditions.

[Issue: CS-ACNS/4]

CS ACNS.E.TAWS.045 Continuity

(See AMC1 ACNS.E.TAWS.045 and GM1 ACNS.E.TAWS.045)

The terrain awareness and warning system (TAWS), including its position sensors, displays, and other associated components, is designed to provide a level of continuity that supports the intended operation.

~~Continuity of the TAWS is designed to an allowable qualitative probability of 'probable'.~~

[Issue: CS-ACNS/4]

AMC1 ACNS.E.TAWS.045 Continuity

The loss of the TAWS function is considered to be a minor failure condition.

[Issue: CS-ACNS/4]

GM1 ACNS.E.TAWS.045 Continuity

The continuity specification should cover the detected loss of the function, which is caused by failures of the equipment or of the sensors required for the function.

[Issue: CS-ACNS/4]

APPENDICES

Appendix A~~:~~ – TAWS ~~I~~installations ~~T~~testing ~~G~~guidance ~~M~~material

[…]

[Issue: CS-ACNS/4]

Appendix B~~:~~ – Example of an ~~A~~acceptable TAWS ~~I~~installation

[…]

[Issue: CS-ACNS/4]

Appendix ~~3~~C – Background information ~~for~~on ~~T~~terrain ~~A~~awareness and ~~W~~warning ~~S~~systems (TAWSs)

(a) General

This ~~a~~Appendix provides additional references, background information, and guidance for maintenance testing, as appropriate to TAWS installations.

(b) Related ~~R~~references

[…]

[Issue: CS-ACNS/4]

SECTION 2 – REDUCED VERTICAL SEPARATION MINIMUM (RVSM)

SYSTEM PERFORMANCE REQUIREMENTS

CS ACNS.E.RVSM.035 Altimetry system accuracy

(See AMC1 ACNS.E.RVSM.035~~,~~ and GM1 ACNS.E.RVSM.035)

(a) For ~~G~~group aircraft, the altimetry system accuracy meets the following criteria ~~in~~throughout the full envelope:

(1) At the point of the flight envelope where the mean altimetry system error~~ASE~~ (ASE~~mean~~$_{mean}$) reaches its largest absolute value, that value does not exceed 25 m (80 ft); and

(2) At the point of the flight envelope where the absolute mean ASE (ASE_{mean}) plus three standard deviations of ASE (ASE3SD) reach~~es~~ their~~its~~ largest absolute value, the absolute value does not exceed 60 m (200 ft).

Examples of methods to establish and monitor static-source errors for group aircraft are provided in Appendix B – Examples of methods to establish and monitor static-source errors (group aircraft only).

[…]

[Issue: CS-ACNS/4]

APPENDICES

Appendix B – Examples of ~~M~~methods to ~~E~~establish and ~~M~~monitor ~~S~~static-~~ S~~source ~~E~~errors (~~G~~group aircraft only)

[…]

[Issue: CS-ACNS/4]