

Avionics requirements for civil aircraft



EUROCONTROL has prepared a short summary offering an overview of avionics requirements for civil aircraft. The intention is to list key avionics requirements including those recently or soon to be brought into force.

It is important to note that the information in these tables relates, unless otherwise stated, to the airspace or airworthiness requirements of the States of the European Civil Aviation Conference (ECAC).

It should also be noted that only National Aeronautical Information Publications (AIPs) and Aeronautical Information Circulars (AICs) contain formal and liable information concerning avionics requirements applicable to civil aircraft.

Where a system requirement is not mandated in ECAC airspace, its application is determined by the world wide ICAO Annex 6 standards. If a State elects to waive the ICAO Annex 6 standards, a difference must be notified to ICAO, which will be made known to the other States. It is up to each Member State to accept, or not, a deviation from the ICAO Annex 6 standards.

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Users are reminded that States remain ultimately responsible for mandating the carriage of avionics equipment in their respective airspace. Users are therefore advised to continue to consult National Aeronautical Information Publications (AIPs) and Aeronautical Information Circulars (AICs)

Civil aircraft – Communications requirements

Domain Programme Area	Equipment Requirement	ECAC Airspace Requirement	Airworthiness or Operational Requirement	Remarks
VHF Com 8.33 KHZ	<p>The probability of the loss of voice communication is better than or equal to remote.</p> <p>Depending of the size of the aircraft and the kind of operation, this could mean that only one set of 8.33kHz COM is required.</p> <p>Manufacturers of radios intended to operate in the VHF band, or their authorised representatives established in the Union, shall ensure that from 17 November 2013 all radios placed on the market, are 8, 33 kHz channel spacing capable.</p>	<p>Mandatory carriage above FL195 from 15 March 2007.</p> <p>Below FL195: the European Commission published the new voice channels spacing implementing rule in the Official Journal of the EU on the 16 November 2012 as Regulation (EU) No 1079/2012</p>	<p>For guidance on airworthiness and operational aspects see JAA TGL 7 Rev 1</p> <p>See also EASA NPA 2013-06</p>	<p>Below FL195: Europe has agreed to extend the use of 8.33 kHz radios in several phases:</p> <p>Phase 2 (2014), a small number of control sectors in the most frequency congested areas in which most aircraft are already 8.33 kHz capable will require 8.33 kHz radio equipage.</p> <p>Phase 3 (by 31st Dec. 2018), aims for full deployment in all European airspace, however European States can propose to delay deployment in areas that have a limited network impact.</p> <p>Attention: Possible amendments to regulation 29/2009 may follow</p>
VHF Com Immunity from FM radio broadcasts	All VHF Comm. equipment		For guidance see JAA TGL16	Some states may have exempted from the requirement.
Controller-Pilot Data Link Communications (CPDLC) ATN/VDL Mode 2	<p>3rd VHF Digital Radio, also either:</p> <p>Communications Management Unit (CMU) and Multi-function Control Display Unit (MCDU), or Air Traffic Service Unit (ATSU) and Dedicated Control and Display Unit (DCDU) or Integrated solution (e.g. Boeing FANS2) or Electronic Flight Bag solution (TBD)</p>	SES Data Link Services Implementing Rule - EC Reg. No. 29/2009 for above FL 285 (all of EU): Feb 2018	See EASA CS	<p>Airframe Dates</p> <p>All aircraft: Feb 2020</p>

Civil aircraft – Navigation requirements

Domain Programme Area	Equipment Requirement	ECAC Airspace Requirement	Airworthiness or Operational Requirement	Remarks
ILS	ILS receiver			Terminal aid available at most airports. ILS is expected to continue to provide service well into the future.
MLS	MLS receiver		EU OPS 1.865	Terminal aid to be made available at London Heathrow. Under consideration at other airports
RNAV5 (or B-RNAV)	RNAV systems (VOR/DME, DME/DME, GNSS or INS/IRU) capable of ± 5 NM accuracy	Mandated above FL95 for en-route IFR operations. In the lower airspace, National Authorities may designate domestic ATS routes which can be used by non B-RNAV capable aircraft. Mandatory all en-route airspace.	See EASA AMC 20-4 (Airworthiness Approval and Operational Criteria for the use of Navigation Systems in European Airspace designated for Basic RNAV operations) and FAA AC 90-96A	For ECAC airspace the primary sources of navigation information are VOR/DME, DME/DME, GNSS or INS/IRU. The availability and continuity of VOR and DME coverage have been calculated for most of Europe and they are considered to be capable of meeting the requirements of the en-route phase of operations.
RNAV1 (or P-RNAV)	RNAV systems (GNSS, DME/DME or DME/DME/IRU) capable of ± 1 NM accuracy	RNAV1 specification covers TMAs	See EASA AMC 20-5, TGL10 - Revision 1 and FAA AC 90-100A OPS approval required to fly P-RNAV	Currently being introduced (whilst no ECAC-wide mandate for the carriage of P-RNAV is foreseen, some States may require P-RNAV certification for IFR operations in notified terminal airspace).
RVSM	ICAO Min. Aircraft System Performance Standard (MASPS)	Mandated from FL 290 to FL410	EC 965/2012, EASA Part SPA and CS-ACNS	See additional details at: www.eurocontrol.int/eurrma and http://www.eurocontrol.int/articles/rvsm-state-aircraft
RNP APCH (flown to LNAV minima)		Deployment status and plan available on the PBN Approach map	See EASA AMC 20-27 (Airworthiness Approval and Operational Criteria for RNP APPROACH (RNP APCH) Operations Including APV BARO-NAV Operations).	
RNP APCH (flown to LNAV/VNAV minima) also called APV Baro/VNAV		Deployment status and plan available on the PBN Approach map	See EASA AMC 20-27 (Airworthiness Approval and Operational Criteria for RNP APPROACH (RNP APCH) Operations Including APV BARO-NAV Operations). See also FAA AC20-138A, AC20-130A or TSO C115b	APV is to be introduced as a replacement for NPA and therefore a means to reduce CFIT incidents by providing aircraft a stabilised approach.

Civil aircraft – Navigation requirements

Domain Programme Area	Equipment Requirement	ECAC Airspace Requirement	Airworthiness or Operational Requirement	Remarks
SBAS APV (flown to LPV minima)	Requirements for SBAS receivers are contained in ICAO annex 10 Volume 1. Also see specification RTCA DO 229C and FAA TSO C145/146A	Deployment status and plans available on the PBN Approach map	See EASA AMC 20-28 and FAA AC 20-138, AC 20-130A or TSO C115b.	SBAS supports RNAV Approach operations to LPV minima. RNP APCH operations approval may be required by national authorities in the State of the intended operations.
RNP AR (Authorisation Required) APCH	Enabling System: GNSS	Under consideration at selected airports (approach specification for challenging environments) Deployment status and plans available on the PBN Approach map	See EASA AMC 20-26 and FAA AC 90-101A	Relies on GNSS and flight crew performance. Specific authorisation required per procedure. Aircraft equipment eligibility includes: <ul style="list-style-type: none"> • Aircraft qualification • Maintenance procedures • Minimum Equipment List revisions
GBAS CAT I and GBAS CAT II/III	GBAS equipment is contained in aircraft multi-mode receiver (MMR). GBAS performance specification is contained in RTCA DO 253c LAAS receiver MOPS.	In operation at selected airports (CAT I operations). Deployment status and plans available at www.flygls.net	Operational approval not required for CAT I (ILS look-alike) and under development for CAT II/III.	GBAS SARPS for CAT I became applicable in Nov 2001 (refer to ICAO SARPS annex 10 volume 1) GBAS SARPS for CAT II/III published as baseline development standards. CAT II certification in progress CAT III standards being developed
A-RNP (Advanced RNP)	RNP operations where the RNP is scalable from 2 NM down to 0.3 NM to all phases of flight. RF required and options for higher continuity, FRT, Baro-VNAV and scalability.		EASA CS ACNS will provide airworthiness material (document in development). Navigation specifications are described in ICAO Doc 9613 4 th Edition 2013 (Performance-based Navigation manual)	Provide a means for a single aircraft qualification being applicable to a broader range of applications.

Civil aircraft – Surveillance requirements

Domain Programme Area	Equipment Requirement	ECAC Airspace Requirement	Airworthiness or Operational Requirement	Remarks
Emergency Locator / ELT	<p>Mandated since 01/01/2002</p> <p>ICAO SARPS Annex 6 Part 1, para 6.17</p> <p>See also EU OPS 1 subpart K (1.820)</p>	Consult National A.I.P	<p>See EU OPS 1 Subpart L (1.820)</p> <p>Upcoming requirement EASA NPA 2013-26:</p> <p>1) Cockpit Voice Recorder: additional requirement ULD (Underwater Location Device) after 1 January 2020: minimum underwater transmission time of 90 days.</p> <p>2) Provision (flight over water with an aeroplane operated for commercial air transport) to require that aeroplanes with an MCTOM of over 27 000 kg and first issued with an individual CofA on or after 1 January 2005 are, no later than 2019, equipped with an 8.8 kHz ULD (ULD with a very long detection range).</p>	<p>ICAO Worldwide aircraft requirement.</p> <p>All aircraft with a C of A after 1/1/2002 shall be equipped with an automatic ELT capable of transmitting on 121.5MHz and 406MHz. Aeroplanes with a C of A before 1/1/2002 must have any type of ELT capable of transmitting on 121.5MHz and 406MHz.</p> <p>An Operator shall ensure that all ELTs that are capable of transmitting on 406Mhz shall be coded in accordance of ICAO Annex 10 and registered with the national agency responsible for initiating a search & rescue service.</p>
SSR Mode A/C (Surveillance with Altitude reporting)	ICAO Annex 10, Volume IV, Chapter 2	Mandated	<p>The EASA Certification Specification for Airborne Communications, Navigation and Surveillance (CS-ACNS), published December 2013, provides the avionics certification documentation in line with Commission Implementing Rule EU1207/2011.</p> <p>(See http://easa.europa.eu/agency-measures/docs/agency-decisions/2013/2013-031-R/Annex%20I%20to%20ED%20Decision%202013-031-R.pdf).</p>	The requirement within each National Airspace can vary therefore refer to National AIC's and AIP's

Civil aircraft – Surveillance requirements

Domain Programme Area	Equipment Requirement	ECAC Airspace Requirement	Airworthiness or Operational Requirement	Remarks
SSR Mode S Elementary Surveillance (ELS)	<p>“Basic Functionality” required:</p> <ul style="list-style-type: none"> • Automatic reporting of Aircraft Identity • Transponder capability report • Altitude reporting in 25 ft intervals • Flight status • SI Code capability <p>See EASA CS-ACNS</p>	<p>Commission Implementing Rule (IR) EU1207/2011 (laying down requirements for the performance and the interoperability of surveillance for the single European sky), as amended by EU1028/2014 specifies the airborne equipage requirements for Mode S ELS.</p> <p>However, existing State mandates that stipulate equipage compliance earlier than the dates specified in this rule remain applicable.</p> <p>It should also be noted that some States, e.g. DE and NL have published mandates requiring aircraft flying VFR to be compliant with Mode S ELS.</p>	<p>The EASA Certification Specification for Airborne Communications, Navigation and Surveillance (CS-ACNS), published December 2013, provides the avionics certification documentation in line with Commission Implementing Rule EU1207/2011.</p> <p>(See http://easa.europa.eu/agency-measures/docs/agency-decisions/2013/2013-031-R/Annex%20to%20ED%20Decision%202013-031-R.pdf).</p>	<p>Commission Implementing Rule EU1207/2011, as amended by EU1028/2014, specifies overall airborne equipage deadlines, however, the requirement within each State's jurisdiction can vary. Therefore refer to National AICs and AIPs.</p> <p>Mode S ELS is already in operational use within MUAC airspace, and the designated airspace of a number of States including DE, NL, FR, CH, AT, IT, CZ, HU and RO. In some States the requirement is also applicable for flights conducted as VFR. ELS operations will extend to all of the airspace defined in Article 1(3) of Regulation (EC) No 551/2004 of the European Parliament and of the Council, by not later than 02 January 2020.</p> <p>Note that local requirements remain in force and are supplemented by EU1207/2011. (see http://www.eurocontrol.int/spi-ir for further details regarding the dates by which the requirements detailed in the Implementing regulations come in to effect)</p>
SSR Mode S Enhanced Surveillance (EHS)	<p>See EASA CS-ACNS</p>	<p>Commission Implementing Rule (IR) EU1207/2011 (laying down requirements for the performance and the interoperability of surveillance for the single European sky), as amended by EU1028/2014, specifies the airborne equipage requirements for Mode S EHS. However, existing State mandates that stipulate equipage compliance earlier than the dates specified in this rule remain applicable. EHS is currently mandated currently in designated airspace of France, Germany, the United Kingdom and the Czech Republic. EHS is also mandated above FL 245 in the airspace of Belgium and the Netherlands (within airspace delegate to MUAC). If an exemption against the carriage and operation of Mode S EHS airborne equipment is required, the operator of the aircraft shall apply to the appropriate National Aviation Authorities. Operators should note that a separate exemption will be required from each of the Mode S implementing States within which flights are planned to take place.</p>	<p>The EASA Certification Specification for Airborne Communications, Navigation and Surveillance (CS-ACNS), published December 2013, provides the avionics certification documentation in line with Commission Implementing Rule EU1207/2011.</p> <p>(See http://easa.europa.eu/agency-measures/docs/agency-decisions/2013/2013-031-R/Annex%20to%20ED%20Decision%202013-031-R.pdf).</p>	<p>Commission Implementing Rule (IR) EU1207/2011 amended by EU1028/2014 specifies overall airborne equipage deadlines, however, as detailed in two columns to the left, the current requirement within each State's jurisdiction can vary. Therefore refer to National AICs and AIPs</p> <p>The requirement is likely to be expanded into other portions of ECAC airspace. Thus National AICs and AIPs should be consulted.</p> <p>Note that local requirements remain in force and are supplemented by EU1207/2011 amended by EU1028/2014 (see http://www.eurocontrol.int/spi-ir for further details regarding dates by which the requirements come in to effect)</p>

Civil aircraft – Surveillance requirements

Domain Programme Area	Equipment Requirement	ECAC Airspace Requirement	Airworthiness or Operational Requirement	Remarks
ADS -B Automatic Dependant Surveillance Broadcast	ADS-B Out Transmit System: EASA ETSO / C166b EUROCAE ED-102A / RTCA DO-260B ICAO Annex 10 Doc. 9871 Ed.2 ADS-B Out Horizontal Position Source: EASA ETSO-129a (plus specific CS-ACNS qualifications).	Commission Implementing Rule (IR) (EU) No 1207/2011 (laying down requirements for the performance and the interoperability of surveillance for the single European sky) amended by EU1028/2014 specifies the airborne equipage requirements for "ADS-B Out".	The EASA Certification Specification for Airborne Communications, Navigation and Surveillance (CS-ACNS), published December 2013, provides the avionics certification documentation in line with Commission Implementing Rule EU1207/2011. (See http://easa.europa.eu/agency-measures/docs/agency-decisions/2013/2013-031-R/Annex%20to%20ED%20Decision%202013-031-R.pdf).	For more details: consult (IR) (EU) No 1207/2011, EU1028/2014 See http://www.eurocontrol.int/spi-ir for further details regarding the dates by which the requirements detailed in the Implementing regulations come in to effect. Standards and implementation timescales are being co-ordinated with FAA, Air services Australia and NAV CANADA. Ground implementation commitment from some 20 European Air Navigation Service Providers (through ADS-B/WAM deployments).

Civil aircraft – Safety Assurance requirements

Domain Programme Area	Equipment Requirement	ECAC Airspace Requirement	Airworthiness or Operational Requirement	Remarks
ACAS II	<p>TCAS II Software Version 7.1 (adjacent column)</p> <p>ICAO Annex 10 vol.4, PANS OPS Doc 8168, PANS ATM Doc 4444, ICAO Doc 7030, ICAO Doc 9863 (ACAS Manual)</p> <p>ICAO Annex 6, Operation of Aircraft, Part 1 – International Commercial Air Transport – Aeroplane</p> <p>European Commission Regulation No 1332/2011, subsequently amended by Regulation No 2016/583</p>	<p>European Union Airspace: TCAS II version 7.1:</p> <p>- all (civil) aircraft with a maximum certified take-off mass exceeding 5,700 kg or authorised to carry more 19 passengers;</p> <p>- Aircraft not referred above but which are equipped on a voluntary basis with ACAS II, must be equipped with version 7.1.</p> <p>The above does not apply to unmanned aircraft systems.</p> <p>ECAC (outside EU airspace): All civil fixed-wing turbine-engine aircraft with a maximum take-off mass over 5,700 kg, or capable of carrying more than 19 passengers: aircraft with new ACAS installations after 1 January 2014 shall be compliant with version 7.1 and after 1 January 2017 all ACAS units shall be compliant with version 7.1 (per ICAO Annex 10 vol. IV, amendment 85, unless a State filed a difference).</p>	<p>European Commission Regulation No 1332/2011, subsequently amended by Regulation No 2016/583</p> <p>For certification JAA TGL 8 Revision 2</p> <p>For pilot training and operational procedures see ICAO PANS-OPS, Doc 8168, ICAO Doc 9863 and JAA TGL11.</p> <p>Guidance Document for MEL Policy JAA TGL 26</p>	<p>MEL for TCAS II throughout Europe is Class A - 10 days (excluding the day of discovery).</p> <p>MEL requirements concerning partial failures are listed in the TGL 26.</p> <p>Some States may have different requirements. E.g. in German airspace, the time period during which TCAS II may be inoperative is reduced to 3 days (refer to German AIP GEN 1.5 para 5). This applies to all aircraft.</p>
EGPWS/TAWS	<p>ICAO ANNEX 6 part 1: Operation of Aircraft, 6.15; Part II: Operation of Aircraft, 6.9.</p>	<p>See EASA CS-ACNS</p>	<p>An operator shall not operate a turbine powered aeroplane having a maximum certificated take-off mass in excess of 5 700 kg or a maximum approved passenger seating configuration of more than nine unless it is equipped with a ground proximity warning system that includes a predictive terrain hazard warning function.</p>	<p>Note: ICAO world-wide mandate</p> <p>For further guidance on EGPWS airworthiness requirements refer to your State regulator.</p>
Flight Data Monitoring			<p>Awaiting EASA adoption</p>	<p>Proposal is for aircraft > 27,000kg to be equipped with a suitable electronic flight data recorder or quick access recorder where flight data can be regularly replayed for purposes of crew monitoring.</p>