

# Avionics requirements for State aircraft



EUROCONTROL has prepared a short summary offering an overview of a significant series of avionics requirements and their applicability to State aircraft.

Although this overview is mainly for information purposes only, it captures useful information that may increase awareness on how military aircraft are impacted by the introduction of specific capabilities.

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 State aircraft.

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## State aircraft – Communications requirements

Capability	Civil Requirements	Mandate Status	State Aircraft equivalent equipage
<b>8.33 kHz VHF Voice</b>	<p>VHF Transceivers with 8.33 KHZ channel spacing</p> <p>More details in the 8.33 FAQ (Question 17): <a href="http://www.eurocontrol.int/sites/default/files/article/content/documents/nm/833/2015-04-28-8%2033-faqs-1.1-final.pdf">http://www.eurocontrol.int/sites/default/files/article/content/documents/nm/833/2015-04-28-8%2033-faqs-1.1-final.pdf</a></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>It applies to all State aircraft with transition arrangements for technical and procurement constraints including handling on VHF 25 kHz or UHF by ANSPs</p>	<p>There is no specific equipage definition for military aircraft. The AGVCS regulation encourages implementation of EUROCAE ED-23C standard, if possible, which has improved performance over ED-23B.</p> <p>EC regulation 1079/2012 (Article 9) contains arrangements for State aircraft:</p> <p>Above FL 195 non-transport type State aircraft when justified by procurement constraints are to equip by 31 December 2015 at the latest</p> <p>All State aircraft entering into service (or suffering major mid-life upgrades) after 01 January 2014 to be equipped (Forward Fit)</p> <p>Retrofit all State aircraft by 31 December 2018</p> <p>Transition Arrangements are possible due to technical, budgetary or procurement constraints with communication to the Commission by 30 June 2018 and equipage by 31 December 2020 at the latest</p> <p>Exempted: All State aircraft that go out of service by 31 December 2025</p> <p>ATS providers are to accommodate non-equipped State Aircraft on UHF or VHF 25 kHz, provided safety ensured. Publication in national aeronautical information publication (AIP) of applicable procedures is also required.</p>
<b>VHF FM Immunity</b>	<p>All VHF Comm and ILS and VOR receivers to be protected against interference from VHF broadcast. FM immune VHF equipment is to be used</p>	<p>Mandated for en-route and airports as specified in national AIPs</p>	<p>Exemptions for State a/c may still be negotiated on a bilateral basis.</p> <p>See JAA TGL 16 and national AIPs.</p>

## State aircraft – Communications requirements

Capability	Civil Requirements	Mandate Status	State Aircraft equivalent equipage
<p><b>Controller-Pilot Data Link Communications (CPDLC) ATN/VDL Mode 2</b></p>	<p>CPDLC application over ATN/VDL Mode 2 (or other communication protocols).</p> <p>Equipage details: (see civil tables):</p> <p>3<sup>rd</sup> VHF Digital Radio, also either:                      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>	<p>EC regulation 310/2015 amending EC implementing regulation (IR) 29/2009 requires implementation by ATS providers of data link services for above FL285:</p> <ul style="list-style-type: none"> <li>- Airborne implementation date (civil aircraft) 5 February 2020 (no distinction between forward- and retro-fit)</li> <li>- Airborne implementation date (new transport type State aircraft if decided to equip with civil capability) 1 January 2019 (forward-fit only)</li> <li>- Ground implementation date 5 February 2018</li> <li>- "Old aircraft" (civil) dates changed by 5 years to 2003 / 2022</li> </ul> <p>Introduction of multi frequency environment is being studied.</p>	<p>The EC regulation 29/2009 includes provisions on State aircraft. Member States which decide to equip new transport type State aircraft entering into service from 01 January 2019 with data link capability relying upon standards which are not specific to military operational requirements, shall ensure that those aircraft have the capability to operate the data link services defined in Annex II of the IR (with ATN/VDL Mode 2 data link or other communications protocol).</p> <p>Technical guidance: see EASA CS ACNS and EASA AMC 20-11</p> <p>Deployment guidance: see SESAR Deployment Manager DLS Recovery Plan</p>

## State aircraft – Navigation requirements

Capability	Civil Requirements	Mandate Status	State Aircraft equivalent equipage
<b>ILS</b>	ILS receiver		Available as part of Multi-Mode Receiver (MMR)
<b>MLS</b>	MLS receiver (EU OPS 1.865)		Available as part of Multi-Mode Receiver (MMR)
<b>RNAV5 (or B-RNAV)</b>	RNAV systems (VOR/DME, DME/DME, GNSS or INS/IRU) capable of $\pm 5$ NM accuracy.  See EASA AMC 20-4 and FAA 90-96A	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.	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.  State aircraft are exempted from the B-RNAV mandatory requirement. Within TMAs, non B-RNAV State aircraft should be routed via non-RNAV-based SIDs and STARs. For en route, State aircraft should be routed via VOR/DME or TACAN-defined ATS routes or via conventional navigation aids. See national AIPs.
<b>RNAV1 (or P-RNAV)</b>	RNAV systems (GNSS, DME/DME or DME/DME/IRU) capable of $\pm 1$ NM accuracy.  See EASA AMC 20-5, TGL10-Revision 1 and FAA AC 90-100A  OPS approval required to fly P-RNAV		RNAV 1 specification covers TMAs. 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).  For certain TMAs for aircraft that are not approved for P-RNAV operations conventional procedures may continue to be available as stated in national AIPs
<b>RVSM</b>	ICAO Min. Aircraft System Performance Standard (MASPS)  The RVSM MASPS include:  (1) Two independent, cross-coupled altitude measurement systems; (2) One automatic altitude control system ( $\pm 65'$ ); (3) One altitude alert system ( $\pm 300'/\pm 50'$ ); (4) One SSR altitude reporting transponder (5) RVSM compliant avionics configuration.  See EC 965/2012, EASA Part SPA and CS-ACNS	Mandated from FL290 to FL410	State aircraft can be accommodated in RVSM airspace: Military aircraft operating as GAT which are non MASPS RVSM compliant are allowed in RVSM airspace but are subject to 2000ft vertical separation from all other aircraft.  However, States are requested to adapt their State aircraft for RVSM approval, to the extent possible, and especially those aircraft used for General Air Traffic (GAT).  There is no exemption for State aircraft to operate as GAT within RVSM airspace (FL 290 to FL 410) with a 1000 ft vertical separation minimum without an RVSM approval. The absence of such approval does not mean that State aircraft cannot access RVSM-designated airspace, but it does require a separation of 2000 ft to be observed. Non-approved State aircraft operating within RVSM airspace with a 2000 ft vertical separation requires the submission of a flight plan with "M" in field 10 and "STS/NONRVSM" in field 18.  On September 2014 the Military ATM Board endorsed the EUROCONTROL <i>Guidance Material for the Certification and Operation of State Aircraft in European RVSM Airspace V2.0</i> .  See additional details at: <a href="http://www.eurocontrol.int/eurrma">www.eurocontrol.int/eurrma</a> And <a href="http://www.eurocontrol.int/articles/rvsm-military">http://www.eurocontrol.int/articles/rvsm-military</a>

## State aircraft – Navigation requirements

Capability	Civil Requirements	Mandate Status	State Aircraft equivalent equipage
<b>RNP APCH (flown to LNAV minima)</b>		Deployment status and plan available on the <i>PBN Approach map</i> (see AMC 20-27).	Specific applicability to State aircraft not defined. May be considered in the context of PBN.
<b>RNP APCH flown to LNAV/VNAV minima)</b>  <b>also called APV Baro/VNAV</b>		Deployment status and plan available on the <i>PBN Approach map</i>  See AMC 20-27, FAA documents AC20-138A, AC20-130A, and 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.  Specific applicability to State aircraft not defined. May be considered in the context of PBN.
<b>SBAS APV (flown to LPV minima)</b>	Requirements for SBAS receivers are contained in ICAO annex 10 Volume 1.  See specification RTCA DO 229C and FAA TSO C145/146A  Also see AMC 20-28 and FAA AC 20-138, AC 20-130A or TSO C115b.	Deployment status and plan available on the PBN Approach map.	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.  Specific applicability to State aircraft not defined.  May be considered in the context of PBN.
<b>RNP AR (Authorisation Required) APCH</b>	Enabling System: GNSS  See EASA AMC 20-26 and FAA AC 90-101A EASA CS ACNS will provide airworthiness material (document in development)	Under consideration at selected airports (approach specification for challenging environments)  Deployment status and plan available on the <i>PBN Approach map</i>	Relies on GNSS and flight crew performance. Specific authorisation required per procedure and the aircraft equipment eligibility includes: aircraft qualification; maintenance procedures; minimum equipment list revisions.  Specific applicability to State aircraft not defined.  May be considered in the context of PBN.
<b>GBAS CAT I GBAS CAT II/III</b>	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 <a href="http://www.flygls.net">www.flygls.net</a> .  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.  Specific applicability to State aircraft not defined. May be considered in the context of PBN taking due account of available MMR capability.
<b>A-RNP (Advanced RNP)</b>	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	Provide a means of a single aircraft qualification being applicable to a broader range of applications. Specific applicability to State aircraft not defined.  May be considered in the context of PBN.

## State aircraft – Surveillance requirements

Capability	Civil Requirements	Mandate Status	State Aircraft equivalent equipage
<b>SSR Mode A+C</b>	Mode A/C airborne transponder	Mandated for IFR/GAT and for VFR/OAT in 'designated airspace'  However note Mode S requirement below	
<b>SSR Mode S Elementary Surveillance (ELS)</b>	<p>"Basic Functionality" required:</p> <p>Automatic reporting of Aircraft Identity Transponder capability report Altitude reporting in 25 ft intervals Flight status SI Code capability</p> <p>See EASA CS-ACNS.</p>	<p>Commission Implementing Rule (IR) (EU) 1207/2011 (laying down requirements for the performance and the interoperability of surveillance for the single European sky) amended by (EU) 1028/2014 and (EU) 2017/386 specifies the airborne equipage requirements for Mode S ELS in State aircraft.</p> <p>The respective overall deadline to equip all State Aircraft is 7 June 2020.</p> <p>For State aircraft that can't be equipped in due time the IR mandates Member States to communicate to the Commission by 1 January 2019 the list of State aircraft that can't be equipped.</p> <p>At the same time it mandates ANSPs to accommodate Non-equipped state aircraft within the safety limits of their system. These limits have to be justified annually to their Member State.</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 <a href="http://easa.europa.eu/agency-measures/docs/agency-decisions/2013/2013-031-R/Annex%20I%20to%20ED%20Decision%202013-031-R.pdf">http://easa.europa.eu/agency-measures/docs/agency-decisions/2013/2013-031-R/Annex%20I%20to%20ED%20Decision%202013-031-R.pdf</a>).</p>	<p>(IR) (EU) No 1207/2011 amended by (EU) 1028/2014 and (EU) 2017/386 specifies overall airborne equipage deadlines.</p> <p>However, the requirement within each State's jurisdiction can vary. Therefore it's strongly recommended to refer to National AICs and AIPs.</p> <p>In some States the requirement is also applicable for flights conducted as VFR.</p> <p>Non-compliant State aircraft: All State aircraft not yet compliant with Mode S ELS requirements need a dispensation for flights in ELS and EHS notified airspace.</p> <p>For more details: consult (IR) (EU) 1207/2011, (EU) 1028/2014, (EU) 2017/386 and <a href="http://www.eurocontrol.int/articles/civil-military-surveillance">www.eurocontrol.int/articles/civil-military-surveillance</a> See also <a href="http://www.eurocontrol.int/spi-ir">http://www.eurocontrol.int/spi-ir</a> for further details regarding the dates by which the requirements detailed in the Implementing Regulations come in to effect.</p>

## State aircraft – Surveillance requirements

Capability	Civil Requirements	Mandate Status	State Aircraft equivalent equipage
<b>SSR Mode S Enhanced Surveillance (EHS)</b>	See EASA CS-ACNS.	<p>Commission Implementing Rule (IR) (EU) 1207/2011 (laying down requirements for the performance and the interoperability of surveillance for the single European sky) amended by (EU) 1028/2014 and (EU) 2017/386 specifies the airborne equipage requirements for Mode S EHS in transport type State aircraft. The respective deadline is 7 June 2020.</p> <p>For State aircraft that can't be equipped in due time the IR mandates Member States to communicate to the Commission by 1 January 2019 a list of State aircraft that can't be equipped.</p> <p>At the same time it mandates ANSPs to accommodate Non-equipped state aircraft within the safety limits of their system. These limits have to be justified annually to their Member State.</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 (EU) 1207/2011. (See <a href="http://easa.europa.eu/agency-measures/docs/agency-decisions/2013/2013-031-R/Annex%20I%20to%20ED%20Decision%202013-031-R.pdf">http://easa.europa.eu/agency-measures/docs/agency-decisions/2013/2013-031-R/Annex%20I%20to%20ED%20Decision%202013-031-R.pdf</a>).</p>	<p>EHS equipment is only required for "transport type" State aircraft.</p> <p>"Transport type" State aircraft with a MTOM of more than 5700 kg or a maximum cruising true airspeed in excess of 250 kts are liable for EHS equipage when flying IFR/GAT.</p> <p>Non-compliant State aircraft: Transport-type State aircraft assessed to be EHS capable but not yet compliant with EHS requirements need a dispensation for flights in EHS notified airspace.</p> <p>Transport-type State aircraft assessed to be non-EHS capable do NOT need a dispensation for flights in EHS notified airspace. They must as a minimum however, be compliant with Mode S ELS requirements.</p> <p>For more details: consult (IR) (EU) No 1207/2011, (EU) 1028/2014, (EU) 2017/386, <a href="http://www.eurocontrol.int/articles/civil-military-surveillance_and">www.eurocontrol.int/articles/civil-military-surveillance_and</a> <a href="http://www.eurocontrol.int/spi-ir">http://www.eurocontrol.int/spi-ir</a> for further details regarding the dates by which the requirements detailed in the Implementing Regulations come in to effect</p>
<b>ADS-B</b>	<p>ADS-B Out Transmit System:</p> <p>EASA ETSO C166b</p> <p>EUROCAE ED-102A RTCA DO-260B</p> <p>ICAO Annex 10 Doc. 9871 Ed.2</p> <p>ADS-B Out Horizontal Position Source:</p> <p>EASA ETSO C129a (plus specific EASA CS ACNS qualifications)</p>	<p>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 and (EU) 2017/386 specifies the airborne equipage requirements for "ADS-B Out" in transport type State aircraft. The respective deadline is 7 June 2020.</p> <p>For State aircraft that can't be equipped in due time the IR mandates Member States to communicate to the Commission by 1 January 2019 a list of State aircraft that can't be equipped. At the same time it mandates ANSPs to accommodate Non-equipped state aircraft within the safety limits of their system. These limits have to be justified annually to their Member State.</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 (EU) 1207/2011. (See <a href="http://easa.europa.eu/agency-measures/docs/agency-decisions/2013/2013-031-R/Annex%20I%20to%20ED%20Decision%202013-031-R.pdf">http://easa.europa.eu/agency-measures/docs/agency-decisions/2013/2013-031-R/Annex%20I%20to%20ED%20Decision%202013-031-R.pdf</a>).</p>	<p>For more details: consult (IR) (EU) No 1207/2011, (EU) 1028/2014, (EU) 2017/386 and <a href="http://www.eurocontrol.int/articles/civil-military-surveillance">www.eurocontrol.int/articles/civil-military-surveillance</a> <a href="http://www.eurocontrol.int/spi-ir">http://www.eurocontrol.int/spi-ir</a></p> <p>EASA Certification Specification for Airborne Communications, Navigation and Surveillance (CS-ACNS), published December 2013, providing the avionics certification documentation in line with regulation EU. Following the standard EASA NPA consultation process, it is expected to include requirements and acceptable means of compliance for Mode A/C only surveillance.</p> <p>The EASA CS-ACNS is compliant with Commission Implementing Rule (IR) (EU)1207/2011 amended by (EU) 1028/2014 and (EU) 2017/386</p> <p>EASA AMC 20-24 remains applicable for initial implementations of "ADS-B Out" in a non-radar environment.</p>

## State aircraft – Safety Assurance requirements

Capability	Civil Requirements	Mandate Status	State Aircraft equivalent equipage
<b>ACAS II</b>	<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>Regulation 1332/2011 (amended by Regulation No 2016/583) mandated TCAS version 7.1 making reference to EASA Basic Regulation (216/2008) in respect to its applicability where military aircraft are excluded.</p> <p>TCAS II version 7.1:</p> <ul style="list-style-type: none"> <li>- all (civil) aircraft with a maximum certified take-off mass exceeding 5,700 kg or authorised to carry more 19 passengers from 1 March 2012;</li> <li>- with the exception of aircraft with an individual certificate of airworthiness issued before 1 March 2012 that must be equipped as of 1 December 2015;</li> <li>- Aircraft not referred above but which will be equipped on a voluntary basis with ACAS II, must be equipped with version 7.1.</li> </ul> <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, must be equipped with TCAS II version 7.0.</p>	<p>ACAS mandate applies only to civil aircraft.</p> <p>Military Authorities of the CMIC Member States adopt TCAS II version 7.1 as the minimum for voluntary forward fit implementation for new military transport type aircraft (MTTA) entering into service or undergoing major mid-life modernisation.</p> <p>It must be applicable to fixed-wing turbine engine aircraft having a maximum certificated take-off mass exceeding 15,000 kgs, or a maximum approved passenger seating configuration of more than 30, were required to be equipped with ACAS.</p> <p>In Germany, carriage and operation of ACAS II by military transport aircraft is mandatory, see AIC IFR 13 20 MAR 03.</p> <p>For more details consult: <a href="http://www.eurocontrol.int/articles/acas-military">http://www.eurocontrol.int/articles/acas-military</a></p>
<b>Enhanced Ground Proximity Warning System (EGPWS) / Terrain Awareness Warning system (TAWS)</b>	<p>Applicable to aircraft with:</p> <p>(1) MCTM&gt;5700kg or a more than 30seats and a C of A issued after 1/1/2001;</p> <p>(2) same MTCM and if 9 seats or more and C of A issued after 1/1/2004;</p> <p>(3) same MCTM and 9 seats or more and already equipped with GPWS - no TAWS required</p>	<p>Mandated from JAN 2003</p> <p>Note:</p> <p>If MCTM&gt;15000kg or passengers &gt;30 the date is 01 JAN 2005 and if</p> <p>MCTM&gt;5700kg or passengers &gt; 9 the date is 01 JAN 2007</p>	<p>Applicability to State a/c not defined.</p> <p>This is not an ATM/CNS Requirement as stated in ICAO Annex 6 Part 1. Paras 6.15.5 to 6.15.7</p>
<b>Flight Data Monitoring</b>		Under consideration for civil aircraft at EASA level	Applicability to State a/c not defined.