

Acceptable Means of Compliance and Guidance Material to Commission Implementing Regulation (EU) No 1207/2011

Issue 1

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¹ For the date of entry into force of this Issue, please refer to Decision 2020/014/R at the [Official Publication](#) of EASA.

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AMC1 Article 4 Performance requirements

SEAMLESS OPERATIONS

To ensure seamless operations at the boundary of their airspace, air navigation service providers (ANSPs) should apply radar-/surveillance-based horizontal separation minima of 5 NM, or 3 NM for high-density airspace. Separation minima of other than 3 or 5 NM may be applied, provided that ANSPs perform an assessment that shows no negative impact on safety, traffic flows, and capacity of the adjacent airspace.

The nominal performance of the surveillance system that supports the applicable separation minima should be in accordance with EUROCONTROL-SPEC-147².

GM1 Article 4 Performance requirements

SEAMLESS OPERATIONS

Information and guidance for air navigation service providers (ANSPs) on how to establish the applicable separation minima can be found in the following ICAO documents:

- Doc 9689-AN/953 'Manual on Airspace Planning Methodology for the Determination of Separation Minima', 1st edition incorporating Amendment 1, 1998; and
- Doc 9426-AN/924 'Air Traffic Services Planning Manual', in particular Section 2, 1st (provisional) edition incorporating Amendment 4, 1984.

AMC1 Article 5 Interoperability requirements

TRANSFER OF SURVEILLANCE DATA

When transferring surveillance data to other air navigation service providers (ANSPs), ANSPs should use the ASTERIX data format as specified in Part 1 of EUROCONTROL-SPEC-0149³ on the basis of the appropriate ASTERIX Data Categories.

Note: Further information on the use of the ASTERIX data format as well as the list of available ASTERIX Data Categories and their respective specifications can be found at <https://www.eurocontrol.int/asterix>.

² EUROCONTROL Specification for ATM Surveillance System Performance (ESASSP), edition 1.1, September 2015, ISBN: 978-2-87497-022-1.

³ EUROCONTROL Specification for Surveillance Data Exchange Part 1 — All Purpose Structured EUROCONTROL Surveillance Information Exchange (ASTERIX), edition 2.4, 24.10.2016, ISBN: 978-2-87497-028-3.

AMC2 Article 5 Interoperability requirements

SECONDARY SURVEILLANCE RADAR TRANSPONDERS

With regard to the requirements for secondary surveillance radar transponders, aircraft operators that are subject to Commission Regulation (EU) No 965/2012⁴ should ensure that their aircraft comply with the EASA Certification Specifications for Airborne Communications, Navigation and Surveillance (CS-ACNS), Subpart D — Surveillance (SUR), and particularly:

- Section 2 ‘Mode S elementary surveillance (ELS)’;
- Section 3 ‘Mode S Enhanced Surveillance (EHS)’; and
- Section 4 ‘1090 MHz Extended Squitter ADS-B (ADSB),

as applicable.

Aircraft that only require the ELS capability and were certified according to JAA TGL 13, Revision 1⁵, or installations that comply with CS-STAN, CS-SC002b (or later versions), are considered an acceptable alternative to compliance with CS-ACNS.

Third-country-operator (TCO) aircraft that operate within the Single European Sky (SES) airspace should comply with national requirements equivalent to the requirements of CS-ACNS, Subpart D, Sections 2, 3, and 4, as applicable.

AMC3 Article 5 Interoperability requirements

TRANSITIONAL ARRANGEMENTS

Operators of aircraft whose certificate of airworthiness (CofA) was first issued before 7 December 2020 and their aircraft cannot be equipped with secondary surveillance radar transponders that have Mode S EHS and/or ADS-B capabilities by 7 December 2020, may defer the required modification until 7 June 2023. To defer the modification, aircraft operators should comply with both of the following conditions:

- demonstrate, by means of a retrofit plan, full commitment to achieving compliance by 7 June 2023; and
- have not received European Union funding to retrofit their aircraft with Mode S EHS and/or ADS-B capabilities as required by Article 5 of Commission Implementing Regulation (EU) No 1207/2011⁶.

⁴ 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 (OJ L 296, 25.10.2012, p. 1).

⁵ Joint Aviation Authorities (JAA) Temporary Guidance Leaflet (TGL) 13, Revision 1 ‘Certification of Mode S Transponder Systems for Elementary Surveillance’, 1 June 2003.

⁶ Commission Implementing Regulation (EU) No 1207/2011 of 22 November 2011 laying down requirements for the performance and the interoperability of surveillance for the single European sky (OJ L 305, 23.11.2011, p. 35).

The retrofit plan should contain installation dates for all affected aircraft, including the necessary supporting documentation to show that the planned installation dates are viable. The supporting documentation should include:

- the required engineering documentation;
- the contractual agreements and delivery schedules for the applicable equipment; and
- the contractual agreements with maintenance organisations for the installation.

For operators of aircraft for which no approved engineering documentation that meets the requirements of CS-ACNS is available on the market prior to 7 December 2020, the retrofit plan may consist of a plan to identify and establish the appropriate engineering documentation and contractual agreements to have the required equipment installed on the affected aircraft and approved by 7 June 2023.

As the retrofit plan requires supporting evidence that demonstrates the aircraft operators' firm commitment, amendments to such a plan should not be necessary. However, in principle, duly justified amendments to the plan may be possible if the completion of the installation prior to 7 June 2023 is evident in the revised supporting documentation, such as a revised contractual arrangement with avionics suppliers and maintenance organisations.

To benefit from the transitional arrangements, aircraft operators are not formally required to submit the retrofit plans to their competent authority or to any other entity. Aircraft operators should have such a plan in place prior to 7 December 2020 and make it available upon request to their competent authority.

Aircraft operators that have received European Union funding to retrofit specific aircraft, should complete the installation of the required systems prior to 7 December 2020. However, if aircraft operators wish to benefit from the transitional arrangements until 7 June 2023, they should return that funding to the European Union prior to 7 December 2020. Furthermore, those aircraft operators should fulfil the conditions for the establishment of a retrofit plan.

GM1 Article 5 Interoperability requirements

CONTINUITY OF SECONDARY SURVEILLANCE RADAR TRANSPONDERS

The continuity requirement for secondary surveillance radar transponders ('they have the continuity sufficient to avoid presenting an operational risk', as stated in Article 5 of Commission Implementing Regulation (EU) No 1207/2011) states that such equipment should function without unscheduled interruption so as not to pose a hazard to other airspace users. The required continuity to ensure continued operation of that equipment in the airspace is established by CS-ACNS. Continuity figures that are less stringent than those specified in CS-ACNS for Mode S ELS and/or ADS-B may be acceptable. Typically, continuity figures not exceeding 2×10^{-4} per flight hour may be acceptable.

GM2 Article 5 Interoperability requirements

COOPERATIVE SURVEILLANCE CHAIN

Commission Implementing Regulation (EU) No 1206/2011⁷ sets out the application and use of the individual aircraft identification capability and requires air navigation service providers (ANSPs) to ensure that the cooperative surveillance chain has the necessary capability to allow them to establish individual aircraft identification using the downlinked aircraft identification feature.

GM3 Article 5 Interoperability requirements

SERVICEABLE SECONDARY SURVEILLANCE RADAR TRANSPONDERS

A secondary surveillance radar transponder is considered serviceable when it transmits all the data and parameters required by paragraphs 5(a), (b) and (c) of Article 5 of Commission Implementing Regulation (EU) No 1207/2011. The transponders should be operated in accordance with Section 13 'SSR Transponder' of the Annex to Commission Implementing Regulation (EU) No 923/2012⁸ and the related AMC and GM.

GM4 Article 5 Interoperability requirements

CONTINUED OPERATIONS

Operators may continue to operate their aircraft within the SES airspace without the Mode S EHS and/or the ADS-B capability, irrespective of the date of issue of the first certificate of airworthiness (CofA), if aircraft are flown for:

- maintenance; or
- export.

For the purpose of maintenance, i.e. routine or non-routine checks and modification action, flights into, out of, or over the SES airspace should be operated as non-revenue flights. For the purpose of export, flights out of or over the SES airspace should also be operated as non-revenue flights.

Operators may also continue to operate their aircraft within the SES airspace without the Mode S EHS and/or the ADS-B capability if aircraft:

- are first issued with a CoA prior to 7 June 1995; or
- will cease to be operated by 31 October 2025.

⁷ Commission Implementing Regulation (EU) No 1206/2011 of 22 November 2011 laying down requirements on aircraft identification for surveillance for the single European sky (OJ L 305, 23.11.2011, p. 23).

⁸ Commission Implementing Regulation (EU) No 923/2012 of 26 September 2012 laying down the common rules of the air and operational provisions regarding services and procedures in air navigation and amending Implementing Regulation (EU) No 1035/2011 and Regulations (EC) No 1265/2007, (EC) No 1794/2006, (EC) No 730/2006, (EC) No 1033/2006 and (EU) No 255/2010 (OJ L 281, 13.10.2012, p. 1).

The later condition is applicable to aircraft whose operators have determined prior to 7 December 2020 that they will cease their operation within the SES airspace prior to 31 October 2025. The operators should have evidence, such as a fleet planning document, of their intention to cease operation of their aircraft prior to 31 October 2025, and make it available upon request to their competent authority. This condition is not intended to provide a means to extend the compliance date for the Mode S EHS and/or the ADS-B capability.

GM5 Article 5 Interoperability requirements

EFFICIENT DEPLOYMENT SOLUTION

The surveillance system should meet the performance requirements that are necessary to support the provision of air traffic services (ATS). Therefore, before commissioning a new or modified surveillance system, air navigation service providers (ANSPs) should develop a business case to demonstrate that the proposed surveillance system is the most effective solution that safely supports the required operations and among other elements considers efficiency issues (e.g. through-life cost (TLC) and the 1030/1090-MHz radio frequencies (RF) band usage).

One option for the business case would be the use of ADS-B data. When comparing options regarding the 1030/1090-MHz RF band usage, ANSPs should consider the impact not only on their own surveillance systems but also on neighbouring ones.

GM1 Article 6 Spectrum protection

EXCESSIVE INTERROGATIONS

To maintain an effective surveillance service that supports the provision of air traffic services (ATS) and the safe separation of aircraft, the ground-based interrogators should not excessively interrogate aircraft. Excessive interrogation may result in the loss of transponder data and the subsequent loss of the surveillance service; therefore, surveillance service providers should maintain the interrogation rates as low as necessary and the surveillance coverage to the minimum required for the safe operation of the system.

Surveillance service providers are required to comply with Annex VIII (Part-CNS) to Commission Implementing Regulation (EU) 2017/373⁹ by demonstrating that their working methods and operating procedures comply with the international Standards and Recommended Practices (SARPs) of Annex 10 'Aeronautical Telecommunications' to the Chicago Convention on International Civil Aviation. Surveillance service providers should compute the reply rates per second of the transponder on board aircraft flying over an EASA Member State and compare them to the minimum reply rates of International Civil Aviation Organization (ICAO) Annex 10, Volume IV¹⁰. As specified in

⁹ Commission Implementing Regulation (EU) 2017/373 of 1 March 2017 laying down common requirements for providers of air traffic management/air navigation services and other air traffic management network functions and their oversight, repealing Regulation (EC) No 482/2008, Implementing Regulations (EU) No 1034/2011, (EU) No 1035/2011 and (EU) 2016/1377 and amending Regulation (EU) No 677/2011 (OJ L 62, 8.3.2017, p. 1).

¹⁰ ICAO Annex 10 'Aeronautical Telecommunications', Volume IV 'Surveillance Radar and Collision Avoidance Systems', 3rd edition incorporating Amendments 1-89.

Section 3.1.1.7.9.1 for Mode A/C replies, and in Section 3.1.2.10.3.7.3 for Mode S replies, the minimum reply rates are as follows:

- for Mode A/C replies:

‘3.1.1.7.9.1 All transponders shall be capable of continuously generating at least 500 replies per second for a 15-pulse coded reply. Transponder installations used solely below 4 500 m (15 000 ft), or below a lesser altitude established by the appropriate authority or by regional air navigation agreement, and in aircraft with a maximum cruising true airspeed not exceeding 175 kt (324 km/h) shall be capable of generating at least 1 000 15-pulse coded replies per second for a duration of 100 milliseconds. Transponder installations operated above 4 500 m (15 000 ft) or in aircraft with a maximum cruising true airspeed in excess of 175 kt (324 km/h), shall be capable of generating at least 1 200 15-pulse coded replies per second for a duration of 100 milliseconds.

Note 1. A 15-pulse reply includes 2 framing pulses, 12 information pulses, and the SPI pulse.

Note 2. The reply rate requirement of 500 replies per second establishes the minimum continuous reply rate capability of the transponder. As per the altitude and speed criteria above, the 100 or 120 replies in a 100-millisecond interval defines the peak capability of the transponder. The transponder must be capable of replying to this short-term burst rate, even though the transponder may not be capable of sustaining this rate. If the transponder is subjected to interrogation rates beyond its reply rate capability, the reply rate limit control of 3.1.1.7.9.2 acts to gracefully desensitize the transponder in a manner that favours closer interrogators. Desensitization eliminates weaker interrogation signals.’; and

- for Mode S replies:

‘3.1.2.10.3.7.3 Minimum reply rate capability, Mode S. A transponder capable of transmitting only short Mode S replies shall be able to generate replies at the following rates:

50 Mode S replies in any 1-second interval

(...)¹¹

In addition to any downlink ELM transmissions, a level 2, 3 or 4 transponder shall be able to generate as long replies at least:

16 of 50 Mode S replies in any 1-second interval

(...)¹²

(...)¹³

In addition, a transponder within an ACAS installation shall be able to generate as ACAS coordination replies at least 3 of 50 Mode S replies in any 1-second interval.’

¹¹ Not applicable. This section is omitted as this GM specifies only rates of reply per second. However, surveillance service providers may consider other time intervals as specified in Annex 10.

¹² Not applicable. This section is omitted as this GM specifies only rates of reply per second. However, surveillance service providers may consider other time intervals as specified in Annex 10.

¹³ Section related to ELM is omitted as not relevant due to ELM not being implemented in the Single European Sky airspace.

Therefore, the reply rates of aircraft transponders should be computed per second, in compliance with ICAO Annex 10, Volume IV, and satisfy the following conditions:

- be less than or equal to 500 Mode A/C replies per second;
- be less than or equal to 50 Mode S replies in any 1-second interval; and
- be less than or equal to 16 Mode S long replies in any 1-second interval.

To verify compliance, several methods may be used:

- simple theoretical calculation;
- simulation of the 1030/1090-MHz RF environment;
- periodic (offline) analysis of the 1030/1090-MHz RF environment recorded on the ground; and
- permanent (online) analysis of the 1030/1090-MHz RF environment on the ground.

For the analysis of the 1030/1090-MHz RF environment, airborne recordings may complement the analysis of the 1030/1090-MHz RF environment on the ground.

The choice of the most appropriate method depends on the estimated reply rates of transponders on board aircraft that fly within a given service area.

Further information may be found in EUROCONTROL-GUID-178¹⁴.

To maintain low interrogation rates outside the ANSPs' area of surveillance interest, the interrogator output power should be as low as possible and as necessary for the safe performance of the system as specified in ICAO Annex 10, Volume IV, paragraph 3.1.1.8.2. In addition, the provisions of Commission Regulation (EC) No 262/2009¹⁵ regarding Mode S surveillance and lockout restrictions should be observed. If an active MLAT system is utilised, the spectrum protection measures as defined in ICAO Annex 10, Volume IV, paragraph 6.2, should be observed.

As per Article 7(3)(g)(iii) of Commission Implementing Regulation (EU) 2019/123¹⁶, the Network Manager is required to monitor the performance of the infrastructure relevant for the execution of the network functions, i.e. surveillance interrogators and avionics. The application of this central analysis tool, which is intended to provide statistics and alerts with respect to transmission rates, does not relieve surveillance service providers of the responsibility to ensure initial and continued compliance with Annex VIII (Part-CNS) to Commission Implementing Regulation (EU) 2017/373. Such statistics and alerts provided by the Network Manager could be used to monitor the continued operation of the interrogators.

¹⁴ EUROCONTROL Guidelines on the Assessment of Ground-based Surveillance Interrogations, edition 1.0, 11.12.2019, ISBN: 978-2-87497-104-4.

¹⁵ Commission Regulation (EC) No 262/2009 of 30 March 2009 laying down requirements for the coordinated allocation and use of Mode S interrogator codes for the single European sky (OJ L 084 31.3.2009, p. 20).

¹⁶ Commission Implementing Regulation (EU) 2019/123 of 24 January 2019 laying down detailed rules for the implementation of air traffic management (ATM) network functions and repealing Commission Regulation (EU) No 677/2011 (OJ L 28, 31.1.2019, p. 1).

GM2 Article 6 Spectrum protection

AVOIDANCE OF HARMFUL INTERFERENCE

The harmful interference of other systems may jeopardise the functioning of radio navigation services or other safety services, or seriously degrade, obstruct or repeatedly interrupt radio communication services. To avoid harmful interference with surveillance or other systems, the configuration of ground-based interrogators (including fixed and mobile military radars for permanent or temporary operation, test radars, wide area multilateration (WAM) systems, etc.) should be correct.

Prior to transmitting from any civil or military ground-based surveillance interrogator, surveillance service providers should verify that the configuration of the interrogator is such to prevent harmful interference with other surveillance systems. The assessment and verification of the configuration of ground-based surveillance interrogators that is performed in the context of the conformity assessment as per Article 139(2) of Regulation (EU) 2018/1139¹⁷ should be sufficient evidence of an appropriate configuration.

In addition, the appropriate implementation of Directive 2014/53/EU¹⁸ (the 'Radio Equipment (RED) Directive') can minimise harmful interference from other air traffic management/air navigation services (ATM/ANS) and non-ATM/ANS systems.

As part of their frequency management, EASA Member States should have established processes to report and manage unexpected and incorrect transmissions. To ensure the effective elimination of any detected interference, surveillance service providers should be familiar with those processes. Furthermore, surveillance service providers should report via their mandatory reporting systems, which are established as per Regulation (EU) No 376/2014¹⁹, the events that are listed in Annex III 'Occurrences related to air navigation services and facilities' to Commission Implementing Regulation (EU) 2015/1018²⁰, such as those that cause a failure of a surveillance service or external interference.

Further information on the topic can be found in EUROCONTROL-GUID-178²¹.

¹⁷ Regulation (EU) 2018/1139 of the European Parliament and of the Council of 4 July 2018 on common rules in the field of civil aviation and establishing a European Union Aviation Safety Agency, and amending Regulations (EC) No 2111/2005, (EC) No 1008/2008, (EU) No 996/2010, (EU) No 376/2014 and Directives 2014/30/EU and 2014/53/EU of the European Parliament and of the Council, and repealing Regulations (EC) No 552/2004 and (EC) No 216/2008 of the European Parliament and of the Council and Council Regulation (EEC) No 3922/91 OJ L 212, 22.8.2018, p. 1.

¹⁸ Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC (OJ L 153, 22.5.2014, p. 62).

¹⁹ Regulation (EU) No 376/2014 of the European Parliament and of the Council of 3 April 2014 on the reporting, analysis and follow-up of occurrences in civil aviation, amending Regulation (EU) No 996/2010 of the European Parliament and of the Council and repealing Directive 2003/42/EC of the European Parliament and of the Council and Commission Regulations (EC) No 1321/2007 and (EC) No 1330/2007 (OJ L 122, 24.4.2014, p. 18).

²⁰ Commission Implementing Regulation (EU) 2015/1018 of 29 June 2015 laying down a list classifying occurrences in civil aviation to be mandatorily reported according to Regulation (EU) No 376/2014 of the European Parliament and of the Council (OJ L 163, 30.6.2015, p. 1).

²¹ EUROCONTROL Guidelines on the Assessment of Ground-based Surveillance Interrogations, edition 1.0, 11.12.2019, ISBN: 978-2-87497-104-4.

GM1 Article 7 Associated procedures

ASSESSMENT OF THE PERFORMANCE OF THE SURVEILLANCE SYSTEM

To assess the performance of their surveillance systems, air navigation service providers (ANSPs) may consider the use of the VERIF (verification function) of the Surveillance Analysis Support System for ATC Centre (SASS-C), and refer to Section 4 of EUROCONTROL-SPEC-147²².

Note: Further information on the EUROCONTROL SASS-C is available at:

<http://www.eurocontrol.int/services/surveillance-analysis-support-system-atc-centre-sass-c>

AMC1 Article 14a Flight Plans

As Commission Implementing Regulation (EU) No 1207/2011²³ requires all qualifying aircraft to be equipped with Mode S and/or ADS-B systems to access SES airspace, information on the equipage and the operational status should be available to ATS units. As required by point SERA.4001 of the Annex to Commission Implementing Regulation (EU) No 923/2012²⁴, information related to an intended flight should be provided to ATS units in the form of a flight plan. The information required is specified in Regulation (EC) No 1033/2006²⁵.

Aircraft to which Commission Implementing Regulation (EU) No 1207/2011 does not apply or aircraft that use the non-equipage or exemption provisions are authorised to access SES airspace when conducting instrument flight rules (IFR) / general air traffic (GAT) operations. The appropriate equipage and operational status, including the correct designator for the functioning surveillance systems, should be inserted in Items 10b and 18 of the flight plan.

Operators of State aircraft that are not equipped with Mode S ELS and who have notified the European Commission as per Article 8(3) of Commission Implementing Regulation (EU) No 1207/2011 should insert the designator 'SUR/EUELSX' in Item 18 of the flight plan.

Operators of aircraft, including State aircraft, which are not equipped with Mode S EHS and/or ADS-B, or are equipped with Mode S EHS and/or ADS-B that are temporarily inoperative, should insert the designators 'SUR/EUADSBX' or 'SUR/EUEHSX', or a combination of them, in Item 18 of the flight plan.

²² EUROCONTROL Specification for ATM Surveillance System Performance (ESASSP), edition 1.1, September 2015, ISBN: 978-2-87497-022-1.

²³ Commission Implementing Regulation (EU) No 1207/2011 of 22 November 2011 laying down requirements for the performance and the interoperability of surveillance for the single European sky (OJ L 305, 23.11.2011, p. 35).

²⁴ Commission Implementing Regulation (EU) No 923/2012 of 26 September 2012 laying down the common rules of the air and operational provisions regarding services and procedures in air navigation and amending Implementing Regulation (EU) No 1035/2011 and Regulations (EC) No 1265/2007, (EC) No 1794/2006, (EC) No 730/2006, (EC) No 1033/2006 and (EU) No 255/2010 (OJ L 281, 13.10.2012, p. 1).

²⁵ Commission Regulation (EC) No 1033/2006 of 4 July 2006 laying down the requirements on procedures for flight plans in the pre-flight phase for the single European sky (OJ L 186, 7.7.2006, p. 46).

- Note 1: ‘operation with Mode S EHS and/or ADS-B that are temporarily inoperative’ is a Commission Implementing Regulation (EU) No 1207/2011 Article 5(5) requirement; therefore, when such operation is required, the requirements of Article 14a of Commission Implementing Regulation (EU) No 1207/2011 also apply, and the flight plan should include the designators ‘SUR/EUADSBX’ or ‘SUR/EUEHSX’, as appropriate, in Item 18.
- Note 2: GM3 Article 5 *Interoperability requirements* — SERVICEABLE SECONDARY SURVEILLANCE RADAR TRANSPONDERS explains the conditions under which a transponder is considered serviceable.