

EUROPEAN ORGANISATION FOR THE SAFETY OF AIR NAVIGATION  
**EUROCONTROL**



**Enclosure 1**

Brussels, XX.XX.2010  
C(2010) XXX

Draft

**COMMISSION REGULATION (EC) No .../..**

**DD/MM/YYYY**

**Laying down requirements for the Performance and Interoperability of Surveillance for  
the single European sky**

**(Text with EEA relevance)**

**(Draft implementing rule prepared by EUROCONTROL in response to a  
European Commission's mandate)**

Draft

**COMMISSION REGULATION (EU) No .../..**

**of [...]**

**Laying down requirements for the Performance and Interoperability of Surveillance for the Single European Sky**

**(Text with EEA relevance)**

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the functioning of the European Union,

Having regard to the Regulation (EC) No 552/2004 of the European Parliament and of the Council of 10 March 2004 on the interoperability of the European Air traffic Management Network (the interoperability Regulation)<sup>1</sup> amended by Regulation (EC) No 1070/2009 of the European Parliament and of the Council of 21 October 2009<sup>2</sup> and in particular Article 3(1) thereof,

Having regard to Regulation (EC) No 549/2004 of the European Parliament and the Council of 10 March 2004 laying down the framework for the creation of the single European sky (the framework Regulation)<sup>3</sup> amended by Regulation (EC) No 1070/2009 of the European Parliament and of the Council of 21 October 2009, and in particular Article 8(2) thereof,

Having regard to Regulation (EC) No 550/2004 of the European Parliament and the Council of 10 March 2004 on the provision of air navigation services in the single European sky (the service provision Regulation)<sup>4</sup> amended by Regulation (EC) No 1070/2009 of the European Parliament and of the Council of 21 October 2009,

Whereas:

- (1) EUROCONTROL has been mandated in accordance with Article 8(1) of the Regulation (EC) No 549/2004 amended by Regulation (EC) No 1070/2009 to develop requirements for the performance and the interoperability of surveillance within the European Air Traffic Management Network (EATMN). This Regulation is based on the resulting mandate report of 9 July 2010.
- (2) Seamless operations are dependent on the coherence of the minima for the separation of aircraft applied within the airspace of the single European sky.

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<sup>1</sup> OJ L96,31.3.2004, p.26

<sup>2</sup> OJ L 300, 14.11.2009, p.34

<sup>3</sup> OJ L 96, 31.3.2004, p.1

<sup>4</sup> OJ L 96, 31.3.2004, p.10

- (3) Common principles should be applied whenever surveillance data is exchanged between systems within the scope of this Regulation in order to ensure interoperability.
- (4) In order to ensure the interoperability, minimal capabilities and performance applicable to the airborne constituents of the surveillance systems should be identified.
- (5) The capabilities of the airborne constituents should give the flexibility to the air navigation service providers to choose the most appropriate ground based surveillance solutions for their particular environments.
- (6) Requirements for the coordinated allocation and use of Mode S interrogator code for the single European sky are identified in the Regulation (EC) 262/2009.
- (7) Operators need sufficient notice to equip their aircraft with new capabilities, both for new aircraft and existing fleets. This should be taken into account when defining dates for mandatory equipage.
- (8) Criteria for possible exemption, based in particular on economic or compelling technical consideration, should be identified allowing operators exceptionally not to equip specific types of aircraft with some of the required capabilities. Appropriate procedures should be defined allowing the Commission to take decisions in this respect.
- (9) The 24-bit aircraft address should be assigned and operated in compliance with the International Civil Aviation Organisation (hereinafter ICAO) requirements in order to ensure the interoperability of the air and ground surveillance systems.
- (10) The foundation established through the implementation of ADS-B ‘Out’ capabilities by aircraft operators will enable the deployment of ground applications and will also facilitate the deployment of future airborne applications.
- (11) The EATMN systems should support the implementation of advanced, agreed and validated concepts of operation for all phases of flight, in particular as envisaged in the SESAR ATM Master Plan.
- (12) The performance of the systems within the scope of this Regulation and of their constituents should be regularly assessed taking into account the local environment in which they operate.
- (13) The uniform application of specific procedures within the airspace of the single European sky is critical for the achievement of interoperability and seamless operations.
- (14) Spectrum used by surveillance systems should be protected to prevent harmful interference. Member States should take the necessary measures in this respect.
- (15) The Directive 1999/5/EC (the R&TTE directive) ensures the efficient use of radio spectrum, the provisions of this Regulation should ensure the fit-for-purpose elements of surveillance data processing systems, their constituents and associated procedures.

- (16) This Regulation should not cover military operations and training as referred in Article 1(2) of Regulation (EC) No 549/2004 amended by Regulation (EC) No 1070/2009.
- (17) With a view to maintaining or enhancing existing safety levels of operations, Member States should be required to ensure that the parties concerned conduct a safety assessment including hazard identification, risk assessment and mitigation processes. Harmonised implementation of these processes to the systems covered by this Regulation requires the identification of specific safety requirements for all interoperability and performance requirements.
- (18) In accordance with Article 3(3) (d) of Regulation (EC) N°552/2004 amended by Regulation (EC) No 1070/2009, implementing rules for interoperability should describe the specific conformity assessment procedures to be used to assess either the conformity or the suitability for use of constituents as well as the verification of systems.
- (19) The measures provided for in this Regulation are in accordance with the opinion of the Single Sky Committee.

HAS ADOPTED THIS REGULATION:

*Article 1*

**Subject matter and scope**

1. This Regulation lays down requirements on the systems contributing to the provision of surveillance data, the constituents thereof and associated procedures in order to ensure the harmonisation of performance, the interoperability and the efficiency of these systems within the EATMN and for the purpose of civil-military coordination.
2. This Regulation shall apply to the surveillance chain constituted of:
  - (a) airborne surveillance systems, their constituents and associated procedures;
  - (b) ground-based surveillance systems, their constituents and associated procedures;
  - (c) surveillance data processing systems, their constituents and associated procedures;
  - (d) ground-ground communications systems, their constituents and associated procedures used for distribution of surveillance data.
3. This Regulation shall apply to all flights operating as general air traffic in accordance with instrument flight rules within the airspace defined in Article 1(3) of Regulation (EC) No 551/2004 amended by Regulation (EC) No 1070/2009 with the exception of Articles 6(3) and 6(4) which shall apply to all flights operating as general air traffic.

*Article 2*

**Definitions**

1. For the purpose of this Regulation the definitions set out in Regulation (EC) No 549/2004 amended by Regulation (EC) No 1070/2009 shall apply.
2. In addition to the definitions referred to in paragraph 1 the following definitions shall apply:

- (1) ‘Accuracy’ means the degree of conformity of the provided value of a data item with its actual value at the time when the data item is output from the surveillance chain. Data item error is the difference between those two values.
- (2) ‘ADS-B’ means Automatic Dependent Surveillance - Broadcast, a surveillance technique in which aircraft automatically provide, via a data link, data derived from on-board navigation and position-fixing systems.
- (3) ‘ADS-B OUT’ means the provision of ADS-B surveillance data from an aircraft transmit perspective.
- (4) aircraft identification means a group of letters, figures or a combination thereof which is either identical to, or the coded equivalent of, the aircraft call sign to be used in air-ground communications, and which is used to identify the aircraft in ground-ground air traffic services communications.
- (5) ‘availability’ means the probability that a system will perform its required function at the initiation of the intended operation.
- (6) ‘Coasted’ means extrapolated for a period longer than the ground surveillance systems update period.
- (7) ‘extrapolated’ means to project, predict or extend known data based upon values within an already observed time interval
- (8) ‘continuity’ means the probability that a system will perform its required function without unscheduled interruption, assuming that the system is available at the initiation of the intended operation.
- (9) ‘co-operative surveillance chain’ means a surveillance chain requiring both ground and airborne components to determine surveillance data items (e.g. SSR and transponder).
- (10) “harmful interferences” mean interferences that prevent the achievement of the performance requirements.
- (11) ‘integrity’ means the degree of undetected (at system level) non-conformity of the input value of the data item with its output value.
- (12) ‘operator’ means a person, organisation or enterprise engaged in or offering to engage in an aircraft operation.
- (13) ‘state aircraft’ means any aircraft used for military, customs and police.
- (14) ‘surveillance data’ means any data item, time stamped or not, within the surveillance system that pertains to:
  - a. aircraft 2D position;
  - b. aircraft vertical position;
  - c. aircraft attitude;
  - d. aircraft identity;
  - e. 24-bit ICAO aircraft address;
  - f. aircraft intent;
  - g. aircraft velocity;
  - h. aircraft acceleration.
- (15) ‘surveillance data processing system’ means a system that processes all surveillance inputs received to form a best estimate of the current aircraft surveillance data.

- (16) ‘Surveillance chain’ means a system composed of the aggregation of airborne and ground-based constituents used to determine the respective surveillance data items of aircraft, including the surveillance data processing system, if deployed.
- (17) ‘Time of applicability’ means the time at which the data item has been measured by the surveillance chain or the time for which it has been calculated by the surveillance chain.
- (18) ‘timeliness’ means the difference between the time of output of a data item and the time of applicability of that data item.
- (19) ‘transport type State aircraft’ means fixed wing State aircraft that are designed for the purpose of transporting persons and/or cargo.

*Article 3*

**Performance requirements**

- 1. Air navigation service providers shall ensure seamless operations within the airspace under their responsibility and at the boundary with adjacent airspaces by applying appropriate separation minima for the separation of aircraft.
- 2. Air navigation service providers shall ensure that systems referred to in Article 1(2) (b) to (d) are deployed as necessary to support the separation minima applied according with paragraph 1.
- 3. Air navigation service providers shall ensure that the output of the surveillance chain referred to in Article 1(2) complies with the requirements defined in Annex I provided that the airborne constituent functions used are compliant with the requirements specified in Annex IV.
- 4. If an air navigation service provider identifies an aircraft whose avionics are not compliant with Articles 4(4) to 4(9) and the relevant Parts of Annex IV and which does not have a valid exemption, he shall inform the operator of the flight of the presumed anomaly.

*Article 4*

**Interoperability requirements**

- 1. Air navigation service providers shall ensure that all surveillance data transferred from their systems identified in Article 1(2) (b) and (c) to other navigation service providers complies with the requirements specified in Annex II.
- 2. Air navigation service providers when transferring surveillance data from their systems identified in Article 1(2) (b) and (c) to other air navigation service providers, shall establish formal arrangements with them for the exchange of the data in accordance with the requirements specified in Annex III.
- 3. Air navigation service providers shall ensure that, by 2 January 2020, the co-operative surveillance chain have the necessary capability allowing them to establish individual aircraft identification using downlinked aircraft identification made available by aircraft equipped in accordance with Annex IV.
- 4. Without prejudice to Article 7, operators shall ensure that aircraft operating flights referred to in Article 1(3) with an individual certificate of airworthiness first issued on or after 8 January 2015 are equipped with secondary surveillance radar transponders having the capabilities defined in Annex IV Part A.

5. Without prejudice to Article 7, operators shall ensure that aircraft with a maximum certificated take-off mass exceeding 5700 kg or having a maximum cruising true airspeed capability greater than 250 knots, operating flights referred to in Article 1(3), with an individual certificate of airworthiness first issued on or after 8 January 2015 are equipped with secondary surveillance radar transponders having, in addition, the capabilities defined in Annex IV Part B.
6. Without prejudice to Article 7, operators shall ensure that fixed wing aircraft with a maximum certificated take-off mass exceeding 5700 kg or having a maximum cruising true airspeed capability greater than 250 knots, operating flights referred to in Article 1(3), with an individual certificate of airworthiness first issued on or after 8 January 2015 are equipped with secondary surveillance radar transponders having, in addition, the capabilities defined in Annex IV Part C.
7. Without prejudice to Article 7, operators shall ensure that aircraft operating flights referred to in Article 1(3), with an individual certificate of airworthiness first issued before 8 January 2015, are equipped, by 7 December 2017, with secondary surveillance radar transponders having the capabilities defined in Annex IV Part A.
8. Without prejudice to paragraph 11 and Article 7, operators shall ensure that, aircraft with a maximum certificated take-off mass exceeding 5700 kg or having a maximum cruising true airspeed capability greater than 250 knots, operating flights referred to in Article 1(3), with an individual certificate of airworthiness first issued before 8 January 2015 are equipped, by 7 December 2017, with secondary surveillance radar transponders having, in addition, the capabilities defined in Annex IV Part B.
9. Without prejudice to paragraph 11 and Article 7, operators shall ensure that, fixed wing aircraft with a maximum certificated take-off mass exceeding 5700 kg or having a maximum cruising true airspeed capability greater than 250 knots, operating flights referred to in Article 1(3), with an individual certificate of airworthiness first issued before 8 January 2015 are equipped, by 7 December 2017, with secondary surveillance radar transponders having, in addition, the capabilities defined in Annex IV Part C.
10. Operators shall ensure that aircraft equipped in accordance with paragraphs 4, 5, 6, 7, 8 and 9 and having a maximum certificated take-off mass exceeding 5700 kg or having a maximum true airspeed capability greater than 250 knots operate with antenna diversity as prescribed in ICAO Annex 10 Vol IV Fourth Edition including amendment 84, paragraph 3.1.2.10.4.
11. Without prejudice to Article 7, Member States may impose carriage requirements in accordance with paragraphs 5 and 8 to all aircraft operating flights referred to in Article 1(3) in areas where surveillance services using the surveillance data identified in Annex IV Part B are provided by air navigation service providers.
12. After 2 January 2020 the Air Navigation Service providers shall put into service 1030 MHz surveillance interrogators only if they have already deployed or are deploying in parallel within that same or similar coverage, 1090 MHz receiver(s) allowing the use within the surveillance chain of data items specified in Annex IV Part B.

*Article 5*

**Spectrum protection**

1. By 5 February 2015 the Member States shall take the necessary measures to ensure that a secondary surveillance radar transponder on board any aircraft flying over a Member State is not subject to excessive interrogations that are transmitted by ground-based surveillance interrogators and which either elicit replies or whilst not eliciting a reply are of sufficient power to exceed the minimum threshold level of the receiver of the secondary surveillance radar transponder.
2. In the context of paragraph 1, the sum of such interrogations shall not cause the secondary surveillance radar transponder to exceed the rates of reply per second, excluding any squitter transmissions, specified in the ICAO Annex 10 Volume IV, Fourth edition including amendment 85, paragraph 3.1.1.7.9.1 for Mode A/C replies and 3.1.2.10.3.7.3 for Mode S replies.
3. Without prejudice to paragraph 3.2 of R&TTE directive 1999/5/EC, by 5 February 2015 the Member States shall take the necessary measures to ensure that the use of a ground based transmitter operated in a Member State does not produce harmful interference on other surveillance systems.
4. In the event of disagreement between Member States regarding the measures detailed in paragraph 1 and 3 the Member States concerned shall bring the matter to the Commission for action. The Commission shall act in accordance with the procedure referred to in Article 5(2) of Regulation (EC) No 549/2004 amended by Regulation (EC) No 1070/2009.

*Article 6*

**Associated procedures**

1. Air navigation service providers shall assess the level of performance of ground based surveillance chain before putting them into service as well as regularly during the service, in accordance with the requirements specified in Annex V
2. Operators shall ensure that a check is performed at least every 2 years, and, whenever an anomaly is detected on a specific aircraft, so that the data items specified in Annex IV Part A paragraph 3 items (a) to (j), in Annex IV Part B paragraph 3 item (a) to (t), if applicable, and in Annex IV Part C paragraph 2 item (a) to (i), if applicable, are correctly provided at the output of secondary surveillance radar transponders installed on board their aircraft.
3. Member States shall ensure that the assignment of 24-bit aircraft addresses to aircraft equipped with a Mode S transponder complies with the ICAO standards specified in Annex 10 Volume III Second edition including amendment 84 Chapter 9 and its appendix.

4. Operators shall ensure that on board the aircraft they are operating, any Mode S transponder operates with a 24-bit ICAO aircraft address that corresponds to the registration that has been assigned by the State in which the aircraft is registered.

*Article 7*

**State aircraft**

1. Without prejudice to paragraph 2, Member States shall ensure that, by 7 December 2017, State aircraft operating in accordance with Article 1(3) are equipped with secondary surveillance radar transponders having the capability defined in Annex IV Part A.
2. Member States shall communicate to the Commission by 1 July 2016 at the latest the list of State aircraft that cannot be equipped with secondary surveillance radar transponders that comply with the requirements specified in Annex IV Part A, together with the justification for non-equipage, in the cases of:
  - (a) Compelling technical reasons;
  - (b) State aircraft operating in accordance with Article 1(3) that will be out of operational service by 1 January 2020;
  - (c) Procurement process constraints.
3. Without prejudice to paragraph 4, Member States shall ensure that, by 1 January 2019, transport-type State aircraft with a maximum certificated take-off mass exceeding 5700 kg or having a maximum cruising true airspeed capability greater than 250 knots, operating in accordance with Article 1(3) are equipped with secondary surveillance radar transponders having in addition the capability defined in Annex IV Part B and Part C.
4. Member States shall communicate to the Commission by 1 July 2018 at the latest the list of transport-type State aircraft with a maximum certificated take-off mass exceeding 5700 kg or having a maximum cruising true airspeed capability greater than 250 knots, that cannot be equipped with secondary surveillance radar transponders that comply with the requirements specified in Annex IV Part B and Part C, together with the justification for non-equipage, in the cases of:
  - (a) Compelling technical reasons;
  - (b) State aircraft operating in accordance with Article 1(3) that will be out of operational service by 1 January 2020;
  - (c) Procurement process constraints.
5. Where State aircraft cannot be equipped with secondary surveillance radar transponders as specified by paragraphs 1 and/or 3 due to the case referred to in paragraph 2 (c) and/or 4 (c), Member States shall include in the justification their procurement plans regarding these aircraft.
6. Air traffic service providers shall ensure that the State aircraft identified in paragraph 2 and/or 4 can be accommodated, provided that they can be safely handled within the capacity of the air traffic management system.
7. Member States shall publish the procedures for the handling of State aircraft which are not equipped according with paragraphs 1 and/or 3 in national aeronautical publications.
8. Air traffic service providers shall communicate on an annual basis to the Member State that has designated them, their plans for the handling of State aircraft which are not

equipped according with paragraphs 1 and/or 3, defined taking into account the capacity limits associated with the procedures referred to in paragraph 7.

*Article 8*

**Safety requirements**

1. Member States shall take the necessary measures to ensure that, by 5 February 2015, a safety assessment is conducted by the parties concerned for all existing systems referred to in Article 1(2) (b) to (d).
2. Member States shall take the necessary measures to ensure that any changes to the existing systems referred to in Article 1(2) (b) to (d) or the introduction of new systems are preceded by a safety assessment, including hazard identification, risk assessment and mitigation, conducted by the parties concerned.
3. During the assessments identified in paragraphs 1 and 2, the requirements specified in Annex VI shall be taken into consideration as a minimum.

*Article 9*

**Conformity or suitability for use of constituents**

1. Before issuing an EC declaration of conformity or suitability for use referred to in Article 5 of Regulation (EC) N° 552/2004 amended by Regulation (EC) No 1070/2009, manufacturers of constituents of the systems referred to in Article 1(2) or their authorized representative established in the Community, shall assess the conformity or suitability for use of these constituents in compliance with the requirements set out in Annex VII, Part A, without prejudice to paragraph 2.
2. Certification processes complying with Regulation (EC) No 216/2008 of the European Parliament and of the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC<sup>5</sup>, amended by Regulation (EC) No 1108/2009<sup>6</sup>, shall be considered as acceptable procedures for the conformity assessment of constituents if they include the demonstration of compliance with the applicable interoperability, performance and safety requirements of this Regulation.

*Article 10*

**Verification of systems**

1. Air navigation service providers which can demonstrate or have demonstrated that they fulfil the conditions set out in Annex VIII shall conduct a verification of the systems referred to in Article 1(2) (b) to (d) in compliance with the requirements set out in Annex VII, Part B.
2. Air navigation service providers which cannot demonstrate that they fulfil the conditions set out in Annex VIII shall subcontract to a notified body a verification of the systems referred to in Article 1(2) (b) to (d). This verification shall be conducted in compliance with the requirements set out in Annex VII, Part C.

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<sup>5</sup> OJ L 79, 19.3.2008, p.1

<sup>6</sup> OJ L 309, 24.11.2009, p.51

*Article 11*

**Additional requirements**

1. Air navigation service providers shall ensure that all relevant personnel are made duly aware of the requirements laid down in this Regulation and that they are adequately trained for their job functions.
2. Air navigation service providers shall:
  - (a) develop and maintain operations manuals containing the necessary instructions and information to enable all related personnel to apply this Regulation;
  - (b) ensure that the manuals referred to in point (a) are accessible and kept up-to-date and that their update and distribution are subject to appropriate quality and documentation configuration management;
  - (c) ensure that the working methods and operating procedures comply with this Regulation.
3. Operators shall take the necessary measures to ensure that the personnel operating and maintaining surveillance equipment are made duly aware of the relevant provisions of this Regulation and that they are adequately trained for their job functions, and that instructions about how to use this equipment are available in the cockpit.
4. Member States shall take the necessary measures to ensure compliance with this Regulation including the publication of relevant information in the national aeronautical information publications.

*Article 12*

**Exemptions**

1. Without prejudice to Article 7, aircraft with a first certificate of airworthiness issued before 8 January 2015 that have either a maximum take off mass in excess of 5700kg or a maximum cruising true airspeed greater than 250 knots that do not have the complete set of parameters detailed in Annex IV part C available on a digital bus on-board the aircraft may be exempted from complying with the requirements of Article 4(9).
2. Without prejudice to Article 7, aircraft with a first certificate of airworthiness issued before 01 January 1990 that have either a maximum take off mass in excess of 5700kg or a maximum cruising true airspeed greater than 250 knots may be exempted from complying with the requirements of Article 4(10).
3. The Member States concerned shall communicate to the Commission by 1 July 2017 at the latest, detailed information justifying the need for granting exemptions to these aircraft.
4. The Commission shall adopt a decision, based on the criteria defined in paragraph 5, in accordance with the procedure referred to in Article 5(3) of Regulation (EC) No 549/2004 amended by Regulation (EC) No 1070/2009, after consultation with the parties concerned.
5. The criteria referred to in paragraph 4 shall include the following:

- (a) Aircraft reaching the end of their production life;
- (b) Aircraft being produced in limited numbers;
- (c) Disproportionate re-engineering costs.

*Article 13*

**Entry into force and application**

1. This Regulation shall enter into force on the twentieth day following that of its publication in the Official Journal of the European Union.
2. Articles 3, 4(1), 4(2) and 6(1) shall apply from 1 January 2013.
3. This Regulation shall be binding in its entirety and directly applicable in all Member States.

**ANNEX I**

**Performance requirements referred to in Article 3(3)**

**1. Surveillance Data Requirements**

1.1 All surveillance chains referred to in Article 3(3) shall provide as a minimum the following surveillance data:

**2D Positional Data:**

- Aircraft horizontal position.

**Surveillance Data Status:**

- Cooperative / Non-Cooperative / Combined;

- Coasted or not;

- Time of applicability of 2D positional data.

1.2 In addition, all cooperative surveillance chains referred to in Article 3(3) shall provide as a minimum the following surveillance data:

**Vertical Positional Data:**

- Based upon pressure altitude received from the aircraft.

**Operational Identification Data:**

- Aircraft identity received from the aircraft (Aircraft Identification and/or Mode A code).

**Supplemental Indicators:**

- Emergency indicators (i.e. unlawful interference, radio failure and general emergency);

- Special Position Indicator.

**Surveillance Data Status:**

- Time of applicability of vertical position data.

**2. Surveillance Data Performance Requirements**

2.1 The Air Navigation Service Providers shall define performance requirements for the accuracy, availability, integrity, continuity and timeliness of the surveillance data provided by the systems referred to in Article 3(3) and used to enable the surveillance applications conducted.

- 2.2 The evaluation of the accuracy of the horizontal position provided by the systems referred to in Article 3(3) shall include, as a minimum, the assessment of horizontal position error.
- 2.3 The Air Navigation Service Providers shall verify compliance with the performance requirements defined in accordance with paragraphs 2.1 and 2.2.
- 2.4 Verification of compliance shall be performed on the basis of the surveillance data provided at the output of the surveillance chain, to the surveillance data user.

**ANNEX II**

**Surveillance data exchange requirements referred to in Article 4(1)**

1. Surveillance data exchanged between the systems referred to in Article 1 (2) (b) and (c), shall be subject to a data format that is agreed between the parties concerned.
2. The surveillance data transferred outside the systems referred to in Article 1 (2) (b) and (c) to other air navigation service providers shall allow:
  - (a) Identification of the data source;
  - (b) Identification of the type of data.
3. Surveillance data transferred outside the systems referred to in Article 1 (2) (b) and (c) to other air navigation service providers shall be time stamped and expressed as Co-ordinated Universal Time (UTC).

**ANNEX III**

**Requirements for formal arrangements referred to in Article 4(2)**

1. Formal arrangements between air navigation service providers for the exchange of surveillance data shall include the following minimum content:
  - (a) The parties to the arrangements;
  - (b) The period of validity of the arrangements;
  - (c) The scope of the surveillance data;
  - (d) The sources of the surveillance data;
  - (e) The exchange format of the surveillance data;
  - (f) The communications means used to exchange the surveillance data;
  - (g) The service delivery point of the surveillance data;
  - (h) Quality requirements for the surveillance data in terms of the following:
    - i. Performance indicators or parameters used to monitor the quality of the surveillance data;
    - ii. The methods and tools to be applied to the measurement of the quality of the surveillance data;
    - iii. The frequency of measurement of the quality of the surveillance data;
    - iv. Data quality reporting procedures;
    - v. For each performance indicator the acceptable range of values shall be defined together with a procedure to be applied if the value falls outside that defined range;
    - vi. Identification of the party responsible for checking and ensuring quality requirements are met.
  - (i) Agreed service levels in terms of the following:
    - i. Hours of availability;
    - ii. Continuity;
    - iii. Integrity;
    - iv. Mean time between failures;
    - v. Reaction times for outages;
    - vi. Procedures for planning and conducting preventative maintenance.
  - (j) Change management procedures;
  - (k) Reporting arrangements with respect to performance and availability including unforeseen outages;
  - (l) Management and co-ordination arrangements;
  - (m) Ground-based surveillance chain safeguarding and notification arrangements.

**ANNEX IV**

**PART A: SECONDARY SURVEILLANCE RADAR TRANSPONDER  
CAPABILITIES REFERRED TO IN ARTICLES 4(4), 4(7), 6(2), 7(1) AND 7(2)**

1. The minimum capability for the secondary surveillance transponder shall be Mode S Level 2s certified in accordance with the ICAO Annex 10 Volume IV Fourth edition including Amendment 84 § 2.1.5.1.2, 2.1.5.1.7 and 3.1.2.10.
2. Each implemented transponder register shall be compliant with the corresponding section of ICAO document 9871 Second Edition.
3. The following data items shall be made available to the transponder and be transmitted by the transponder via the Mode S protocol and in accordance with the formats specified in ICAO doc 9871 Second Edition:

(a) ICAO 24-bit address.
(b) Mode A code.
(c) Pressure altitude.
(d) Flight status: on the ground or airborne.
(e) Data link capability report: <ol style="list-style-type: none"><li>i. Airborne Collision Avoidance System (ACAS) capability;</li><li>ii. Mode S specific services capability;</li><li>iii. Aircraft identification capability;</li><li>iv. Squitter capability;</li><li>v. Surveillance identifier capability;</li><li>vi. Common usage Ground Initiated Comms.-B (GICB) capability report (indication of change);</li><li>vii. Mode S subnetwork version number.</li></ol>
(f) Common usage GICB capability report.
(g) Aircraft identification.
(h) Special Position Indication (SPI).
(i) Emergency status: general emergency, no communications, unlawful interference (including the use of specific Mode A codes to indicate different emergency states).
(j) ACAS Active resolution advisories when the aircraft is equipped with Traffic Alert and Collision Avoidance System II (TCAS II).

4. Other data items may be made available to the transponder.

5. The data items referred to in paragraph 4 shall only be transmitted by the transponder via the Mode S protocol if the aircraft and equipment certification process covers the transmission of these data items via the Mode S protocol.
6. The continuity of transponder functionality supporting the Mode S protocol shall be equal to or less than  $2 \cdot 10^{-4}$  per flight hour (i.e. Mean Time Between Failure equal to or greater than 5000 flight hours).

**PART B: SECONDARY SURVEILLANCE RADAR TRANSPONDER  
CAPABILITIES REFERRED TO IN ARTICLES 4(5), 4(8), 4(11), 6(2), 7(3) AND 7(4)**

1. The minimum capability for the secondary surveillance transponder shall be Mode S Level 2es certified in accordance with the ICAO Annex 10 Volume IV Fourth edition including Amendment 84 § 2.1.5.1.2, 2.1.5.1.6, 2.1.5.1.7 and 3.1.2.10.
2. Each implemented transponder register shall be compliant with the corresponding section of ICAO document 9871 Second Edition.
3. The following data items shall be made available to the transponder and be transmitted by the transponder via Version 2 of the Extended Squitter (ES) ADS-B protocol in accordance with the formats specified in ICAO doc 9871 Second Edition.

(a) ICAO 24-bit address.
(b) Aircraft identification.
(c) Mode A code.
(d) Special Position Indication (SPI) using the same source as for the same parameter specified in Part A.
(e) Emergency status (General emergency, No communications, Unlawful interference) using the same source as for the same parameter specified in Part A.
(f) ADS-B version number (=2).
(g) ADS-B emitter category.
(h) Geodetic horizontal position (WGS84 latitude and longitude), both while airborne or on the ground.
(i) Geodetic horizontal position quality indicators (corresponding to the integrity containment bound (NIC), 95% accuracy bound (NAC <sub>p</sub> ), Source Integrity Level (SIL) and System Design Assurance level (SDA)).
(j) Pressure altitude using the same source as for the same parameter specified in Part A.
(k) Geometric altitude in accordance with the World Geodetic System revision 1984 (WGS84) (provided in addition and encoded as a difference to pressure altitude).
(l) Geometric vertical accuracy (GVA).
(m) Velocity over ground, both while airborne (East/West and North/South Airborne Velocity over ground) or on the ground (Surface Heading/Ground Track and Movement).
(n) Velocity quality indicator (corresponding to Navigation Accuracy Category for velocity (NAC <sub>v</sub> )).

(o) Coded aircraft length and width.
(p) Global Navigation Satellite System (GNSS) antenna offset.
(q) Vertical rate: barometric vertical rate using the same source as for the same parameter specified in Part C (data item 2.(g)) when the aircraft is required and capable to transmit this data item via the Mode S protocol, or Global Navigation Satellite System (GNSS) vertical rate.
(r) Mode Control Panel / Flight Control Unit (MCP/FCU) Selected altitude using the same source as for the same parameter specified in Part C when the aircraft is required and capable to transmit this data item via the Mode S protocol.
(s) Barometric pressure setting (minus 800 hectoPascals) using the same source as for the same parameter specified in Part C when the aircraft is required and capable to transmit this data item via the Mode S protocol.
(t) ACAS Active resolution advisories when the aircraft is equipped with TCAS II using the same source as for the same parameter specified in Part A.

4. Surveillance data items (data items 3. (h), (k) and (m)) and their quality indicator data items (data items 3. (i), (l) and (n)) shall be provided to the transponder(s) on the same physical interface.
5. The data source connected to the transponder and providing data items 3. (h) and (i) shall meet the following data integrity requirements:
  - (a) Horizontal position (data item 3. (h)) source integrity level (SIL, expressed with respect to NIC) shall be equal to or less than  $10^{-7}$  per flight-hour;
  - (b) Horizontal position (data item 3. (h)) integrity time to alert (leading to a change of the NIC quality indicator), if on-board monitoring is required to meet the horizontal position source integrity level, shall be equal to or less than 10 seconds.
6. The primary data source providing data items 3. (h) and (i) shall be at least compatible with GNSS receivers that perform receiver autonomous integrity monitoring (RAIM) and fault detection and exclusion (FDE), along with the output of corresponding measurement status information, as well as integrity containment bound and 95% accuracy bound indications.
7. The system integrity level of the data sources providing data items 3. (f), (g), (k) to (p) shall be equal to or less than  $10^{-5}$  per flight-hour.
8. The quality indicator information (NIC,  $NAC_p$ , SIL, SDA,  $NAC_v$  and GVA) (data items 3. (i), (l) and (n)) shall express the actual performance of the selected data source as valid at the time of applicability of the measurement of the data items (3. (h), (k) and (m)).
9. With respect to the processing of data items 3. (a) to (t), the transponder system integrity level for the Extended Squitter ADS-B protocol, including any interconnecting avionics to the transponder, shall be equal to or less than  $10^{-5}$  per flight-hour.

10. The total latency of the horizontal position data (data items 3. (h) and (i)) shall be equal to or less than 1.5 second in 95% of all transmissions.
11. The uncompensated latency of the horizontal position data (data item 3. (h)) shall be equal to or less than 0.6 second in 95% of the cases and shall be equal to or less than 1.0 second in 99.9% of all transmissions.
12. The total latency of the ground speed data items (data items 3. (m) and (n)) shall be equal to or less than 1.5 second in 95% of all transmissions.
13. If the transponder is set to use a Mode A conspicuity code of 1000 then the broadcast of Mode A code information via the Extended Squitter ADS-B protocol shall be inhibited.
14. Other data items may be made available to the transponder.
15. Except for military reserved formats, the data items referred to in paragraph 14 shall only be transmitted by the transponder via the Extended Squitter ADS-B protocol if the aircraft and equipment certification process covers the transmission of these data items via the Extended Squitter ADS-B protocol.
16. The continuity of transponder functionality supporting the ADS-B protocol shall be equal to or less than  $2 \cdot 10^{-4}$  per flight hour (i.e. Mean Time Between Failure equal to or greater than 5000 flight hours).

**PART C: SECONDARY SURVEILLANCE RADAR TRANSPONDER ADDITIONAL SURVEILLANCE DATA CAPABILITY REFERRED TO IN ARTICLES 4(6), 4(9), 6(2), 7(3), 7(4) AND 12(1)**

1. Each transponder register that is implemented shall be compliant with the corresponding section of ICAO document 9871 Second Edition.
2. The following data items shall be made available to the transponder and be transmitted by the transponder as requested by the ground-based surveillance chain, via the Mode S protocol and in accordance with the formats specified in ICAO doc 9871 Second Edition:

(a) MCP/FCU Selected altitude.
(b) Roll angle.
(c) True track angle.
(d) Ground speed.
(e) Magnetic heading.
(f) Indicated airspeed (IAS) or mach number.
(g) Vertical rate (Barometric or Baro-inertial).
(h) Barometric pressure setting (minus 800 hectoPascals).
(i) Track angle rate or true airspeed if track angle rate is not available.

3. Other data items may be made available to the transponder.
4. The data items referred to in paragraph 3 shall only be transmitted by the transponder via the Mode S protocol if the aircraft and equipment certification process covers the transmission of these data items via the Mode S protocol.

**ANNEX V**

**Requirements for the evaluation of the level of performance of surveillance chains referred to in Article 6(1)**

1. The evaluation of the level of the ongoing performance of the systems referred to in Article 1 (2) (b) to (d) shall be performed in the volume of airspace where the corresponding provision of surveillance services utilising the systems is undertaken.
2. ANSP shall periodically check system and components and develop and enforce performance validation regime. The periodicity shall be agreed with the national supervisory authority taking into account the specificities of the system and its components.
3. Before the implementation of airspace design modification the systems referred to in Article 1 (2) (b) to (d) shall be verified that they still meet the required performance in the new volume of operation.

**ANNEX VI**

**Requirements referred to in Article 8**

1. The performance requirements specified in Article 3.
2. The interoperability requirements specified in Article 4(2), (3) and (11).
3. The spectrum protection requirements specified in Article 5.
4. The associated procedures requirements specified in Article 6.
5. The State aircraft requirement specified in Article 7(6).
6. The additional requirements specified in Article 11(3).
7. The surveillance data exchange requirements specified in Annex II (3).

**ANNEX VII**

**PART A: REQUIREMENTS FOR THE ASSESSMENT OF THE CONFORMITY OR SUITABILITY FOR USE OF CONSTITUENTS REFERRED TO IN ARTICLE 9(1)**

1. The verification of compliance activities shall demonstrate the conformity or suitability for use of constituents with the applicable requirements of this Regulation whilst these constituents are in operation in the test environment.
2. The manufacturer shall manage the conformity assessment activities and shall in particular:
  - (a) determine the appropriate test environment;
  - (b) verify that the test plan describes the constituents in the test environment;
  - (c) verify that the test plan provides full coverage of applicable requirements;
  - (d) ensure the consistency and quality of the technical documentation and the test plan;
  - (e) plan the test organisation, staff, installation and configuration of test platform;
  - (f) perform the inspections and tests as specified in the test plan;
  - (g) write the report presenting the results of inspections and tests.
3. The manufacturer shall ensure that the constituents referred to in Article 9, integrated in the test environment meet the applicable requirements of this Regulation.
4. Upon satisfying completion of verification of conformity or suitability for use, the manufacturer shall under its responsibility draw up the EC declaration of conformity or suitability for use, specifying notably the applicable requirements of this Regulation met by the constituent and its associated conditions of use in accordance with Annex III point (3) of Regulation (EC) No 552/2004 amended by Regulation (EC) No 1070/2009.

**PART B: REQUIREMENTS FOR THE VERIFICATION OF SYSTEMS REFERRED TO IN ARTICLE 10(1)**

1. The verification of systems identified in Article 1(2) (b) to (d) shall demonstrate the compliance of these systems with the interoperability, performance and safety requirements of this Regulation in an assessment environment that reflects the operational context of these systems.
2. The verification of systems identified in Article 1(2) (b) to (d) shall be conducted in accordance with appropriate and recognised testing practices.
3. Test tools used for the verification of systems identified in Article 1(2) (b) to (d) shall have appropriate functionalities.
4. The verification of systems identified in Article 1(2) (b) to (d) shall produce the elements of the technical file required by Annex IV (3) of Regulation (EC) No 552/2004 amended by Regulation (EC) No 1070/2009 including the following elements:
  - (a) description of the implementation;
  - (b) the report of inspections and tests achieved before putting the system into service.
5. The air navigation service provider shall manage the verification activities and shall in particular:
  - (a) determine the appropriate operational and technical assessment environment reflecting the operational environment;
  - (b) verify that the test plan describes the integration of systems identified in Article 1(2) (b) to (d) in an operational and technical assessment environment;
  - (c) verify that the test plan provides full coverage of the applicable interoperability, performance and safety requirements of this Regulation;
  - (d) ensure the consistency and quality of the technical documentation and the test plan;
  - (e) plan the test organisation, staff, installation and configuration of the test platform;
  - (f) perform the inspections and tests as specified in the test plan;
  - (g) write the report presenting the results of inspections and tests.
6. The air navigation service provider shall ensure that the systems identified in Article 1(2) (b) to (d) operated in an operational assessment environment meet the interoperability, performance and safety requirements of this Regulation.
7. Upon satisfying completion of verification of compliance, air navigation service providers shall draw up the EC declaration of verification of system and submit it to the national supervisory authority together with the technical file as required by Article 6 of Regulation (EC) No 552/2004 amended by Regulation (EC) No 1070/2009.

**PART C: REQUIREMENTS FOR THE VERIFICATION OF SYSTEMS REFERRED TO IN ARTICLE 10(2)**

1. The verification of systems identified in Article 1(2) (b) to (d) shall demonstrate the compliance of these systems with the interoperability, performance and safety requirements of this Regulation in an assessment environment that reflects the operational context of these systems.
2. The verification of systems identified in Article 1(2) (b) to (d) shall be conducted in accordance with appropriate and recognised testing practices.
3. Test tools used for the verification of systems identified in Article 1(2) (b) to (d) shall have appropriate functionalities.
4. The verification of systems identified in Article 1(2) (b) to (d) shall produce the elements of the technical file required by Annex IV (3) of Regulation (EC) No 552/2004 amended by Regulation (EC) No 1070/2009 including the following elements:
  - (a) description of the implementation;
  - (b) the report of inspections and tests achieved before putting the system into service.
5. The air navigation service provider shall determine the appropriate operational and technical assessment environment reflecting the operational environment and shall have verification activities performed by a notified body.
6. The notified body shall manage the verification activities and shall in particular:
  - (a) verify that the test plan describes the integration of systems identified in Article 1(2) (b) to (d) in an operational and technical assessment environment;
  - (b) verify that the test plan provides full coverage of the applicable interoperability, performance and safety requirements of this Regulation;
  - (c) ensure the consistency and quality of the technical documentation and the test plan;
  - (d) plan the test organisation, staff, installation and configuration of the test platform;
  - (e) perform the inspections and tests as specified in the test plan;
  - (f) write the report presenting the results of inspections and tests.
7. The notified body shall ensure that the systems identified in Article 1(2) (b) to (d) operated in an operational assessment environment meet the interoperability, performance and safety requirements of this Regulation.
8. Upon satisfying completion of verification tasks, the notified body shall draw up a certificate of conformity in relation to the tasks it carried out.
9. Then, the air navigation service provider shall draw up the EC declaration of verification of system and submit it to the national supervisory authority together with the technical file as required by Article 6 of Regulation (EC) No 552/2004 amended by Regulation (EC) No 1070/2009.

**ANNEX VIII**

**Conditions referred to in Article 10**

1. The air navigation service provider must have in place reporting methods within the organization which ensure and demonstrate impartiality and independence of judgement in relation to the verification activities.
2. The air navigation service provider must ensure that the personnel involved in verification processes, carry out the checks with the greatest possible professional integrity and the greatest possible technical competence and are free of any pressure and incentive, in particular of a financial type, which could affect their judgment or the results of their checks, in particular from persons or groups of persons affected by the results of the checks.
3. The air navigation service provider must ensure that the personnel involved in verification processes, have access to the equipment that enables them to properly perform the required checks.
4. The air navigation service provider must ensure that the personnel involved in verification processes, have sound technical and vocational training, satisfactory knowledge of the requirements of the verifications they have to carry out, adequate experience of such operations, and the ability required to draw up the declarations, records and reports to demonstrate that the verifications have been carried out.
5. The air navigation service provider must ensure that the personnel involved in verification processes, are able to perform their checks with impartiality. Their remuneration shall not depend on the number of checks carried out, or on the results of such checks.