EASA
European Aviation Safety Agency

ATM/ANS (IR + AMC/GM)

eRules

Easy Access Rules for ATM-ANS (Regulation (EU) 2017/373)

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LIST OF REVISIONS

Published	Reason of revision
November 2017	First Easy Access Rules document powered by eRules
December 2017	To incorporate a missing table in GM1 ATM/ANS.OR.A.001 Scope
February 2018	To correct a minor editorial mistake
June 2018	To correct an editorial error in GM1 to AMC2 ATS.OR.205(a)(2), paragraph (a)(4) and to correct the applicability dates for the Implementing Rules (IRs)

NOTE FROM THE EDITOR

The content of this document is arranged as follows: the cover regulation (recitals and articles) with the implementing rule (IR) points appear first, followed by the related acceptable means of compliance (AMC) and guidance material (GM) paragraph(s).

All elements (i.e. cover regulation, IRs, AMC, and GM) are colour-coded and can be identified according to the illustration below. The Commission regulation or EASA Executive Director (ED) decision through which the point or paragraph was introduced or last amended is indicated below the point or paragraph title(s) *in italics*.

Cover regulation article

Commission regulation

Implementing rule

Commission regulation

Acceptable means of compliance

ED decision

Guidance material

ED decision

This document will be updated regularly to incorporate further amendments.

The format of this document has been adjusted to make it user-friendly and for reference purposes. Any comments should be sent to erules@easa.europa.eu.

INCORPORATED AMENDMENTS

IMPLEMENTING RULES (IRS) (COMMISSION REGULATIONS)

Incorporated Commission Regulation	Affected Part	Regulation amendment	Applicability date[1, 2]
Regulation (EU) 2017/373	Annex I (Part-DEFINITIONS)	N/A	2/1/2020, except for the Agency and the DAT providers
	Annex II (Part-ATM/ANS.AR)		2/1/2020, except for the Agency
	Annex III (Part-ATM/ANS.OR)		2/1/2020, except for the DAT providers
	Annex IV (Part-ATS)		2/1/2020
	Annex V (Part-MET)		2/1/2020
	Annex VI (Part-AIS)		2/1/2020
	Annex VII (Part-DAT)		1/1/2019 or 28/3/2017
	Annex VIII (Part-CNS)		2/1/2020
	Annex IX (Part-ATFM)		2/1/2020
	Annex X (Part-ASM)		2/1/2020
	Annex XI (Part-ASD)		N/A
	Annex XII (Part-NM)		2/1/2020
	Annex XIII (Part-PERS)		2/1/2020, except for the DAT providers

[1] This is the date of application (i.e. the date from which an act or a provision in an act produces its full legal effects) as defined in the relevant cover regulation article. Some provisions of the regulations though may be applicable at a later date (deferred applicability). Besides, there may be some opt-outs (derogations from certain provisions) notified by the Member States.

[2] Regulation (EU) 2017/373 shall apply from 2 January 2020. However:

- in respect of the Agency, Article 4(1), (2), (5), (6) and (8) and Article 5 shall apply from the date of entry into force of this Regulation;
- in respect of data services providers, Article 6 shall apply in any case from 1 January 2019 and, where such a provider applies for and is granted a certificate in accordance with Article 6, from the date of entry into force of this Regulation.

AMC/GM TO IRs (ED DECISIONS)

Incorporated ED Decision	Affected AMC/GM	AMC/GM Issue No, Amendment No	Applicability date
ED Decision 2017/001/R	GM to Definitions of terms used in Annexes II to XIII to Commission Implementing Regulation (EU) 2017/373	Initial issue	2/1/2020, except for DAT providers
	AMC and GM to Part-ATM/ANS.AR (Annex II to ED Decision 2017/001/R)		2/1/2020, except for the Agency
	AMC and GM to Part-ATM/ANS.OR (Annex III to ED Decision 2017/001/R)		2/1/2020, except for DAT providers
	AMC and GM to Part-ATS (Annex IV to ED Decision 2017/001/R)		2/1/2020
	AMC and GM to Part-MET (Annex V to ED Decision 2017/001/R)		2/1/2020
	AMC and GM to Part-AIS (Annex VI to ED Decision 2017/001/R)		2/1/2020
	AMC and GM to Part-DAT (Annex VII to ED Decision 2017/001/R)		1/1/2019 or 28/3/2017
	AMC and GM to Part-CNS (Annex VIII to ED Decision 2017/001/R)		2/1/2020
	AMC and GM to Part-ATFM (Annex IX to ED Decision 2017/001/R)		2/1/2020
	AMC and GM to Part-ASM (Annex X to ED Decision 2017/001/R)		2/1/2020
	AMC and GM to Part-ASD (Annex XI to ED Decision 2017/001/R)		N/A
	AMC and GM to Part-NM (Annex XII to ED Decision 2017/001/R)		2/1/2020
	AMC and GM to Part-PERS (Annex XIII to ED Decision 2017/001/R)		2/1/2020, except for DAT providers
	AMC and GM to Regulation (EU) 2017/373 (Annex XIV to ED Decision 2017/001/R)		2/1/2020, except for DAT providers

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COVER REGULATION

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

Regulation (EU) 2017/373

THE EUROPEAN COMMISSION,

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

Having regard to 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[1], and in particular Article 8b(6) thereof,

Having regard to Regulation (EC) No 550/2004 of the European Parliament and of the Council of 10 March 2004 on the provision of air navigation services in the single European sky (the service provision Regulation)[2], and in particular Articles 4 and 6 thereof,

Having regard to Regulation (EC) No 551/2004 of the European Parliament and of the Council of 10 March 2004 on the organisation and use of the airspace in the single European sky (the airspace Regulation)[3], and in particular Article 6(7) thereof,

Whereas:

(1) Commission Implementing Regulations (EU) No 1034/2011[4] and (EU) No 1035/2011[5] lay down requirements on safety oversight in air traffic management and air navigation services and common requirements for the provision of air navigation services, respectively. Those latter requirements are to be complied with by the service providers concerned in order for them to be issued the certificates referred to in Article 7(1) of Regulation (EC) No 550/2004 and Article 8b(2) of Regulation (EC) No 216/2008. Those Regulations also lay down requirements concerning the competent authorities, which are responsible for issuing those certificates and exercising oversight and enforcement tasks, in accordance with Article 4 of Regulation (EC) No 549/2004 of the European Parliament and of the Council[6], Articles 2 and 7(7) of Regulation (EC) No 550/2004 and Articles 10 and 22a of Regulation (EC) No 216/2008.

(2) The requirements set out in Implementing Regulations (EU) No 1034/2011 and (EU) No 1035/2011 serve in particular to implement, at an initial stage, the essential requirements concerning the provision of air traffic management and air navigation services ('ATM/ANS') set out in Regulation (EC) No 216/2008, in particular to ensure compliance with Articles 8b and 22a

[1] OJ L 79, 19.3.2008, p. 1.

[2] OJ L 96, 31.3.2004, p. 10.

[3] OJ L 96, 31.3.2004, p. 20.

[4] Commission Implementing Regulation (EU) No 1034/2011 of 17 October 2011 on safety oversight in air traffic management and air navigation services and amending Regulation (EU) No 691/2010 (OJ L 271, 18.10.2011, p. 15).

[5] Commission Implementing Regulation (EU) No 1035/2011 of 17 October 2011 laying down common requirements for the provision of air navigation services and amending Regulations (EC) No 482/2008 and (EU) No 691/2010 (OJ L 271, 18.10.2011, p. 23).

[6] Regulation (EC) No 549/2004 of the European Parliament and of the Council of 10 March 2004 laying down the framework for the creation of the single European Sky (OJ L 96, 31.3.2004, p. 1).

of Regulation (EC) No 216/2008 and Annex Vb thereto and to allow the commencement of standardisation inspections in accordance with Article 24 of Regulation (EC) No 216/2008.

(3) Those requirements set out in Implementing Regulations (EU) No 1034/2011 and (EU) No 1035/2011 should now be complemented and updated, in light of technical progress. It should also be clarified that, for service providers to be issued and retain a certificate, or to make a declaration, in accordance with this Regulation, they must comply, and continue to comply, with those requirements as well as with the essential requirements referred to in Article 8b(1) of Regulation (EC) No 216/2008. In addition, consistency should be ensured between those requirements and the requirements set out in Commission Regulations (EU) No 965/2012[1], (EU) No 1178/2011[2], (EU) No 139/2014[3] and (EU) 2015/340[4], thus moving towards a 'total system approach', which entails a logical and technologically consistent approach across the various domains. Therefore, the requirements set out in Implementing Regulations (EU) No 1034/2011 and (EU) No 1035/2011 should now be laid down in a single instrument and Implementing Regulations (EU) No 1034/2011 and (EU) No 1035/2011 should be repealed.

(4) Common rules for the certification and oversight of the service providers concerned are essential to increase the Member States' confidence in each other's systems. Therefore, and in order to ensure the highest level of safety and security, uniform requirements for the provision of services and their oversight should be strengthened. That should ensure the safe, high-quality provision of services for the purpose of air navigation and the mutual recognition of certificates throughout the Union, thereby increasing freedom of movement and improving the availability of those services.

(5) In order to ensure a harmonised approach to certification and oversight, the measures to be implemented for security of systems, constituents in use and data should be coordinated across Member States, functional airspace blocks and the network formed by the services, functions and products offered by service providers, the Network Manager, aerodromes and other persons providing the necessary infrastructure for flight operations.

(6) Safety management ensures the identification, assessment and minimisation of safety risks as well as security vulnerabilities which have an impact on safety. Therefore, it is necessary to further elaborate the requirements related to the safety assessment of changes to the functional system by a certified organisation. Those requirements should be adapted taking into account the integration of requirements relating to change management into the common regulatory structure for civil aviation safety, as well as the experience gained by stakeholders and competent authorities in the field of safety oversight.

(7) It is appropriate to introduce safety culture as an aspect of the management systems of the service providers in a manner that promotes understanding and improvement of those systems,

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[1] 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).

[2] Commission Regulation (EU) No 1178/2011 of 3 November 2011 laying down technical requirements and administrative procedures related to civil aviation aircrew pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (OJ L 311, 25.11.2011, p. 1).

[3] Commission Regulation (EU) No 139/2014 of 12 February 2014 laying down requirements and administrative procedures related to aerodromes pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (OJ L 44, 14.2.2014, p. 1).

[4] Commission Regulation (EU) 2015/340 of 20 February 2015 laying down technical requirements and administrative procedures relating to air traffic controllers' licences and certificates pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council, amending Commission Implementing Regulation (EU) No 923/2012 and repealing Commission Regulation (EU) No 805/2011 (OJ L 63, 6.3.2015, p. 1).

while acknowledging the need to strengthen management systems further, especially by integrating reliable occurrence reporting.

(8) It should be specified which authorities are responsible for the tasks related to certification, oversight and enforcement in respect of the service providers that are subject to this Regulation, in line with the criterion set out in Article 7(2) of Regulation (EC) No 550/2004 and the tasks of the European Aviation Safety Agency ('the Agency') pursuant to Article 22a of Regulation (EC) No 216/2008, and without prejudice to the requirements of Article 2 of Regulation (EC) No 550/2004. The Agency should be the competent authority for providers of data services and for the Network Manager, in light of the nature and scale of the services provided. In order to fulfil the objectives of Regulation (EC) No 216/2008, in particular the objective set out in point (d) of Article 2(2) thereof, and the objective set out in Article 1(3) of Regulation (EC) No 549/2004, it is also appropriate to align the requirements for the competent authorities with the progress in International Civil Aviation Organisation ('ICAO') safety management concepts, in particular the introduction of the authority management system, as well as in the implementation of the state safety programme and in ensuring coordination between those authorities.

(9) It should be clarified that, when exercising their certification, oversight and enforcement tasks under this Regulation, the competent authorities should be independent from any service provider, through ensuring adequate separation of those authorities from those providers at least at the functional level, and that any possible conflict of interest should be avoided. The aim is to guarantee the objectivity and impartiality of those authorities and to ensure that the exercise of their tasks under this Regulation is of high quality.

(10) The Agency should establish a database with relevant information relating to the competent authorities, so as to facilitate standardisation inspections of, and coordination with, the competent authorities, as well as to support the Commission in carrying out its tasks.

(11) With a view to ensuring that the requirements for service providers set out in this Regulation are complied with at all times and the competent authorities can effectively exercise their tasks under this Regulation, in accordance with Article 4(3) and (4) of Regulation (EC) No 549/2004, those authorities should be granted certain specific investigatory powers, in addition to the possibility to carry out investigations and surveys referred to in Article 2(2) of Regulation (EC) No 550/2004 and Article 10(2) and (3) of Regulation (EC) No 216/2008. It is appropriate to clarify that those powers should be exercised in accordance with the applicable rules of national law, while having due regard to a number of specific elements, which are meant to ensure a fair balance between all rights and interests at issue in a particular case.

(12) The air traffic safety electronics personnel employed by a service provider or the Network Manager should be subject to a harmonised training and competence assessment scheme. The service provider or Network Manager should also ensure that the personnel of contracted organisations are appropriately qualified. Therefore, detailed provisions on training and competence assessment of such personnel should be included in this Regulation.

(13) In order to ensure a high level of civil aviation safety in the Union, the measures set out in this Regulation should reflect the state of the art in aviation safety, including best practice and scientific and technical progress in the field of meteorological services. Therefore, this Regulation should be based on the applicable ICAO standards and recommended practices, specifically Annex 3 to the Convention on International Aviation, signed in Chicago on 7 December 1944 ('Chicago Convention') on 'Meteorological Service for International Air Navigation', while drawing on the experience of Union and worldwide meteorological service

provision and ensuring proportionality according to the size, type and complexity of the meteorological services provider.

(14) Common requirements should be established for the certification and oversight of data services providers to ensure that the providers of aeronautical data for use on aircraft process the data in an appropriate manner, which meets the airspace end-users' requirements and allows for safe performance-based navigation operations.

(15) The aeronautical industry and the competent authorities of the Member States should be allowed sufficient time to adapt to the new regulatory framework established by this Regulation and to replace certificates issued before the date of application of this Regulation.

(16) However, in order to ensure consistency with Regulation (EU) No 965/2012, the relevant provisions of this Regulation should apply to data services providers already from an earlier date. Moreover, those providers should be allowed, on a voluntary basis, to apply for, and be granted, the relevant certificates already immediately upon the entry into force of this Regulation, so as to allow them, as entities that are not subject to Implementing Regulation (EU) No 1035/2011 but that are subject to the practice of issuing voluntary letters of acceptance by the Agency, to benefit from an early application of this Regulation in this regard and the mutual recognition of those certificates. Such early application of this Regulation with respect to data services providers would also relieve aircraft operators from their oversight responsibilities when contracting the services of those providers, once the provider is certified for aeronautical databases. Where such a provider makes use of that possibility, it should be bound by the applicable requirements of this Regulation for the purposes of obtaining a certificate and subsequently continue to be bound by those requirements. In view of this possibility for data service providers, the relevant provisions of this Regulation concerning the competent authority in respect of those providers, which is in this case only the Agency, should also apply already from the date of entry into force of this Regulation.

(17) The provisions contained in Commission Implementing Regulation (EU) No 923/2012[1] should be complemented with aspects related to the provision of air traffic services, to ensure consistency of service provision with pilot and air traffic service personnel actions and requirements under that Regulation.

(18) The safety acceptability of any change proposed by a service provider should be assessed based on the analysis of the risks posed by the introduction of a change to its functional system, differentiated under either quantitative or qualitative objective assessment criteria, or a combination of both, to be determined at a local level.

(19) For reasons of consistency and ease of application, the provisions of Commission Regulation (EC) No 482/2008[2] should be integrated in this Regulation and Commission Regulation (EC) No 482/2008 should therefore be repealed.

[1] 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).

[2] Commission Regulation (EC) No 482/2008 of 30 May 2008 establishing a software safety assurance system to be implemented by air navigation service providers and amending Annex II to Regulation (EC) No 2096/2005 (OJ L 141, 31.5.2008, p. 5).

(20) The requirements of Articles 12 and 21 of Commission Regulation (EU) No 677/2011[1] and Annex VI thereto should be integrated in this Regulation in order to ensure a harmonised approach to all service providers. Therefore, those provisions should be deleted.

(21) Commission Implementing Regulation (EU) 2016/1377[2], which has not yet become applicable, contains numerous errors. In order to eliminate those errors, while at the same time ensuring the required legal clarity, it is appropriate to repeal Implementing Regulation (EU) 2016/1377 in its entirety and to replace it with the rules set out in this Regulation.

(22) The measures provided for in this Regulation are based on the opinion of the Agency in accordance with Articles 17(2)(b) and 19(1) of Regulation (EC) No 216/2008.

(23) The measures provided for in this Regulation are in accordance with the opinion of the Committee established by Article 5(3) of Regulation (EC) No 549/2004,

HAS ADOPTED THIS REGULATION:

Article 1 Subject matter

Regulation (EU) 2017/373

This Regulation lays down common requirements for:

(1) the provision of air traffic management and air navigation services ('ATM/ANS') and other air traffic management network functions ('ATM network functions') for general air traffic, in particular for the legal or natural persons providing those services and functions;

(2) the competent authorities, and the qualified entities acting on their behalf, which exercise certification, oversight and enforcement tasks in respect of the providers of the services and functions referred to in point (1).

GM1 Article 1 'Subject matter'

ED Decision 2017/001/R

SCOPE

In reference to the 'scope', please refer to GM1 ATM/ANS.OR.A.001 'Scope'.

Article 2 Definitions

Regulation (EU) 2017/373

For the purposes of this Regulation, the definitions in Annex I and the following definitions shall apply:

(1) the definitions in Article 2 of Regulation (EC) No 549/2004 and Article 3 of Regulation (EC) No 216/2008, except for the definition of 'certificate' in Article 2(15) of Regulation (EC) No 549/2004;

(2) 'service provider' means any legal or natural person providing functions or services of ATM/ANS as defined in point (q) of Article 3 of Regulation (EC) No 216/2008 or other ATM network functions, either individually or bundled for general air traffic;

[1] Commission Regulation (EU) No 677/2011 of 7 July 2011 laying down detailed rules for the implementation of air traffic management (ATM) network functions and amending Regulation (EU) No 691/2010 (OJ L 185, 15.7.2011, p. 1).

[2] Commission Implementing Regulation (EU) 2016/1377 of 4 August 2016 laying down common requirements for service providers and the oversight in air traffic management/air navigation services and other air traffic management network functions, repealing Regulation (EC) No 482/2008, Implementing Regulations (EU) No 1034/2011 and (EU) No 1035/2011 and amending Regulation (EU) No 677/2011 (OJ L 226, 19.8.2016, p. 1).

(3) 'Network Manager' means the body established in accordance with Article 6 of Regulation (EC) No 551/2004 to perform the duties provided for in that Article and in Articles 3 and 4 of Regulation (EU) No 677/2011;

(4) 'pan-European service' means an activity which is designed and established for users within most or all Member States and which may also extend beyond the airspace of the territory to which the Treaty applies;

(5) 'data services provider (DAT provider)' means an organisation, which is:

(a) type 1 DAT provider that processes aeronautical data for use on aircraft and provides an aeronautical database meeting the DQRs, under controlled conditions, for which no corresponding airborne application/equipment compatibility has been determined;

(b) type 2 DAT provider that processes aeronautical data and provides an aeronautical database for use on certified aircraft application/equipment meeting the DQRs for which compatibility with that application/equipment has been determined.

GM1 Article 2 'Definitions'

ED Decision 2017/001/R

GENERAL

(a) Article 3(q) of Regulation (EC) No 216/2008 defines ATM/ANS as 'the air traffic management functions as defined in Article 2(10) of Regulation (EC) No 549/2004, air navigation services defined in Article 2(4) of that Regulation, and services consisting in the origination and processing of data and formatting and delivering data to general air traffic for the purpose of safety-critical air navigation'.

(b) It should, therefore, be noted that 'ATM/ANS' includes more services and functions than 'air traffic management' and 'air navigation services' together.

(c) It is important to note that ATS is included in ATM and ANS.

(d) As already defined, 'ATM network functions' refers to functions performed by the Network Manager in accordance with Regulation (EU) No 677/2011.

Article 3 Provision of ATM/ANS and ATM network functions

Regulation (EU) 2017/373

1. Member States shall ensure that the appropriate ATM/ANS and ATM network functions are provided in accordance with this Regulation in a manner that facilitates general air traffic, while taking into account safety considerations and traffic requirements.

2. When Member States adopt additional provisions to complement this Regulation on any matters left to the Member States under this Regulation, those provisions shall follow the standards and recommended practices set by the Chicago Convention. Where use is made of the provisions of Article 38 of the Chicago Convention, in addition to notifying the International Civil Aviation Organisation, the Member States shall notify the European Aviation Safety Agency ('Agency'), with due justification, at the latest two months after the additional provisions have been adopted.

3. Member States shall publish, in accordance with the Chicago Convention, those additional provisions through their aeronautical information publications.

4. Where a Member State decides to organise the provision of certain specific air traffic services in a competitive environment, that Member State shall take all appropriate measures to ensure

that the providers of those services shall neither engage in conduct that would have as its object or effect the prevention, restriction or distortion of competition, nor shall they engage in conduct that amounts to an abuse of a dominant position, in accordance with applicable Union and national law.

Article 4 Competent authority for certification, oversight and enforcement

Regulation (EU) 2017/373

1. The competent authority responsible for the issuing of certificates to service providers, for the acknowledgment of receipts of declarations made by providers of flight information services referred to in Article 7 where relevant, and for the oversight and enforcement in respect of service providers shall be the national supervisory authority referred to in Article 4 of Regulation (EC) No 549/2004 of the Member State where the legal or natural person applying for the certificate or making the declaration has its principal place of operation or, if any, its registered office, unless the Agency is the competent authority pursuant to Article 22a of Regulation (EC) No 216/2008.

   For the purposes of this Regulation, data services providers and the Network Manager shall be considered to be pan-European service providers in respect of which, in accordance with point (c) of Article 22a of Regulation (EC) No 216/2008, the Agency is the competent authority.

2. The competent authorities referred to in paragraph 1 shall comply with the requirements laid down in Annex II.

3. Where one of the service providers concerned is an organisation in respect of which the Agency is the competent authority, the competent authorities of the Member States concerned shall coordinate with the Agency in order to ensure that the requirements set out in points (1), (2) and (3) of point ATM/ANS.AR.A.005(b) of Annex II are complied with where, alternatively:

   (a) service providers provide services in respect of functional airspace blocks that extend across the airspace falling under the responsibility of more than one Member State, as referred to in Article 2(3) of Regulation (EC) No 550/2004;

   (b) service providers provide cross-border air navigation services as referred to in Article 2(5) of Regulation (EC) No 550/2004.

4. Where a Member State has nominated or established more than one competent authority in accordance with Article 4 of Regulation (EC) No 549/2004 or as referred to in Article 2(3) to (6) of Regulation (EC) No 550/2004 to exercise the certification, oversight and enforcement tasks under this Regulation, it shall ensure that the areas of competence of each of those authorities are clearly defined, in particular in terms of responsibilities and geographic and airspace limitation. In such a case, those authorities shall establish coordination between them, based on written arrangements, so as to ensure effective oversight and enforcement in respect of all service providers to which they issued certificates or, where relevant, which made declarations to them.

5. When exercising their certification, oversight and enforcement tasks under this Regulation, the competent authorities shall be independent of any service provider. That independence shall be ensured by adequate separation, at least at the functional level, between the competent authorities and the service providers. In this context, Member States shall ensure that the competent authorities exercise their powers impartially and transparently.

6. Member States and, where the Agency is the competent authority, the Commission shall ensure that their competent authorities do not allow their personnel to be involved in the exercise of

the certification, oversight and enforcement tasks of that authority under this Regulation where there are indications that such involvement could result, directly or indirectly, in a conflict of interest, in particular relating to family or financial interests.

7. The Agency shall maintain a database of contact details of the competent authorities referred to in paragraph 1. For this purpose, Member States shall notify the Agency of the names and addresses of their competent authorities, and of any subsequent changes thereto.

8. Member States and, where the Agency is the competent authority, the Commission shall determine the necessary resources and capabilities required by the competent authorities for the exercise of their tasks, in accordance with Article 4(4) of Regulation (EC) No 549/2004 and Article 22a of Regulation (EC) No 216/2008, taking into account all relevant factors, including an assessment carried out by the respective competent authorities to determine the resources needed for the exercise of their tasks under this Regulation.

GM1 Article 4(5) 'Competent authority for certification, oversight and enforcement'

ED Decision 2017/001/R

SEPARATION AT THE FUNCTIONAL LEVEL

'Functional level separation' means that a competent authority may be engaged in operational activities and the oversight of organisations in the same domain, provided that the different functions are clearly separated and that the organisational governance ensures effective oversight by avoiding conflicts of interest by personnel and preventing their engagement in operational activities of the entities that they are meant to oversee. This could be achieved by applying appropriate management and control mechanisms.

GM2 Article 4(5) 'Competent authority for certification, oversight and enforcement'

ED Decision 2017/001/R

SEPARATION AT THE FUNCTIONAL LEVEL

When achieving independence between the competent authority and the service provider(s) through functional level separation, the Member State should ensure that:

(a) the responsibility for the service provision and the responsibility for the certification, receipt of declarations and oversight activities are allocated to separate personnel;

(b) the former should not have any control over the latter; and

(c) this happens within a just culture environment.

AMC1 Article 4(8) 'Competent authority for certification, oversight and enforcement'

ED Decision 2017/001/R

REGULARITY OF THE ASSESSMENT CARRIED OUT BY THE COMPETENT AUTHORITY

The competent authorities should establish, and update every two years, an assessment of the resources needed to effectively exercise their certification, oversight and enforcement tasks under this Regulation, based on an analysis of the processes and other measures necessary to that end.

Article 5 Powers of the competent authority referred to in Article 4

Regulation (EU) 2017/373

1. The competent authorities shall, where required for the exercise of their certification, oversight and enforcement tasks under this Regulation, be empowered to:

   (a) require the service providers subject to their oversight to provide all necessary information;

   (b) require any representative, manager or other member of the personnel of those service providers to provide oral explanations on any fact, document, object, procedure or other subject matter relevant to the oversight of the service provider;

   (c) enter any premises and land, including operating sites, and means of transport of those service providers;

   (d) examine, copy or make extracts from any document, record or data held by or accessible to those service providers, irrespective of the medium on which the information in question is stored;

   (e) carry out audits, assessments, investigations and inspections of those service providers.

2. The competent authorities shall, where required for the exercise of their certification, oversight and enforcement tasks under this Regulation, also be empowered to exercise the powers set out in paragraph 1 in relation to the contracted organisations subject to the service providers' oversight, as referred to in point ATM/ANS.OR.B.015 of Annex III.

3. The powers provided for in paragraphs 1 and 2 shall be exercised in compliance with the national law of the Member State where the activities in question take place, with due regard for the need to ensure the effective exercise of those powers and for the rights and legitimate interests of the service provider and any third persons concerned, and in compliance with the principle of proportionality. Where, in accordance with the applicable national law, prior authorisation from the judicial authority of the Member State concerned is needed to enter premises, land and means of transport as referred to in point (c) of paragraph 1, the related powers shall be exercised only after having obtained such prior authorisation.

   When exercising the powers provided for in paragraphs 1 and 2, the competent authority shall ensure that the members of its staff and, where relevant, any other expert participating in the activities in question are duly authorised.

4. The competent authorities shall take or initiate any appropriate enforcement measure necessary to ensure that the service providers to which they issued a certificate or, where relevant, which made a declaration to them, comply and continue to comply with the requirements of this Regulation.

AMC1 Article 5 'Powers of the competent authority referred to in Article 4'

ED Decision 2017/001/R

ASSESSMENTS AND INVESTIGATIONS

Investigations and assessments should include tests and exercises as determined by the competent authority.

Article 6 Service providers

Regulation (EU) 2017/373

Service providers shall be granted a certificate and be entitled to exercise the privileges granted within the scope of that certificate, where, in addition to the requirements referred to in Article 8b(1) of Regulation (EC) No 216/2008, they comply and continue to comply with the following requirements:

(a) for all service providers, the requirements laid down in Annex III (Part-ATM/ANS.OR), Subparts A and B, and in Annex XIII (Part-PERS);

(b) for service providers other than providers of air traffic services, in addition to the requirements of point (a), the requirements laid down in Annex III (Part-ATM/ANS.OR), Subpart C;

(c) for providers of air navigation services, providers of air traffic flow management and the Network Manager, in addition to the requirements of point (a), the requirements laid down in Annex III (Part-ATM/ANS.OR), Subpart D;

(d) for providers of air traffic services, in addition to the requirements of points (a) and (c), the requirements laid down in Annex IV (Part-ATS);

(e) for providers of meteorological services, in addition to the requirements of points (a), (b) and (c), the requirements laid down in Annex V (Part-MET);

(f) for providers of aeronautical information services, in addition to the requirements of points (a), (b) and (c), the requirements laid down in Annex VI (Part-AIS);

(g) for data services providers, in addition to the requirements of points (a) and (b), the requirements laid down in Annex VII (Part-DAT);

(h) for providers of communication, navigation or surveillance services, in addition to the requirements of points (a), (b) and (c), the requirements laid down in Annex VIII (Part-CNS);

(i) for providers of air traffic flow management, in addition to the requirements of points (a), (b) and (c), the requirements laid down in Annex IX (Part-ATFM);

(j) for providers of airspace management, in addition to the requirements of points (a) and (b), the requirements laid down in Annex X (Part-ASM);

(k) for providers of procedure design, in addition to the requirements of points (a) and (b), the requirements laid down in Annex XI (Part-ASD), when those requirements will be adopted by the Commission;

(l) for the Network Manager, in addition to the requirements of points (a), (b) and (c), the requirements laid down in Annex XII (Part-NM).

GM1 Article 6 'Service providers'

ED Decision 2017/001/R

PROVISION OF ATFM AND/OR ASM

(a) In most cases, the provision of ATFM and/or ASM takes place in a bundled service performed by the ATS providers. However, the provision of ATFM and/or ASM as a bundled service is not a legal requirement.

(b) Initially under the single European sky (SES) I initiative in 2004 with the adoption of Regulation (EC) No 549/2004, functions were not subject to certification; they were only subject to continuous oversight. This difference between functions and services was removed in the 2009 with the SESII initiative and the amendments to Regulation (EC) No 216/2008 (the EASA Basic

Regulation), with the effect that the two concepts now have an identical certification and oversight regime.

Article 7 Declaration by providers of flight information services

Regulation (EU) 2017/373

Where Member States allow providers of flight information services to declare their capability and means of discharging the responsibilities associated with the services provided in accordance with Article 8b(3) of Regulation (EC) No 216/2008, those providers shall fulfil, in addition to the requirements referred to in Article 8b(1) of Regulation (EC) No 216/2008, the requirements laid down in point ATM/ANS.OR.A.015 in Annex III to this Regulation.

Article 8 Existing certificates

Regulation (EU) 2017/373

1. Certificates that have been issued in accordance with Implementing Regulation (EU) No 1035/2011 shall be deemed to have been issued in accordance with this Regulation.
2. Member States shall replace the certificates referred to in paragraph 1 with certificates complying with the format laid down in Appendix 1 to Annex II by 1 January 2021 at the latest.

Article 9 Repeal and amendment

Regulation (EU) 2017/373

1. Regulation (EC) No 482/2008 and Implementing Regulations (EU) No 1034/2011 and (EU) No 1035/2011 are repealed.
2. Implementing Regulation (EU) 2016/1377 is repealed.
3. Articles 12 and 21 of Regulation (EU) No 677/2011 and Annex VI to that Regulation are deleted.

Article 10 Entry into force

Regulation (EU) 2017/373

This Regulation shall enter into force on the twentieth day following that of its publication in the Official Journal of the European Union.

It shall apply from 2 January 2020.

However:

(1) Article 9(2) shall apply from the date of entry into force of this Regulation;

(2) in respect of the Agency, Article 4(1), (2), (5), (6) and (8) and Article 5 shall apply from the date of entry into force of this Regulation;

(3) in respect of data services providers, Article 6 shall apply in any case from 1 January 2019 and, where such a provider applies for and is granted a certificate in accordance with Article 6, from the date of entry into force of this Regulation.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

GM1 Article 10 'Entry into force'

ED Decision 2017/001/R

DAT PROVIDERS

In respect of DAT providers, Regulation (EU) 2017/373 applies from 1 January 2019.

However, DAT providers are allowed, on a voluntary basis, to apply for, and be granted, the relevant certificates upon the entry into force of this Regulation (before 1 January 2019).

Where a DAT provider makes use of this possibility and is issued a certificate, it is bound by the applicable requirements of this Regulation.

Until 1 January 2019, DAT providers may continue to apply for the issuance of a Letter of Acceptance (LoA) by the Agency, in accordance with the terms and conditions set out in EASA Opinion 1/2005 issued on 21 January 2005.

Regulation (EU) 2017/343

Done at Brussels, 1 March 2017.

For the Commission

The President

Jean-Claude JUNCKER

ANNEX I — PART-DEFINITIONS

DEFINITIONS OF TERMS USED IN ANNEXES II TO XIII (PART-DEFINITIONS)

Regulation (EU) 2017/373

For the purposes of Annexes II to XIII, the following definitions shall apply:

(1) 'acceptable means of compliance (AMC)' means non-binding standards adopted by the Agency to illustrate means to establish compliance with Regulation (EC) No 216/2008 and its implementing rules;

(2) 'aerial work' means an aircraft operation in which an aircraft is used for specialised services such as agriculture, construction, photography, surveying, observation and patrol, search and rescue or aerial advertisement;

(3) 'aerodrome climatological summary' means a concise summary of specified meteorological elements at an aerodrome, based on statistical data;

(4) 'aerodrome climatological table' means a table providing statistical data on the observed occurrence of one or more meteorological elements at an aerodrome;

(5) 'aerodrome elevation' means the elevation of the highest point of the landing area;

(6) 'aerodrome flight information service (AFIS)' means flight information service and alerting service for aerodrome traffic at an aerodrome;

(7) 'aerodrome meteorological office' means an office responsible for providing meteorological service for an aerodrome;

(8) 'aerodrome warning' means information issued by an aerodrome meteorological office concerning the occurrence or expected occurrence of meteorological conditions which could adversely affect aircraft on the ground, including parked aircraft and the aerodrome facilities and services;

(9) 'aeronautical data' means a representation of aeronautical facts, concepts or instructions in a formalised manner suitable for communication, interpretation or processing;

(10) 'aeronautical database' means a collection of aeronautical data organised and arranged as a structured data set, stored electronically on systems, which is valid for a dedicated period and may be updated;

(11) 'aeronautical fixed service (AFS)' means a telecommunication service between specified fixed points provided primarily for the safety of air navigation and for the regular, efficient and economical operation of air services;

(12) 'aeronautical fixed telecommunication network (AFTN)' means a worldwide system of aeronautical fixed circuits provided, as part of the AFS, for the exchange of messages and/or digital data between aeronautical fixed stations having the same or compatible communications characteristics;

(13) 'aeronautical information' means information resulting from the assembly, analysis and formatting of aeronautical data;

(14) 'aerodrome mapping data' means data collected for the purpose of compiling aerodrome mapping information;

(15) ‘aerodrome mapping database (AMDB)’ means a collection of aerodrome mapping data organised and arranged as a structured data set;

(16) ‘aeronautical meteorological station’ means a station making observations and meteorological reports for use in air navigation;

(17) ‘air-report’ means a report from an aircraft in flight prepared in conformity with the requirements for position and operational and/or meteorological reporting;

(18) ‘aircraft’ means any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface;

(19) ‘AIRMET message’ means information issued by a meteorological watch office concerning the occurrence or expected occurrence of specified en-route weather phenomena which may affect the safety of low-level aircraft operations and of the development of those phenomena in time and space, and which was not already included in the forecast issued for low-level flights in the flight information region concerned or sub-area thereof;

(20) ‘air traffic safety electronics personnel (ATSEP)’ means any authorised personnel who are competent to operate, maintain, release from, and return into operations equipment of the functional system;

(21) ‘air traffic services unit’ is a generic term meaning variously air traffic control unit, flight information centre, aerodrome flight information service unit or air traffic services reporting office;

(22) ‘alternate aerodrome’ means an aerodrome to which an aircraft may proceed when it becomes either impossible or inadvisable to proceed to or to land at the aerodrome of intended landing where the necessary services and facilities are available, where aircraft performance requirements can be met and which is operational at the expected time of use;

(23) ‘alternative means of compliance (AltMOC)’ means those means of compliance that propose an alternative to an existing AMC or those that propose new means to establish compliance with Regulation (EC) No 216/2008 and its Implementing Rules for which no associated AMC have been adopted by the Agency;

(24) ‘altitude’ means the vertical distance of a level, a point, or an object considered as a point, measured from mean sea level;

(25) ‘area control centre (ACC)’ means a unit established to provide air traffic control service to controlled flights in control areas under its jurisdiction;

(26) ‘area forecast for low-level flights’ means a forecast of weather phenomena for a flight information region or sub-area thereof, issued to cover the layer below flight level 100 (or below flight level 150 in mountainous areas, or higher, where necessary);

(27) ‘area navigation (RNAV)’ means a method of navigation which permits aircraft operation on any desired flight path within the coverage of ground- or space-based navigation aids or within the limits of the capability of self-contained aids, or a combination of them;

(28) ‘argument’ means a claim that is supported via inferences by a body of evidence;

(29) ‘ASHTAM’ means a special series of NOTAM notifying by means of a specific format of a change in the activity of a volcano, a volcanic eruption and/or volcanic ash cloud that is of significance to aircraft operations;

(30) ‘ATM network functions’ means the functions performed by the Network Manager in accordance with Regulation (EU) No 677/2011;

(31) ‘audit’ means a systematic, independent and documented process for obtaining evidence and evaluating it objectively to determine the extent to which requirements are complied with;

(32) ‘authoritative source’ means:

(a) a State authority: or

(b) an organisation formally recognised by the State authority to originate and/or publish data which meets the data quality requirements (DQRs) as specified by that State;

(33) ‘automatic observing system’ means an observing system that measures, derives and reports all required elements without human interaction;

(34) ‘aviation undertaking’ means an entity, person or organisation, other than the service providers regulated by this Regulation, that is affected by or affects a service delivered by a service provider;

(35) ‘break’ means a period of time within the duty period when an air traffic controller is not required to perform duties, for recuperation purposes;

(36) ‘certified aircraft application’ means a software application approved by the Agency as part of aircraft subject to Article 4 of Regulation (EC) No 216/2008;

(37) ‘cloud of operational significance’ means a cloud with the height of cloud base below 1500 m (5000 ft) or below the highest minimum sector altitude, whichever is greater, or a cumulonimbus cloud or a towering cumulus cloud at any height;

(38) ‘commercial air transport’ means any aircraft operation involving the transport of passengers, cargo or mail for remuneration or other valuable consideration;

(39) ‘control area’ means a controlled airspace extending upwards from a specified limit above the earth;

(40) ‘critical incident stress’ means the manifestation of unusual and/or extreme emotional, physical and/or behavioural reactions of an individual following an event or incident;

(41) ‘data quality’ means a degree or level of confidence that the provided data meets the user's data requirements in terms of accuracy, resolution, integrity (or equivalent assurance level), traceability, timeliness, completeness, and format;

(42) ‘data quality requirements (DQRs)’ means a specification of the characteristics of data (i.e. accuracy, resolution, integrity (or equivalent assurance level), traceability, timeliness, completeness and format) to ensure that the data is compatible with its intended use;

(43) ‘destination alternate’ means an alternate aerodrome at which an aircraft would be able to land should it become either impossible or inadvisable to land at the aerodrome of intended landing;

(44) ‘duty’ means any task that an air traffic controller is required to perform by the air traffic control service provider;

(45) ‘duty period’ means a period which starts when an air traffic controller is required by the air traffic control service provider to report for or be available for or to commence duty and ends when the air traffic controller is free from duty;

(46) ‘elevation’ means the vertical distance of a point or a level, on or affixed to the surface of the earth, measured from mean sea level;

(47) ‘en-route alternate’ means an alternate aerodrome at which an aircraft would be able to land in the event that a diversion becomes necessary while en-route;

(48) ‘fatigue’ means a physiological state of reduced mental or physical performance capability resulting from sleep loss or extended wakefulness, circadian phase or workload (mental or physical activity, or both) that can impair an individual's alertness and ability to safely perform his/her tasks;

(49) ‘flight documentation’ means documents, including charts or forms, containing meteorological information for a flight;

(50) ‘flight information centre (FIC)’ means a unit established to provide flight information service and alerting service;

(51) ‘flight information region (FIR)’ means an airspace of defined dimensions within which flight information service and alerting service are provided;

(52) ‘flight level (FL)’ means a surface of constant atmospheric pressure which is related to a specific pressure datum, 1013,2 hectopascals (hPa), and is separated from other such surfaces by specific pressure intervals;

(53) ‘flight test’ means a flight for the development phase of a new design (aircraft, propulsion systems, parts and appliances), a flight to demonstrate compliance to certification basis or to type design for aircraft coming from the production line, a flight intended to experiment new design concepts, requiring unconventional manoeuvres or profiles for which it could be possible to exit the already approved envelope of the aircraft or a training flight to perform either of those flights;

(54) ‘forecast’ means a statement of expected meteorological conditions for a specified time or period, and for a specified area or portion of airspace;

(55) ‘forecast for take-off’ means a forecast for a specified period of time, prepared by an aerodrome meteorological office, which contains information on expected conditions over the runways complex in regard to surface wind direction and speed and any variations thereof, temperature, pressure (QNH) and any other element as agreed locally;

(56) ‘functional system’ means a combination of procedures, human resources and equipment, including hardware and software, organised to perform a function within the context of ATM/ANS and other ATM network functions;

(57) ‘general aviation’ means any civil aircraft operation other than aerial work or commercial air transport;

(58) ‘grid point data in digital form’ means computer-processed meteorological data for a set of regularly spaced points on a chart, for transmission from a meteorological computer to another computer in a code form suitable for automated use;

(59) ‘guidance material’ means non-binding material developed by the Agency that helps to illustrate the meaning of a requirement or specification and is used to support the interpretation of Regulation (EC) No 216/2008, its implementing rules and AMC;

(60) ‘gridded global forecasts’ means forecasts of expected values of meteorological elements on a global grid with a defined vertical and horizontal resolution;

(61) ‘hazard’ means any condition, event, or circumstance which could induce a harmful effect;

(62) ‘height’ means the vertical distance of a level, a point or an object considered as a point, measured from a specified datum;

(63) ‘level’ is a generic term relating to the vertical position of an aircraft in flight and meaning variously height, altitude or flight level;

(64) 'local routine report' means a meteorological report issued at fixed time intervals, intended only for dissemination at the aerodrome of origin where the observations were made;

(65) 'local special report' means a meteorological report issued in accordance with the criteria established for special observations, intended only for dissemination at the aerodrome of origin where the observations were made;

(66) 'meteorological bulletin' means a text comprising meteorological information preceded by an appropriate heading;

(67) 'meteorological information' means meteorological report, analysis, forecast, and any other statement relating to existing or expected meteorological conditions;

(68) 'meteorological observation' means the measurement and/or evaluation of one or more meteorological elements;

(69) 'meteorological report' means a statement of observed meteorological conditions related to a specified time and location;

(70) 'meteorological satellite' means an artificial Earth satellite making meteorological observations and transmitting these observations to Earth;

(71) 'meteorological watch office' means an office monitoring meteorological conditions affecting flight operations and providing information concerning the occurrence or expected occurrence of specified en-route weather phenomena, natural and other hazards which may affect the safety of aircraft operations within a specified area of responsibility;

(72) 'minimum sector altitude (MSA)' means the lowest altitude which may be used which will provide a minimum clearance of 300 m (1000 ft) above all objects located in an area contained within a sector of a circle of 46 km (25 NM) radius centred on a significant point, the aerodrome reference point (ARP) or the heliport reference point (HRP);

(73) 'NOTAM' means a notice distributed by means of telecommunication containing information concerning the establishment, condition, or change in any aeronautical facility, service, procedure, or hazard, the timely knowledge of which is essential to personnel concerned with flight operations;

(74) 'obstacle' means all fixed (whether temporary or permanent) and mobile objects, or parts thereof, that:

(a) are located on an area intended for the surface movement of aircraft; or

(b) extend above a defined surface intended to protect aircraft in flight; or

(c) stand outside those defined surfaces and have been assessed as being a hazard to air navigation;

(75) 'OPMET' means operational meteorological information for use in preparatory or in-flight planning of flight operations;

(76) 'OPMET databank' means a databank established to store and make available internationally operational meteorological information for aeronautical use;

(77) 'pre-eruption volcanic activity' means an unusual and/or increasing volcanic activity which could presage a volcanic eruption;

(78) 'prevailing visibility' means the greatest visibility value, observed in accordance with the definition of 'visibility', which is reached within at least half the horizon circle or within at least

half of the surface of the aerodrome. These areas could comprise contiguous or non-contiguous sectors;

(79) 'problematic use of psychoactive substances' means the use of one or more psychoactive substances by an individual, in a way that:

(a) constitutes a direct hazard to the user or endangers the lives, health, or welfare of others; and/or

(b) causes or worsens an occupational, social, mental or physical problem or disorder;

(80) 'prognostic chart' means a forecast of (a) specified meteorological element(s) for a specified time or period and a specified surface or portion of airspace, depicted graphically on a chart;

(81) 'psychoactive substances' means alcohol, opioids, cannabinoids, sedatives and hypnotics, cocaine, other psychostimulants, hallucinogens, and volatile solvents, whereas caffeine and tobacco are excluded;

(82) 'rescue coordination centre (RCC)' means a unit responsible for promoting efficient organisation of search and rescue services, and for coordinating the conduct of search and rescue operations within a search and rescue region;

(83) 'rest period' means a continuous and defined period of time, subsequent to and/or prior to duty, during which an air traffic controller is free of all duties;

(84) 'rostering system' means the structure of duty and rest periods of air traffic controllers in accordance with legal and operational requirements;

(85) 'risk' means the combination of the overall probability or frequency of occurrence of a harmful effect induced by a hazard and the severity of that effect;

(86) 'runway' means a defined rectangular area on a land aerodrome prepared for the landing and take-off of aircraft;

(87) 'runway visual range (RVR)' means the range over which the pilot of an aircraft on the centre line of a runway can see the runway surface markings or the lights delineating the runway or identifying its centre line;

(88) 'safety directive' means a document issued or adopted by a competent authority which mandates actions to be performed on a functional system or sets restrictions to its operational use to restore safety when evidence shows that aviation safety may otherwise be compromised;

(89) 'safety management system (SMS)' means a systematic approach to managing safety, including the necessary organisational structures, accountabilities, policies, and procedures;

(90) 'search and rescue services unit' is a generic term covering, as the case may be, rescue coordination centre, rescue sub-centre or alerting post;

(91) 'selected volcano observatory' means a provider, selected by the competent authority, that observes the activity of a volcano or a group of volcanoes and makes these observations available to an agreed list of aviation recipients;

(92) 'semi-automatic observing system' means an observing system that allows the augmentation of measured elements and requires a human in the loop for issuing the appropriate reports;

(93) 'SIGMET' means information concerning en-route weather phenomena, which may affect the safety of aircraft operations;

(94) ‘SIGMET message’ means information issued by a meteorological watch office concerning the occurrence or expected occurrence of specified en-route weather phenomena which may affect the safety of aircraft operations and of the development of those phenomena in time and space;

(95) ‘special air-report’ means a meteorological report by an aircraft issued in accordance with the criteria based on observations made during the flight;

(96) ‘stress’ means the outcomes experienced by an individual when faced with a potential cause (‘stressor’) of human performance modification. The experience of the stressor may impact the individual's performance negatively (distress), neutrally or positively (eustress), based on the individual's perception of his/her ability to manage the stressor;

(97) ‘system and equipment rating training’ means training designed to impart specific system/equipment knowledge and skills leading towards operational competence;

(98) ‘tailored data’ means aeronautical data which is provided by the aircraft operator or DAT provider on the aircraft operator's behalf and produced for this aircraft operator for its intended operational use;

(99) ‘take-off alternate aerodrome’ means an alternate aerodrome at which an aircraft can land should this become necessary shortly after take-off and if it be not possible to use the aerodrome of departure;

(100) ‘terminal aerodrome forecast (TAF)’ means a concise statement of the expected meteorological conditions at an aerodrome for a specified period;

(101) ‘terrain’ means the surface of the Earth containing naturally occurring features such as mountains, hills, ridges, valleys, bodies of water, permanent ice and snow, and excluding obstacles;

(102) ‘threshold’ means the beginning of that portion of the runway usable for landing;

(103) ‘touchdown zone’ means the portion of a runway, beyond the threshold, where it is intended that landing aeroplanes first contact the runway;

(104) ‘tropical cyclone’ is a generic term for a non-frontal synoptic-scale cyclone originating over tropical or subtropical waters with organised convection and definite cyclonic surface wind circulation;

(105) ‘tropical cyclone advisory centre (TCAC)’ means a meteorological centre providing advisory information to meteorological watch offices, world area forecast centres and international OPMET databanks regarding the position, forecast direction and speed of movement, central pressure and maximum surface wind of tropical cyclones;

(106) ‘visibility’ means visibility for aeronautical purposes, which is the greater of:

(a) the greatest distance at which a black object of suitable dimensions, situated near the ground, can be seen and recognised when observed against a bright background;

(b) the greatest distance at which lights in the vicinity of 1000 candelas can be seen and identified against an unlit background;

(107) ‘volcanic ash advisory centre (VAAC)’ means a meteorological centre providing advisory information to meteorological watch offices, area control centres, flight information centres, world area forecast centres and international OPMET databanks regarding the lateral and vertical extent and forecast movement of volcanic ash in the atmosphere following volcanic eruptions;

(108) 'world area forecast centre (WAFC)' means a meteorological centre preparing and issuing significant weather forecasts and upper-air forecasts in digital form on a global basis direct to the Member States by appropriate means as part of the aeronautical fixed service;

(109) 'world area forecast system (WAFS)' means a worldwide system by which world area forecast centres provide aeronautical meteorological en-route forecasts in uniform standardised formats.

GM1 9. Aeronautical data

ED Decision 2017/001/R

DAT PROVIDERS

Aeronautical data in the context of DAT providers should mean that aeronautical data needed for the functionality of certified aircraft application(s) and does not form part of its (their) approved type design. It may change over the course of time such as e.g. 'aerodrome mapping data', 'obstacles data' and 'terrain data', etc. which are amongst other types of 'aeronautical data'.

GM1 20. Air traffic safety electronics personnel (ATSEP)

ED Decision 2017/001/R

AUTHORISED PERSONNEL

(a) The achievement of competence is independent of the permission to perform any task. Therefore, the ATSEP should be authorised to work on operational systems.

(b) It is intentionally not specified who is responsible for providing this authorisation. This is usually done by the service provider, but it might be done by another entity depending on the national arrangements for managing the competence and performance of ATSEP.

OPERATE, MAINTAIN, RELEASE FROM, AND RETURN INTO OPERATIONS

(c) The term 'operate' refers to the ability of the ATSEP to actively control a system and should not be confused with, for example, the air traffic controllers' function to operate particular equipment in order to provide air traffic services. However, it is necessary for ATSEP to have an understanding of how air traffic controllers operate or make use of operational systems, in order to repair and maintain them appropriately. An ATSEP usually manages the engineering operation of operational systems, for example by:

(1) making a radiotelephony test transmission to check a voice communication and control system or a recording system;

(2) switching between systems A and B, or switching off the stand-by system, in case of duplicated systems; or

(3) changing the range and gating maps of a radar system processor.

(d) The term 'maintain' refers to planned, preventative and corrective maintenance, including fault-finding.

(e) The term 'release from operations' refers to the process of withdrawal from use of a system/equipment from the operational environment, and 'return into operations' refers to the process whereby the system/equipment is checked and restored to operational use, in accordance with both risk assessment and mitigation.

MAINTENANCE TASKS BY ATSEP

(f) An operational system that has been released from operational service, but remains connected to the operational environment must be maintained by ATSEP.

(g) An operational system that has been removed and fully isolated from the operational environment by ATSEP, and cannot be returned without ATSEP intervention, may be maintained by a non-ATSEP, but will be subject to the ANSP's checks before return to the operational environment.

(h) A non-ATSEP is not authorised to remove an operational system from the operational environment.

(i) A non-ATSEP is not authorised to return a system into the operational environment.

(j) An ATSEP is responsible for determining the operational system status/serviceability before returning it to the operational environment.

GM2 20. Air traffic safety electronics personnel (ATSEP)

ED Decision 2017/001/R

SCOPE

The design, testing, installation and commissioning of operational systems and equipment are excluded from the scope of this section.

DESIGN OF OPERATIONAL SYSTEMS AND EQUIPMENT

Design also includes software.

COMMISSIONING OF OPERATIONAL SYSTEMS AND EQUIPMENT

The term 'commissioning' is understood to be the process by which a system/equipment, which has been installed, is tested to ensure that it works according to its design objectives or specifications, and that it is ready to be operated and maintained in accordance with the users' operational requirements.

GM1 32. Authoritative source

ED Decision 2017/001/R

ORGANISATIONS

Organisations formally recognised by the State authority to originate and/or publish data, which meets the Data Quality Requirements (DQRs) as specified by that State, may be considered at least but are not limited to Mapping, Cadastre, and Land Registry authorities.

GM1 42. Data quality requirements (DQRs)

ED Decision 2017/001/R

GENERAL

Depending on the data characteristics considered, DQRs are specified as 'internationally recognised Data Quality Requirements' (mainly when data is provided by authoritative sources), 'end-user Data Quality Requirements' (typically for completeness, timeliness, etc.), or 'system designer Data Quality Requirements' (considering other data characteristics, such as accuracy, resolution, assurance level, traceability, format, etc.).

GM1 74. Obstacle

ED Decision 2017/001/R

MOBILE OBJECTS

Mobile objects may be converted to fixed items in obstacle database taking into account its mobility boundaries.

GM1 101. Terrain

ED Decision 2017/001/R

GENERAL

In practical terms, depending on the method of data collection used, terrain represents the continuous surface that exists at the bare Earth, the top of the canopy or something in-between, also known as ‘first reflective surface’.

ANNEX II — PART-ATM/ANS.AR

REQUIREMENTS FOR COMPETENT AUTHORITIES — OVERSIGHT OF SERVICES AND OTHER ATM NETWORK FUNCTIONS

SUBPART A — GENERAL REQUIREMENTS

ATM/ANS.AR.A.001 Scope

Regulation (EU) 2017/373

This Annex establishes the requirements for the administration and management systems of the competent authorities responsible for certification, oversight and enforcement in respect of the application of the requirements set out in Annexes III to XIII by the service providers in accordance with Article 6.

ATM/ANS.AR.A.005 Certification, oversight and enforcement tasks

Regulation (EU) 2017/373

(a) The competent authority shall exercise certification, oversight and enforcement tasks in respect of the application of the requirements applicable to service providers, monitor the safe provision of their services and verify that the applicable requirements are met.

(b) The competent authorities shall identify and exercise the responsibilities for certification, oversight and enforcement in a manner which ensures that:

(1) specific points of responsibility exist to implement each provision of this Regulation;

(2) they are aware of the safety oversight mechanisms and their results;

(3) relevant information exchange is ensured between competent authorities.

The competent authorities concerned shall regularly review the agreement on the supervision of the service providers providing air navigation services in functional airspace blocks (FABs) that extend across the airspace falling under the responsibility of more than one Member States referred to in Article 2(3) of Regulation (EC) No 550/2004 and, in the case of cross-border provision of air navigation services, the agreement on the mutual recognition of supervisory tasks referred to in Article 2(5) of Regulation (EC) No 550/2004, as well as the practical implementation of those agreements, in particular in the light of achieved safety performance of the service providers under their supervision.

(c) The competent authority shall establish coordination arrangements with other competent authorities for notified changes to functional systems involving service providers under the oversight of the other competent authorities. Those coordination arrangements shall ensure the effective selection and review of those notified changes, in accordance with point ATM/ANS.AR.C.025.

AMC1 ATM/ANS.AR.A.005(b) Certification, oversight and enforcement tasks

ED Decision 2017/001/R

REVIEW OF THE AGREEMENT

The agreement on the supervision in a functional airspace block (FAB) or in cases of cross-border provision should include the frequency of the review.

GM1 ATM/ANS.AR.A.005(b) Certification, oversight and enforcement tasks

ED Decision 2017/001/R

CONCLUSION OF AN AGREEMENT

The agreement on the supervision in a FAB or in cases of cross-border provision may be concluded among:

(a) the competent authorities nominated or established under agreements concluded among Member States in accordance with Article 2(3) of Regulation (EC) No 550/2004; or

(b) the competent authorities of the service providers in cases of cross-border provision.

GM2 ATM/ANS.AR.A.005(b) Certification, oversight and enforcement tasks

ED Decision 2017/001/R

REVIEW OF THE AGREEMENT

During the review of the agreement, the competent authorities should address the practical implementation considering the results of the assessment performed in accordance with ATM/ANS.AR.C.001.

GM1 ATM/ANS.AR.A.005(c) Certification, oversight and enforcement tasks

ED Decision 2017/001/R

COORDINATION ARRANGEMENTS BETWEEN COMPETENT AUTHORITIES FOR SELECTION AND REVIEW OF MULTI-ACTOR CHANGES

(a) When the notification of a change to a service provider's functional system indicates, as per AMC1 ATM/ANS.OR.A.045(a), that the change will affect the services provided by other service providers either directly or by affecting the context in which these services are delivered, these other service providers and the notifying service provider are participating in a multi-actor change. Some or all of these other service providers may also notify their competent authorities because they either have to make a reactive change or they are participating in a cooperative change to their functional systems.

(b) If there are service providers participating in the multi-actor change who are proposing to make changes to their functional systems and are under the oversight of more than one competent authority, then the decision to review and the review itself of safety assessments and safety support assessments has to be a coordinated activity involving all the competent authorities that oversee the service providers participating in the multi-actor change.

(c) Normally, competent authorities act independently when making decisions on how to select and review safety assessments, but in the case of multi-actor changes that cross State boundaries, the only way to ensure the effective selection and review of the notified changes is through coordination with other competent authorities. Coordination arrangements, which are difficult to define in advance, are to be established when the need arises. The objective of these agreements should be to ensure that the overall change is safe, i.e. the overall safety case is based on a complete and correct set of assumptions and mitigations and the associated risk assessments are valid.

(d) The arrangements should ensure that:

(1) the competent authorities involved evaluate in a harmonised way the risk posed by the change, and as a consequence there is an agreement on what safety (support) assessments will be reviewed by each competent authority; and

(2) individual reviews of safety (support) assessments assure the necessary conditions are met, i.e. common assumptions and common mitigations are used correctly in each safety (support) assessment and the identified risks are valid.

(e) However, the assurance that the set of common assumptions and common mitigations are complete and correct cannot be provided in each individual safety case. The argument for that assurance has to be made in an overall safety case and reviewed collectively by the competent authorities involved in the overall change. The form of this collective review should be included in the coordination agreement.

ATM/ANS.AR.A.010 Certification, oversight and enforcement documentation

Regulation (EU) 2017/373

The competent authority shall make available the relevant legislative acts, standards, rules, technical publications and related documents to its personnel in order to perform their tasks and to discharge their responsibilities.

ATM/ANS.AR.A.015 Means of compliance

Regulation (EU) 2017/373

(a) The Agency shall develop acceptable means of compliance (AMC) that may be used to establish compliance with the requirements of this Regulation. When AMC are complied with, the applicable requirements of this Regulation shall be deemed to have been met.

(b) Alternative means of compliance (AltMOC) may be used to establish compliance with the requirements of this Regulation.

(c) The competent authority shall establish a system to consistently evaluate that all AltMOC used by itself or by the service providers under its oversight allow the establishment of compliance with the requirements of this Regulation.

(d) The competent authority shall evaluate all AltMOC proposed by a service provider in accordance with point ATM/ANS.OR.A.020 by analysing the documentation provided and, if considered necessary, conducting an inspection of the service provider.

When the competent authority finds that the AltMOC are sufficient to ensure compliance with the applicable requirements of this Regulation it shall without undue delay:

(1) notify the applicant that the AltMOC may be implemented and, if applicable, amend the certificate of the applicant accordingly;

(2) notify the Agency of their content, including copies of all relevant documentation;

(3) inform other Member States about the AltMOC that were accepted.

(e) When the competent authority itself uses AltMOC to achieve compliance with the applicable requirements of this Regulation, it shall:

(1) make them available to all service providers under its oversight;

(2) notify the Agency without undue delay.

The competent authority shall provide the Agency with a full description of the AltMOC, including any revisions to procedures that may be relevant, as well as an assessment demonstrating that the applicable requirements of this Regulation are met.

GM1 ATM/ANS.AR.A.015 Means of compliance

ED Decision 2017/001/R

GENERAL

Alternative means of compliance used by a competent authority or by organisations under its oversight may be used by other competent authorities or service providers only if processed again in accordance with ATM/ANS.AR.A.015(d) and (e).

AMC1 ATM/ANS.AR.A.015(d)(3) Means of compliance

ED Decision 2017/001/R

GENERAL

The information to be provided to other Member States following approval of an alternative means of compliance (AltMoC) should contain a reference to the acceptable means of compliance (AMC) to which such means of compliance provides an alternative, where such AMC exists, as well as a reference to the corresponding implementing rule (IR), indicating, as applicable, the point(s) covered by the AltMoC.

ATM/ANS.AR.A.020 Information to the Agency

Regulation (EU) 2017/373

(a) The competent authority shall without undue delay notify the Agency in case of any significant problems with the implementation of the relevant provisions of Regulation (EC) No 216/2008 and its implementing rules or of Regulations (EC) No 549/2004, (EC) No 550/2004, (EC) No 551/2004 and Regulation (EC) No 552/2004 of the European Parliament and of the Council[1] applicable to service providers.

[1] 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) (OJ L 96, 31.3.2004, p. 26).

(b) Without prejudice to Regulation (EU) No 376/2014 of the European Parliament and of the Council[1], the competent authority shall provide the Agency with safety-significant information stemming from the occurrence reports it has received.

GM1 ATM/ANS.AR.A.020(b) Information to the Agency

ED Decision 2017/001/R

MEANING OF SAFETY-SIGNIFICANT INFORMATION STEMMING FROM OCCURRENCE REPORTS

The following should be considered safety-significant information stemming from occurrence reports:

(a) Conclusive safety analyses that summarise individual occurrence data and provide an in-depth assessment of the safety issue. These safety analyses can be used for Agency regulatory activities or for safety promotion activities such as the European Plan for Aviation Safety; and

(b) Individual occurrence data where the Agency is the competent authority.

GM2 ATM/ANS.AR.A.020(b) Information to the Agency

ED Decision 2017/001/R

RECOMMENDED CONTENT FOR CONCLUSIVE SAFETY ANALYSES

(a) The following content should be provided in conclusive safety analyses:

(1) a detailed description of the safety issue, containing the scenario in which the safety issue takes place; and

(2) an indication of the users affected by the safety issue, including types of services and organisations.

(b) The content of such safety analyses may additionally include, as appropriate, the following:

(1) a risk assessment quantifying the severity and frequency of the safety issue;

(2) information about the existing safety barriers that the aviation system has in place to prevent the safety issue from releasing its likely consequences;

(3) any mitigating actions already being in place or developed to deal with the safety issue;

(4) recommendations for future actions to mitigate the reported safety issue; and

(5) any other element the competent authority understands as essential in order for the Agency to properly assess the safety issue.

[1] 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).

GM3 ATM/ANS.AR.A.020(b) Information to the Agency

ED Decision 2017/001/R

REPORTING CRITERIA FOR SAFETY-SIGNIFICANT INFORMATION STEMMING FROM OCCURRENCE REPORTS WHERE THE AGENCY IS THE COMPETENT AUTHORITY

In the case of occurrences related to organisations certified by the Agency, safety-significant information stemming from occurrence reports should be notified to the Agency if:

(a) the occurrence is defined as a reportable occurrence for organisations certified as Pan-European service providers and service providers in the airspace of the territory to which the Treaty applies and having their principal place of operation or, if any, their registered office located outside the territory subject to the provisions of the Treaty; and

(b) the competent authority has come to the conclusion that:

(1) the organisation certified by the Agency to which the occurrence relates, has not been informed of the occurrence; or

(2) the occurrence has not been properly addressed or has been left unattended by the organisation certified by the Agency.

Such occurrence data should be reported in a format compatible with the European Coordination Centre for Accident and Incident Reporting Systems (ECCAIRS) and should provide all relevant information for its assessment and analysis, including necessary additional files in the form of attachments.

GM4 ATM/ANS.AR.A.020(b) Information to the Agency

ED Decision 2017/001/R

EXCHANGE OF SAFETY-SIGNIFICANT INFORMATION WITH THE AGENCY

A coordinator should be appointed by each competent authority, as appropriate, to exchange information regarding safety-significant information between the authority reporting the occurrence and the Agency.

ATM/ANS.AR.A.025 Immediate reaction to safety problem

Regulation (EU) 2017/373

(a) Without prejudice to Regulation (EU) No 376/2014, the competent authority shall implement a system to appropriately collect, analyse, and disseminate safety information.

(b) The Agency shall implement a system to appropriately analyse any relevant safety information received from the competent authorities and without undue delay provide to Member States and the Commission, as appropriate, any information, including recommendations or corrective actions to be taken, necessary for them to react in a timely manner to a safety problem involving the service providers.

(c) Upon receiving the information referred to in points (a) and (b), the competent authority shall take adequate measures to address the safety problem, including the issuing of safety directives in accordance with point ATM/ANS.AR.A.030.

(d) Measures taken under point (c) shall immediately be notified to the service providers concerned to comply with them, in accordance with point ATM/ANS.OR.A.060. The competent authority shall also notify those measures to the Agency and, when combined action is required, the other competent authorities concerned.

ATM/ANS.AR.A.030 Safety directives

Regulation (EU) 2017/373

(a) The competent authority shall issue a safety directive when it has determined the existence of an unsafe condition in a functional system requiring immediate action.

(b) The safety directive shall be forwarded to the service providers concerned and contain, as a minimum, the following information:

(1) the identification of the unsafe condition;

(2) the identification of the affected functional system;

(3) the actions required and their rationale;

(4) the time limit for completing the actions required;

(5) its date of entry into force.

(c) The competent authority shall forward a copy of the safety directive to the Agency and any other competent authorities concerned within one month from its issuance.

(d) The competent authority shall verify the compliance of service providers with the applicable safety directives.

GM1 ATM/ANS.AR.A.030 Safety directives

ED Decision 2017/001/R

GENERAL

(a) The safety directive is a document issued by the competent authority, mandating actions to be performed by one or more service providers, when evidence shows that aviation safety may otherwise be compromised. Thus, the competent authority is responsible for the determination of the actions required and their rationale.

(b) The competent authority is required to perform a verification of compliance of the service providers with the safety directives in accordance with ATM/ANS.AR.A.030(d). In this respect, ATM/ANS.AR.C.005(a)(6) requires the competent authority to establish a process to verify the implementation of safety directives by the service providers. The actions that need to be taken depend on the content of the safety directive and the nature of the unsafe condition.

GM2 ATM/ANS.AR.A.030(b) Safety directives

ED Decision 2017/001/R

CONTENT

[Name of the competent authority]	SAFETY DIRECTIVE
[Logo of the competent authority]	SD No/ ISSUE No:[…] Date: dd Month YYYY
This Safety Directive is issued in accordance with Commission Implementing Regulation (EU) 2017/373	
[Name of the service provider(s)]	[Identification of the affected functional system]
Safety Directive Title	[Title]
Unsafe condition identified:	[Describe the unsafe condition that is the reason for the issuance of the SD]
Required action(s), their rationale and compliance time(s):	[Describe the required action(s) and their rationale; indicate the compliance time(s) within which the action(s) should be accomplished]
Date of entry into force of SD:	dd Month YYYY
Distributed to:	(a) [service provider(s) address: Post code, City Country Email address:…] (b) [competent authorities concerned] (c) [European Aviation Safety Agency]
Remarks:	

GM3 ATM/ANS.AR.A.030(c) Safety directives

ED Decision 2017/001/R

FORWARDING OF SAFETY DIRECTIVES

For instance, a safety directive that should be forwarded to the Agency under ATM/ANS.AR.A.030 could be a case:

(a) where the competent authority has determined that there is an immediate need to take certain actions in order to respond to a safety recommendation; or

(b) following an accident or serious incident; or

(c) when this or a similar unsafe condition may be present in other service providers of the same Member State.

SUBPART B — MANAGEMENT (ATM/ANS.AR.B)

ATM/ANS.AR.B.001 Management system

Regulation (EU) 2017/373

(a) The competent authority shall establish and maintain a management system, including, as a minimum, the following elements:

(1) documented policies and procedures to describe its organisation, means and methods to achieve compliance with Regulation (EC) No 216/2008 and its implementing rules as necessary for the exercise of its certification, oversight and enforcement tasks under this Regulation. The procedures shall be kept up to date and serve as the basic working documents within that competent authority for all related tasks;

(2) a sufficient number of personnel, including inspectors, to perform its tasks and discharge its responsibilities under this Regulation. Such personnel shall be qualified to perform their allocated tasks and have the necessary knowledge, experience, initial, on-the-job and recurrent training to ensure continuing competence. A system shall be in place to plan the availability of personnel, in order to ensure the proper completion of all related tasks;

(3) adequate facilities and office accommodation to perform those allocated tasks;

(4) a process to monitor compliance of the management system with the relevant requirements and adequacy of the procedures, including the establishment of an internal audit process and a safety risk management process. Compliance monitoring shall include a feedback system of audit findings to the senior management of the competent authority to ensure implementation of corrective actions as necessary;

(5) a person or group of persons ultimately responsible to the senior management of the competent authority for the compliance monitoring function.

(b) The competent authority shall, for each field of activity included in the management system, appoint one or more persons with the overall responsibility for the management of the relevant task(s).

(c) The competent authority shall establish procedures for participation in a mutual exchange of all necessary information and assistance with other competent authorities concerned, including exchange of all findings raised and follow-up actions taken as a result of certification and oversight of service providers exercising activities in the territory of a Member State, but certified by the competent authority of another Member State or the Agency.

(d) A copy of the procedures related to the management system and their amendments shall be made available to the Agency for the purpose of standardisation.

AMC1 ATM/ANS.AR.B.001(a)(2) Management system

ED Decision 2017/001/R

QUALIFIED PERSONNEL

The competent authority should:

(a) define and document the education, training, technical and operational knowledge, experience and qualifications relevant to the duties of each position involved in oversight activities within their structure;

(b) ensure specific training for those involved in oversight activities within their structure; and

(c) ensure that personnel designated to conduct safety regulatory audits, including auditing personnel from qualified entities, meet specific qualification criteria defined by the competent authority. The criteria should address:

(1) the knowledge and understanding of the requirements related to the services provision in ATM/ANS and other ATM network functions against which safety regulatory audits may be performed;

(2) the use of assessment techniques;

(3) the skills required for managing an audit; and

(4) the demonstration of competence of auditors through evaluation or other acceptable means.

AMC2 ATM/ANS.AR.B.001(a)(2) Management system

ED Decision 2017/001/R

TRAINING PROGRAMME AND RECURRENT TRAINING

(a) The competent authority should establish a training programme for its personnel, including its inspectors for the oversight of services provision in ATM/ANS and other ATM network functions, and a plan for its implementation. The training programme should include, as appropriate to the role, current knowledge, experience and skills of the personnel, at least the following:

(1) organisation and structure of the aviation legislation;

(2) the Chicago Convention, relevant ICAO annexes and documents, the applicable requirements of Regulation (EC) No 216/2008[1], its IRs, as well as Regulations (EC) Nos 549/2004[2], 550/2004[3], 551/2004[4], and 552/2004[5] and their IRs and related acceptable means of compliance (AMC), certification specifications (CSs) and guidance material (GM), as well as assessment methodology of the alternative means of compliance and the applicable national legislation;

(3) the applicable requirements and procedures; and

(4) areas of particular interest.

[1] Regulation (EC) No 216/2008 of the European Parliament and 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 (OJ L 79, 19.3.2008, p. 1).

[2] Regulation (EC) No 549/2004 of the European Parliament and of the Council of 10 March 2004 laying down the framework for the creation of the single European sky (the framework Regulation) - Statement by the Member States on military issues related to the single European sky (OJ L 96, 31.3.2004, p. 1).

[3] Regulation (EC) No 550/2004 of the European Parliament and of the Council of 10 March 2004 on the provision of air navigation services in the single European sky (the service provision Regulation) (OJ L 96, 31.3.2004, p. 10).

[4] Regulation (EC) No 551/2004 of the European Parliament and of the Council of 10 March 2004 on the organisation and use of the airspace in the single European sky (the airspace Regulation) - Commission statement (OJ L 96, 31.3.2004, p. 20).

[5] 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) (OJ L 96, 31.3.2004, p. 26).

(b) The training programme and the training plan should be updated, as needed, to reflect at least changes in aviation legislation and industry. The training programme should also cover specific needs of the personnel and the competent authority.

(c) The competent authority should ensure that its personnel, including its inspectors for the oversight of services provision in ATM/ANS and other ATM network functions, undergo recurrent training at regular intervals as defined by the competent authority or whenever deemed necessary in order to keep being up to date.

GM1 ATM/ANS.AR.B.001(a)(2) Management system

ED Decision 2017/001/R

SUFFICIENT PERSONNEL

(a) This guidance material for the determination of the required personnel is limited to the performance of certification and oversight tasks, excluding personnel required to perform tasks subject to any national regulatory requirements.

(b) The elements to be considered when determining required personnel and planning their availability may be divided into quantitative and qualitative:

(1) Quantitative elements:

(i) number of initial certificates to be issued;

(ii) number of service providers certified by the competent authority; and

(iii) number of flight information services providers having declared their activity to the competent authority.

(2) Qualitative elements:

(i) size, nature, and complexity of activities of service providers (cf. AMC1 ATM/ANS.OR.B.005(e));

(ii) results of past oversight activities, including audits, inspections and reviews, in terms of risks and regulatory compliance:

(A) number and level of findings; and

(B) implementation of corrective actions; and

(iii) size of the Member State's aviation industry and potential growth of activities in the field of civil aviation, which may be an indication of the number of new applications and changes to existing certificates to be expected.

(c) Based on existing data from previous oversight planning cycles and taking into account the situation within the Member State's aviation industry, the competent authority may estimate:

(1) the standard working time required for processing applications for new certificates;

(2) the standard working time required for processing declarations;

(3) the number of new declarations or changed declarations;

(4) the number of new certificates to be issued for each planning period; and

(5) the number of changes to existing certificates and changes to functional systems to be processed for each planning period.

(d) In line with the competent authority's oversight policy, the following planning data should be determined specifically for each service provider, certified or declared, as well as for the Network Manager:

(1) standard number of audits/inspections to be performed per oversight planning cycle;

(2) standard duration of each audit/inspection;

(3) standard working time for audit/inspection preparation, on-site audit/inspection, reporting and follow-up per inspector for the oversight of services provision and other ATM network functions; and

(4) minimum number and required qualification of inspectors for the oversight of services provision and other ATM network functions for each audit/inspection.

(e) Standard working time could be expressed either in working hours or in working days per inspector for the oversight of services provision and other ATM network functions. All planning calculations should then be based on the same unit (hours or working days).

(f) For each service provider, the number of working hours/days per planning period for each qualified inspector for the oversight of services provision and other ATM network functions that may be allocated for certification, oversight and enforcement activities should be determined taking into account:

(1) purely administrative tasks not directly related to oversight and certification;

(2) training;

(3) participation in other projects;

(4) planned absence; and

(5) the need to include a reserve for unplanned tasks or unforeseeable events.

(g) The determination of working time available for certification, oversight and enforcement activities should also take into account the possible use of third parties.

AMC1 ATM/ANS.AR.B.001(a)(4) Management system

ED Decision 2017/001/R

COMPLIANCE MONITORING PROCESS

The formal process to monitor the compliance of the management system with the relevant requirements, and the adequacy of the procedures should:

(a) include a feedback system of audit findings to ensure implementation of corrective actions as necessary; and

(b) be the responsibility of a person or group of persons who should be responsible to the senior management of the competent authority and who perform(s) compliance monitoring activities with functional independence from the units/departments (s)he (they) oversees (oversee) and with direct access to the senior management of the competent authority and to appropriate management for safety matters.

ATM/ANS.AR.B.005 Allocation of tasks to qualified entities

Regulation (EU) 2017/373

(a) The competent authority may allocate its tasks related to the certification or oversight of service providers under this Regulation, other than the issuance of certificates themselves, to qualified entities. When allocating such tasks, the competent authority shall ensure that it has:

(1) a system in place to initially and continuously assess that the qualified entity complies with Annex V to Regulation (EC) No 216/2008. This system and the results of the assessments shall be documented; and

(2) established a documented agreement with the qualified entity, approved by both parties at the appropriate management level, which clearly defines:

(i) the tasks to be performed;

(ii) the declarations, reports and records to be provided;

(iii) the technical conditions to be met when performing such tasks;

(iv) the related liability coverage;

(v) the protection given to information acquired when carrying out such tasks.

(b) The competent authority shall ensure that the internal audit process and the safety risk management process required by point ATM/ANS.AR.B.001(a)(4) cover all tasks performed on its behalf by the qualified entity.

AMC1 ATM/ANS.AR.B.005 Allocation of tasks to qualified entities

ED Decision 2017/001/R

ASSESSMENT OF THE QUALIFIED ENTITIES

(a) The competent authority should include in its system to initially and continuously assess the qualified entity's (ies') compliance with Annex V to Regulation (EC) No 216/2008, the possibility for the competent authority to perform audits of the qualified entity (ies).

(b) The competent authority should verify that all qualified entities' personnel concerned with the conduct of audits or reviews should be adequately trained and qualified. The competent authority should verify how the qualified entities:

(1) define and document the education, training, technical and operational knowledge, experience and qualifications for those involved in oversight activities;

(2) ensure specific training for those involved in oversight activities; and

(3) ensure that personnel designated to conduct audits meet specific qualification criteria. The criteria should address:

(i) the knowledge and understanding of the requirements related to the services provision in ATM/ANS and other ATM network functions against which audits may be performed;

(ii) the use of assessment techniques;

(iii) the skills required for managing an audit; and

(iv) the demonstration of competence of auditors through evaluation or other acceptable means.

GM1 ATM/ANS.AR.B.005 Allocation of tasks to qualified entities

ED Decision 2017/001/R

CERTIFICATION TASKS

The tasks that may be performed by a qualified entity on behalf of the competent authority include those related to the initial certification and continuing oversight of service providers as defined in this Regulation, with the exclusion of the issuance of a certificate.

ATM/ANS.AR.B.010 Changes in the management system

Regulation (EU) 2017/373

(a) The competent authority shall have a system in place to identify changes that affect its capability to perform its tasks and discharge its responsibilities under this Regulation. This system shall enable it to take action, as appropriate, to ensure that the management system remains adequate and effective.

(b) The competent authority shall update its management system to reflect any change to this Regulation in a timely manner, so as to ensure effective implementation.

(c) The competent authority shall notify the Agency of significant changes affecting its capability to perform its tasks and discharge its responsibilities under this Regulation.

ATM/ANS.AR.B.015 Record-keeping

Regulation (EU) 2017/373

(a) The competent authority shall establish a system of record-keeping providing for adequate storage, accessibility, and reliable traceability of:

(1) the management system's documented policies and procedures;

(2) training, qualification, and authorisation of personnel as required by point ATM/ANS.AR.B.001(a)(2);

(3) the allocation of tasks, covering the elements required by point ATM/ANS.AR.B.005, as well as the details of tasks allocated;

(4) certification and/or declaration processes;

(5) designations of air traffic services and meteorological services providers, as appropriate;

(6) certification and oversight of service providers exercising activities within the territory of the Member State, but certified by the competent authority of another Member State or the Agency, as agreed between those authorities;

(7) the evaluation and notification to the Agency of AltMOC proposed by service providers and the assessment of AltMOC used by the competent authority itself;

(8) compliance of service providers with the applicable requirements of this Regulation after the issuance of the certificate or, where relevant, submission of a declaration, including the reports of all audits, covering findings, corrective actions, and date of action closure, and observations as well as other safety-related records;

(9) enforcement measures taken;

(10) safety information, safety directives and follow-up measures;

(11) the use of flexibility provisions in accordance with Article 14 of Regulation (EC) No 216/2008.

(b) The competent authority shall maintain a list of all service provider certificates issued and declarations received.

(c) All records shall be kept for a minimum period of 5 years after the certificate ceases to be valid or the declaration is withdrawn, subject to the applicable data protection law.

AMC1 ATM/ANS.AR.B.015(a)(2) Record-keeping

ED Decision 2017/001/R

DURATION OF RETENTION PERIOD OF RECORDS

Records related to the training and qualification of the personnel of the competent authority should be kept until the end of their employment.

AMC1 ATM/ANS.AR.B.015(a)(8) Record-keeping

ED Decision 2017/001/R

RECORD-KEEPING FOR FUNCTIONAL SYSTEMS CHANGE MANAGEMENT PROCEDURES

The competent authority should keep a record of all the change management procedures, modifications and deviations it has approved in accordance with ATM/ANS.AR.C.030(a) and those that have been rejected, together with a rationale. The competent authority should be able to cross-reference them to the requirement of the associated requirement in the Regulation that they intend to comply with.

SUBPART C — OVERSIGHT, CERTIFICATION AND ENFORCEMENT (ATM/ANS.AR.C)

ATM/ANS.AR.C.001 Monitoring of safety performance

Regulation (EU) 2017/373

(a) The competent authorities shall regularly monitor and assess the safety performance of the service providers under their oversight.

(b) The competent authorities shall use the results of the monitoring of safety performance in particular within their risk-based oversight.

ATM/ANS.AR.C.005 Certification, declaration, and verification of service providers' compliance with the requirements

Regulation (EU) 2017/373

(a) Within the framework of point ATM/ANS.AR.B.001(a)(1), the competent authority shall establish a process in order to verify:

(1) service providers' compliance with the applicable requirements set out in Annexes III to XIII, and any applicable conditions attached to the certificate before the issue of that certificate. The certificate shall be issued in accordance with Appendix 1 to this Annex;

(2) compliance with any safety-related obligations in the designation act issued in accordance with Article 8 of Regulation (EC) No 550/2004;

(3) continued compliance with the applicable requirements of the service providers under its oversight;

(4) implementation of safety objectives, safety requirements and other safety-related conditions identified in declarations of verification of systems, including any relevant declaration of conformity or suitability for use of constituents of systems issued in accordance with Regulation (EC) No 552/2004;

(5) the implementation of safety directives, corrective actions and enforcement measures.

(b) The process referred to in point (a) shall:

(1) be based on documented procedures;

(2) be supported by documentation specifically intended to provide its personnel with guidance to perform their tasks related to certification, oversight and enforcement;

(3) provide the organisation concerned with an indication of the results of the certification, oversight and enforcement activity;

(4) be based on audits, reviews and inspections conducted by the competent authority;

(5) with regard to certified service providers, provide the competent authority with the evidence needed to support further action, including measures referred to in Article 9 of Regulation (EC) No 549/2004, Article 7(7) of Regulation (EC) No 550/2004, and by Articles 10, 25, and 68 of Regulation (EC) No 216/2008 in situations where requirements are not complied with;

(6) with regard to service providers making declarations, provide the competent authority with the evidence to take, if appropriate, remedial action which may include enforcement actions, including, where appropriate, under national law.

ATM/ANS.AR.C.010 Oversight

Regulation (EU) 2017/373

(a) The competent authority, or qualified entities acting on its behalf, shall conduct audits, in accordance with Article 5.

(b) The audits referred to in point (a) shall:

(1) provide the competent authority with evidence of compliance with the applicable requirements and with the implementing arrangements;

(2) be independent of any internal auditing activities undertaken by the service provider;

(3) cover complete implementing arrangements or elements thereof, and processes or services;

(4) determine whether:

(i) the implementing arrangements comply with the applicable requirements;

(ii) the actions taken comply with the implementing arrangements and the applicable requirements;

(iii) the results of actions taken match the results expected from the implementing arrangements.

(c) The competent authority shall, on the basis of the evidence at its disposal, monitor the continuous compliance with the applicable requirements of this Regulation of the service providers under its oversight.

GM1 ATM/ANS.AR.C.010 Oversight

ED Decision 2017/001/R

DEMONSTRATION OF COMPLIANCE — DAT PROVIDERS

In addition to the applicable requirements, the competent authority should assess the standards and processes applied by the DAT provider. The following specific areas should be overseen against EUROCAE ED-76A/RTCA DO-200B ‘Standards for Processing Aeronautical Data’, dated June 2015:

(a) plans and procedures, including:

(1) alteration procedures (i.e. informing the supplier or data originator of the data alteration and endeavouring to receive concurrence/agreement);

(2) data verification and validation (including the procedures that define the level of checking of the database prior to release). These procedures should be reviewed to ensure adequacy;

(3) reporting and handling procedures (including occurrence reporting);

(4) data configuration management;

(5) data transmission practices;

(6) tool qualification; and

(7) internal audit checks and response mechanisms;

(b) internal standards; and

(c) definition of 'Data Quality Requirements'.

EUROCAE ED-76/RTCA DO-200A may be also used for the demonstration of compliance.

AMC1 ATM/ANS.AR.C.010(a) Oversight

ED Decision 2017/001/R

AUDITS

The audits should include oversight of changes to the functional system in order to:

(a) verify that changes made to the functional system:

(1) comply with ATM/ANS.OR.A.045;

(2) have been managed in accordance with the procedures identified in ATM/ANS.OR.B.010(a) that have been approved; and

(3) are being verified against the monitoring criteria that were identified in the assurance argument as a result of complying with ATM/ANS.OR.C.005(b)(2) or ATS.OR.205(b)(6), as appropriate; and

(b) verify that if, as a result of the monitoring referred to in (a)(3), the argument, referred to in ATS.OR.205(a)(2) and ATM/ANS.OR.C.005(a)(2), is found to be incomplete and/or incorrect, then the service provider has initiated a change or has revised the argument such that the inferences or evidence are now sufficient to justify the claim.

GM1 ATM/ANS.AR.C.010(b)(1) Oversight

ED Decision 2017/001/R

IMPLEMENTING ARRANGEMENTS

Implementing arrangements should be considered to be the service provider's (safety) management system(s) documentation, manuals, service provision conditions or the certificate and the content of the declaration, as applicable.

ATM/ANS.AR.C.015 Oversight programme

Regulation (EU) 2017/373

(a) The competent authority shall establish and update annually an oversight programme taking into account the specific nature of the service providers, the complexity of their activities, the results of past certification and/or oversight activities and shall be based on the assessment of associated risks. It shall include audits, which shall:

(1) cover all the areas of potential safety concern, with a focus on those areas where problems have been identified;

(2) cover all the service providers under the supervision of the competent authority;

(3) cover the means implemented by the service provider to ensure the competency of personnel;

(4) ensure that audits are conducted in a manner commensurate with the level of the risk posed by the service provider operations and services provided; and

(5) ensure that for service providers under its supervision, an oversight planning cycle not exceeding 24 months is applied.

The oversight planning cycle may be reduced if there is evidence that the safety performance of the service provider has decreased.

For a service provider certified by the competent authority, the oversight planning cycle may be extended to a maximum of 36 months if the competent authority has established that, during the previous 24 months:

(i) the service provider has demonstrated an effective identification of aviation safety hazards and management of associated risks;

(ii) the service provider has continuously demonstrated compliance with the change management requirements under points ATM/ANS.OR.A.040 and ATM/ANS.OR.A.045;

(iii) no level 1 findings have been issued;

(iv) all corrective actions have been implemented within the time period accepted or extended by the competent authority as defined in point ATM/ANS.AR.C.050.

If, in addition to the above, the service provider has established an effective continuous reporting system to the competent authority on the safety performance and regulatory compliance of the service provider, which has been approved by the competent authority, the oversight planning cycle may be extended to a maximum of 48 months;

(6) ensure follow-up of the implementation of corrective actions;

(7) be subject to consultation with the service providers concerned and notification thereafter;

(8) indicate the envisaged interval of the inspections of the different sites, if any.

(b) The competent authority may decide to modify the objectives and the scope of pre-planned audits, including documentary reviews and additional audits, wherever that need arises.

(c) The competent authority shall decide which arrangements, elements, services, functions, physical locations, and activities are to be audited within a specified time frame.

(d) Audit observations and findings issued in accordance with point ATM/ANS.AR.C.050 shall be documented. The latter shall be supported by evidence, and identified in terms of the applicable requirements and their implementing arrangements against which the audit has been conducted.

(e) An audit report, including the details of the findings and observations, shall be drawn up and communicated to the service provider concerned.

AMC1 ATM/ANS.AR.C.015 Oversight programme

ED Decision 2017/001/R

GENERAL

(a) When establishing an oversight programme appropriate to each provider, the competent authority should take into account the safety performance of the service provider to be audited. Inspectors for the oversight of services provision and other ATM network functions should work in accordance with the schedule provided to them.

(b) Having regard to the performance of service providers, the competent authority may vary the frequency of the audits or inspections.

(c) When defining the oversight programme, the competent authority should assess the risks related to the activity of each service provider, certified or declared, or the Network Manager, and adapt the audits and inspections to the level of risk identified.

AMC1 ATM/ANS.AR.C.015(a) Oversight programme

ED Decision 2017/001/R

SPECIFIC NATURE AND COMPLEXITY OF THE ORGANISATION

(a) When determining the oversight programme for a service provider, the competent authority should consider in particular the following elements, as applicable:

(1) the implementation by the service provider of industry standards, directly relevant to the organisation's activity subject to this Regulation;

(2) the procedure applied for and scope of changes not requiring prior approval in accordance with ATM/ANS.OR.A.040(b); and

(3) specific procedures implemented by the service provider related to any alternative means of compliance used.

(b) For the purpose of assessing the complexity of an organisation's management system, AMC1 ATM/ANS.OR.B.005(e) should be used.

AMC1 ATM/ANS.AR.C.015(a)(1) Oversight programme

ED Decision 2017/001/R

AREA OF POTENTIAL SAFETY CONCERNS — DAT PROVIDERS

The competent authority should audit the DAT provider's procedures for dealing with situations where resolution and corrections could not be obtained with the aeronautical data source or other DAT providers for data that has been called into question in accordance with AMC1 DAT.TR.105(a). Such audits should confirm that effective controls are in place to ensure that an unsafe product is not released and that such concerns are communicated to customers in accordance with the requirements laid down in DAT.OR.200.

ATM/ANS.AR.C.020 Issue of certificates

Regulation (EU) 2017/373

(a) Following the process laid down in point ATM/ANS.AR.C.005(a), upon receiving an application for the issuance of a certificate to a service provider, the competent authority shall verify the service provider's compliance with the applicable requirements of this Regulation.

(b) The competent authority may require any audits, inspections or assessments it finds necessary before issuing the certificate.

(c) The certificate shall be issued for an unlimited duration. The privileges of the activities that the service provider is approved to conduct shall be specified in the service provision conditions attached to the certificate.

(d) The certificate shall not be issued where a level 1 finding remains open. In exceptional circumstances, finding(s), other than level 1, shall be assessed and mitigated as necessary by

the service provider and a corrective action plan for closing the finding(s) shall be approved by the competent authority prior to the certificate being issued.

GM1 ATM/ANS.AR.C.020 Issue of certificates

ED Decision 2017/001/R

OPERATIONAL CONDITIONS OR LIMITATIONS

(a) If, during the certification process, an operational condition or limitation has been determined as necessary to be imposed on or implemented by the service provider, the competent authority should ensure that such operational condition or limitation is prescribed in the service provision conditions attached to the service provider's certificate.

(b) Limitations in the certification may be used to identify restrictions to be applied in the provision of services and any other particularity of the service provided (e.g. intended usage, type of operations).

(c) Limitations may also relate to some restrictions on the service(s) provided associated with non-compliances with respect to some performance requirements.

(d) Conditions may address actions that require to be accomplished to confirm the validity of the certificate.

GM2 ATM/ANS.AR.C.020 Issue of certificates

ED Decision 2017/001/R

EXAMPLES OF LIMITATIONS IN SERVICES

(a) Limitations for the provision of ILS Signal in Space could be:

(1) CAT I;

(2) CAT II; and

(3) CAT III.

(b) Limitations for the provision of Global Navigation Satellite System (GNSS) signal could be:

(1) based on the system used to provide Signal-in-Space:

(i) GNSS Core System;

(ii) Satellite-Based Augmentation System (SBAS); and

(iii) Ground-Based Augmentation System (GBAS); and/or

(2) based on the type of operations supported (e.g. en-route, en-route terminal, NPA, APV-I, APV-II, Cat I, from ICAO Annex 10)

(c) Limitations for the Aeronautical Mobile Service (air–ground communication) could be:

(1) for flight information services;

(2) for area control service;

(3) for approach control service; and

(4) for aerodrome control service.

(d) Limitations for the provision of data from the secondary surveillance radar (SSR) could be:

(1) mode A/C; and

(2) mode S.

(e) Limitations for the provision of data from automatic dependant surveillance (ADS) could be:

(1) ADS-C; and

(2) ADS-B.

ATM/ANS.AR.C.025 Changes

Regulation (EU) 2017/373

(a) Upon receiving a notification for a change in accordance with point ATM/ANS.OR.A.045, the competent authority shall comply with points ATM/ANS.AR.C.030, ATM/ANS.AR.C.035 and ATM/ANS.AR.C.040.

(b) Upon receiving a notification for a change in accordance with point ATM/ANS.OR.A.040(a)(2) that requires prior approval, the competent authority shall:

(1) verify the service provider's compliance with the applicable requirements before issuing the change approval;

(2) take immediate appropriate action, without prejudice to any additional enforcement measures, when the service provider implements changes requiring prior approval without having received competent authority approval referred to in point (1).

(c) To enable a service provider to implement changes to its management system and/or safety management system, as applicable, without prior approval in accordance with point ATM/ANS.OR.A.040(b), the competent authority shall approve a procedure defining the scope of such changes and describing how such changes will be notified and managed. In the continuous oversight process, the competent authority shall assess the information provided in the notification to verify whether the actions taken comply with the approved procedures and applicable requirements. In case of any non-compliance, the competent authority shall:

(1) notify the service provider of the non-compliance and request further changes;

(2) in case of level 1 and level 2 findings, act in accordance with point ATM/ANS.AR.C.050.

AMC1 ATM/ANS.AR.C.025(b) Changes

ED Decision 2017/001/R

CHANGES REQUIRING PRIOR APPROVAL

(a) Upon receipt of a notification for a proposed change that requires prior approval, the competent authority should:

(1) formally acknowledge the receipt of the notification in writing within 10 working days;

(2) assess the proposed change in relation to the service provider’s certificate or the conditions attached or management system of it, and the applicable requirements of Part-ATM/ANS.OR, as well as any other applicable requirements within 30 working days after the receipt of all the evidence supporting the proposed change;

(3) assess the actions proposed by the service provider in order to show compliance; and

(4) notify the service provider of its approval/rejection without delay.

(b) A simple management system documentation system status sheet should be maintained, which contains information on when an amendment was received by the competent authority and when it was approved, if applicable.

(c) The competent authority should, in due time, verify the compliance of the service provider and, depending on the change, examine the need for prescribing any condition for the operation of it during the change.

(d) For changes requiring prior approval, the competent authority may conduct an audit of the service provider in order to verify the service provider's compliance with the applicable requirements.

(e) When notifying, the competent authority should also inform the service provider of the right of appeal, as exists under the applicable national legislation.

AMC2 ATM/ANS.AR.C.025(b) Changes

ED Decision 2017/001/R

CHANGE OF NAME OF THE SERVICE PROVIDER

Upon receipt of the notification and the relevant parts of the service provider's documentation as required by Part-ATM/ANS.OR, the competent authority should reissue the certificate.

GM1 ATM/ANS.AR.C.025(b) Changes

ED Decision 2017/001/R

CHANGE OF NAME OF THE SERVICE PROVIDER

A name change alone does not require the competent authority to audit the organisation unless there is evidence that other aspects of the organisation have changed.

GM2 ATM/ANS.AR.C.025(b) Changes

ED Decision 2017/001/R

APPROPRIATE ACTION

Appropriate action by the competent authority may include suspension, limitation or revocation of the service provider's certificate.

AMC1 ATM/ANS.AR.C.025(c) Changes

ED Decision 2017/001/R

CHANGES NOT REQUIRING PRIOR APPROVAL

(a) When the service provider submits the name of the nominee for the nominated persons in accordance with AMC2 ATM/ANS.OR.A.040(b), the competent authority should consider his or her qualification.

(b) Upon receipt of a notification for a proposed change that does not require prior approval by the competent authority, it should acknowledge receipt of the notification in writing within 10 working days from receipt unless it is not specified under the relevant national legislation.

ATM/ANS.AR.C.030 Approval of change management procedures for functional systems

Regulation (EU) 2017/373

(a) The competent authority shall review:

(1) change management procedures for functional systems or any material modification to those procedures submitted by the service provider in accordance with point ATM/ANS.OR.B.010(b);

(2) any deviation from the procedures referred to in point (1) for a particular change, when requested by a service provider in accordance with point ATM/ANS.OR.B.010(c)(1).

(b) The competent authority shall approve the procedures, modifications and deviations referred to in point (a) when it has determined that they are necessary and sufficient for the service provider to demonstrate compliance with points ATM/ANS.OR.A.045, ATM/ANS.OR.C.005, ATS.OR.205, and ATS.OR.210, as applicable.

GM1 ATM/ANS.AR.C.030 Approval of change management procedures for functional systems

ED Decision 2017/001/R

GENERAL

The review by the competent authority is focused on the change management procedures and not on the project management part of these procedures that are not required by the regulations, even though they may be useful for the smooth execution of the project dealing with the change. Consequently, not all parts of a procedure may be approved by the competent authority. The approved parts should be identified in the record (see AMC1 ATM/ANS.AR.B.015(a)(8)) and communicated to the service provider.

AMC1 ATM/ANS.AR.C.030(a) Approval of change management procedures for functional systems

ED Decision 2017/001/R

MEANS AND METHOD OF SUBMITTING PROCEDURES

The competent authority should agree with the service provider on the means and method of submitting the procedures, modifications and deviations referred to in ATM/ANS.AR.C.030(a). Until an agreement is reached, the competent authority will prescribe the means and method of submission.

AMC1 ATM/ANS.AR.C.030(b) Approval of change management procedures for functional systems

ED Decision 2017/001/R

APPROVAL OF PROCEDURES

(a) When approving the change management procedures for functional systems as per ATM/ANS.OR.B.010, the competent authority should perform the following:

(1) check that the procedures used by a service provider to manage changes cover the life cycle of a change as defined in ATM/ANS.OR.C.005(a)(1) or ATS.OR.205(a)(1);

(2) use the compliance matrix provided by the service provider (referred to in AMC1 ATM/ANS.OR.B.010(a)), when reviewing the content of the procedures, modifications and/or deviations referred to in ATM/ANS.AR.C.030(a); as part of the oversight activity, the competent authority should check that the compliance matrix covers all the aforementioned requirements.

(3) check that the procedures make mandatory provisions that require actions to be undertaken and all required evidence to be produced to comply with requirements laid down in ATM/ANS.OR.A.045, ATM/ANS.OR.C.005, ATS.OR.205 and ATS.OR.210;

(4) check that the procedures identify the roles and responsibilities of the service provider in the change management processes;

(5) check that the procedures state that it is not allowed to use new, modified or deviating change management procedures until approval is granted; and

(6) check that the procedures state that any change selected for review must not enter into operational service before the approval is granted.

(b) The competent authority should provide a response to the service provider's notification of change referred to in ATM/ANS.OR.A.045(a) without undue delay.

GM1 ATM/ANS.AR.C.030(b) Approval of change management procedures for functional systems

ED Decision 2017/001/R

DEVIATIONS

Some changes might stem from the need to implement immediate action and, therefore, their implementation cannot be delayed until they receive approval or communication that the change is not being reviewed from the competent authority such as changes due to urgent unforeseen circumstances that would, if uncorrected, lead to an immediate unsafe condition, presence of volcanic ash, etc.

The competent authority may consider this type of changes as part of the approval of change management procedures for functional systems.

ATM/ANS.AR.C.035 Decision to review a notified change to the functional system

Regulation (EU) 2017/373

(a) Upon receipt of a notification in accordance with point ATM/ANS.OR.A.045(a)(1), or upon receipt of modified information in accordance with point ATM/ANS.OR.A.045(b), the competent authority shall make a decision on whether to review the change or not. The competent authority shall request any additional information needed from the service provider to support this decision.

(b) The competent authority shall determine the need for a review based on specific, valid and documented criteria that, as a minimum, ensure that the notified change is reviewed if the combination of the likelihood of the argument being complex or unfamiliar to the service provider and the severity of the possible consequences of the change is significant.

(c) When the competent authority decides the need for a review based on other risk based criteria in addition to point (b), these criteria shall be specific, valid and documented.

(d) The competent authority shall inform the service provider of its decision to review a notified change to a functional system and provide the associated rationale to the service provider upon request.

AMC1 ATM/ANS.AR.C.035(a) Decision to review a notified change to the functional system

ED Decision 2017/001/R

MEANS AND METHOD OF SUBMITTING NOTIFICATION OF CHANGES TO FUNCTIONAL SYSTEMS

The competent authority should agree with the service provider on the means and method of submitting the notification of changes and additional information referred to in ATM/ANS.OR.A.045(a). Until an agreement is reached, the competent authority will prescribe the means of submission.

GM1 ATM/ANS.AR.C.035(c) Decision to review a notified change to the functional system

ED Decision 2017/001/R

OTHER SELECTION CRITERIA

(a) Some changes may not necessarily need to be reviewed providing that, even though they relate to safety, they can be considered as routine by the provider as they have been consistently assessed, implemented and proved safe in the past and, therefore, the competent authority has sufficient confidence that the provider will address them in a similar manner.

(b) The selection criterion for review may deviate from a simple threshold on the scalar risk metric (distance from the origin), to deal with concerns due to the coarse grain and high uncertainty of the inputs. For instance, a separate threshold on the 'severity' axis may be used to specify, for instance:

(1) that changes with very high potential severity should always be reviewed, irrespective of the probability of the safety argument being incomplete and/or incorrect (Figure below). This criterion may well respond to common perceptions and could be justified by the fact that judgements of low probabilities based on limited information are often unreliable, and errors in the judgment of risk are proportional to the error on probability and the size of the loss; and

(2) that changes with minor potential severity need not be reviewed, irrespective of the probability of the safety argument being incomplete and/or incorrect (Figure below) (though the process may retain the option for the competent authority to review the change, since the estimate itself of potential severity may be suspected of being erroneous).

(c) It is also possible that deviations be required on the basis of some of the component factors that affect either probability or severity, e.g. exempting changes based on small size of change and high competence of the air traffic services provider.

(d) In order to validate the process or provide data for the evolution of the process, it may be advisable to randomly select changes to review and then assess whether the safety argument is complete and/or correct or not and whether or not the case would have been selected for review using the current criteria for the selection process.

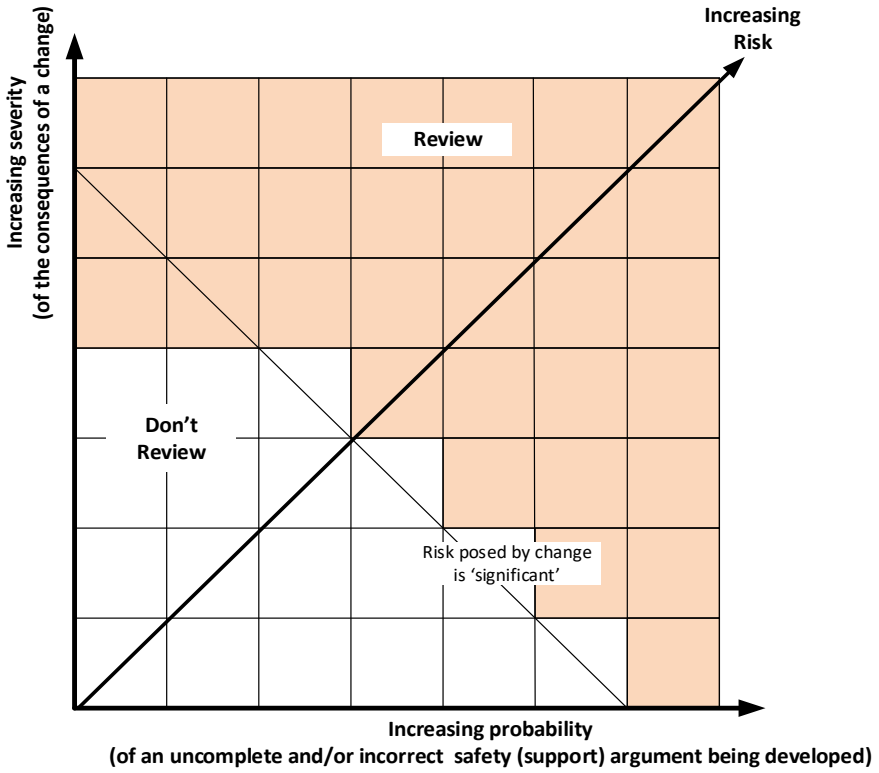

Figure 1: Criteria that may be used when severity is high

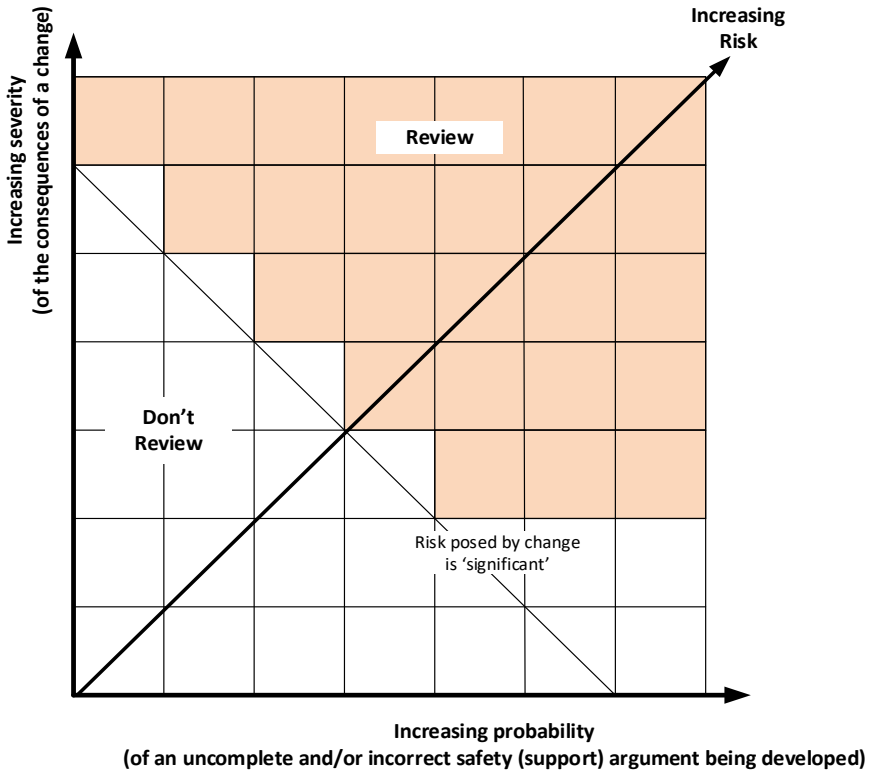

Figure 2: Criteria that may be used when severity is low

ATM/ANS.AR.C.040 Review of a notified change to the functional system

Regulation (EU) 2017/373

(a) When the competent authority reviews the argument for a notified change, it shall:

(1) assess the validity of the argument presented with respect to point ATM/ANS.OR.C.005(a)(2) or ATS.OR.205(a)(2);

(2) coordinate its activities with other competent authorities whenever necessary.

(b) The competent authority shall, alternatively:

(1) approve the argument referred to in point (a)(1), with conditions where applicable, when it is shown to be valid and so inform the service provider,

(2) reject the argument referred to in point (a)(1) and inform the service provider together with a supporting rationale.

ATM/ANS.AR.C.045 Declarations of flight information services providers

Regulation (EU) 2017/373

(a) Upon receiving a declaration from a provider of flight information services intending to provide such services, the competent authority shall verify that the declaration contains all the information required by point ATM/ANS.OR.A.015 and shall acknowledge receipt of the declaration to that service provider.

(b) If the declaration does not contain the required information, or contains information that indicates non-compliance with the applicable requirements, the competent authority shall notify the provider of flight information services concerned about the non-compliance and request further information. If necessary, the competent authority shall carry out an audit of the provider of flight information services. If the non-compliance is confirmed, the competent authority shall take action provided for in point ATM/ANS.AR.C.050.

(c) The competent authority shall keep a register of the declarations of providers of flight information services which were made to it in accordance with this Regulation.

ATM/ANS.AR.C.050 Findings, corrective actions, and enforcement measures

Regulation (EU) 2017/373

(a) The competent authority shall have a system to analyse findings for their safety significance and decide on enforcement measures on the basis of the safety risk posed by the service provider's non-compliance.

(b) In circumstances where no or very low additional safety risk would be present with immediate appropriate mitigation measures, the competent authority may accept the provision of services to ensure continuity of service whilst corrective actions are being taken.

(c) A level 1 finding shall be issued by the competent authority when any serious non-compliance is detected with the applicable requirements of Regulation (EC) No 216/2008 and its implementing rules as well as Regulations (EC) No 549/2004, (EC) No 550/2004, (EC) No 551/2004, and (EC) No 552/2004 and their implementing rules, with the service provider's

procedures and manuals, with the terms of conditions of certificate or certificate, with the designation act, if applicable, or with the content of a declaration which poses a significant risk to flight safety or otherwise calls into question the service provider's capability to continue operations.

Level 1 findings shall include but not be limited to:

(1) promulgating operational procedures and/or providing a service in a way which introduces a significant risk to flight safety;

(2) obtaining or maintaining the validity of the service provider's certificate by falsification of submitted documentary evidence;

(3) evidence of malpractice or fraudulent use of the service provider's certificate;

(4) the lack of an accountable manager.

(d) A level 2 finding shall be issued by the competent authority when any other non-compliance is detected with the applicable requirements of Regulation (EC) No 216/2008 and its implementing rules as well as Regulations (EC) No 549/2004, (EC) No 550/2004, (EC) No 551/2004, and (EC) No 552/2004 and their implementing rules, with the service provider's procedures and manuals or with the terms of conditions or certificate, or with the content of a declaration.

(e) When a finding is detected, during oversight or by any other means, the competent authority shall, without prejudice to any additional action required by Regulation (EC) No 216/2008 and this Regulation, as well as Regulations (EC) No 549/2004, (EC) No 550/2004, (EC) No 551/2004 and (EC) No 552/2004 and their implementing rules, communicate the finding to the service provider in writing and require corrective action to address the non-compliance(s) identified.

(1) In the case of level 1 findings, the competent authority shall take immediate and appropriate action, and may, if appropriate, limit, suspend or revoke in whole or in part the certificate while ensuring the continuity of services provided that safety is not compromised, and in the case of the Network Manager, it shall inform the Commission. The measure taken shall depend upon the extent of the finding and shall remain until successful corrective action has been taken by the service provider.

(2) In the case of level 2 findings, the competent authority shall:

(i) grant the service provider a corrective action implementation period included in an action plan appropriate to the nature of the finding;

(ii) assess the corrective action and implementation plan proposed by the service provider and, if the assessment concludes that they are sufficient to address the non-compliance(s), accept them.

(3) In the case of level 2 findings, where the service provider fails to submit a corrective action plan that is acceptable to the competent authority in light of the finding, or where the service provider fails to perform the corrective action within the time period accepted or extended by the competent authority, the finding may be raised to a level 1 finding, and action taken as laid down in point (1).

(f) For those cases not requiring level 1 and 2 findings, the competent authority may issue observations.

GM1 ATM/ANS.AR.C.050 Findings, corrective actions, and enforcement measures

ED Decision 2017/001/R

CATEGORIES OF FINDINGS — DOCUMENTARY EVIDENCE

Documentary evidence may include but is not limited to:

(a) operations or technical manuals;

(b) contracts or other types of arrangements;

(c) training, qualification or medical records;

(d) inspection records;

(e) test or exercise results;

(f) internal audit results;

(g) maintenance records; and

(h) other similar material required to be maintained by the service provider, etc.

GM2 ATM/ANS.AR.C.050 Findings, corrective actions, and enforcement measures

ED Decision 2017/001/R

ENFORCEMENT MEASURES — FINANCIAL PENALTIES

In accordance with Article 7(7) of Regulation No 550/2004 and Articles 10, 22a(d), 25, and 68 of Regulation (EC) No 216/2008, the competent authority may additionally, and depending on the nature and the repetitiveness of the findings or the level of implementation of the corrective actions, impose appropriate enforcement measures that may include financial penalties, which are effective, proportionate, and dissuasive.

AMC1 ATM/ANS.AR.C.050(e) Findings, corrective actions, and enforcement measures

ED Decision 2017/001/R

CORRECTIVE ACTION AND CORRECTIVE ACTION IMPLEMENTATION PERIOD — DAT PROVIDERS

(a) In case of a Level 1 finding, the competent authority may extend the initial 21-working-day period for demonstration of corrective action by the DAT provider, depending on the nature of the finding.

(b) In case of a Level 2 finding, the initial corrective action implementation period granted by the competent authority should be appropriate to the nature of the finding but should not, in any case, exceed 3 months. At the end of this period and subject to the nature of the finding, the competent authority may extend the 3-month period subject to a satisfactory corrective action plan agreed by the competent authority.

GM1 ATM/ANS.AR.C.050(e) Findings, corrective actions, and enforcement measures

ED Decision 2017/001/R

CORRECTIVE ACTION IMPLEMENTATION PERIOD

At the end of the corrective action implementation period included in an action plan approved by the competent authority and subject to the nature of the finding, the competent authority may extend it. It should be subject to a satisfactory corrective action plan agreed by the competent authority.

GM1 ATM/ANS.AR.C.050(f) Findings, corrective actions, and enforcement measures

ED Decision 2017/001/R

OBSERVATIONS

The observation should be a way to communicate and draw future audit teams' attention on specific matters that deserve scrutiny. It should be communicated to the audited service provider.

APPENDICES TO ANNEX II

Appendix 1 — EASA Form 157

Regulation (EU) 2017/373

CERTIFICATE FOR SERVICE PROVIDER

EUROPEAN UNION

COMPETENT AUTHORITY

SERVICE PROVIDER CERTIFICATE

[CERTIFICATE NUMBER/ISSUE No]

Pursuant to Implementing Regulation (EU) 2017/373 and subject to the conditions specified below, the [competent authority] hereby certifies

[NAME OF THE SERVICE PROVIDER]

[ADDRESS OF THE SERVICE PROVIDER]

as a service provider with the privileges, as listed in the attached service provision conditions.

CONDITIONS:

This certificate is issued subject to the conditions and the scope of providing services and functions as listed in the attached service provision conditions.

This certificate is valid whilst the certified service provider remains in compliance with Implementing Regulation (EU) 2017/373 and the other applicable regulations and, when relevant, with the procedures in the service provider's documentation.

Subject to compliance with the foregoing conditions, this certificate shall remain valid unless the certificate has been surrendered, limited, suspended or revoked.

Date of issue:

Signed:

[Competent authority]

EASA Form 157 Issue 1 — Page 1/4

SERVICE PROVIDER

CERTIFICATE

SERVICE PROVISION CONDITIONS

Attachment to service provider's certificate:

[CERTIFICATE NUMBER/ISSUE No]

[NAME OF THE SERVICE PROVIDER]

has obtained the privileges to provide the following scope of services/functions:

(Delete lines as appropriate)

Services/Functions	Type of Service/Function	Scope of Service/Function	Limitations[1]
Air traffic services (ATS)[2]	Air traffic control (ATC)	Area control service	
		Approach control service	
		Aerodrome control service	
	Flight information service (FIS)	Aerodrome flight information service (AFIS)	
		En-route flight information service (En-route FIS)	
	Advisory service	n/a	
Air traffic flow management (ATFM)	ATFM	Provision of the local ATFM	
Airspace management (ASM)	ASM	Provision of the local ASM (tactical/ASM Level 3) service	
Conditions[3]			

Services/Functions	Type of Service/Function	Scope of Service/Function	Limitations[1]
Air traffic services (ATS) for flight test[2,4]	Air traffic control (ATC)	Area control service	
		Approach control service	
		Aerodrome control service	
	Flight information service (FIS)	Aerodrome flight information service (AFIS)	
		En-route flight information service (En-route FIS)	
	Advisory service	n/a	
Conditions[3]			

[1] As prescribed by the competent authority.

[2] ATS covers alerting service.

[3] Where necessary.

[4] If the competent authority considers it necessary to establish additional requirements.

Services/Functions	Type of Service/Function	Scope of Service/Function	Limitations[1]
Communication, navigation or surveillance services (CNS)	Communications (C)	Aeronautical mobile service (air-ground communication)	
		Aeronautical fixed service (ground-ground communications)	
		Aeronautical mobile satellite service (AMSS)	
	Navigation (N)	Provision of NDB signal in space	
		Provision of VOR signal in space	
		Provision of DME signal in space	
		Provision of ILS signal in space	
		Provision of MLS signal in space	
		Provision of GNSS signal in space	
	Surveillance (S)	Provision of data from primary surveillance (PS)	
		Provision of data from secondary surveillance (SS)	
		Provision of automatic dependent surveillance (ADS) Data	
Conditions[2]			

Services/Functions	Type of Service/Function	Scope of Service/Function	Limitations[1]
Aeronautical information services (AIS)	AIS	Provision of the whole AIS service	
Conditions[2]			

Services/Functions	Type of Service/Function	Scope of Service/Function	Limitations[1]
Data services (DAT)	Type 1	Provision of Type 1DAT authorises the supply of aeronautical databases in the following formats: [list of the generic data formats] Provision of Type 1 DAT does not authorise the supply of aeronautical databases directly to end-users/ aircraft operators.	
	Type 2	Provision of Type 2 DAT authorises the supply of aeronautical databases to end-users/aircraft operators for the following airborne application/ equipment, for which compatibility has been demonstrated: [Manufacturer] Certified Application/ Equipment model [XXX], Part No [YYY]	
Conditions[2]			

[1] As prescribed by the competent authority.

[2] Where necessary.

Services/Functions	Type of Service/Function	Scope of Service/Function	Limitations[1]
Meteorological services (MET)	MET	Meteorological watch office	
		Aerodrome meteorological offices	
		Aeronautical meteorological stations	
		VAAC	
		WAFC	
		TCAC	
Conditions[2]			

Services/Functions	Type of Service/Function	Scope of Service/Function	Limitations[1]
ATM network functions	Design of ERN	n/a	
	Scarce resources	Radio frequency	
		Transponder code	
	ATFM	Provision of the central ATFM	
Conditions[2]			

Date of issue:

Signed: [Competent authority]

For the Member State/EASA

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[1] As prescribed by the competent authority.

[2] Where necessary.

ANNEX III — PART-ATM/ANS.OR

COMMON REQUIREMENTS FOR SERVICE PROVIDERS

SUBPART A — GENERAL REQUIREMENTS (ATM/ANS.OR.A)

ATM/ANS.OR.A.001 Scope

Regulation (EU) 2017/373

In accordance with Article 6, this Annex establishes the requirements to be met by the service providers.

GM1 ATM/ANS.OR.A.001 Scope

ED Decision 2017/001/R

DEFINITIONS AND SCOPE IN RELATION TO SERVICE PROVIDERS

(a) To recognise which of the annexes applies to which service provider, it is necessary to understand how services are defined. These definitions have determined the structure and the content of Annexes III to XIII.

(b) Article 3(q) of Regulation (EC) No 216/2008 defines ATM/ANS as 'the air traffic management functions as defined in Article 2(10) of Regulation (EC) No 549/2004, air navigation services defined in Article 2(4) of that Regulation, and services consisting in the origination and processing of data and formatting and delivering data to general air traffic for the purpose of safety-critical air navigation'.

(c) It should, therefore, be noted that ATM/ANS include more services than 'Air Traffic Management' and 'Air Navigation Services' together.

(d) In this Regulation, 'services' means those specified in Annex Vb(2) to Regulation (EC) No 216/2008. This Annex includes an additional service (airspace design) that is neither directly included in the definition of ATM/ANS nor in the definition of 'Air Traffic Management' or 'Air Navigation Service'.

(e) As already defined, 'ATM network functions' refers to functions performed by the Network Manager in accordance with Regulation (EU) No 677/2011[1].

(f) Figure 1 below provides a pictorial representation of the services and how they interrelate through the various definitions.

(g) Figure 1 indicates both a further breakdown of ATS into air traffic control services (ATC), alerting services, air traffic advisory services, and flight information services and groupings of:

(1) air traffic management (ATM): comprising ATS, ASM, and ATFM;

(2) air navigation services (ANS): comprising ATS, CNS, MET, and AIS; and

(3) airspace design (ASD) and data provision (DAT) and ATM network functions.

(h) It is important to note that ATS is included in ATM and ANS.

[1] Commission Regulation (EU) No 677/2011 of 7 July 2011 laying down detailed rules for the implementation of air traffic management (ATM) network functions and amending Commission Regulation (EU) No 691/2010 (OJ L 185, 15.7.2011, p. 1).

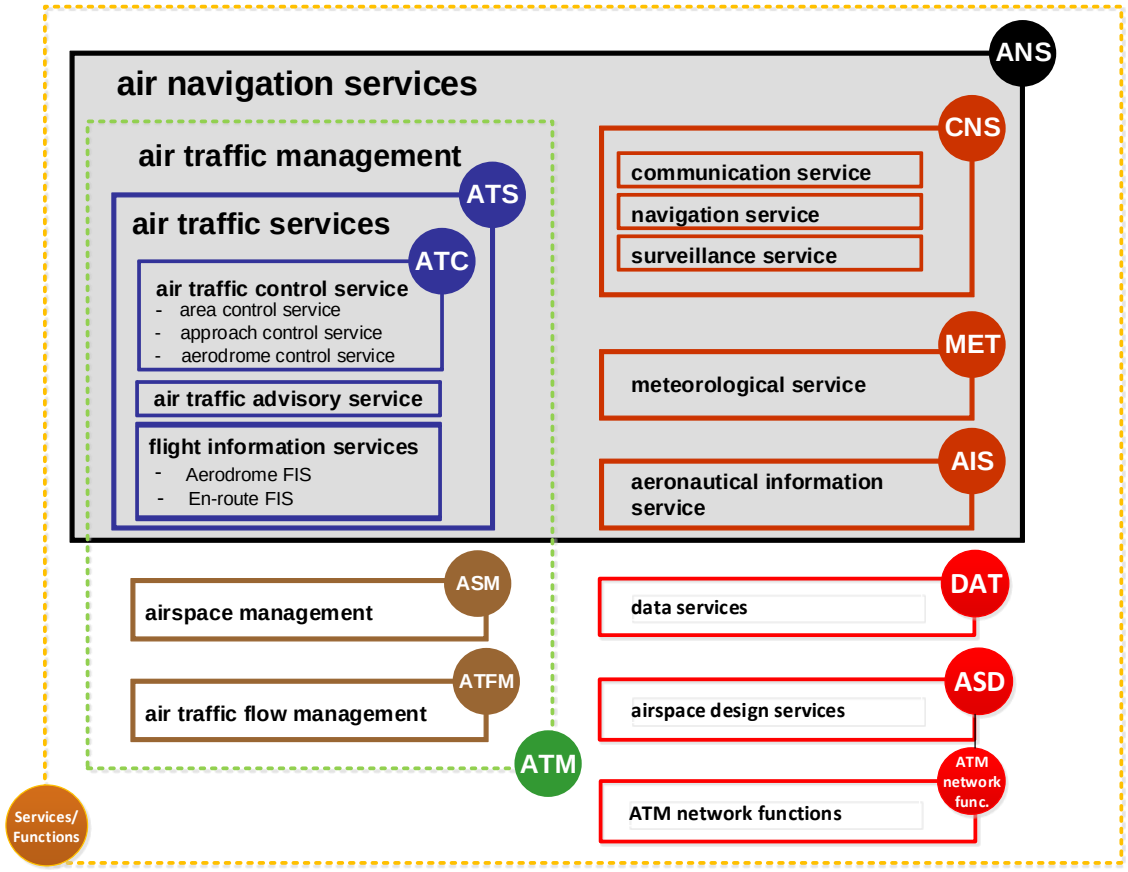


Figure 1: The scope of the services as specified in Annex Vb to Regulation (EC) No 216/2008 and, additionally, the other ATM network functions.

SERVICES

(a) Annex III (Part-ATM/ANS.OR) applies to the service providers, as relevant, and contains the common requirements for the service providers. This Annex is broken down into four subparts:

(1) Subpart A — General requirements (ATM/ANS.OR.A);

(2) Subpart B — Management (ATM/ANS.OR.B);

(3) Subpart C — Specific organisational requirements for service providers other than ATS providers (ATM/ANS.OR.C); and

(4) Subpart D — Specific organisational requirements for ANS and ATFM providers and the Network Manager (ATM/ANS.OR.D).

(b) Subpart D applies only to ANS and ATFM providers and the Network Manager (and not to ASM and DAT providers).

(c) Thereafter, each specific requirement for various service providers is allocated to an annex (Annexes IV to XII) which contains specific requirements for that service provider. Table 1 below indicates which annexes are applicable to each service provided.

(d) Annex XIII contains requirements for service providers regarding personnel training and competence assessment.

AIR TRAFFIC SERVICES FOR FLIGHT TEST

(a) When the flight tests have one of the following characteristics:

(1) frequent changes in levels and headings, depending on the tests which are carried out with certain unpredictability;

(2) unless necessary for the purpose of the flight tests, navigation in general (route/destination, etc.) is not the primary objective of these flights;

(3) specific aircraft configurations sometimes resulting in reduced ability to manoeuvre;

(4) technical constraints, including airborne and ground testing facilities;

(5) airborne equipment is not proven to be up to the required certification level; and

(6) the planning for conducting flight tests can be of a very ad hoc nature giving little timing for carrying out strategy or pre-tactical air traffic flow management. (e.g. the need to test under specific weather conditions which would require flexibility for allocation of slots for these flight tests),

then the air traffic services provider providing services to this type of flight testing may need a specific privilege within the certificate issued by the competent authority because of the specificities of the air traffic services to be provided to this type of operations and because of the need to ensure safe operations in the airspace in which flight tests are being conducted.

(b) Given the characteristics in (a), flight tests can be made in cohabitation with other airspace users in controlled or non-controlled airspace, and sometimes in temporarily reserved areas when necessary.

	Annex III (Part-ATM/ANS.OR)				Annex IV (Part-ATS)	Annex V (Part-MET)	Annex VI (Part-AIS)	Annex VII (Part-DAT)	Annex VIII (Part-CNS)	Annex IX (Part-ATFM)	Annex X (Part-ASM)	Annex XI (Part-ASD)	Annex XII (Part-NM)	Annex XIII (Part-PERS)
	Subpart A	Subpart B	Subpart C	Subpart D										
Air traffic services (see Note 1)	X	X		X	X									
Meteorological services	X	X	X	X		X								
Aeronautical information services	X	X	X	X			X							
Data services	X	X	X					X						
Communication, navigation and surveillance service	X	X	X	X					X					
Air traffic flow management service	X	X	X	X						X				
Airspace management service	X	X	X								X			
Airspace design service	X	X	X									tbd*		
Network Manager	X	X	X	X									X	
service providers (see Note 2)														X

Table 1: Applicability of annexes to service providers

X = Applicable annexes for each service provider.

Note 1: Section 3 of Annex IV (Part-ATS) only applies to providers of air traffic control services and not to providers of alerting, air traffic advisory, and flight information services.

Note 2: The applicability of Annex XIII is dependent upon the scope as specified within each of the subparts of Annex XIII.

* to be introduced under RMT.0445, as necessary.

ATM/ANS.OR.A.005 Application for a service provider certificate

Regulation (EU) 2017/373

(a) Application for a service provider certificate or an amendment to an existing certificate shall be made in a form and manner established by the competent authority, taking into account the applicable requirements of this Regulation.

(b) In accordance with Article 6, in order to obtain the certificate, the service provider shall comply with:

(1) the requirements referred to in Article 8b(1) of Regulation (EU) No 216/2008;

(2) the common requirements set out in this Annex;

(3) the specific requirements set out in Annexes IV to XIII, where those requirements are applicable in light of the services that the service provider provides or plans to provide.

AMC1 ATM/ANS.OR.A.005 Application for a service provider certificate

ED Decision 2017/001/R

EXPOSITION — DAT PROVIDERS

(a) The DAT provider should submit to the competent authority an exposition providing the following information:

(1) a statement signed by the accountable manager confirming that the exposition and any associated manuals which define the organisation's compliance with the requirements will be complied with at all times;

(2) the duties and responsibilities of the manager(s) as required by ATM/ANS.OR.B.020 including matters on which they may deal directly with the competent authority on behalf of the organisation;

(3) an organisational chart showing lines of responsibility and accountability throughout the DAT provider, including a direct accountability of the accountable manager as required by ATM/ANS.OR.B.005(a)(1);

(4) a list of attesting staff as referred to in DAT.TR.100(b);

(5) a general description of manpower resources;

(6) a general description of the facilities of the DAT provider;

(7) a general description of the activities for which the DAT provider's certificate is requested;

(8) the procedure for the notification of organisational changes to the competent authority;

(9) the amendment procedure for the exposition;

(10) a description of the management system and the procedures as required by DAT.OR.110; and

(11) a list of those contracted organisations referred to in ATM/ANS.OR.B.015(b).

(b) The exposition should be amended as necessary to remain an up-to-date description of the organisation, and copies of any amendments should be supplied to the competent authority.

GM1 to AMC1 ATM/ANS.OR.A.005 Application for a service provider certificate

ED Decision 2017/001/R

EXPOSITION — DAT PROVIDERS

The exposition should contain the following table of contents:

1. **General**

   Table of contents, document revision history, abbreviations, and terms.

2. **Introduction**

   Purpose, scope, standards declaration, and reference documents.

3. **Company description and policy**

   Description of the company, products and services, quality policy and objectives, customer requirements.

4. **Terms of approval**

   Scope of work, notification of changes to the terms of approval, control of documents and records.

5. **Management/resources responsibilities**

   Management team and personnel, organisation charts, duties and responsibilities of personnel.

   Management review, human resources, competence, awareness, and training.

6. **Production processes**

   Data production procedures, arrangements with suppliers, users/customers and other DAT providers, data receiving inspection and testing, data release, data distribution process, data products identification and quality checks, tailored data, data error reporting.

7. **Management system**

   Introduction, document control, quality assurance, internal system audits, standards compliance plan audits, methods of improvement, occurrence management and reporting, record-keeping.

8. **Appendix 1 — List of relevant personnel**

GM2 to AMC1 ATM/ANS.OR.A.005 Application for a service provider certificate

ED Decision 2017/001/R

EXPOSITION — DAT PROVIDERS

A means to develop the exposition may be by cross-referring to the procedures of the quality manual, which are needed to demonstrate compliance with these requirements.

ATM/ANS.OR.A.010 Application for a limited certificate

Regulation (EU) 2017/373

(a) Notwithstanding point (b), the air traffic services provider may apply for a certificate limited to the provision of services in the airspace under the responsibility of the Member State where its principal place of operation or, if any, registered office is located, when it provides or plans to provide services only with respect to one or more of the following categories:

(1) aerial work;

(2) general aviation;

(3) commercial air transport limited to aircraft with less than 10 tonnes of maximum take-off mass or less than 20 passenger seats;

(4) commercial air transport with less than 10 000 movements per year, regardless of the maximum take-off mass and the number of passenger seats; for the purposes of this provision, 'movements' means, in a given year, the average over the previous three years of the total number of take-offs and landings.

(b) In addition, the following air navigation service providers may also apply for a limited certificate:

(1) an air navigation service provider, other than a provider of air traffic services, with a gross annual turnover of EUR 1 000 000 or less in relation to the services they provide or plan to provide;

(2) an air navigation service provider providing aerodrome flight information services by operating regularly not more than one working position at any aerodrome.

(c) As determined by the competent authority, an air navigation service provider applying for a limited certificate in accordance with points (a) or (b)(1) shall comply, as a minimum, with the following requirements set out in:

(1) point ATM/ANS.OR.B.001 Technical and operational competence and capability;

(2) point ATM/ANS.OR.B.005 Management system;

(3) point ATM/ANS.OR.B.020 Personnel requirements;

(4) point ATM/ANS.OR.A.075 Open and transparent provision of services;

(5) Annexes IV, V, VI and VIII, where those requirements are applicable in light of the services that the service provider provides or plans to provide, in accordance with Article 6.

(d) As determined by the competent authority, the air navigation service provider applying for a limited certificate in accordance with point (b)(2) shall comply, as a minimum, with the requirements set out in points (c)(1) to (c)(4) and with the specific requirements set out in Annex IV.

(e) An applicant for a limited certificate shall submit an application to the competent authority in a form and manner established by the competent authority.

GM1 ATM/ANS.OR.A.010 Application for a limited certificate

ED Decision 2017/001/R

GENERAL

The relationship between the type of service provision, criteria to be complied with and the applicable rules are indicated in Table 2 below.

Type of service	Type of approval	Criteria to be complied with	Applicable Rules
Air traffic service providers	Limited Certificate	ATM/ANS.OR.A.010(a)	ATM/ANS.OR.B.001 ATM/ANS.OR.B.005 ATM/ANS.OR.B.020 ATM/ANS.OR.A.075 Annex IV
Air navigation service providers (other than the air traffic services providers) (gross annual turnover of EUR 1 000 000 or less)	Limited Certificate	ATM/ANS.OR.A.010(b)(1)	ATM/ANS.OR.B.001 ATM/ANS.OR.B.005 ATM/ANS.OR.B.020 ATM/ANS.OR.A.075 Annexes V, VI and VIII depending upon service provision
Air navigation service providers (aerodrome flight information services providers operating regularly not more than one working position at any aerodrome)	Limited Certificate	ATM/ANS.OR.A.010(b)(2)	ATM/ANS.OR.B.001 ATM/ANS.OR.B.005 ATM/ANS.OR.B.020 ATM/ANS.OR.A.075 Annex IV

Table 2: Type of service provision, criteria to be complied with, and the applicable rules

ATM/ANS.OR.A.015 Declaration by flight information services providers

Regulation (EU) 2017/373

(a) Pursuant to Article 7, a flight information services provider may declare its capability and means of discharging the responsibilities associated with the services provided where it meets, in addition to the requirements referred to in Article 8b(1) of Regulation (EU) No 216/2008, the following alternative requirements:

(1) the flight information services provider provides, or plans to provide, its services by operating regularly not more than one working position;

(2) those services are of a temporary nature, for a duration agreed with the competent authority as necessary to ensure proportional safety assurance.

(b) A flight information services provider declaring its activities shall:

(1) provide the competent authority with all the relevant information prior to commencing operations, in a form and manner established by the competent authority;

(2) provide the competent authority with a list of the alternative means of compliance used, in accordance with point ATM/ANS.OR.A.020;

(3) maintain compliance with the applicable requirements and with the information given in the declaration;

(4) notify the competent authority of any changes to its declaration or the means of compliance it uses through submission of an amended declaration;

(5) provide its services in accordance with its operations manual and comply with all the relevant provisions contained therein.

(c) Before ceasing the provision of its services, the flight information services provider declaring its activities shall notify the competent authority within a period determined by the competent authority.

(d) A flight information services provider declaring its activities shall comply with the following requirements set out in:

(1) point ATM/ANS.OR.A.001 Scope;

(2) point ATM/ANS.OR.A.020 Means of compliance;

(3) point ATM/ANS.OR.A.035 Demonstration of compliance;

(4) point ATM/ANS.OR.A.040 Changes — general;

(5) point ATM/ANS.OR.A.045 Changes to the functional system;

(6) point ATM/ANS.OR.A.050 Facilitation and cooperation;

(7) point ATM/ANS.OR.A.055 Findings and corrective actions;

(8) point ATM/ANS.OR.A.060 Immediate reaction to a safety problem;

(9) point ATM/ANS.OR.A.065 Occurrence reporting;

(10) point ATM/ANS.OR.B.001 Technical and operational competence and capability;

(11) point ATM/ANS.OR.B.005 Management system;

(12) point ATM/ANS.OR.B.020 Personnel requirements;

(13) point ATM/ANS.OR.B.035 Operations manuals;

(14) point ATM/ANS.OR.D.020 Liability and insurance cover,

(15) Annex IV.

(e) A flight information services provider declaring its activities shall only start operation after receiving the acknowledgement of receipt of the declaration from the competent authority.

GM1 ATM/ANS.OR.A.015(b)(1) Declaration by flight information services providers

ED Decision 2017/001/R

MODEL TEMPLATE OF DECLARATION OF COMPLIANCE

DECLARATION OF COMPLIANCE FOR THE PROVISION OF FLIGHT INFORMATION SERVICES in accordance with Commission Implementing Regulation (EU) 2017/373
Provider of flight information service Name: Principal place of operation and, if any, registered office: Name and contact details of the accountable manager:
Flight Information Service
Starting date of provision of flight information services/applicability date of the change:
Scope of flight information services: ☐ Aerodrome flight information services (AFIS) ☐ En-route flight information services (En-route FIS)
List of alternative means of compliance with references to the AMCs they replace (to be attached to the declaration)
Statements
☐ The management system documentation, including the operations manual, complies with the applicable requirements set out in Part-ATM/ANS.OR and Part-ATS.
☐ The provision of flight information services will be carried out in accordance with the requirements of Regulation (EC) No 216/2008 and its implementing rules, as well as Regulations (EC) Nos 549/2004, 550/2004, 551/2004, and 552/2004 and their implementing rules, and the procedures and instructions specified in the operations manual.
☐ All personnel are qualified, competent and trained in accordance with the applicable requirements.
☐ (If applicable) The provider of flight information services has implemented and demonstrated conformance to an officially recognised industry standard. Reference of the standard: Certification body: Date of the last conformance audit:
☐ Any change in the provision of flight information services that affects the information disclosed in this declaration will be notified to the competent authority.
☐ The provider of flight information service confirms that the information disclosed in this declaration is correct.
Date, name, and signature of the accountable manager

ATM/ANS.OR.A.020 Means of compliance

Regulation (EU) 2017/373

(a) Alternative means of compliance (AltMOC) to the AMC adopted by the Agency may be used by the service provider to establish compliance with the requirements of this Regulation.

(b) When the service provider wishes to use an AltMOC, it shall, prior to implementing it, provide the competent authority with a full description of the AltMOC. The description shall include any revisions to manuals or procedures that may be relevant, as well as an assessment demonstrating compliance with the requirements of this Regulation.

A service provider may implement these alternative means of compliance subject to prior approval by the competent authority and upon receipt of the notification as prescribed in point ATM/ANS.AR.A.015(d).

ATM/ANS.OR.A.025 Continued validity of a certificate

Regulation (EU) 2017/373

(a) A service provider's certificate shall remain valid subject to:

(1) the service provider remaining in compliance with the applicable requirements of this Regulation, including those concerning facilitating and cooperating for the purposes of the exercise of the powers of the competent authorities and those concerning the handling of findings as specified in points ATM/ANS.OR.A.050 and ATM/ANS.OR.A.055 respectively;

(2) the certificate not having been surrendered, suspended or revoked.

(b) Upon revocation or surrender, the certificate shall be returned to the competent authority without delay.

ATM/ANS.OR.A.030 Continued validity of a declaration of a flight information services provider

Regulation (EU) 2017/373

A declaration made by the flight information services provider in accordance with point ATM/ANS.OR.A.015 shall remain valid subject to:

(a) the flight information services remaining in compliance with the applicable requirements of this Regulation, including those concerning facilitating and cooperating for the purposes of the exercise of the powers of the competent authorities and those concerning the handling of findings as specified in point ATM/ANS.OR.A.050 and ATM/ANS.OR.A.055 respectively;

(b) the declaration not having been withdrawn by the provider of such services or deregistered by the competent authority.

ATM/ANS.OR.A.035 Demonstration of compliance

Regulation (EU) 2017/373

A service provider shall provide all the relevant evidence to demonstrate compliance with the applicable requirements of this Regulation at the request of the competent authority.

AMC1 ATM/ANS.OR.A.035 Demonstration of compliance

ED Decision 2017/001/R

EVIDENCE — DAT PROVIDERS

The exposition as referred to in AMC1 ATM/ANS.OR.A.005 'Application for service provider certificate' EXPOSITION — DAT PROVIDERS should be considered as one of the means to demonstrate compliance with the applicable requirements.

GM1 ATM/ANS.OR.A.035 Demonstration of compliance

ED Decision 2017/001/R

GENERAL — DAT PROVIDERS

In order to demonstrate compliance with the applicable requirements, the DAT provider should produce a compliance matrix/checklist detailing how its data production processes relate to EUROCAE ED-76A/RTCA DO-200B 'Standards for Processing Aeronautical Data', dated June 2015. EUROCAE ED-76/RTCA DO-200A may be also used for the demonstration of compliance.

ATM/ANS.OR.A.040 Changes — general

Regulation (EU) 2017/373

(a) The notification and management of:

(1) a change to the functional system or a change that affects the functional system shall be carried out in accordance with point ATM/ANS.OR.A.045;

(2) a change to the provision of service, the service provider's management system and/or safety management system, that does not affect the functional system, shall be carried out in accordance with point (b).

(b) Any change as referred to in point (a)(2) shall require prior approval before implementation, unless such a change is notified and managed in accordance with a procedure approved by the competent authority as laid down in point ATM/ANS.AR.C.025(c).

AMC1 ATM/ANS.OR.A.040 Changes — general

ED Decision 2017/001/R

CHANGE OF THE OWNERSHIP AND/OR THE LOCATION

A change of the service provider's ownership and/or the location of its facilities should comply with ATM/ANS.OR.A.040(a)(2) and should not be subject to the procedure identified in ATM/ANS.AR.C.025(c).

AMC1 ATM/ANS.OR.A.040(b) Changes — general

ED Decision 2017/001/R

PROCEDURE FOR CHANGES REQUIRING PRIOR APPROVAL

For changes requiring prior approval, a procedure should define how the service provider should notify the competent authority and obtain an approval issued by that authority:

(a) Notifications should be submitted before any such change is made in order to enable the competent authority to determine continued compliance with Regulation (EC) No 216/2008 and its implementing rules and also to amend, if necessary, the certificate and the related conditions attached to it.

(b) Changes should only be implemented upon receipt of approval by the competent authority in accordance with the procedure established by that authority.

(c) The service provider should operate under the conditions prescribed by the competent authority during such changes, as applicable.

AMC2 ATM/ANS.OR.A.040(b) Changes — general

ED Decision 2017/001/R

PROCEDURE FOR CHANGES NOT REQUIRING PRIOR APPROVAL

(a) For changes not requiring prior approval, the procedure should define how the service provider should notify and manage the change.

(b) The service provider should inform the competent authority of any changes to nominated persons specified in ATM/ANS.OR.B.020(b) and ATS.OR.200(1)(iii), as applicable.

GM1 ATM/ANS.OR.A.040(b) Changes — general

ED Decision 2017/001/R

PROCEDURE FOR CHANGES NOT REQUIRING PRIOR APPROVAL

The procedure agreed by the service provider and the competent authority may also include the process for the reaction by the service provider to an unplanned change that may arise with the need for urgent action that would normally require prior approval of the competent authority. This is the case in which the service provider responds immediately to a safety problem as required in ATM/ANS.OR.A.060 or when an emergency situation arises in which the service provider has to take immediate action to ensure the safety of the services.

ATM/ANS.OR.A.045 Changes to a functional system

Regulation (EU) 2017/373

(a) A service provider planning a change to its functional system shall:

(1) notify the competent authority of the change;

(2) provide the competent authority, if requested, with any additional information that allows the competent authority to decide whether or not to review the argument for the change;

(3) inform other service providers and, where feasible, aviation undertakings affected by the planned change.

(b) Having notified a change, the service provider shall inform the competent authority whenever the information provided in accordance with points (a)(1) and (2) is materially modified, and the relevant service providers and aviation undertakings whenever the information provided in accordance with point (a)(3) is materially modified.

(c) A service provider shall only allow the parts of the change, for which the activities required by the procedures referred to in point ATM/ANS.OR.B.010 have been completed, to enter into operational service.

(d) If the change is subject to competent authority review in accordance with point ATM/ANS.AR.C.035, the service provider shall only allow the parts of the change for which the competent authority has approved the argument to enter into operational service.

(e) When a change affects other service providers and/or aviation undertakings, as identified in point (a)(3), the service provider and these other service providers, in coordination, shall determine:

(1) the dependencies with each other and, where feasible, with the affected aviation undertakings;

(2) the assumptions and risk mitigations that relate to more than one service provider or aviation undertaking.

(f) Those service providers affected by the assumptions and risk mitigations referred to in point (e)(2) shall only use, in their argument for the change, agreed and aligned assumptions and risk mitigations with each other and, where feasible, with aviation undertakings.

AMC1 ATM/ANS.OR.A.045(a) Changes to a functional system

ED Decision 2017/001/R

NOTIFICATION

The notification of a change should not be considered complete until the following information is provided:

(a) Name of the organisation notifying the change;

(b) Unique identifier of change;

(c) Version number of notification;

(d) Title of the change;

(e) Date of the submission of the original of this change notification;

(f) Scheduled date of entry into service (even if only approximate);

(g) Details of the change and its impact;

(h) The list of the service providers and other aviation undertakings that are affected by the change as identified in ATM/ANS.OR.A.045(a)(3);

(i) Entity in charge of the assurance case; and

(j) Identity of a point of contact for communications with the competent authority.

GM1 ATM/ANS.OR.A.045(a) Changes to a functional system

ED Decision 2017/001/R

NOTIFICATION

(a) A change should be notified as soon as the data defined in AMC1 ATM/ANS.OR.A.045(a) is available. The decision to review a change by the competent authority will be based, in most circumstances, on the notification data. Exceptions to this are cases where the competent authority is not familiar with the type of change or the complexity of the change requires a more thorough consideration.

(b) Early and accurate notification facilitates the interactions between the provider and the competent authority and, thus, maximises the likelihood of introducing a change into service in due time and according to the service provider's initial schedule when the competent authority has decided to review an assurance case. Therefore, it is advisable that the change description

identified in AMC1 ATM/ANS.OR.A.045(a) is completed as soon as possible and contains the following data:

(1) Purpose of the change;

(2) Reasons for the change;

(3) Place of implementation;

(4) New/modified functions/services brought about by the change;

(5) High-level identification of the constituents of the functional system being changed, and what is modified in their functionality;

(6) Consequence of the change, i.e. the harmful effects of the hazards associated with the change — see (f) below and also the definition of 'risk' in Annex I (80).

(c) The information provided in (b) may expedite the decision whether to review or not the proposed change, because it will allow the competent authority to gain complete knowledge of the change and, consequently, reduces the need for additional information. However, lack of some of this data should not delay the service provider's submission of the notification if to do so is likely to impede the introduction of the change. It should be noted that early interaction with its competent authority may help to complete the missing data.

(d) The service provider should take into account that an early, clear and accurate change notification will assist the competent authority in making the decision to review or not the change and may prevent any inconvenience such as:

(1) the competent authority having to ask for more information about the change in order to make its decision as required in ATM/ANS.OR.A.045(a)(2);

(2) the competent authority deciding to review a change unnecessarily because the notification is not clear enough; or

(3) the delay in the competent authority deciding whether to review a change, caused by the lack of information, having an impact on the proposed date of entry into service.

(e) It is recognised that the understanding of the change will improve as the change process progresses and the interaction between the competent authority and the service provider strengthens. The service provider should notify the competent authority when the information provided in the previous notification is no longer valid or when the information previously missing becomes available. When additional information — other than the data specified in AMC1 ATM/ANS.OR.A.045(a) — is supplied at the competent authority's request, then no update of the notification is required.

(f) For air traffic services (ATS) providers, the consequences of the change specified in (b)(6), should be expressed in terms of the harmful effects of the change, i.e. the effects of the hazards associated with safety risks. These could be the result of a preliminary safety assessment, if available, or an early hazard analysis that concentrates on the service level effects. For service providers other than air traffic services providers, the consequences should be expressed in terms of what aspects of the performance of the service are impacted by the change.

(g) The point of contact, as required in point (j) in AMC1 ATM/ANS.OR.A.045(a), provides a focal point for the competent authority to contact when seeking complementary information about the change when required. The aim is to improve communications between the provider and the competent authority about the change.

(h) All notified changes should be unambiguously identified. The service provider and its competent authority should agree on a means of referencing so as to associate a unique identifier to a given notified change.

(i) For routine changes, the notification to the competent authority may be done in a simpler manner, e.g. using forms less detailed than those specified in AMC1 ATM/ANS.OR.A.045(a) or notifying these changes collectively after being implemented at regular periods of times agreed between the provider and the competent authority. A service provider and its competent authority should coordinate so as to reach a common agreement on these types of changes that may not be reviewed by the competent authority. The list of such changes should be documented and formalised. The formalised agreement becomes part of the change management procedures identified in ATM/ANS.OR.B.010. Consequently, the list will be reviewed by the competent authority as part of the audits it performs that are described in ATM/ANS.AR.C.010(a). The relevant audit activity is detailed in AMC1 ATM/ANS.AR.C.010(a)(a)(2).

AMC1 ATM/ANS.OR.A.045(a)(3) Changes to a functional system

ED Decision 2017/001/R

NOTIFICATION TO USERS OF THE SERVICE

Having notified a change, the service provider should:

(a) individually inform all known service providers potentially affected by the notified change; and

(b) inform all aviation undertakings potentially affected by the change either individually or via a representative body of aviation undertakings or by publishing details of the planned change in a dedicated publication of the service provider or aeronautical information publications such as an aeronautical information circular (AIC).

GM1 ATM/ANS.OR.A.045(a)(3) Changes to a functional system

ED Decision 2017/001/R

DEDICATED PUBLICATION FOR PROPOSED CHANGES

The final users of services potentially affected by a change to a functional system may not be known by the service provider proposing the change. However, this should not prevent the service provider from using other means for notification than direct communication with the interested parties. In that case, the changes may be published in a dedicated website where the users of the service can periodically check for current proposed changes to the functional system that may affect them.

AMC1 ATM/ANS.OR.A.045(b) Changes to a functional system

ED Decision 2017/001/R

MODIFICATION OF A NOTIFIED CHANGE

(a) The service provider should inform the competent authority that was initially notified about any update in the notification data when the information provided in a previous notification about the same change is no longer valid or when information previously missing becomes available. The other service providers and aviation undertakings should also be informed, when they are affected by the new data.

(b) The cancellation of a previously notified change should be considered as a modification of a notified change. Therefore, the service provider should inform about this update the competent

authority, and inform other service providers and aviation undertakings that were initially informed about the change.

AMC1 ATM/ANS.OR.A.045(c); (d) Changes to a functional system

ED Decision 2017/001/R

ENTRY INTO OPERATIONAL SERVICE OF A CHANGE SELECTED FOR REVIEW

The service provider should not start the implementation of any part of the change that has the potential to affect the safety of the services currently being provided until a valid safety (support) assessment for that part of the change exists and, if the change is subject to competent authority review, it has been approved by the competent authority.

GM1 ATM/ANS.OR.A.045(c); (d) Changes to a functional system

ED Decision 2017/001/R

TRANSITION INTO SERVICE

(a) No matter whether the competent authority has decided to review the notified change or not, the service provider should not start the implementation of any part of the change that has the potential to affect the safety of any of the services it provides, e.g. the functions performed or the performance of the services, until it has produced a valid argument in accordance with ATS.OR.205(a)(2) or/and ATM/ANS.OR.C.005(a)(2), as appropriate.

(b) Implementation of the change, which means the creation and installation of the items to be used in the changed operational system may or may not affect the performance of the current services offered by the service provider. For example, much of the implementation of equipment and procedures can be performed 'off line', i.e. in development facilities that do not interact with the operational services and installation may be started, provided the items are not connected to the operational system and their presence in the operational environment does not affect the current services. However, these items must not be introduced into the operational system, i.e. they must not affect the behaviour of any operational service, until a valid assurance case exists and, if the change is subject to competent authority review, before the competent authority has approved the change.

(c) The installation of an artefact may have an impact on services other than the service being changed. This can happen where the installation involves disrupting these other services, e.g. aerodrome operations may be disrupted because runways or taxiways are being used by constructor's vehicles or are being interfered with. In this case, the scope of the change includes these other services (please refer to ATM/ANS.OR.C.005(a)(1)(iii) & (iv) or ATS.OR.205(a)(1)(iii) & (iv), as appropriate) and the assessment of the change includes the effects installation may have on them, including where the installation does not go according to plan.

AMC1 ATM/ANS.OR.A.045(e) Changes to the functional system

ED Decision 2017/001/R

CHANGES AFFECTING MULTIPLE SERVICE PROVIDERS — OVERARCHING SAFETY ARGUMENT

A change as defined in ATM/ANS.OR.A.045(e) may involve more than one service provider changing their functional systems. In this case, the change will consist of a set of changes to different ATM/ANS functional systems or their context. However, no matter how many individual changes to service providers' functional systems are part of the change, they should be coordinated. An overarching

safety argument, coherent with the arguments of the individual changes, that claims the complete change is safe should be provided.

GM1 ATM/ANS.OR.A.045(e) Changes to the functional system

ED Decision 2017/001/R

CHANGES AFFECTING MULTIPLE SERVICE PROVIDERS AND AVIATION UNDERTAKINGS — GENERAL

(a) Any change proposed by a service provider as defined in ATM/ANS.OR.A.045(a) affects other service providers and/or aviation undertakings when:

(1) the proposed change may alter the service delivered to other service providers and aviation undertakings as users of that service; or

(2) the proposed change may alter the operational context in which the services of other service providers and aviation undertakings are delivered or in which the aviation undertakings are operating.

(b) The changes referred to in ATM/ANS.OR.A.045(e) could be considered 'multi-actor changes' and are those changes that require coordination between the service provider(s) proposing the change and any service providers and aviation undertakings affected by the change(s) due to the presence of dependencies between the service providers that planned the change and other affected service providers and/or other aviation undertakings. This coordination is essential to ensure a correct safety (support) assessment when there are dependencies.

(c) A single-actor change is one that is limited to those cases where a change to a service provider's functional system alters neither the service nor the operational context of other service providers and aviation undertakings.

GM2 ATM/ANS.OR.A.045(e) Changes to the functional system

ED Decision 2017/001/R

AFFECTED STAKEHOLDERS — SERVICE PROVIDERS AND AVIATION UNDERTAKINGS

(a) 'Other service providers' mentioned in ATM/ANS.OR.A.045(e) refers to European service providers other than the service provider proposing the change, that are regulated in accordance with Regulation (EC) No 216/2008 and its implementing rules;

(b) Aviation undertakings affected by the change included in ATM/ANS.OR.A.045(e) can be understood as the stakeholders and professional associations with dependencies with the changed service, and may include the following:

(1) service providers that do not fall under the remit of Regulation (EC) No 216/2008 and its implementing rules, e.g. non-European service providers;

(2) aerodrome operators;

(3) aircraft operators;

(4) airframe and equipment manufacturers;

(5) maintenance organisations;

(6) regulatory bodies, e.g. European Commission, EASA, national aviation authorities (NAAs); and

(7) other bodies not regulated by Regulation (EC) No 216/2008 and its implementing rules, e.g. power suppliers or military authorities.

GM3 ATM/ANS.OR.A.045(e) Changes to the functional system

ED Decision 2017/001/R

CHANGE AFFECTING MULTIPLE SERVICE PROVIDERS AND AVIATION UNDERTAKINGS — COORDINATION

(a) ATM/ANS.OR.A.045(e) applies to all the affected service providers involved in the change, and, therefore, they should coordinate dependencies as well as shared assumptions and shared risk mitigations. They should only use the agreed and aligned assumptions and mitigations that are related to more than one service provider or aviation undertaking in their safety or safety support cases, as required by ATM/ANS.OR.A.045(f).

(b) Assumptions and risk mitigations used during the assessment of the change that are not shared by the affected service providers, can be handled independently by each service provider, and do not need agreement.

(c) This coordination means that the affected service providers:

(1) have jointly identified the scope of their responsibilities with regard to the change, and in particular their safety responsibilities, e.g. what part of the change will be covered in whose safety (support) assessment case;

(2) have jointly identified the dependencies;

(3) have jointly identified the hazards associated with the change in the common context;

(4) have mutually agreed on the assumptions for the change that jointly relate to them; and

(5) have mutually agreed on the mitigations for risks that require joint implementation.

(d) Service providers would need to achieve a common understanding about:

(1) consequences in the shared operational context; and

(2) chains of causes/consequences.

(e) Service providers would jointly need to identify their dependencies to be able to assess the change to their functional systems.

(f) Where necessary in relation to the dependences identified in accordance with GM1 ATM/ANS.OR.A.045(e)(1), the service providers may perform together:

(1) identification of hazards/effects;

(2) assessment of risks;

(3) evaluation of risks;

(4) planning and assessment of risk mitigations; and

(5) verification.

(g) The level of interaction and coordination between service providers and aviation undertakings will vary depending on the particular needs of the change at hand.

GM4 ATM/ANS.OR.A.045(e) Changes to a functional system

ED Decision 2017/001/R

COORDINATION WITH AFFECTED AVIATION UNDERTAKINGS

(a) The aviation undertakings are the entities, persons or organisations as defined in point 34 of Annex I to Regulation (EU) 2017/373 and thus, ATM/ANS.OR.A.045(e) does not apply to them. However, any service provider affected by a change should seek the participation of aviation undertakings when assumptions and risk mitigations used in the safety (support) assessment are shared with those aviation undertakings.

(b) When the number of aviation undertakings affected by the change is large, the service providers may not need to involve every individual stakeholder. If a body can represent the views of a group of affected aviation undertakings, it may suffice to involve that representative body to obtain the supporting evidence to move forward with the assessment of the change.

GM1 ATM/ANS.OR.A.045(e)(2) Changes to a functional system

ED Decision 2017/001/R

CHANGE AFFECTING MULTIPLE SERVICE PROVIDERS AND AVIATION UNDERTAKINGS — ASSUMPTIONS AND RISK MITIGATIONS

In order to satisfy ATM/ANS.OR.A.045(e)(2), the affected service providers coordination will identify those assumptions and risk mitigations that relate to:

(a) more than one service provider;

(b) a service provider and one or more aviation undertakings; or

(c) multiple service providers and aviation undertakings.

GM1 ATM/ANS.OR.A.045(f) Changes to a functional system

ED Decision 2017/001/R

LACK OF COORDINATION

(a) If an aviation undertaking decides not to cooperate, the service provider, who has identified dependencies with the aviation undertaking, in accordance with ATM/ANS.OR.A.045(e)(1), needs to consider the impact of having the assumptions and risk mitigations not agreed with that aviation undertaking. It should propose a way forward by doing one or more of the following:

(1) making the assumptions themselves and providing evidence that supports them;

(2) adding additional mitigating measures so that the change remains acceptably safe;

(3) modifying the scope of the change, or even reconsidering and cancelling the change.

(b) The service provider affected by a lack of cooperation with an aviation undertaking may wish to inform its competent authority about those aviation undertakings that are not participating and its form of non-participation, in order to seek the assistance of the competent authority in trying to persuade the aviation undertaking to participate.

ATM/ANS.OR.A.050 Facilitation and cooperation

Regulation (EU) 2017/373

A service provider shall facilitate inspections and audits by the competent authority or by a qualified entity acting on its behalf and it shall cooperate as necessary for the efficient and effective exercise of the powers of the competent authorities referred to in Article 5.

ATM/ANS.OR.A.055 Findings and corrective actions

Regulation (EU) 2017/373

After receipt of notification of findings from the competent authority, the service provider shall:

(a) identify the root cause of the non-compliance;

(b) define a corrective action plan that meets the approval by the competent authority;

(c) demonstrate corrective action implementation to the satisfaction of the competent authority within the time period proposed by the service provider and agreed with that authority, as defined in point ATM/ANS.AR.C.050(e).

GM1 ATM/ANS.OR.A.055 Findings and corrective actions

ED Decision 2017/001/R

GENERAL

(a) Corrective action is the action taken to eliminate or mitigate the root cause(s) and prevent the recurrence of existing detected non-compliance or other undesirable condition or situation.

(b) The proper determination of the root cause is crucial for defining effective corrective actions.

AMC1 ATM/ANS.OR.A.055(b) Findings and corrective actions

ED Decision 2017/001/R

GENERAL

The corrective action plan defined by the service provider should address the effects of the non-conformity and its root cause.

AMC1 ATM/ANS.OR.A.055(c) Findings and corrective actions

ED Decision 2017/001/R

CORRECTIVE ACTION IMPLEMENTATION PERIOD — DAT PROVIDERS

In case of a Level 1 finding, the DAT provider should demonstrate corrective action to the satisfaction of the competent authority within a period of no more than 21 working days following receipt of written confirmation of the finding. At the end of this period and subject to the nature of the finding, the 21-working-day period may be extended and agreed by the competent authority when the safety issue is mitigated.

ATM/ANS.OR.A.060 Immediate reaction to a safety problem

Regulation (EU) 2017/373

A service provider shall implement any safety measures, including safety directives, mandated by the competent authority in accordance with point ATM/ANS.AR.A.025(c).

ATM/ANS.OR.A.065 Occurrence reporting

Regulation (EU) 2017/373

(a) A service provider shall report to the competent authority, and to any other organisation required by the Member State where the service provider provides its services, any accident, serious incident and occurrence as defined in Regulation (EU) No 996/2010 of the European Parliament and of the Council[1] and Regulation (EU) No 376/2014.

(b) Without prejudice to point (a), the service provider shall report to the competent authority and to the organisation responsible for the design of system and constituents, if different from the service provider, any malfunction, technical defect, exceeding of technical limitations, occurrence, or other irregular circumstance that has or may have endangered the safety of services and that has not resulted in an accident or serious incident.

(c) Without prejudice to Regulations (EU) No 996/2010 and (EU) No 376/2014, the reports referred to in points (a) and (b) shall be made in a form and manner established by the competent authority and contain all the pertinent information about the event known to the service provider.

(d) Reports shall be made as soon as possible and in any case within 72 hours of the service provider identifying the details of the event to which the report relates unless exceptional circumstances prevent this.

(e) Without prejudice to Regulation (EU) No 376/2014, where relevant, the service provider shall produce a follow-up report to provide details of actions it intends to take to prevent similar occurrences in the future, as soon as these actions have been identified. This report shall be produced in a form and manner established by the competent authority.

AMC1 ATM/ANS.OR.A.065 Occurrence reporting

ED Decision 2017/001/R

REPORTING PROCEDURES

The service provider should establish procedures to be used for reporting to the competent authority and any other organisation required which include:

(a) description of the applicable requirements for reporting;

(b) description of the reporting mechanism, including reporting forms, means and deadlines;

(c) personnel responsible for reporting; and

(d) description of mechanism and personnel responsibilities for identifying root causes, and the actions that may be needed to be taken to prevent similar occurrences in the future, as appropriate.

[1] Regulation (EU) No 996/2010 of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation and repealing Directive 94/56/EC (OJ L 295, 12.11.2010, p. 35).

GM1 ATM/ANS.OR.A.065 Occurrence reporting

ED Decision 2017/001/R

GENERAL

The reporting to the organisations defined in the ATM/ANS.OR.A.065 does not affect the need to report to other organisations with which the service provider interfaces, and which might be involved in or be affected by the reported event (e.g. other service providers involved in an occurrence, aerodrome operators, etc.).

AMC1 ATM/ANS.OR.A.065(a) Occurrence reporting

ED Decision 2017/001/R

GENERAL

(a) The service provider should submit all reportable occurrences as defined in Regulation (EU) No 2015/1018[1].

(b) In addition to the reports required by (a), the service provider should report volcanic ash clouds, encountered by aircraft operators, for which it has become aware of.

GM1 ATM/ANS.OR.A.065(b) Occurrence reporting

ED Decision 2017/001/R

SYSTEMS AND CONSTITUENTS

(a) When determining which failures of systems and constituents are to be reported, a degree of practicality is required as it is not intended that every failure is reported. Only those that have or may have an impact on the safety of the provision of services are reported.

(b) When nothing is defined in European Union or national legislation, the determination of the failures of systems and constituents that need to be reported is done by the service provider and needs to be approved by the competent authority. This determination can be done as a result of an assessment of the installations or changes to the systems and constituents.

(c) The organisation responsible for the design of the systems and constituents may no longer exist or may no longer support the design. In this case, the service provider will have made arrangements to ensure that the safety of the systems and constituents can be assured by appropriate and practical means. In many cases, this means that the service provider has taken over the design responsibilities.

(d) Within the application of Regulation (EC) No 552/2004, the organisation responsible for the design of the constituent will be the entity that signs the Declaration of Conformity or Suitability for use. For systems and constituents which existed before the applicability date of Regulation (EC) No 552/2004, the service provider should identify the responsible organisation, otherwise the service provider should make appropriate arrangements.

[1] 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).

ATM/ANS.OR.A.070 Contingency plans

Regulation (EU) 2017/373

A service provider shall have in place contingency plans for all the services it provides in the case of events which result in significant degradation or interruption of its operations.

GM1 ATM/ANS.OR.A.070 Contingency plans

ED Decision 2017/001/R

GENERAL

The contingency plan may include the definition of the measures, the coordination with other actors (i.e. the State, the competent authorities, possibly the other service providers, the insurance companies, aerodrome operators, as applicable) and alternative services needed in case of degradation or interruption of the services, while the applicability of emergency response planning may be attributable to or affected by an aviation safety occurrence.

ATM/ANS.OR.A.075 Open and transparent provision of services

Regulation (EU) 2017/373

(a) A service provider shall provide its services in an open and transparent manner. It shall publish the conditions of access to its services and changes thereto and establish a consultation process with the users of its services on a regular basis or as needed for specific changes in service provision, either individually or collectively.

(b) A service provider shall not discriminate on grounds of nationality or other characteristic of the user or the class of users of its services in a manner that is contrary to Union law.

AMC1 ATM/ANS.OR.A.075(a) Open and transparent provision of services

ED Decision 2017/001/R

GENERAL — PROVIDERS OF AIR NAVIGATION SERVICES AND AIR TRAFFIC FLOW MANAGEMENT

Providers of air navigation services and air traffic flow management should consult with the users of their services at least once a year.

SUBPART B — MANAGEMENT (ATM/ANS.OR.B)

ATM/ANS.OR.B.001 Technical and operational competence and capability

Regulation (EU) 2017/373

A service provider shall ensure that it is able to provide its services in a safe, efficient, continuous and sustainable manner, consistent with any foreseen level of overall demand for a given airspace. To this end, it shall maintain adequate technical and operational capacity and expertise.

GM1 ATM/ANS.OR.B.001 Technical and operational competence and capability

ED Decision 2017/001/R

TECHNICAL AND OPERATIONAL CAPACITY

Technical and operational capacity should include a sufficient number of personnel to perform its tasks and discharge its responsibilities.

ATM/ANS.OR.B.005 Management system

Regulation (EU) 2017/373

(a) A service provider shall implement and maintain a management system that includes:

(1) clearly defined lines of responsibility and accountability throughout its organisation, including a direct accountability of the accountable manager;

(2) a description of the overall philosophies and principles of the service provider with regard to safety, quality, and security of its services, collectively constituting a policy, signed by the accountable manager;

(3) the means to verify the performance of the service provider's organisation in light of the performance indicators and performance targets of the management system;

(4) a process to identify changes within the service provider's organisation and the context in which it operates, which may affect established processes, procedures and services and, where necessary, change the management system and/or the functional system to accommodate those changes;

(5) a process to review the management system, identify the causes of substandard performance of the management system, determine the implications of such substandard performance, and eliminate or mitigate such causes;

(6) a process to ensure that the personnel of the service provider are trained and competent to perform their duties in a safe, efficient, continuous and sustainable manner. In this context, the service provider shall establish policies for the recruitments and training of its personnel;

(7) a formal means for communication that ensures that all personnel of the service provider are fully aware of the management system that allows critical information to be conveyed and that makes it possible to explain why particular actions are taken and why procedures are introduced or changed.

(b) A service provider shall document all management system key processes, including a process for making personnel aware of their responsibilities, and the procedure for the amendment of those processes.

(c) A service provider shall establish a function to monitor compliance of its organisation with the applicable requirements and the adequacy of the procedures. Compliance monitoring shall include a feedback system of findings to the accountable manager to ensure effective implementation of corrective actions as necessary.

(d) A service provider shall monitor the behaviour of its functional system and, where underperformance is identified, it shall establish its causes and eliminate them or, after having determined the implication of the underperformance, mitigate its effects.

(e) The management system shall be proportionate to the size of the service provider and the complexity of its activities, taking into account the hazards and associated risks inherent in those activities.

(f) Within its management system, the service provider shall establish formal interfaces with the relevant service providers and aviation undertakings in order to:

(1) ensure that the aviation safety hazards entailed by its activities are identified and evaluated, and the associated risks are managed and mitigated as appropriate;

(2) ensure that it provides its services in accordance with the requirements of this Regulation.

(g) In the case that the service provider holds also an aerodrome operator certificate, it shall ensure that the management system covers all activities in the scope of its certificates.

GM1 ATM/ANS.OR.B.005 Management system

ED Decision 2017/001/R

DEFINITIONS AND CONCEPT OF MANAGEMENT SYSTEM

(a) ISO 9000:2005 defines a management system as a 'set of interrelated or interacting elements to establish policy and objectives and to achieve those objectives'.

(b) Another available definition of management system is the following: ‘The structure, processes and resources needed to establish an organisation's policy and objectives and to achieve those objectives.'

(c) Traditionally, separate management systems were developed to address issues such as safety, quality, environment, health and safety, finance, human resources, information technology and data protection. However, it is foreseen that more and more the services providers will establish integrated management systems following the harmonised set of requirements in this Regulation.

(d) The Regulation does not require that the different management systems are integrated but it facilitates their integration.

GM2 ATM/ANS.OR.B.005 Management system

ED Decision 2017/001/R

RELATIONSHIP BETWEEN THE TYPE OF SERVICE AND SAFETY MANAGEMENT — QUALITY MANAGEMENT

(a) All service providers are required to establish and maintain a management system. However, only an air traffic services provider can have managerial control over functions directly affecting the safety of the flight (e.g. the ATCO to separate aircraft from each other). Hence, the management system requirements in Annex III, which apply to all service providers, are more broadly associated with the quality of the service rather than the safety of the service. Annex IV (Part-ATS) has specific safety management requirements for the provision of air traffic services. Therefore, only the air traffic services provider (that providing air traffic control, alerting service, air traffic advisory service or flight information service) is required to have a safety management system and undertake safety assessment of changes to the functional system.

(b) Service providers other than the air traffic services provider can still affect the safety of the flight through functions or services they provide, but this will always be influenced by the way in which the air traffic services provider or airspace user are using those functions or services. Therefore, service providers other than air traffic services providers have a management system which manages the performance of service (rather than the safe use of their services for flight navigation and the control which is beyond the managerial control of the service provider). This performance of the service refers to such properties of the service provided such as accuracy, reliability, integrity, availability, timeliness, etc.

(c) It is quite likely that air traffic services providers have contractual arrangements in place with other service providers, whose services they use, specifying the required performance and requiring the service provider to inform, in a timely manner, the air traffic services provider of any impact on the performance of services supplied.

(d) When the service provider other than an air traffic services provider provides services or functions directly to a flight (e.g. MET) without involving air traffic services, then the safe use of those services is the responsibility of the users of those services.

(e) When the air traffic services provider also provides other services, it may choose to combine the necessary performance and safety management activities into an integrated management system covering all services.

AMC1 ATM/ANS.OR.B.005(a) Management system

ED Decision 2017/001/R

GENERAL

An ISO 9001 certificate, issued by an appropriately accredited organisation, addressing the quality management elements required in this Subpart should be considered a sufficient means of compliance for the service provider. In this case, the service provider should accept the disclosure of the documentation related to the certification to the competent authority upon the latter's request.

GM1 to AMC1 ATM/ANS.OR.B.005(a) Management system

ED Decision 2017/001/R

GENERAL

ISO 9001 Certificate(s) covers (cover) the quality management elements of the management system. Other elements required by this Regulation in reference to the management system that are not covered by the ISO 9001 certificate issued by an appropriately accredited organisation should be subject to oversight by the competent authority.

GM2 to AMC1 ATM/ANS.OR.B.005(a) Management system

ED Decision 2017/001/R

GENERAL — FOR ATS PROVIDERS

An ISO 9001 certificate may not give the presumption of compliance with the provisions of ATS.OR.200 'Safety management system'.

AMC2 ATM/ANS.OR.B.005(a) Management system

ED Decision 2017/001/R

GENERAL — TYPE 1 DAT PROVIDERS

An ISO 9001 or EN 9100 certificate issued by an appropriately accredited organisation addressing the quality management elements required in the respective Subparts should be considered a sufficient means of compliance for the Type 1 DAT provider. In this case, the Type 1 DAT provider should accept the disclosure of the documentation related to the certification to the competent authority upon its request.

GM1 to AMC2 ATM/ANS.OR.B.005(a) Management system

ED Decision 2017/001/R

GENERAL — TYPE 1 DAT PROVIDERS

ISO 9001/EN 9100 Certificate(s) covers (cover) the quality management elements of the management system. Other elements required by this Regulation in reference to the management system that are not covered by the ISO 9001/EN 9100 certificate issued by an appropriately accredited organisation should be subject to oversight by the competent authority.

AMC3 ATM/ANS.OR.B.005(a) Management system

ED Decision 2017/001/R

GENERAL — TYPE 2 DAT PROVIDERS

An EN 9100 certificate issued by an appropriately accredited organisation addressing the quality management elements required in the respective Subparts should be considered as a sufficient means of compliance for the Type 2 DAT provider. In this case, the Type 2 DAT provider should accept the disclosure of the documentation related to the certification to the competent authority upon its request.

GM1 to AMC3 ATM/ANS.OR.B.005(a) Management system

ED Decision 2017/001/R

EN 9100 CERTIFICATE — TYPE 2 DAT PROVIDERS

EN 9100 Certificate(s) covers (cover) the quality management elements of the management system. Other elements required by this Regulation in reference to the management system that are not covered by EN 9100 certificate issued by an appropriately accredited organisation should be subject to oversight by the competent authority.

AMC4 ATM/ANS.OR.B.005(a) Management system

ED Decision 2017/001/R

GENERAL — NON-COMPLEX SERVICE PROVIDERS

(a) The policy should include a commitment to improve towards the highest standards, comply with all the applicable legal requirements, meet all the applicable standards, consider the best practices, and provide the appropriate resources.

(b) The compliance monitoring task may be exercised by the accountable manager, provided that he or she has demonstrated having the related competence as defined in point (b)(4) of GM1 ATM/ANS.OR.B.005(c).

(c) Risk management may be performed using hazard checklists or similar risk management tools or processes, which are integrated into the activities of the service provider.

(d) A service provider should manage associated risks related to changes, as applicable. Management of changes should be a documented process to identify external and internal changes.

(e) A service provider should identify persons who fulfil the role of managers and who are responsible with regard to safety, quality and security of its services, as applicable. These persons may be accountable managers or individuals with an operational role in the service provider.

GM1 ATM/ANS.OR.B.005(a)(1) Management system

ED Decision 2017/001/R

RESPONSIBILITIES AND ACCOUNTABILITIES

(a) Senior management should ensure that responsibilities and accountabilities are defined and communicated within the service provider and documented within the management system. In the context of this rule, ‘responsibilities’ refers to obligations that can be delegated and ‘accountabilities’ refers to obligations that cannot be delegated.

(b) The appointment of an accountable manager who is given the required authorities and responsibilities, requires that the individual has the necessary attributes to fulfil the role. The accountable manager may have more than one function in the organisation. Nonetheless, the accountable manager’s role is to ensure that the management system is properly implemented and maintained through the allocation of resources and tasks.

AMC1 ATM/ANS.OR.B.005(a)(2) Management system

ED Decision 2017/001/R

POLICY

(a) The policy should:

(1) be signed by the accountable manager;

(2) reflect organisational commitments regarding performance of its services and safety, where applicable, and its proactive and systematic management;

(3) include reporting principles; and

(4) include a commitment to:

(i) improve towards the highest performance standards so as to support the achievement of the highest level of safety;

(ii) comply with all applicable legislation and requirements, meet all applicable standards and consider best practices;

(iii) continually improve the effectiveness of the management system;

(iv) provide appropriate resources;

(v) enforce the performance of the service required to support the achievement of the highest level of safety in the airspace where the service is provided as one primary responsibility of all managers; and

(vi) that the purpose of reporting is improvement and not to apportion blame to individuals.

(b) Senior management should:

(1) ensure that the policy:

(i) is appropriate to the purpose of service providers;

(ii) provides a framework for establishing and reviewing objectives in relation to the provision of the service;

(iii) is communicated and understood within the service provider; and

(iv) is reviewed for continuing suitability;

(2) continually promote the policy to all personnel and demonstrate their commitment to it;

(3) provide necessary and appropriate human and financial resources for its implementation; and

(4) establish objectives in relation to the provision of the services and performance standards.

GM1 ATM/ANS.OR.B.005(a)(2) Management system

ED Decision 2017/001/R

POLICY FOR AIR TRAFFIC SERVICES PROVIDERS VS POLICY FOR ALL OTHER SERVICE PROVIDERS

If a service provider does not undertake the provision of air traffic services, then the policy will be recognisable more as a quality policy that is concerned with the performance of the service and conformance to the service provision requirements supporting the achievement of the highest level of safety in the airspace where the service is provided. Should the service provider undertake the provision of air traffic services, then ATS.OR.200 also applies and the policy will need to be expanded to include both the safety and the quality of the service.

GM2 ATM/ANS.OR.B.005(a)(2) Management system

ED Decision 2017/001/R

POLICY — NON-COMPLEX SERVICE PROVIDERS

The policy is the means whereby the service provider states its intention to maintain and, where practicable, improve performance levels in all their activities and to minimise their contribution to the risk of an aircraft accident as far as is reasonably practicable.

GM3 ATM/ANS.OR.B.005(a)(2) Management system

ED Decision 2017/001/R

SAFETY CULTURE

The policy should actively encourage effective safety reporting and, by defining the line between acceptable performance (often unintended errors) and unacceptable performance (such as negligence, recklessness, violations or sabotage), provide fair protection to reporters. A safety or just culture may not, however, preclude the 'criminalisation of error', which is legally, ethically and morally within the sovereign rights of any Member State, provided that European Union law and established international agreements are observed. A judicial investigation, and consequences of some form, may be expected following an accident or serious incident especially if a system failure resulted in lives lost or property damaged, even if no negligence or ill intent existed. A potential issue could, therefore, exist if voluntary hazard reports, which relate to latent deficiencies of a system or its performance, are treated in the same way as those concerning accident and serious incident investigations. The intent of protecting hazard reports should not challenge the legitimacy of a judicial investigation or demand undue immunity.

AMC1 ATM/ANS.OR.B.005(a)(3) Management system

ED Decision 2017/001/R

MANAGEMENT OF METEOROLOGICAL SERVICES PERFORMANCE

(a) The management system of the meteorological service provider should provide users with assurance that the meteorological information supplied complies with the stated requirements in terms of geographical and spatial coverage, format and content, time and frequency of issuance and period of validity, as well as the accuracy of measurements, observations and forecasts.

(b) When the management system indicates that the meteorological information to be supplied to users does not comply with the stated requirements, and automatic error correction procedures are not appropriate, such information should not be supplied to users unless it is validated with the originator.

(c) In regard to the exchange of meteorological information for operational purposes, the management system should include verification and validation procedures and resources for monitoring adherence to the prescribed transmission schedules for individual messages and/or bulletins required to be exchanged as well as the times of their filing for transmission. The management system should be capable of detecting excessive transit times of messages and bulletins received.

AMC2 ATM/ANS.OR.B.005(a)(3) Management system

ED Decision 2017/001/R

SAFETY PERFORMANCE MONITORING AND MEASUREMENT — ATS PROVIDER

(a) Safety performance monitoring and measurement should be the process by which the safety performance of the air traffic services providers is verified in comparison to the safety policy and the safety objectives established by the air traffic services provider.

(b) This process should include:

(1) safety reporting;

(2) safety studies encompassing broad safety concerns;

(3) safety reviews including trends reviews, which would be conducted during introduction and deployment of new technologies, change or implementation of procedures, or in situations of structural change in operations;

(4) safety audits focusing on the integrity of the air traffic services provider's management system, and periodically assessing the status of safety risk controls; and

(5) safety surveys, examining particular elements or procedures of a specific operation, such as problem areas or bottlenecks in daily operations, perceptions and opinions of operational personnel, and areas of dissent or confusion.

GM1 to AMC2 ATM/ANS.OR.B.005(a)(3) Management system

ED Decision 2017/001/R

SAFETY SURVEYS — COMPLEX AIR TRAFFIC SERVICES PROVIDER

(a) An air traffic services provider should:

(1) initiate safety surveys and ensure that all safety-related activities within its scope are addressed periodically;

(2) appoint an appropriate survey leader and survey team whose expertise is in accordance with the particular requirements of the intended survey, taking due account of the desirability of including staff from outside areas where relevant, and being mindful of the opportunity such an activity provides for staff development and engagement;

(3) define an annual safety survey plan;

(4) take immediate remedial action as soon as any safety-related shortcomings are identified;

(5) ensure that the actions identified in the action plans are carried out within the specified timescales; and

(6) ensure that examples of lesson learning and good practice arising from safety surveys are disseminated and acted upon.

(b) The survey leader should:

(1) carry out the survey;

(2) record the results;

(3) make recommendations; and

(4) agree actions with the relevant operational management.

(c) The survey team should assist the survey leader in fulfilling their responsibilities as determined by the survey leader.

(d) Safety surveys may be initiated by a number of means such as occurrence reports, safety performance, suggestions from members of staff, etc.

(e) Safety surveys may be documented in a safety survey report which should also contain the specific actions that will be taken to address the recommendations. The actions should specify those responsible for completion and the target dates. The actions should be tracked to closure through an action plan. This action plan may be implemented as part of an existing locally or centrally managed action tracker.

(f) A typical safety survey report would require the following content:

(1) Front sheet:

(i) reference number;

(ii) title;

(iii) survey period;

(iv) team members and team leader; and

(v) survey initiator;

(2) Survey description:

(i) introduction;

(ii) objective;

(iii) scope;

(iv) record of results;

(v) conclusions; and

(vi) recommendations and actions.

(g) Survey leader

The survey leader should be adequately trained and competent for the subject of the survey. Where this is not possible, at least one member of the survey team should be competent in the subject of the survey.

(h) Survey team

It is advantageous for the survey team to be multi-disciplined and, where possible, be drawn from differing parts of the air traffic services provider's organisation.

GM1 ATM/ANS.OR.B.005(a)(3) Management system

ED Decision 2017/001/R

SAFETY PERFORMANCE MONITORING AND MEASUREMENT — ATS PROVIDER

(a) The means to monitor performance is often through one or more leading or lagging indicators.

(b) Indicators and performance measures provide feedback on what is happening so that the air traffic services provider can take appropriate actions to respond to changing circumstances. The indicators provide information on:

(1) what is happening around the air traffic services provider;

(2) how well the air traffic services provider is doing;

(3) what has happened so far; and

(4) warning of impending problems or dangers that the air traffic services provider may need to take action to avoid.

(c) Although 'lagging' performance indicators that measure the final outcomes resulting from the air traffic services provider's activities are often considered as the most interesting, lagging indicators themselves may not provide enough information to guide the air traffic services provider's actions and ensure success.

(d) By measuring the inputs to a process, leading performance indicators can complement the use of lagging indicators and compensate for some of their shortcomings. Leading indicators can be used to monitor the effectiveness of control systems and give advance warning of any developing weaknesses before problems occur. One purpose of leading performance indicators is, therefore, to show the condition of systems before accidents, incidents, harm, damage or failure occurs. In this way, they can help to control risks and prevent mishaps.

(e) There is good evidence that when leading performance indicators are used correctly, they are effective in improving performance. However, there is also good evidence that they can be misused.

(f) For leading performance indicators to play an effective role in the improvement process, there should be an association between the inputs that the leading performance indicators measure and the desired lagging outputs. There needs to be a reasonable belief that the actions taken to improve leading performance indicators will be followed by an improvement in the associated lagging output indicators.

(g) The process for effective use of leading performance indicators can be summarised as:

(1) Identify where there are potential weaknesses or opportunities for improvement;

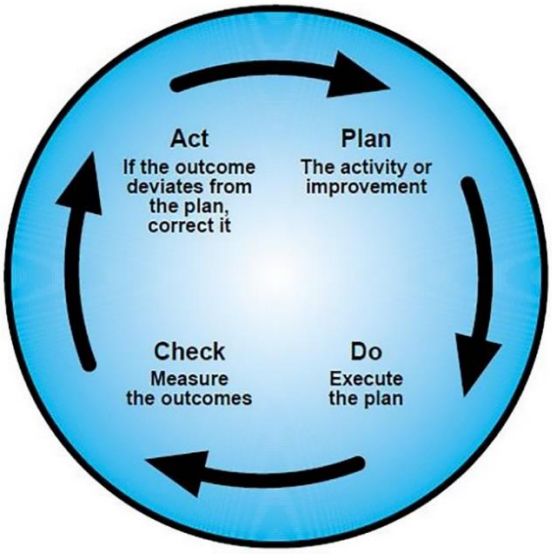
(2) Identify what can be done to counter weaknesses or deliver improvement;

(3) Set performance standards for the actions identified;

(4) Monitor performance against the standards;

(5) Take corrective actions to improve performance; and

(6) Repeat the process by using the following continuous improvement model:



(h) For any performance indicator to be effective, it is important that it is:

(1) objective and easy to measure and collect;

(2) relevant to the air traffic services provider whose performance is being measured;

(3) capable of providing immediate and reliable indications of the level of performance;

(4) cost-efficient in terms of the equipment, personnel and additional technology required to gather the information;

(5) understood and owned by the air traffic services provider whose performance is being measured;

(6) related to activities considered to be important for future performance;

(7) amenable to intervention/influence by the air traffic services provider whose performance is being measured;

(8) related to something where there is scope to improve; and

(9) a clear indication of a means to improve performance.

GM2 ATM/ANS.OR.B.005(a)(3) Management system

ED Decision 2017/001/R

PERFORMANCE MONITORING AND MEASUREMENT — SERVICE PROVIDER OTHER THAN AIR TRAFFIC SERVICES PROVIDER

A performance indicator (PI) is a type of performance measurement. An organisation may use PIs to evaluate its success, or to evaluate the success of a particular activity in which it is engaged. Sometimes success is defined in terms of making progress towards strategic goals, but often success is simply the repeated, periodic achievement of some level of operational goal (e.g. zero defects). Accordingly, choosing the right PIs relies upon a good understanding of what is important to the organisation. Since there is a need to understand well what is important, various techniques to assess the present state of the business, and its key activities, are associated with the selection of PIs. These assessments often lead to the identification of potential improvements, so performance indicators are routinely associated with 'performance improvement' initiatives. When PIs have performance targets associated with them, they are known as key performance indicators (KPIs).

GM1 ATM/ANS.OR.B.005(a)(4) Management system

ED Decision 2017/001/R

IDENTIFICATION OF CHANGES TO FUNCTIONAL SYSTEMS

This process is used by the service provider to correctly identify proposed changes. The changes dealt with in this GM are the proposed changes to the functional system. These can be triggered internally by changing circumstances that are related to the service provider of concern or externally by changing circumstances that are related to others or to the context in which the service operates, i.e. in situations where the service provider does not have managerial control over them. The triggers are called 'change drivers'.

(a) Identification of internal circumstances

(1) The procedure to identify changes needs to be embedded in all parts of the organisation that can modify the functional system, i.e. the operational system used to support the services provided. Examples of proposed changes to the functional system as a response to changing circumstances under the control of the organisation, therefore, include:

(i) changes to the way the components of the functional system are used;

(ii) changes to equipment, either hardware or software;

(iii) changes to roles and responsibilities of operational personnel;

(iv) changes to operating procedures;

(v) changes to system configuration, excluding changes during maintenance, repair and alternative operations that are already part of the accepted operational envelope;

(vi) changes that are necessary as a result of changing circumstances to the operational context under the managerial control of the provider that can impact the service, e.g. provision of service under new conditions;

(vii) changes that are necessary as a result of changing circumstances to the local physical (operational) environment of the functional system; and

(viii) changes to the working hours and/or shift patterns of key personnel which could impact on the safe delivery of services.

(2) These changes are often identified by the service provider using business processes, which will be used to identify changes planned for the medium and long term. Such processes can include:

(i) annual business plans;

(ii) strategic safety boards;

(iii) equipment replacement projects;

(iv) airspace reorganisation plans;

(v) introduction of new operational concepts, e.g. Free Flight;

(vi) accident and incident investigation reports; and

(vii) safety monitoring and safety surveys.

(b) Identification of external circumstances

The service provider should have processes in place to react appropriately to notifications received from those service providers that supply services to them. In addition, changes to the context that can impact on the service provided and are not under the managerial control of the service provider should be identified and treated as potential triggers. Furthermore, the service provider should negotiate contracts with unregulated service providers in accordance with ATM/ANS.OR.B.015 'Contracted activities' that place a responsibility on such organisations to inform them of planned changes to their services.

AMC1 ATM/ANS.OR.B.005(a)(5) Management system

ED Decision 2017/001/R

ASSESSMENT OF THE MANAGEMENT SYSTEM

(a) Senior management should assess the service provider's management system, at planned intervals, to ensure its continuing suitability, adequacy and effectiveness.

(b) The review should include assessing opportunities for improvement and the need for changes to the management system, including the policy and objectives.

(c) Records from management assessments should be maintained.

AMC1 ATM/ANS.OR.B.005(a)(6) Management system

ED Decision 2017/001/R

TRAINING AND COMPETENCY

A service provider should:

(a) determine the necessary competence for personnel performing activities supporting services provision;

(b) where applicable, provide training or take other actions to achieve the necessary competence;

(c) evaluate the effectiveness of the actions taken;

(d) ensure that personnel are aware of the relevance and importance of their activities and how they contribute to the achievement of the objectives; and

(e) maintain appropriate records of education, training, skills and experience.

AMC1 ATM/ANS.OR.B.005(a)(7) Management system

ED Decision 2017/001/R

COMMUNICATION RESPONSIBILITIES

The senior management should ensure that appropriate communication processes are established within the service provider and that communication takes place regarding the effectiveness of the management system.

AMC1 ATM/ANS.OR.B.005(b) Management system

ED Decision 2017/001/R

SERVICE PROVIDER'S MANAGEMENT SYSTEM DOCUMENTATION

A service provider's management system documentation should at least include the following information:

(a) a statement signed by the accountable manager to confirm that the service provider will continuously work in accordance with the applicable requirements and the service provider's documentation as required by this Part and other applicable Parts;

(b) the service provider's scope of activities;

(c) the titles and names of nominated postholders referred to in ATM/ANS.OR.B.020(b);

(d) the service provider's chart showing the lines of responsibility between the persons referred to in ATM/ANS.OR.B.020(b);

(e) a general description and location of the facilities referred to in ATM/ANS.OR.B.025;

(f) procedures describing the function and specifying how the service provider monitors and ensures compliance with the applicable requirements referred to in ATM/ANS.OR.B.005(c); and

(g) the amendment procedure for the service provider's management system documentation.

GM1 ATM/ANS.OR.B.005(b) Management system

ED Decision 2017/001/R

SERVICE PROVIDER'S MANAGEMENT SYSTEM DOCUMENTATION

(a) It is not required to duplicate information in several manuals. The information may be contained in the service provider's manuals (e.g. operations manual, training manual), which may also be combined.

(b) A service provider may also choose to document some of the information required to be documented in separate documents (e.g. procedures). In this case, it should ensure that manuals contain adequate references to any document kept separately. Any such documents are then to be considered an integral part of the service provider's management system documentation.

(c) A service provider's management system documentation may be included in a separate manual or in (one of) the manual(s) as required by the applicable subpart(s). A cross reference should be included.

AMC1 ATM/ANS.OR.B.005(c) Management system

ED Decision 2017/001/R

COMPLIANCE MONITORING — GENERAL FOR COMPLEX SERVICE PROVIDERS

(a) Compliance monitoring

The implementation and use of a compliance monitoring function should enable the service provider to monitor compliance with the relevant requirements of this Part and other applicable Parts.

(1) A service provider should specify the basic structure of the compliance monitoring function applicable to the activities conducted.

(2) The compliance monitoring function should be structured according to the size of the service provider and the complexity of the activities to be monitored, including those which have been subcontracted.

(b) A service provider should monitor compliance with the procedures they have designed to ensure that services are provided with the required safety levels and quality, as applicable. In doing so, they should as a minimum, and where appropriate, monitor:

(1) manuals, logs, and records;

(2) training standards; and

(3) management system procedures.

(c) Organisational set-up

(1) A person should be responsible for compliance monitoring to ensure that the service provider continues to meet the requirements of this Part and other applicable Parts. The accountable manager should ensure that sufficient resources are allocated for compliance monitoring.

(2) Personnel involved in the compliance monitoring should have access to all parts of service provider and, as necessary, any contracted organisation.

(3) In the case the person responsible for compliance monitoring acts also as safety manager, the accountable manager, with regard to his or her direct accountability for safety, should ensure that sufficient resources are allocated to both functions, taking into account the size of the service provider and the nature and complexity of its activities.

(4) The independence of the compliance monitoring function should be established by ensuring that audits and inspections are carried out by personnel not directly involved in the activity being audited.

(d) Compliance monitoring documentation

(1) Relevant documentation should include relevant part(s) of the service provider's management system documentation.

(2) In addition, relevant documentation should also include:

(i) terminology;

(ii) specified activity standards;

(iii) a description of the service provider;

(iv) allocation of duties and responsibilities;

(v) procedures to ensure compliance;

(vi) the compliance monitoring programme, reflecting:

(A) the schedule of the monitoring programme;

(B) audit procedures;

(C) reporting procedures;

(D) follow-up and corrective action procedures; and

(E) the record-keeping system;

(vii) the training syllabus referred to in (e)(2); and

(viii) document control.

(e) Training

(1) Correct and thorough training is essential to optimise compliance in every service provider. In order to achieve significant outcomes of such training, the service provider should ensure that all personnel understand the objectives as laid down in the service provider's management system documentation.

(2) Those responsible for managing the compliance monitoring function should receive training on this task. Such training should cover the requirements of compliance monitoring, manuals and procedures related to the task, audit techniques, reporting and recording.

(3) Time should be provided to train all personnel involved in compliance management and for briefing the remainder of the personnel.

(4) The allocation of time and resources should be governed by the volume and complexity of the activities concerned.

GM1 ATM/ANS.OR.B.005(c) Management system

ED Decision 2017/001/R

COMPLIANCE MONITORING ORGANISATIONAL SET-UP

(a) The role of the compliance monitoring may be performed by a compliance monitoring manager to ensure that the activities of the service provider are monitored for compliance with the applicable regulatory requirements and any additional requirements established by the service provider, and that these activities are being carried out properly under the supervision of other relevant nominated postholders and line managers.

(b) The compliance monitoring manager should:

(1) be responsible for ensuring that the compliance monitoring programme is properly implemented, maintained, and continually reviewed and improved;

(2) have direct access to the accountable manager;

(3) not be one of the line managers; and

(4) be able to demonstrate relevant knowledge, background and appropriate experience related to the activities of the service provider, including knowledge and experience in compliance monitoring.

(c) The compliance monitoring manager may perform all audits and inspections himself/herself or appoint one or more auditors by choosing personnel having the related competence as defined in point (b)(iii), either from within or outside the service provider.

(d) Regardless of the option chosen, it needs to be ensured that the independence of the audit function is not affected, in particular in cases where those performing the audit or inspection are also responsible for other activities within the service provider.

(e) In case external personnel are used to perform compliance audits or inspections:

(1) any such audits or inspections are performed under the responsibility of the compliance monitoring manager; and

(2) the compliance monitoring manager remains responsible for ensuring that the external personnel has relevant knowledge, background and experience as appropriate to the

activities being audited or inspected, including knowledge and experience in compliance monitoring.

(f) A service provider retains the ultimate responsibility for the effectiveness of the compliance monitoring function, in particular for the effective implementation and follow-up of all corrective actions.

AMC1 ATM/ANS.OR.B.005(d) Management system

ED Decision 2017/001/R

REACTION TO UNDERPERFORMANCE OF FUNCTIONAL SYSTEMS

If the cause of the underperformance is found to be:

(a) a flaw in the functional system, the service provider should initiate a change to the functional system either to remove the flaw or mitigate its effects;

(b) a flawed argument associated with a change to that functional system, the service provider should either:

(1) provide a valid argument; or

(2) where the service provider considers it more feasible, initiate a change to the functional system.

AMC1 ATM/ANS.OR.B.005(e) Management system

ED Decision 2017/001/R

SIZE, NATURE AND COMPLEXITY OF THE ACTIVITY

(a) An air traffic services provider should be considered as complex unless it is eligible to apply for a limited certificate and fulfils the criteria set out in ATM/ANS.OR.A.010(a).

(b) An air navigation services provider, other than an air traffic services provider, should be considered as complex unless it is eligible to apply for a limited certificate and fulfils the criteria set out in ATM/ANS.OR.A.010(b)(1).

(c) An aerodrome flight information services provider should be considered as complex unless it is eligible to apply for a limited certificate and fulfils the criteria set out in ATM/ANS.OR.A.010(b)(2).

(d) A service provider, other than an air navigation services provider, should be considered as complex when it has a workforce of more than 20 full-time equivalents (FTEs) involved in the activity subject to Regulation (EC) No 216/2008 and its implementing rules.

GM1 ATM/ANS.OR.B.005(e) Management system

ED Decision 2017/001/R

SIZE, NATURE AND COMPLEXITY OF THE ACTIVITY

(a) In consideration of the EUR 1 000 000 gross annual turnover referred to in ATM/ANS.OR.A.010(b)(1), this is assessed against the income the air navigation services provider generates in the provision of the services specified in Annex Vb to Regulation (EC) No 216/2008 and does not include any income generated by the air navigation services provider who undertakes other commercial activity that generates income.

(b) In consideration of operating regularly not more than one working position at any aerodrome referred to in ATM/ANS.OR.A.010(b)(2), this means that for the majority (i.e. greater than 50 %) of time an aerodrome is operational, only one working position is used.

(c) Table 3 below illustrates the circumstances under which the service provider could be considered as non-complex.

Type of service	Criteria to be complied with
Air traffic services	Eligible for limited certificate and meets criteria in ATM/ANS.OR.A.010(a)
CNS/MET/AIS	Eligible for limited certificate and meets criteria in ATM/ANS.OR.A.010(b)(1)
AFIS	Eligible for limited certificate and meets criteria in ATM/ANS.OR.A.010(b)(2)
ASM/ATFM/DAT	Workforce of 20 or less FTEs per service

Table 3: Non-complex service provider

GM1 ATM/ANS.OR.B.005(f) Management system

ED Decision 2017/001/R

GENERAL

Within the scope of this Regulation, only the air traffic services provider can identify hazards, assess the associated risks and mitigate or propose mitigating measures where necessary. This requirement implies that all service providers (air traffic services and non-air traffic services) establish formal interfaces (e.g. service level agreements, letters of understanding, memorandum of cooperation) between the relevant services providers themselves or between the service providers and other aviation undertakings (e.g. aerodrome operators) so as to ensure that hazards associated with the use of the services they provide are identified and the risks assessed and whenever needed mitigated. It does not imply that this has to be done by the service providers themselves (e.g. MET or AIS providers cannot do this by themselves) as only the air traffic services provider can, but they need to establish the interfaces with those service providers (ATS providers) or other aviation undertaking (e.g. aerodrome operators) who are able to do so. The formal interfaces could address the mitigation means put on the different providers (e.g. via requirements in a service level agreement).

GM2 ATM/ANS.OR.B.005(f) Management system

ED Decision 2017/001/R

LOCAL RUNWAY SAFETY TEAM

The service provider should participate in the local runway safety team (LRST) established by the aerodrome operator in accordance with AMC1 ADR.OR.D.027 and GM2 ADR.OR.D.027.

ATM/ANS.OR.B.010 Change management procedures

Regulation (EU) 2017/373

(a) A service provider shall use procedures to manage, assess and, if necessary, mitigate the impact of changes to its functional systems in accordance with points ATM/ANS.OR.A.045, ATM/ANS.OR.C.005, ATS.OR.205 and ATS.OR.210, as applicable.

(b) The procedures referred to in point (a) or any material modifications to those procedures shall:

(1) be submitted, for approval, by the service provider to the competent authority;

(2) not be used until approved by the competent authority.

(c) When the approved procedures referred to in point (b) are not suitable for a particular change, the service provider shall:

(1) make a request to the competent authority for an exemption to deviate from the approved procedures;

(2) provide the details of the deviation and the justification for its use to the competent authority;

(3) not use the deviation before being approved by the competent authority.

AMC1 ATM/ANS.OR.B.010(a) Change management procedures

ED Decision 2017/001/R

GENERAL

(a) The procedures, and the change of the procedures, used by a service provider to manage changes should cover the complete lifecycle of a change.

(b) The service provider should show that the procedures address all the actions and all the evidence needed in order to comply with the requirements laid down in ATM/ANS.OR.A.045, ATS.OR.205, ATS.OR.210, and ATM/ANS.OR.C.005, as appropriate. For that purpose, the service provider should use a compliance matrix, which shows:

(1) which part of a procedure addresses which part of the Regulation (i.e. the requirement of the implementing rule); and

(2) the rationale explaining how the procedures demonstrate compliance with the Regulation.

(c) The service provider should ensure that the roles and responsibilities for the change management processes are identified in the procedures.

(d) Procedures should be submitted in a manner agreed between the service provider and the competent authority. Until an agreement is reached, the competent authority will prescribe the means of submission.

(e) The procedure that defines the notification process for changes includes:

(1) the point of contact in charge of the notification of changes, e.g. person, or part of the organisation and the role;

(2) the means used for notification, e.g. fax, email, mail, use of database or others.

(f) The management of change procedures should include a change identification procedure. This procedure, which is a precursor of the change notification process, should seek out potential changes, confirm that there is a real intent to implement them (propose the change) and, if so, initiate the notification process.

GM1 to AMC1 ATM/ANS.OR.B.010(a) Change management procedures

ED Decision 2017/001/R

COMPLIANCE MATRIX

The following example of a matrix could be used by the service provider to document the compliance status of its change management procedures.

Service provider	[Name of the provider]								
Provided services	ATS: ☐	C: ☐	N: ☐	S: ☐	MET: ☐	AIS: ☐	DAT: ☐	ASM: ☐	ATFCM: ☐
Date	MM/DD/YYYY								
Version of the form	Vx.y								
Submitted procedure(s)	Procedure ‘ XYZ ‘ — version ‘ a.b ‘ of MM/DD/YYYY								
	Procedure ‘ JKL ‘ — version ‘ c.d ‘ of MM/DD/YYYY								
	[…]								

Requirement in the Regulation	AMC	Procedure	Rationale	Status	Competent authority comment
ATM/ANS.OR.A.045(c)	None	Procedure ‘ JKL ’ — version ‘ c.d ’ — Paragraph 4	Paragraph 4 states that the transition into operation of any functional change will occur following the completion of the activities required by the procedures XYZ, MNO, and ABC	Non-approved	To be assessed
ATM/ANS.OR.A.045(d)	AMC1 ATM/ANS.OR.A.045(d)	Procedure ‘ XYZ ’ — version ‘ a.b ’ — Paragraph 3	Paragraph 3 stresses that a change subject to competent authority review should not be allowed to be put into service before formal approval has been granted.	Approved	None

AMC2 ATM/ANS.OR.B.010(a) Change management procedures

ED Decision 2017/001/R

GENERAL

(a) As part of the change management procedures, the service provider should keep a register of the records of all notified changes. The register should include:

(1) the status of the implementation of the change, i.e. planned, under review, under implementation, implemented, or cancelled;

(2) the notification;

(3) (a link to) the location of the actual record, including a reference to all information passed to the competent authority in accordance with ATM/ANS.OR.A.045(a)(2).

(b) In addition, when the changes are selected for review, the register should also include:

(1) the review decision from the competent authority; and

(2) a link to records of the change approval by the competent authority.

GM1 ATM/ANS.OR.B.010(a) Change management procedures

ED Decision 2017/001/R

GENERAL

(a) The change management procedures for changes to functional systems should include:

(1) the identification and notification of proposed changes;

(2) the identification of the scope of the change, i.e. the identification of what parts of the functional system are to be changed or are affected by the change;

(3) the assessment and assurance of the change;

(4) the approval of the change; and

(5) the establishment of the monitoring criteria to ensure that the change will remain acceptable as long as it is in operation (acceptably safe for air traffic service providers or acceptably trustworthy for other service providers). The monitoring of the changed system is part of the activities related to the management system of the service provider. It is not covered by the change management procedures themselves.

(b) The procedures that manage changes to functional systems do not include the processes to identify the circumstances that will trigger the change. These should be part of the management system(s) as laid down in ATM/ANS.OR.B.005 and/or ATS.OR.200, as applicable.

(c) The change management procedures should address the following:

(1) procedural-oriented content, which details:

(i) the roles and activities with regard to change management, safety assessment and safety support assessment;

(ii) the identification of the parts of the functional system affected by the proposed change;

(iii) the type of safety assessment or safety support assessment that has to be used for the identified type of changes;

(iv) the competence of the persons performing change management, safety assessments and safety support assessments;

(v) the identified triggers for performing a safety assessment and a safety support assessment;

(vi) the means of change notification; 'means' includes the form of notification;

(vii) the means of identifying any organisations or aviation undertakings using the service that are potentially affected by the change; and

(viii) the means of informing those identified in (vii).

(2) Method-oriented content, which details description of the safety assessments and safety support assessments methods and mitigation methods used by the service provider.

(d) For each change management procedure or part of a change management procedure approved, the agreement on notification of any change over them should be documented and formalised. In any case, the service provider should keep records of these changes.

ATM/ANS.OR.B.015 Contracted activities

Regulation (EU) 2017/373

(a) Contracted activities include all the activities within the scope of the service provider's operations, in accordance with the terms of the certificate, that are performed by other organisations either themselves certified to carry out such activity or if not certified, working under the service provider's oversight. A service provider shall ensure that when contracting or purchasing any part of its activities to external organisations, the contracted or purchased activity, system or constituent conforms to the applicable requirements.

(b) When a service provider contracts any part of its activities to an organisation that is not itself certified in accordance with this Regulation to carry out such activity, it shall ensure that the contracted organisation works under its oversight. The service provider shall ensure that the competent authority is given access to the contracted organisation to determine continued compliance with the applicable requirements under this Regulation.

AMC1 ATM/ANS.OR.B.015 Contracted activities

ED Decision 2017/001/R

RESPONSIBILITY WHEN CONTRACTING ACTIVITIES

(a) A contract should exist between the service provider and the contracted organisation clearly defining the contracted activities and the applicable requirements, including training and competences requirements for air traffic safety electronics personnel (ATSEP) employed by the contracted organisation, where applicable.

(b) The contracted activities, performed by an organisation that is not itself certified in accordance with this Regulation to carry out such activity, should be included in the service provider's oversight process. In this context, where the contracted activity requires the ATSEP employed by contracted organisation to undertake any aspect of this activity, the service provider should ensure that those ATSEP have received the applicable training and competences foreseen in Subpart A of Annex XIII.

(c) A service provider should ensure that the contracted organisation has the necessary authorisation, declaration or approval when required, and commands the resources and competence to undertake the task.

GM1 to AMC1 ATM/ANS.OR.B.015 Contracted activities

ED Decision 2017/001/R

RESPONSIBILITY WHEN CONTRACTING ACTIVITIES

The applicable requirements may include the necessary elements from the training and competence assessment of ATSEP laid down in Annex XIII to this Regulation in accordance with ATSEP.OR.105 in order to ensure equivalent level of safety and level playing field for the maintenance of systems and equipment regardless of whether such services are provided internally in the service provider or outsourced.

AMC2 ATM/ANS.OR.B.015 Contracted activities

ED Decision 2017/001/R

RESPONSIBILITY WHEN CONTRACTING ACTIVITIES

(a) When the contracted organisation is itself certified in accordance with this Regulation to carry out the contracted activities, the service providers' compliance monitoring should at least check that the approval effectively covers the contracted activities and that it is still valid.

(b) When the service provider is not certified itself to provide the service, it should only contract or purchase services from a certified organisation when so required by this Regulation.

AMC3 ATM/ANS.OR.B.015 Contracted activities

ED Decision 2017/001/R

SAFETY — ATS PROVIDER

An air traffic services provider should ensure adequate justification of the safety of the externally provided and supplied services, having regard to their safety significance within the provision of its services.

GM1 ATM/ANS.OR.B.015 Contracted activities

ED Decision 2017/001/R

GENERAL

(a) A service provider may contract certain activities to external organisations. 'Contracted activities' means those activities within the service provision conditions attached to the service provider's certificate that are performed by other organisations either themselves certified to carry out such an activity or if not certified, working under the service provider's oversight. The scope of the service provider's oversight covers the contracted activities performed by the external organisation that is not itself certified in accordance with this Regulation.

(b) Activities contracted to external organisations for the provision of services may include areas such as:

(1) aeronautical information services;

(2) meteorological services, etc.

(c) In the case of activities contracted, the service provider should define relevant management responsibilities within its own organisation.

(d) The ultimate responsibility for the services provided by contracted organisations should always remain with the contracting service provider.

GM2 ATM/ANS.OR.B.015 Contracted activities

ED Decision 2017/001/R

RESPONSIBILITY WHEN CONTRACTING ACTIVITIES

(a) A contract could take the form of a written agreement, letter of agreement, service letter agreement, memorandum of understanding, etc. as appropriate for the contracted activities.

(b) A service provider's assurance process could be included into the service provider's management system and compliance monitoring programmes.

(c) In order to ensure that the contracted organisation is able to perform the contracted activities, the service provider may conduct a prior audit of the contracted party.

GM3 ATM/ANS.OR.B.015 Contracted activities

ED Decision 2017/001/R

RESPONSIBILITY WHEN CONTRACTING ACTIVITIES

(a) Regardless of the approval status of the contracted organisation, the service provider is responsible for ensuring that all contracted activities are subject to compliance monitoring as required by ATM/ANS.OR.B.005(c), and in the case of air traffic services provider, also to hazard identification and risk management as required by ATS.OR.200(2).

(b) If a service provider requires a contracted organisation to conduct an activity which exceeds the privileges of the contracted organisation's certificate, this will be considered as the contracted organisation working under the approval and oversight of the contracting service provider.

GM4 ATM/ANS.OR.B.015 Contracted activities

ED Decision 2017/001/R

RESPONSIBILITY WHEN CONTRACTING ACTIVITIES

Table 4 below illustrates the responsibilities when contracting.

	Contracted activity – **subject to certification; and** – **the contracting service provider certified for that activity**	**Contracted activity** – **subject to certification; and** – **contracting service provider NOT certified for that activity**
Contracted external organisation certified to provide the activity	A contracting service provider undertakes compliance monitoring of the contracted external organisation and should at least check that the certificate effectively covers the contracted activities and that it is valid.	A contracting service provider undertakes compliance monitoring of the contracted external organisation and should at least check that the certificate effectively covers the contracted activities and that it is valid.
Contracted external organisation NOT certified to provide the activity	The contracted external organisation works under the oversight of the contracting service provider.	The activity cannot be contracted to the external organisation.

Table 4: Responsibility when contracting activities

ATM/ANS.OR.B.020 Personnel requirements

Regulation (EU) 2017/373

(a) A service provider shall appoint an accountable manager, who has the authority over ensuring that all activities can be financed and carried out in accordance with the applicable requirements. The accountable manager shall be responsible for establishing and maintaining an effective management system.

(b) A service provider shall define the authority, duties and responsibilities of the nominated post holders, in particular of the management personnel in charge of safety, quality, security, finance and human resources-related functions as applicable.

GM1 ATM/ANS.OR.B.020(a) Personnel requirements

ED Decision 2017/001/R

ACCOUNTABLE MANAGER

Depending on the size, structure and complexity of the organisation, the accountable manager may be:

(a) the chief executive officer (CEO);

(b) the chief operating officer (COO);

(c) the chairperson of the board of directors;

(d) a partner; or

(e) the proprietor.

AMC1 ATM/ANS.OR.B.020(b) Personnel requirements

ED Decision 2017/001/R

GENERAL

Senior management should appoint a member of the service provider's management who, irrespective of other responsibilities, should have responsibility and authority that includes:

(a) ensuring that processes needed for the management system are established, implemented and maintained;

(b) reporting to senior management on the performance of the management system and any need for improvement; and

(c) ensuring the promotion of awareness of performance and service requirements throughout the service provider and of the impact it has on safety.

GM1 ATM/ANS.OR.B.020(b) Personnel requirements

ED Decision 2017/001/R

COMBINATION OF NOMINATED POSTHOLDERS RESPONSIBILITIES

(a) The acceptability of a single person holding more than one post, possibly in combination with being the accountable manager, should depend upon the service provider's organisation and the complexity of its activities. The two main areas of concern should be competence and an individual's capacity to meet his or her responsibilities.

(b) As regards competence in different areas of responsibility, there should not be any difference from the requirements applicable to persons holding only one post.

The capacity of an individual to meet his or her responsibilities should primarily be dependent upon the complexity of the service provider's organisation and its activities. However, the complexity of the service provider's organisation or of its activities may prevent or limit the combination of posts

ATM/ANS.OR.B.025 Facilities requirements

Regulation (EU) 2017/373

A service provider shall ensure that there are adequate and appropriate facilities to perform and manage all tasks and activities in accordance with the applicable requirements.

ATM/ANS.OR.B.030 Record-keeping

Regulation (EU) 2017/373

(a) A service provider shall establish a system of record-keeping that allows adequate storage of the records and reliable traceability of all its activities, covering in particular all the elements indicated in point ATM/ANS.OR.B.005.

(b) The format and the retention period of the records referred to in point (a) shall be specified in the service provider's management system procedures.

(c) Records shall be stored in a manner that ensures protection against damage, alteration and theft.

AMC1 ATM/ANS.OR.B.030 Record-keeping

ED Decision 2017/001/R

GENERAL

(a) The record-keeping system should ensure that all the records required in ATM/ANS.OR.B.030(a) are accessible whenever needed. These records should be organised in a way that ensures traceability and retrieval throughout the retention period.

(b) Records should be kept in paper form or in electronic format or a combination of both. Records stored on microfilm or optical disc format are also acceptable. The records should remain legible throughout the required retention period. The retention period starts when a record has been created or last amended.

(c) Paper systems should use robust material which can withstand normal handling and filing.

(d) Computer systems should have at least one backup system which should be updated within 24 hours of any new entry. Computer systems should include safeguards against the probability of unauthorised personnel altering the data.

(e) All computer hardware used to ensure data backup should be stored in a different location from that containing the working data and in an environment that ensures they remain in good condition. When hardware or software changes take place, special care should be taken that all necessary data continues to be accessible at least through the full retention period.

GM1 ATM/ANS.OR.B.030 Record-keeping

ED Decision 2017/001/R

GENERAL

The record-keeping provision is intended to address the management system records rather than operational data which is covered by other record-keeping applicable requirements.

AMC1 ATM/ANS.OR.B.030(b) Record-keeping

ED Decision 2017/001/R

RETENTION PERIOD

The records should be kept for a minimum period of at least 5 years unless otherwise specified by the competent authority.

ATM/ANS.OR.B.035 Operations manuals

Regulation (EU) 2017/373

(a) A service provider shall provide and keep up to date its operations manuals relating to the provision of its services for the use and guidance of operations personnel.

(b) It shall ensure that:

(1) operations manuals contain the instructions and information required by the operations personnel to perform their duties;

(2) relevant parts of the operations manuals are accessible to the personnel concerned;

(3) the operations personnel are informed of amendments to the operations manual applying to their duties in a manner that enables their application as of their entry into force.

SUBPART C — SPECIFIC ORGANISATION REQUIREMENTS FOR SERVICE PROVIDERS OTHER THAN ATS PROVIDERS (ATM/ANS.OR.C)

ATM/ANS.OR.C.001 Scope

Regulation (EU) 2017/373

This Subpart establishes the requirements to be met by the service provider other than the air traffic services provider, in addition to the requirements set out in Subparts A and B.

ATM/ANS.OR.C.005 Safety support assessment and assurance of changes to the functional system

Regulation (EU) 2017/373

(a) For any change notified in accordance with point ATM/ANS.OR.A.045(a)(1), the service provider other than the air traffic services provider shall:

(1) ensure that a safety support assessment is carried out covering the scope of the change which is:

(i) the equipment, procedural and human elements being changed;

(ii) interfaces and interactions between the elements being changed and the remainder of the functional system;

(iii) interfaces and interactions between the elements being changed and the context in which it is intended to operate;

(iv) the life cycle of the change from definition to operations including transition into service;

(v) planned degraded modes;

(2) provide assurance, with sufficient confidence, via a complete, documented and valid argument that the service will behave and will continue to behave only as specified in the specified context.

(b) A service provider other than an air traffic services provider shall ensure that the safety support assessment referred to in point (a) comprises:

(1) verification that:

(i) the assessment corresponds to the scope of the change as defined in point (a)(1);

(ii) the service behaves only as specified in the specified context;

(iii) the way the service behaves complies with and does not contradict any applicable requirements of this Regulation placed on the services provided by the changed functional system; and

(2) specification of the monitoring criteria necessary to demonstrate that the service delivered by the changed functional system will continue to behave only as specified in the specified context.

GM1 ATM/ANS.OR.C.005(a)(1) Safety support assessment and assurance of changes to the functional system

ED Decision 2017/001/R

GENERAL

(a) The safety support assessment should be conducted by the service provider itself. It may also be carried out by another organisation, on its behalf, provided that the responsibility for the safety support assessment remains with the service provider.

(b) A safety support assessment needs to be performed when a change affects a part of the functional system managed by a service provider other than an air traffic services provider and it is being used in the provision of its services. The safety support assessment or the way it is conducted does not depend on whether the change is a result of a business decision or a decision to improve the service performance.

GM2 ATM/ANS.OR.C.005(a)(1) Safety support assessment and assurance of changes to the functional system

ED Decision 2017/001/R

SAFETY SUPPORT ASSESSMENTS BY PROVIDERS THAT ARE ALSO ATS PROVIDERS

(a) Only air traffic services providers can perform a safety assessment. Service providers other than air traffic services providers can only perform a safety support assessment to determine that the new or changed service behaves only as specified in a specified context.

(b) A safety support assessment should be carried out for changes that cross the organisation's boundary.

(c) An air traffic services provider may choose not to perform a safety support assessment of changes to its functional system when the changes do not cross the organisation's boundary. In this specific case, the safety assessment of changes to the functional system should be performed.

GM3 ATM/ANS.OR.C.005(a)(1) Safety support assessment and assurance of changes to the functional system

ED Decision 2017/001/R

SAFETY SUPPORT ASSESSMENT

(a) A safety support assessment is needed whenever the functional system of a service provider other than an air traffic services provider changes. This may be as a result of:

(1) the provider proposing a change to:

(i) its functional system;

(ii) the services it provides;

(iii) the context in which its functional system operates; or

(iv) the context in which the service is provided;

(2) the services used by the provider in the delivery of its services being planned to change; or/and

(3) a change to the context in which the service provider's functional system operates as a result of a proposed change by another service provider, another organisation regulated by Regulation (EC) No 216/2008 or an unregulated body.

(b) The granularity of the safety support case report will depend on:

(1) the scope of the change;

(2) the nature and number of arguments; and

(3) the necessary and sufficient evidence needed to provide appropriate confidence that the safety support assurance is valid (complete and correct).

GM4 ATM/ANS.OR.C.005(a)(1) Safety support assessment and assurance of changes to the functional system

ED Decision 2017/001/R

SCOPE OF THE CHANGE

(a) The description of the elements being changed includes the nature, functionality, location, performance, maintenance tasks, training and responsibilities of these elements, where applicable. The description of interfaces and interactions, between machines and between humans and machines, should include communication means, e.g. language, phraseology, protocol, format, order and timing and transmission means, where applicable. In addition, it includes the description of the context in which they operate.

(b) There are two main aspects to consider in evaluating the scope of a change:

(1) The interactions within the changed functional system.

(2) The interactions within the changing functional system, i.e. those that occur during transitions from the current functional system to the changed system. During such transitions, components are replaced/installed in the functional system. These installation activities are interactions within the changing functional system and are to be included within the scope of the change.

As each transition can be treated as a change to the functional system, the identification of both the above has a common approach described below.

(c) The scope of the change is defined as the set of the changed components and affected components. In order to identify the impacted components and the changed components, it is necessary to:

(1) know which components will be changed;

(2) know which component's (components') behaviour might be affected by the changed components, although it is (they are) not changed itself (themselves); and

(3) detect indirectly affected components by identifying:

(i) new interactions introduced by the changed or directly affected components;

(ii) interactions with changed or directly affected components via the context.

Furthermore, directly and indirectly impacted components will be identified as a result of applying the above iteratively to any directly and indirectly impacted components that have been identified previously.

The scope of the change is the set of changed, directly impacted and indirectly impacted components identified when the iteration identifies no new components.

(d) The context in which the changed service is intended to be provided (see ATM/ANS.OR.C.005(a)(1)(iii)) includes the interface through which the service will be delivered to other service providers.

GM5 ATM/ANS.OR.C.005(a)(1) Safety support assessment and assurance of changes to the functional system

ED Decision 2017/001/R

TRAINING

If the change modifies the way people interact with the rest of the functional system, then they will require training before the change becomes operational. Care should be taken when training operational staff before the change is operational, as the training may change the behaviour of the operational staff when they interact with the existing functional system before any other part of the change is made, and so the training may have to be treated as a transitional stage of the change. For example, as a result of training, ATCOs may come to expect information or alerts to be presented differently. People may also need refreshment training periodically in order to ensure that their performance does not degrade over time. The training needed before operation forms part of the design of the change, while the refreshment training is part of the maintenance of the functional system after the change is in operation.

GM6 ATM/ANS.OR.C.005(a)(1) Safety support assessment and assurance of changes to the functional system

ED Decision 2017/001/R

INTERACTIONS

The identification of changed interactions is necessary in order to identify the scope of the change because any changed behaviour in the system comes about via a changed interaction. Changed interaction happens via an interaction at an interface of the functional system and the context in which it operates. Consequently, identification of both interfaces and interactions is needed to ensure that all interactions have identified interfaces and all interfaces have identified interactions. From this, all interactions and interfaces that will be changed can be identified.

AMC1 ATM/ANS.OR.C.005(a)(2) Safety support assessment and assurance of changes to the functional system

ED Decision 2017/001/R

FORM OF ASSURANCE

Service providers other than air traffic services providers should ensure that the assurance is documented in a safety support case.

AMC2 ATM/ANS.OR.C.005(a)(2) Safety support assessment and assurance of changes to the functional system

ED Decision 2017/001/R

COMPLETENESS OF THE ARGUMENT

The argument should be considered complete when it shows that:

(a) the safety support assessment of ATM/ANS.OR.C.005(b) has produced a service specification and context specification where:

(1) the service has been defined in terms of functionality, performance and the form of the interfaces;

(2) the specification of context correctly and completely records the conditions under which the specification of the service is true;

(3) the interaction of components, under failure conditions or failures in services delivered to the components, have been assessed for their impact on the service and, where necessary, degraded modes of service have been defined; and

(4) the specification encompasses the interaction with the environment;

(b) safety support requirements have been placed on the elements changed and on those elements affected by the change;

(c) the behaviour necessitated by the safety support requirements is the complete behaviour expressed by the service specification;

(d) all safety support requirements have been traced from the service specification to the level of the architecture at which they have been satisfied;

(e) each component satisfies its safety support requirements; and

(f) the evidence is derived from known versions of the components and the architecture and known sets of products, data and descriptions that have been used in the production or verification of those versions.

GM1 to AMC2 ATM/ANS.OR.C.005(a)(2) Safety support assessment and assurance of changes to the functional system

ED Decision 2017/001/R

COMPLETENESS OF THE ARGUMENT

(a) Sufficiency of specifications

The way the service specification is arrived at is not of particular interest in a safety support case and so it is not dealt with here. A specification that is sufficient implies that the service meets the provider's intent, i.e. it is valid. Two necessary conditions for a sufficient specification are provided here:

(1) Assessment of failure conditions

(i) Failures or failure conditions are malfunctions of behaviour. This means either the loss or corruption of some intended behaviour, e.g. behaviour that is considered to be:

(A) more than (quantity, information);

(B) less than (quantity, information);

(C) additional to;

(D) faster than;

(E) slower than;

(F) part of;

(G) reverse of;

(H) other than;

(I) not;

(J) earlier than;

(K) later than;

(L) before; or

(M) after

that which was intended. If the behaviour of the service is altered in any way during malfunctions, the altered behaviour needs to be included in the specification. Further details could be found GM1 ATM/ANS.OR.C.005(b)(1) and GM1 ATM/ANS.OR.C.005(b)(2).

(ii) Some failures may not result in a degraded service.

(iii) Some failures may not be relevant in the context of use.

(iv) Strictly speaking, the failure and failure conditions described here are malfunctions of the services delivered by a component and may be caused by failures of components, errors in design, failures of services used by the component, or failures of the activities associated with installing the component, i.e. failure to install the component in the intended manner.

(v) When a redundancy within a component is no longer available, the behaviour of the component is considered to have changed, e.g. the reliability of the component will have changed and an indication of the loss of redundancy will have been provided.

(2) Evaluation of the behaviour

It is necessary to argue that the behaviour of the implementation, i.e. the system as built, matches the specification and there is no additional (unspecified) behaviour. This implies verification of service behaviour, which is required by ATM/ANS.OR.C.005(b)(2) and stated here in a more specific way.

It is also necessary to argue that the behaviour of the change during transition into service matches the specification and there is no additional (unspecified) behaviour. If transition into service causes disruption to the service being changed or other services provided by the service provider, then it may be necessary to include, within the specification, a specification of the intended installation activities. This implies an assessment of failure conditions associated with the installation activities and the specification of any

necessary mitigations, should the failures materialise and the installation not be performed as intended.

(b) Safety support requirements

(1) The safety support requirements are characteristics/items of the functional system to ensure that the system operates as specified. Based on the verification/demonstration of these characteristics/items, it could be concluded that the specifications are met.

(2) The highest-layer of safety support requirements represents the desired behaviour of the change at its interface with the operational context. These, ultimately become the specification, once the implementation is verified.

(3) In almost all cases, verification that a system behaves as specified cannot be accomplished to an acceptable level of confidence at the level of its interface with its operational environment. To this end, the system verification should be decomposed into verifiable parts, taking into account the following principles:

(i) Verification relies on requirements placed on these parts via a hierarchical decomposition of the top-level requirements, in accordance with the constraints imposed by the chosen architecture.

(ii) At the lowest level, this decomposition places requirements on elements, where verification that the implementation satisfies its requirements can be achieved by testing.

(iii) At higher levels in the architecture, during integration, verified elements of different types are combined into subsystems/components, in order to verify more complete parts of the system.

(iv) While they cannot be fully tested, other verification techniques may be used to provide sufficient levels of confidence that these subsystems/components do what they are supposed to do.

(v) Consequently, since decomposing the system into verifiable parts relies on establishing requirements for those parts, then safety support requirements are necessary.

(4) The way safety support requirements are achieved, is not of particular interest in a safety assessment, because a safety support argument demonstrates the trustworthiness of the specification.

(5) The architecture may not have requirements. During development, the need to argue satisfaction of system level requirements, which cannot be performed at the system level for any practical system, drives the architecture because verifiability depends on the decomposition of the system into verifiable parts.

(6) Demonstration that safety support requirements at system level are met allows them to be transformed into the safety support specification.

(c) Satisfaction of safety support requirements

(1) The concept laid down in AMC2 ATM/ANS.OR.C.005(a)(2) is that, provided the system and each subsystem/component/element meet its requirements, the system will behave as specified. This will be true provided (2), (3) and (4) below are met.

(2) The activity needed to meet objective (c) of AMC2 ATM/ANS.OR.C.005(a)(2) consists of obtaining sufficient confidence that the set of requirements is complete and correct, i.e. that:

(i) the architectural decomposition leads to a complete and correct set of requirements being allocated to each subsystem/component/element;

(ii) each requirement is a correct, complete and unambiguous statement of the desired behaviour, and does not contradict another requirement or any other subset of requirements; and

(iii) the requirements allocated to a subsystem/component/element necessitate the complete required behaviour of the subsystem/component/element in the target environment.

(3) This should take into account specific aspects such as:

(i) the possible presence of functions within the subsystem/component/element that produce unnecessary behaviour. For instance, in the case where a previously developed part is used, activities should be undertaken to identify all the possible behaviours of the part. If any of these behaviours is not needed for the foreseen use, then additional requirements may be needed to make sure that these functions are not solicited or inadvertently activated in operation or that the effects of any resulting behaviour are mitigated;

(ii) subsystem/component/element requirements that are not directly related to the desired behaviour of the functional system. This kind of requirement can, for instance, ask that the subsystem/component/element be developed in a given syntax or be designed in a certain way. These requirements often relate to technical aspects of the subsystem/component/element. Activities should be undertaken to ensure that each of these requirements is a correct, complete and unambiguous statement of the desired effect, and does not contradict another requirement or any other subset of requirements.

(4) The system behaviour should be considered complete in the sense that the specification is only true for the defined context. This restriction to the context of the use of the service makes safety support assessment and assurance of changes to the functional system a practical proposition.

(d) Traceability of requirements

The traceability requirement can be met by tracing to the highest-level element in the architectural hierarchy that has been shown to satisfy its requirements, by verifying it in isolation. It is likely and completely acceptable that this point will be reached at a different architectural level for each element.

(e) Satisfaction of safety support requirements

(1) The component view taken must be able to support verification, i.e. the component must be verifiable — see guidance in (b).

(2) Care should be taken in selecting subsystems that are to be treated as components for verification to ensure that they are small and simple enough to be verifiable.

(3) The context argument needs to demonstrate that the context in which a component is verified does not compromise the claim that the specification is true over a specified context, i.e. the component verification context is correctly related to the context claimed for the operation of the functional system.

(f) Configuration identification

(1) This is only about configuration of the evidence and should not be interpreted as configuration management of the functional system. However, since the safety support assessment is based on a set of elements and the way they are interlinked, the safety support assessment should only be valid if the configuration remains as described in the safety support argument.

(2) Evidence for the use of a component should rely on testing activities considering the actual usage of domains and contexts. When the same component is used in different parts of the system or in different systems, it may not be possible to rely on testing in a single context since it is unlikely that the contexts for each use will be the same or can be covered by a single set of test conditions. This applies equally to the reuse of evidence gathered from testing subsystems.

AMC3 ATM/ANS.OR.C.005(a)(2) Safety support assessment and assurance of changes to the functional system

ED Decision 2017/001/R

DETERMINATION OF THE SPECIFICATION OF THE CHANGED SERVICE

When determining the changes in the service specification that have resulted from the change to the functional system, service providers other than air traffic services providers should ensure that:

(a) the properties specified for the service can be observed and measured either directly or indirectly with a degree of certainty commensurate with the level of confidence sought from assurance; and

(b) the specification of the changed service must cover everything that has changed in the service provided when operated within the declared operational context.

AMC4 ATM/ANS.OR.C.005(a)(2) Safety support assessment and assurance of changes to the functional system

ED Decision 2017/001/R

DETERMINATION OF THE OPERATIONAL CONTEXT FOR THE CHANGE

(a) When determining the operational context for the change, service providers other than an air traffic services provider should ensure that:

(1) the specification of the operational context can be shown to be true for all circumstances and environments in which the changed service is intended to operate;

(2) the operational context is completely and coherently specified; and

(3) the specification of the operational context is internally consistent.

(b) The operational context must be specified so that its adherence to (a)(1) and (a)(2) is observable and measurable either directly or indirectly with a degree of certainty commensurate with the level of confidence sought from assurance.

GM1 ATM/ANS.OR.C.005(a)(2) Safety support assessment and assurance of changes to the functional system

ED Decision 2017/001/R

SPECIFICATION

'Continue to behave only as specified in the specified context' means that assurance needs to be provided that the monitoring requirements are suitable for demonstrating that the service behaves only as specified in the specified context during operation.

GM2 ATM/ANS.OR.C.005(a)(2) Safety support assessment and assurance of changes to the functional system

ED Decision 2017/001/R

ASSURANCE LEVELS

The use of assurance level concepts, e.g. design assurance levels (DAL), software assurance levels (SWAL), hardware assurance levels (HWAL), can be helpful in generating an appropriate and sufficient body of evidence to help establish the required confidence in the argument.

GM3 ATM/ANS.OR.C.005(a)(2) Safety support assessment and assurance of changes to the functional system

ED Decision 2017/001/R

SAFETY SUPPORT REQUIREMENTS

The complete behaviour is limited to the scope of the change. Safety support requirements only apply to the parts of a system affected by the change. In other words, if parts of a system can be isolated from each other and only some parts are affected by the change, then these are the only parts that are of concern and so will have safety support requirements attached to them.

The following list contains examples, not exhaustive, of safety support requirements that specify:

(a) for equipment, the complete behaviour, in terms of functions, accuracy, timing, order, format, capacity, resource usage, robustness to abnormal conditions, overload tolerance, availability, reliability, confidence and integrity;

(b) for people, their performance in terms of tasks (e.g. accuracy, response times, acceptable workload, resilience to distraction, self-awareness, 'team-playerness', adaptability, reliability, confidence, skills, and knowledge in relation to their tasks);

(c) for procedures, the circumstances for their enactment, the resources needed to perform the procedure (i.e. people and equipment), the sequence of actions to be performed and the timing and accuracy of the actions; and

(d) interactions between all parts of the system.

AMC1 ATM/ANS.OR.C.005(b)(1) Safety support assessment and assurance of changes to the functional system

ED Decision 2017/001/R

VERIFICATION

The service provider other than the air traffic services provider should ensure that verification activities of the safety support assessment process include verification:

(a) that the full scope of the change is addressed throughout the whole assessment process, i.e. all the elements of the functional system or environment of operation that are changed or affected by the change and those unchanged elements that depend upon them and on which they depend are identified;

(b) that the way the service behaves complies with and does not contradict any requirements placed on the changed service by another part of the regulations or conditions attached to the providers' certificate;

(c) that the specification of the way the service behaves and the safety support requirements are complete and correct;

(d) that the specification of the operational context is complete and correct;

(e) that the specification was analysed in the context in which it is intended to operate;

(f) of the completeness of the argument as per AMC2 ATM/ANS.OR.C.005(a)(2);

(g) that the safety support requirements are correct and complete by reference to the specification; and

(h) to the intended degree of confidence, that the implementation satisfies the safety support requirements and behaves only as specified in the given operational context.

GM1 ATM/ANS.OR.C.005(b)(1) Safety support assessment and assurance of changes to the functional system

ED Decision 2017/001/R

DESCRIPTION OF THE SCOPE — 'MULTI-ACTOR CHANGE'

In the case where the change is a 'multi-actor change' in reference to ATM/ANS.OR.A.045(e), the interfaces and interactions include the interfaces with the other service providers and/or aviation undertakings that are also affected by the change.

Information related to cooperatively identifying the scope of 'multi-actor changes' may be found in EUROCAE ED-78A.

GM2 ATM/ANS.OR.C.005(b)(1) Safety support assessment and assurance of changes to the functional system

ED Decision 2017/001/R

VERIFICATION

This requirement is seeking verification because it is a simple cross-check of available material, i.e. that the specification reflects the requirements of other parts of this Regulation.

(a) Behaviour

ATM/ANS.OR.C.005(b)(1)(ii) requires that the service meets its specification. Consequently, the specification must be complete and valid, i.e. it includes the behaviour addressed in ATM/ANS.OR.C.005(b)(1)(iii) and any additional behaviour in the specified context.

(b) Compliance with other requirements

(1) ATM/ANS.OR.C.005(b)(1)(iii) requires the service providers to identify all parts of this Regulation that impose behaviour on the changed service and also includes any conditions attached to the certificate. They have to identify only those parts of this Regulation that describe required behaviour relevant to the changed service. The identified behaviour shall be included in the specification of the changed service.

Note that the Regulation or conditions attached to the certificate may render compliance with technical standards and ICAO SARPs mandatory.

(2) Compliance with other non-mandatory standards may also be a necessary condition for other reasons.

(3) ATM/ANS.OR.C.005(b)(1)(iii) does not state that the service only meets the requirements of the other parts of this Regulation. It may do other things as well, as described in (5) below.

(4) In ATM/ANS.OR.C.005(b)(1)(iii), ‘does not contradict’ is used to express the concern that behaviour beyond that required by a standard might cause the behaviour required by the standard to be undermined.

(5) The behaviour of a service is likely to include behaviour unspecified in standards; such behaviour may come from:

(i) the behaviour of degraded modes of operation;

(ii) additional behaviour not required by the standard, but put there for commercial purposes, e.g. competitive edge; or

(iii) other behaviour identified by the customer, e.g. an air traffic services provider.

(6) Consequently, the total behaviour should be specified.

AMC1 ATM/ANS.OR.C.005(b)(2) Safety support assessment and assurance of changes to the functional system

ED Decision 2017/001/R

MONITORING

Service providers other than an air traffic services provider should ensure that within the safety support assessment process for a change, the monitoring criteria that are to be used to demonstrate that the safety support case remains valid during the operation of the changed functional system, i.e. that the changed service continues to meet its specification, are identified and documented. These criteria should be such that:

(a) they indicate that the assumptions made in the safety support case remain valid; and

(b) if the properties being monitored remain within the bounds set by these criteria, the service will be behaving as specified.

GM1 ATM/ANS.OR.C.005(b)(2) Safety support assessment and assurance of changes to the functional system

ED Decision 2017/001/R

MONITORING OF INTRODUCED CHANGES

(a) Monitoring is intended to maintain confidence in the safety support argument during operation of the changed functional system. Monitoring is, therefore, only applicable following the entry into service of the change.

(b) Monitoring is likely to be of internal parameters of the functional system that provide a good indication of the performance of the service. These parameters may not be directly observable at the service level, i.e. at the interface of the service with the operational environment. For example, where a function is provided by multiple redundant resources, the availability of the function will be so high that monitoring it may not be useful. However, monitoring the availability of individual resources, which fail much more often, may be a useful indicator of the performance of the overall function.

SUBPART D — SPECIFIC ORGANISATIONAL REQUIREMENTS FOR ANS AND ATFM PROVIDERS AND THE NETWORK MANAGER (ATM/ANS.OR.D)

ATM/ANS.OR.D.001 Scope

Regulation (EU) 2017/373

This Subpart establishes the requirements to be met by air navigation services (ANS) and air traffic flow management (ATFM) providers and the Network Manager, in addition to the requirements set out in Subparts A, B and C.

ATM/ANS.OR.D.005 Business, annual, and performance plans

Regulation (EU) 2017/373

(a) *Business plan*

(1) Air navigation services and air traffic flow management providers shall produce a business plan covering a minimum period of five years. The business plan shall:

(i) set out the overall aims and goals of the air navigation services and of the air traffic flow management providers, and their strategy towards achieving them in consistency with any overall longer-term plan of the air navigation services provider or of the air traffic flow management provider and with the relevant requirements of Union law for the development of infrastructure or other technology;

(ii) contain performance targets in terms of safety, capacity, environment and cost-efficiency, as may be applicable pursuant to Commission Implementing Regulation (EU) No 390/2013[1].

(2) The information listed in points (i) and (ii) of point (1) shall be aligned with the performance plan referred to in Article 11 of Regulation (EC) No 549/2004 and, as far as safety data is concerned, it shall be consistent with the state safety programme referred to in Standard 3.1.1 of Annex 19 to the Chicago Convention in its first edition of July 2013.

(3) Air navigation services and air traffic flow management providers shall provide safety and business justifications for major investment projects including, where relevant, the estimated impact on the appropriate performance targets referred to in point (1)(ii) and identifying investments stemming from the legal requirements associated with the implementation of the Single European Sky ATM Research Programme (SESAR).

(b) *Annual plan*

(1) Air navigation services and air traffic flow management providers shall produce an annual plan covering the forthcoming year which shall further specify the features of the business plan and describe any changes to it as compared to the previous plan.

[1] Commission Implementing Regulation (EU) No 390/2013 of 3 May 2013 laying down a performance scheme for air navigation services and network functions (OJ L 128, 9.5.2013, p. 1).

(2) The annual plan shall cover the following provisions on the level and quality of service, such as the expected level of capacity, safety, environment and cost-efficiency:

(i) information on the implementation of new infrastructure or other developments, and a statement on how they will contribute to improving the performance of the air navigation services provider or of the air traffic flow management provider, including level and quality of services;

(ii) performance indicators, as may be applicable, consistent with the performance plan referred to in Article 11 of Regulation (EC) No 549/2004, against which the performance level and quality of service may be reasonably assessed;

(iii) information on the measures foreseen to mitigate the safety risks identified by the air navigation services and air traffic flow management provider, including safety indicators to monitor safety risk and, where appropriate, the estimated cost of mitigation measures;

(iv) the air navigation services and air traffic flow management providers' expected short-term financial position as well as any changes to or impacts on the business plan.

(c) *Performance part of the plans*

The air navigation services and the air traffic flow management providers shall make the content of the performance part of their business plans and of their annual plans available to the Commission on its request, under the conditions set by the competent authority in accordance with national law.

ATM/ANS.OR.D.010 Security management

Regulation (EU) 2017/373

(a) Air navigation services and air traffic flow management providers and the Network Manager shall, as an integral part of their management system as required in point ATM/ANS.OR.B.005, establish a security management system to ensure:

(1) the security of their facilities and personnel so as to prevent unlawful interference with the provision of services;

(2) the security of operational data they receive, or produce, or otherwise employ, so that access to it is restricted only to those authorised.

(b) The security management system shall define:

(1) the procedures relating to security risk assessment and mitigation, security monitoring and improvement, security reviews and lesson dissemination;

(2) the means designed to detect security breaches and to alert personnel with appropriate security warnings;

(3) the means of controlling the effects of security breaches and to identify recovery action and mitigation procedures to prevent re-occurrence.

(c) Air navigation services and air traffic flow management providers and the Network Manager shall ensure the security clearance of their personnel, if appropriate, and coordinate with the relevant civil and military authorities to ensure the security of their facilities, personnel and data.

(d) Air navigation services and air traffic flow management providers and the Network Manager shall take the necessary measures to protect their systems, constituents in use and data and prevent compromising the network against information and cyber security threats which may have an unlawful interference with the provision of their service.

GM1 ATM/ANS.OR.D.010(d) Security management

ED Decision 2017/001/R

INFORMATION SECURITY THREAT

Information security threat may be any circumstance or event with the potential to adversely impact the operation, systems and/or constituents due to human action (accidental, casual or purposeful, intentional or unintentional, mistaken) resulting from unauthorised access, use, disclosure, denial, disruption, modification, or destruction of information and/or information system interfaces. This should include malware and the effects of external systems on dependent systems, but does not include physical threats.

ATM/ANS.OR.D.015 Financial strength — economic and financial capacity

Regulation (EU) 2017/373

Air navigation services and air traffic flow management providers shall be able to meet their financial obligations, such as fixed and variable costs of operation or capital investment costs. They shall use an appropriate cost-accounting system. They shall demonstrate their ability through the annual plan as referred to in point ATM/ANS.OR.D.005(b), as well as through balance sheets and accounts, as applicable under their legal statute, and regularly undergo an independent financial audit.

ATM/ANS.OR.D.020 Liability and insurance cover

Regulation (EU) 2017/373

(a) Air navigation services and air traffic flow management providers and the Network Manager shall have in place arrangements to cover liabilities related to the execution of their tasks in accordance with the applicable law.

(b) The method employed to provide the cover shall be appropriate to the potential loss and damage in question, taking into account the legal status of the providers concerned and the Network Manager and the level of commercial insurance cover available.

(c) Air navigation services and air traffic flow management providers and the Network Manager which avail themselves of services of another service provider shall ensure that the agreements that they conclude to that effect specify the allocation of liability between them.

ATM/ANS.OR.D.025 Reporting requirements

Regulation (EU) 2017/373

(a) Air navigation services and air traffic flow management providers shall provide an annual report of their activities to the competent authority.

(b) For air navigation services and air traffic flow management providers, the annual report shall cover their financial results, without prejudice to Article 12 of Regulation (EC) No 550/2004, as

well as their operational performance and any other significant activities and developments in particular in the area of safety.

(c) The Network Manager shall, in accordance with Article 20 of Regulation (EU) No 677/2011, provide an annual report of its activities to the Commission and the Agency. This report shall cover its operational performance, as well as significant activities and developments in particular in the area of safety.

(d) The annual reports referred to in points (a) and (c) shall include as a minimum:

(1) an assessment of the level of performance of services provided;

(2) for air navigation services and air traffic flow management providers, their performance compared to the performance targets established in the business plan referred to in point ATM/ANS.OR.D.005(a), comparing actual performance against the performance set out in the annual plan by using the indicators of performance established in the annual plan;

(3) for the Network Manager, its performance compared to the performance objectives established in the Network Strategy Plan referred to in Article 2(24) of Regulation (EU) No 677/2011, comparing actual performance against the performance set out in the Network Operational Plan referred to in Article 2(23) of that Regulation by using the indicators of performance established in the Network Operational Plan;

(4) an explanation for differences with the relevant targets and objectives and an identification of the measures required to address any gaps between the plans and actual performance, during the reference period referred to in Article 11 of Regulation (EC) No 549/2004;

(5) developments in operations and infrastructure;

(6) the financial results, where they are not published separately in accordance with Article 12(1) of Regulation (EC) No 550/2004;

(7) information about the formal consultation process with the users of its services;

(8) information about the human resources policy.

(e) Air navigation services and air traffic flow management providers and the Network Manager shall make their annual reports available to the Commission and the Agency on their request. They shall also make those reports available to the public, under the conditions set by the competent authority in accordance with Union and national law.

ANNEX IV — PART-ATS

SPECIFIC REQUIREMENTS FOR PROVIDERS OF AIR TRAFFIC SERVICES

SUBPART A — ADDITIONAL ORGANISATION REQUIREMENTS FOR PROVIDERS OF AIR TRAFFIC SERVICES (ATS.OR)

SECTION 1 — GENERAL REQUIREMENTS

ATS.OR.100 Ownership

Regulation (EU) 2017/373

(a) An air traffic services provider shall notify the competent authorities of:

(1) its legal status, its ownership structure and any arrangements having a significant impact on control over its assets;

(2) any links with organisations not involved in the provision of air navigation services, including commercial activities in which they are engaged either directly or through related undertakings, which account for more than 1 % of their expected revenue; furthermore, it shall notify any change of any single shareholding which represents 10 % or more of their total shareholding.

(b) An air traffic services provider shall take all necessary measures to prevent any situation of conflict of interests that could compromise the impartial and objective provision of its services.

ATS.OR.105 Open and transparent provision of service

Regulation (EU) 2017/373

In addition to point ATM/ANS.OR.A.075 of Annex III, the air traffic service provider shall neither engage in conduct that would have as its object or effect the prevention, restriction or distortion of competition, nor shall they engage in conduct that amounts to an abuse of a dominant position, in accordance with applicable Union and national law.

SECTION 2 — SAFETY OF SERVICES

ATS.OR.200 Safety management system

Regulation (EU) 2017/373

An air traffic services provider shall have in place a safety management system (SMS), which may be an integral part of the management system required in point ATM/ANS.OR.B.005, that includes the following components:

(1) *Safety policy and objectives*

(i) Management commitment and responsibility regarding safety which shall be included in the safety policy.

(ii) Safety accountabilities regarding the implementation and maintenance of the SMS and the authority to make decisions regarding safety.

(iii) Appointment of a safety manager who is responsible for the implementation and maintenance of an effective SMS;

(iv) Coordination of an emergency response planning with other service providers and aviation undertakings that interface with the ATS provider during the provision of its services.

(v) SMS documentation that describes all the elements of the SMS, the associated SMS processes and the SMS outputs.

(2) *Safety risk management*

(i) A process to identify hazards associated to its services which shall be based on a combination of reactive, proactive and predictive methods of safety data collection.

(ii) A process that ensures analysis, assessment and control of the safety risks associated with identified hazards.

(iii) A process to ensure that its contribution to the risk of aircraft accidents is minimised as far as is reasonably practicable.

(3) *Safety assurance*

(i) Safety performance monitoring and measurement means to verify the safety performance of the organisation and validate the effectiveness of the safety risk controls.

(ii) A process to identify changes which may affect the level of safety risk associated with its service and to identify and manage the safety risks that may arise from those changes.

(iii) A process to monitor and assess the effectiveness of the SMS to enable the continuous improvement of the overall performance of the SMS.

(4) *Safety promotion*

(i) Training programme that ensures that the personnel are trained and competent to perform their SMS duties.

(ii) Safety communication that ensures that the personnel are aware of the SMS implementation.

AMC1 ATS.OR.200(1); (2); (3) Safety management system

ED Decision 2017/001/R

GENERAL — NON-COMPLEX ATS PROVIDERS

(a) The safety policy should include a commitment to improve towards the highest safety standards, comply with all the applicable legal requirements, meet all the applicable standards, consider the best practices and provide the appropriate resources.

(b) In cooperation with other stakeholders, the air traffic services provider should develop, coordinate and maintain an emergency response plan (ERP) that ensures orderly and safe transition from normal to emergency operations and return to normal operations. The ERP should determine the actions to be taken by the air traffic services provider or specified individuals in an emergency and reflect the size, nature and complexity of the activities performed by the air traffic services provider.

(c) Safety risk management may be performed using hazard checklists or similar risk management tools or processes, which are integrated into the activities of the air traffic services provider.

(d) An air traffic services provider should manage safety risks related to changes. Management of changes should be a documented process to identify external and internal changes that may have an adverse effect on safety. It should make use of the air traffic services provider's existing hazard identification, risk assessment and mitigation processes.

(e) An air traffic services provider should identify persons who fulfil the role of safety managers and who are responsible for coordinating the safety management system (SMS). These persons may be accountable managers or individuals with an operational role in the air traffic services provider.

(f) Within the air traffic services provider, responsibilities should be identified for hazard identification, risk assessment and mitigation.

AMC1 ATS.OR.200(1)(i) Safety management system

ED Decision 2017/001/R

SAFETY POLICY — COMPLEX ATS PROVIDERS

(a) The safety policy should:

(1) be signed by the accountable manager;

(2) reflect organisational commitments regarding safety and its proactive and systematic management;

(3) be communicated, with visible endorsement, throughout the air traffic services provider;

(4) include safety reporting principles;

(5) include a commitment to:

(i) improve towards the highest safety standards;

(ii) comply with all the applicable legal requirements, meet all the applicable standards and consider the best practices;

(iii) provide appropriate resources; and

(iv) enforce safety as one primary responsibility of all managers and staff;

(6) include the safety reporting procedures;

(7) clearly indicate which types of operational behaviours are unacceptable, and include the conditions under which disciplinary action would not apply; and

(8) be periodically reviewed to ensure it remains relevant and appropriate.

(b) Senior management should:

(1) continually promote the safety policy to all personnel and demonstrate their commitment to it;

(2) provide necessary human and financial resources for its implementation; and

(3) establish safety objectives and performance standards.

GM1 ATS.OR.200(1)(i) Safety management system

ED Decision 2017/001/R

SAFETY POLICY — COMPLEX ATS PROVIDERS

Operational behaviour, when disciplinary action would not apply, could be where someone is not blamed for reporting something which would not have been otherwise detected.

GM2 ATS.OR.200(1)(i) Safety management system

ED Decision 2017/001/R

SAFETY POLICY — COMPLEX ATS PROVIDERS

(a) The safety policy should state that the purpose of safety reporting and internal investigations is to improve safety, not to apportion blame to individuals.

(b) An air traffic services provider may combine the safety policy with the policy required by ATM/ANS.OR.B.005(a)(2).

GM3 ATS.OR.200(1)(i) Safety management system

ED Decision 2017/001/R

SAFETY POLICY — NON-COMPLEX ATS PROVIDERS

(a) The safety policy should state that the purpose of safety reporting is to improve safety, not to apportion blame to individuals.

(b) An air traffic services provider may combine the safety policy with the policy required by ATM/ANS.OR.B.005(a)(2).

AMC1 ATS.OR.200(1)(ii) Safety management system

ED Decision 2017/001/R

ACCOUNTABILITIES — COMPLEX ATS PROVIDERS

The SMS of the air traffic services provider should ensure that:

(a) everyone involved in the safety aspects of the provision of air traffic services has an individual safety responsibility for their own actions;

(b) managers should be responsible for the safety performance of their respective departments or divisions; and

(c) the top management of the provider carries an overall safety responsibility.

GM1 ATS.OR.200(1)(ii) Safety management system

ED Decision 2017/001/R

SAFETY ACTION GROUP — COMPLEX ATS PROVIDERS

(a) A safety action group may be established as a standing group or as an ad hoc group to assist or act on behalf of the safety review board as defined in point (b) of AMC2 ATS.OR.200(1)(ii);(iii).

(b) More than one safety action group may be established depending on the scope of the task and the specific expertise required.

(c) The safety action group should report to and take strategic direction from the safety review board and should comprise managers, supervisors and personnel from operational areas.

(d) The safety action group should:

(1) monitor operational safety;

(2) resolve identified risks;

(3) assess the impact on safety of operational changes; and

(4) ensure that safety actions are implemented within agreed timescales.

(e) The safety action group should review the effectiveness of previous safety recommendations and safety promotion.

(f) Members of the safety action group should participate in the local runway safety team as per GM2 ADR.OR.D.027 ‘Safety programmes’.

AMC1 ATS.OR.200(1)(ii);(iii) Safety management system

ED Decision 2017/001/R

ORGANISATION AND ACCOUNTABILITIES

An air traffic service provider should:

(a) identify the safety manager who, irrespective of other functions, has ultimate responsibility and accountability, on behalf of the organisation, for the implementation and maintenance of the SMS;

(b) clearly define lines of safety accountability throughout the organisation, including a direct accountability for safety on the part of senior management;

(c) identify the accountabilities of all members of management, irrespective of other functions, as well as of employees, with respect to the safety performance of the SMS;

(d) document and communicate safety responsibilities, accountabilities and authorities throughout the organisation; and

(e) define the levels of management with authority to make decisions regarding safety risk tolerability.

AMC2 ATS.OR.200(1)(ii);(iii) Safety management system

ED Decision 2017/001/R

ORGANISATION AND ACCOUNTABILITIES — COMPLEX ATS PROVIDERS

The SMS of the air traffic services provider should encompass safety by including a safety manager and a safety review board in the organisational structure.

(a) Safety manager

(1) The safety manager should act as the focal point and be responsible for the development, administration and maintenance of an effective SMS. He or she should be independent of line management, and accountable directly to the highest organisational level.

(2) The role of the safety manager should, as a minimum, be to:

(i) ensure that hazard identification, risk analysis and management are undertaken in accordance with the SMS processes;

(ii) monitor the implementation of actions taken to mitigate risks;

(iii) provide periodic reports on safety performance;

(iv) ensure maintenance of safety management documentation;

(v) ensure that there is safety management training available and that it meets acceptable standards;

(vi) provide advice on safety matters; and

(vii) monitor initiation and follow-up of internal occurrence/accident investigations.

(3) The safety manager should have:

(i) adequate practical experience and expertise in air traffic services or a similar area;

(ii) adequate knowledge of safety and quality management;

(iii) adequate knowledge of the working methods and operating procedures; and

(iv) comprehensive knowledge of the applicable requirements in the area of air traffic services.

(b) Safety review board

(1) The safety review board should be a high-level committee that considers matters of strategic safety in support of the accountable manager's safety accountability.

(2) The board should be chaired by the accountable manager and composed of heads of functional areas.

(3) The safety review board should, as a minimum:

(i) monitor safety performance against safety policy and objectives;

(ii) ensure that any safety action is taken in a timely manner; and

(iii) monitor the effectiveness of the air traffic services provider's SMS processes.

(4) The safety review board should ensure that appropriate resources are allocated to achieve the planned safety performance.

(5) The safety manager or any other relevant person may attend, as appropriate, safety review board meetings. He or she may communicate to the accountable manager all information, as necessary, to allow decision-making based on safety data.

GM1 ATS.OR.200(1)(iii) Safety management system

ED Decision 2017/001/R

SAFETY MANAGER — COMPLEX ATS PROVIDERS

(a) Depending on the size of the air traffic services provider and the nature and complexity of their activities, the safety manager may be assisted by additional safety personnel in the performance of all the safety-management-related tasks.

(b) Regardless of the organisational set-up, it is important that the safety manager remains the unique focal point as regards the development, administration and maintenance of the air traffic services provider's SMS.

GM2 ATS.OR.200(1)(iii) Safety management system

ED Decision 2017/001/R

SAFETY MANAGER — NON-COMPLEX AIR TRAFFIC SERVICES PROVIDERS

In the case of a non-complex air traffic services provider, the function of the safety manager could be combined with another function within the organisation provided that sufficient independence is guaranteed.

AMC1 ATS.OR.200(1)(iv) Safety management system

ED Decision 2017/001/R

COORDINATION OF EMERGENCY RESPONSE PLANNING FOR ATS PROVIDERS — COMPLEX ATS PROVIDERS

(a) An air traffic services provider should develop, coordinate and maintain a plan for its response to an emergency. It should:

(1) reflect the nature and complexity of the activities performed by the air traffic services provider;

(2) ensure an orderly and safe transition from normal to emergency operations;

(3) ensure safe continuation of operations or return to normal operations as soon as practicable; and

(4) ensure coordination with the ERPs of other organisations, where appropriate.

(b) For emergencies occurring at the aerodrome or in its surroundings, the plan should be aligned with the aerodrome ERP and be coordinated with the aerodrome operator.

GM1 ATS.OR.200(1)(iv) Safety management system

ED Decision 2017/001/R

TYPES OF EMERGENCIES

At least the following types of emergencies may be considered:

(a) aircraft emergencies;

(b) natural phenomena (e.g. extreme weather conditions);

(c) acts of terrorism;

(d) loss of the ability to communicate with the aircraft; and

(e) loss of the air traffic services unit.

GM2 ATS.OR.200(1)(iv) Safety management system

ED Decision 2017/001/R

COORDINATION OF THE EMERGENCY RESPONSE PLANNING FOR ATS PROVIDERS — COMPLEX ATS PROVIDERS

For aerodrome-related emergencies, please refer to GM4 ADR.OPS.B.005(a) 'Aerodrome Emergency Planning'.

AMC1 ATS.OR.200(1)(v) Safety management system

ED Decision 2017/001/R

SAFETY MANAGEMENT MANUAL (SMM) — COMPLEX ATS PROVIDERS

The safety management manual should be the key instrument for communicating the approach to safety for the air traffic services provider. The SMM should document all aspects of safety management, including but not limited to the:

(a) scope of the SMS;

(b) safety policy and objectives;

(c) safety accountability of the accountable manager;

(d) safety responsibilities, accountabilities and authorities of key safety personnel throughout the air traffic services provider;

(e) documentation control procedures;

(f) hazard identification and safety risk management schemes;

(g) safety performance monitoring;

(h) incident investigation and reporting;

(i) emergency response planning;

(j) management of change (including organisational changes with regard to safety responsibilities and changes to functional systems); and

(k) safety promotion.

AMC2 ATS.OR.200(1)(v) Safety management system

ED Decision 2017/001/R

SAFETY RECORDS — COMPLEX ATS PROVIDERS

Safety records that should be maintained and retained include but are not limited to:

(a) certificates;

(b) limited certificates;

(c) declarations;

(d) safety policy;

(e) safety accountabilities/responsibilities;

(f) safety occurrences;

(g) emergency response plan;

(h) SMS documentation;

(i) training and competence;

(j) occurrence reports;

(k) safety risk assessments including safety assessment of changes to the functional system;

(l) determination of either complex or non-complex organisation; and

(m) approved alternative means of compliance.

GM1 ATS.OR.200(1)(v) Safety management system

ED Decision 2017/001/R

SAFETY MANAGEMENT MANUAL (SMM) — COMPLEX ATS PROVIDERS

The SMM may be contained in (one of) the manual(s) of the air traffic services provider.

GM1 ATS.OR.200(3)(i) Safety management system

ED Decision 2017/001/R

SAFETY ASSURANCE — COMPLEX ATS PROVIDERS

(a) Leading indicators

(1) Metrics that measure inputs to the safety system (either within an organisation, a sector or across the total aviation system) to manage and improve safety performance.

(2) Leading indicators measure the specific features of the aviation safety system designed to support continuous improvement and to give an indication of likely future safety performance. They are designed to help identify whether the providers and regulators are taking actions and/or have processes in place that are effective in lowering the risk.

(b) Lagging indicators

Metrics that measure the outcome of the service delivery by measuring events that have already occurred and that impact safety performance. There are two subsets of lagging indicators:

(1) Outcome indicators: These include only the occurrences that one aims to prevent, for example fatal or catastrophic accidents. Depending on the system, the severity of the occurrences that are included as outcome indicators can be adjusted to include all accidents and serious incidents.

(2) Precursor indicators: These indicators do not manifest themselves in accidents or serious incidents. They indicate less severe system failures or ‘near misses’, and are used to assess how frequently the system comes close to severe failure. Because they are typically more numerous than outcome indicators, they can be used for trend monitoring.

(c) Safety management system

In the case of a complex air traffic services provider, the SMS should include all of these measures. Risk management efforts, however, should be targeted at leading indicators and precursor events. The reason for doing this is to reduce the number of accidents and serious incidents.

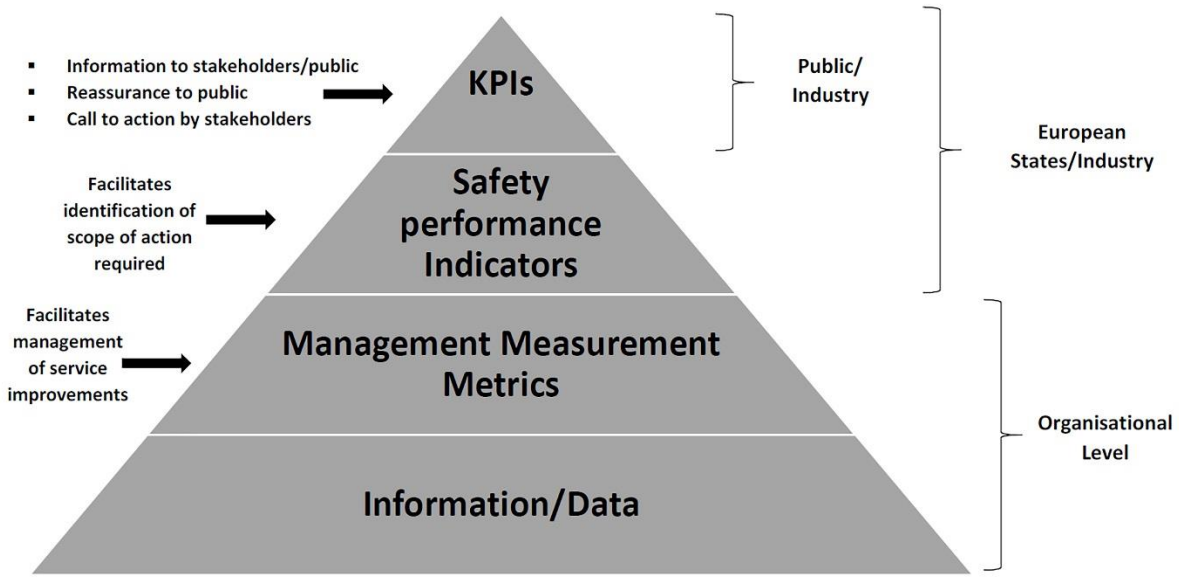
(d) Differing levels of safety performance monitoring

(1) Measurements of safety in terms of undesirable events, such as accidents and incidents, are examples of 'lagging indicators', which can capture safety performance a posteriori. Such indicators give valuable signals to all involved in air traffic services — providers, regulators, and recipients — of the levels of safety being experienced and of the ability of the organisations concerned to take appropriate mitigation action.

However, other types of measurement — 'leading indicators' — can give a wider perspective of the safety 'health' of the functional system, and focus on systemic issues, such as safety maturity and SMS performance.

(2) A holistic approach to performance monitoring is an essential input to decision-making with regard to safety. It is important to ensure that good safety performance is attributable to good performance of the SMS, not simply to lack of incidents or accidents. It is also essential that the metrics chosen match the requirements of the stakeholders and decision-makers involved in safety improvement.

(3) As shown in the diagram, stakeholders in the wider aviation industry and the general public require relatively small numbers of safety indicators (safety performance indicators or key performance indicators) which can give an instant 'feel' for the overall position regarding safety performance. Conversely, those involved in the management of services concerned need a more detailed set of metrics on which to base decisions regarding the management of the services and facilities being reviewed.



Monitoring metrics

AMC1 ATS.OR.200(3)(iii) Safety management system

ED Decision 2017/001/R

CONTINUOUS IMPROVEMENT OF THE SMS — COMPLEX ATS PROVIDERS

An air traffic services provider should continuously improve the effectiveness of its SMS by:

(a) developing and maintaining a formal process to identify the causes of substandard performance of the SMS;

(b) establishing one or more mechanisms to determine the implications of substandard performance of the SMS;

(c) establishing one or more mechanisms to eliminate or mitigate the causes of substandard performance of the SMS; and

(d) developing and maintaining a process for the proactive evaluation of facilities, equipment, documentation, processes and procedures (through internal audits, surveys, etc.).

GM1 ATS.OR.200(3)(iii) Safety management system

ED Decision 2017/001/R

CONTINUOUS IMPROVEMENT OF THE SMS — COMPLEX ATS PROVIDERS

(a) Substandard performance of the SMS can manifest itself in two ways. Firstly, where the SMS processes themselves do not fit their purpose (e.g. not adequately enabling the air traffic services provider to identify, manage and mitigate hazards and their associated risks) resulting in the safety performance of the service being impacted in a negative way. Secondly, where the SMS processes fit their purpose, but are not applied correctly or adequately by the personnel whose safety accountabilities and responsibilities are discharged through the application of the SMS. Personnel who have safety accountabilities and responsibilities are considered an essential part of the effectiveness of the SMS and viewed as part of the SMS.

(b) Therefore, by detecting substandard performance of the SMS, the air traffic services provider can take action to improve the SMS processes themselves or to improve the application of the SMS processes by those with safety accountabilities and responsibilities resulting in an improvement to the safety performance.

(c) Continuous improvement of the effectiveness of the safety management processes can be achieved through:

(1) proactive and reactive evaluations of facilities, equipment, documentation, processes and procedures through safety audits and surveys; and

(2) reactive evaluations in order to verify the effectiveness of the system for control and mitigation of risks.

(d) In the same way that continuous improvement is sought through safety performance monitoring and measurement (see GM1 ATM/ANS.OR.B.005(a)(3) and GM1 ATS.OR.200(3)(i)) by the use of leading and lagging indicators, continuous improvement of the SMS provides the air traffic services provider with safety assurance for the service.

(e) As with safety performance monitoring, the continuous improvement of the SMS lends itself to a process that can be summarised as:

(1) Identify where there are potential weaknesses or opportunities for improvement;

(2) Identify what goes right and disseminate as best practice;

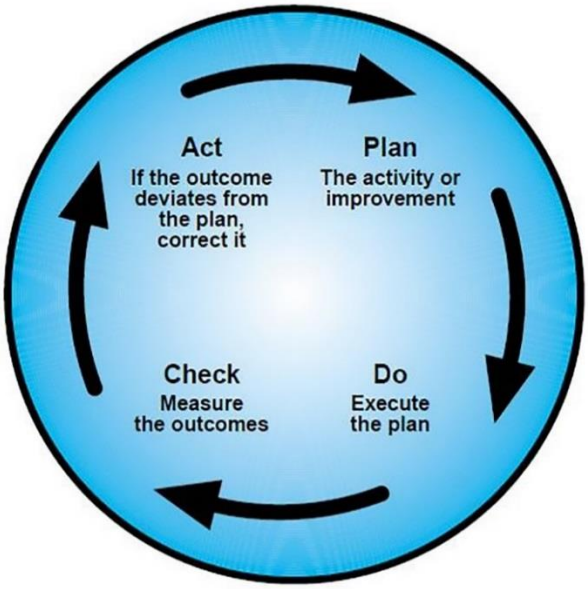
(3) Identify what can be done to tackle weaknesses or lead to improvement;

(4) Set performance standards for the actions identified;

(5) Monitor performance against the standards;

(6) Take corrective actions to improve performance; and

(7) Repeat the process by using the continuous improvement model below:



(f) Taking into account that the SMS is being required to manage safety, it can be assumed that by continuously improving the effectiveness of the SMS, ATS providers should be able to better manage and mitigate, and ultimately control the safety risks associated with the provisions of their services.

AMC1 ATS.OR.200(4)(i) Safety management system

ED Decision 2017/001/R

TRAINING AND COMMUNICATION — COMPLEX ATS PROVIDERS

(a) Training

(1) All personnel should receive safety training as appropriate for their safety responsibilities.

(2) Adequate records of all safety training provided should be kept.

(b) Communication

(1) The ATS provider should establish communication about safety matters that:

(a) ensures that all personnel are aware of the safety management activities as appropriate for their safety responsibilities;

(b) conveys critical information, especially relating to assessed risks and analysed hazards;

(c) explains why particular actions are taken; and

(d) explains why safety procedures are introduced or changed.

(2) Regular meetings with personnel where information, actions and procedures are discussed, may be used to communicate safety matters.

GM1 ATS.OR.200(4)(i) Safety management system

ED Decision 2017/001/R

TRAINING — COMPLEX ATS PROVIDERS

The safety training programme may consist of self-instruction (e.g. newsletters, flight safety magazines), classroom training, e-learning or similar training provided by training organisations.

ATS.OR.205 Safety assessment and assurance of changes to the functional system

Regulation (EU) 2017/373

(a) For any change notified in accordance with point ATM/ANS.OR.A.045(a)(1), the air traffic services provider shall:

(1) ensure that a safety assessment is carried out covering the scope of the change, which is:

(i) the equipment, procedural and human elements being changed;

(ii) interfaces and interactions between the elements being changed and the remainder of the functional system;

(iii) interfaces and interactions between the elements being changed and the context in which it is intended to operate;

(iv) the life cycle of the change from definition to operations including transition into service;

(v) planned degraded modes of operation of the functional system; and

(2) provide assurance, with sufficient confidence, via a complete, documented and valid argument that the safety criteria identified via the application of point ATS.OR.210 are valid, will be satisfied and will remain satisfied.

(b) An air traffic services provider shall ensure that the safety assessment referred to in point (a) comprises:

(1) the identification of hazards;

(2) the determination and justification of the safety criteria applicable to the change in accordance with point ATS.OR.210;

(3) the risk analysis of the effects related to the change;

(4) the risk evaluation and, if required, risk mitigation for the change such that it can meet the applicable safety criteria;

(5) the verification that:

(i) the assessment corresponds to the scope of the change as defined in point (a)(1);

(ii) the change meets the safety criteria;

(6) the specification of the monitoring criteria necessary to demonstrate that the service delivered by the changed functional system will continue to meet the safety criteria.

GM1 ATS.OR.205(a)(1) Safety assessment and assurance of changes to the functional system

ED Decision 2017/001/R

GENERAL

(a) The safety assessment should be conducted by the air traffic services provider itself. It may also be carried out by another organisation, on its behalf, provided that the responsibility for the safety assessment remains with the air traffic services provider.

(b) A safety assessment needs to be performed when a change affects a part of the functional system managed by the provider of air traffic services and that is being used in the provision of its (air traffic) services. The safety assessment or the way it is conducted does not depend on whether the change is a result of a business decision or a decision to improve safety.

GM2 ATS.OR.205(a)(1) Safety assessment and assurance of changes to the functional system

ED Decision 2017/001/R

SCOPE OF THE CHANGE

(a) The description of the elements being changed includes the nature, functionality, location, performance, maintenance tasks, training and responsibilities of these elements, where applicable. The description of interfaces and interactions, between machines and between humans and machines, should include communication means, e.g. language, phraseology, protocol, format, order and timing and transmission means, where applicable. In addition, it includes the description of the context in which they operate.

(b) There are two main aspects to consider in evaluating the scope of a change:

(1) The interactions within the changed functional system;

(2) The interactions within the changing functional system, i.e. those that occur during transitions from the current functional system to the changed functional system. During such transitions, components are replaced/installed in the functional system. These installation activities are interactions within the changing functional system and are to be included within the scope of the change.

As each transition can be treated as a change to the functional system, the identification of both the above has a common approach described below.

(c) The scope of the change is defined as the set of the changed components and affected components. In order to identify the affected components and the changed components, it is necessary to:

(1) know which components will be changed;

(2) know which component's (components') behaviour might be directly affected by the changed components, although it is (they are) not changed itself (themselves);

(3) detect indirectly affected components by identifying:

(i) new interactions introduced by the changed or directly affected components; and/or

(ii) interactions with changed or directly affected components via the environment.

(4) Furthermore, directly and indirectly affected components will be identified as a result of applying the above iteratively to any directly and indirectly affected components that have been identified previously.

The scope of the change is the set of changed, directly impacted and indirectly impacted components identified when the iteration identifies no new components.

(d) The context in which the changed service is intended to operate (see ATS.OR.205(a)(1)(iii)) includes the interface through which the service will be delivered to its users.

GM3 ATS.OR.205(a)(1) Safety assessment and assurance of changes to the functional system

ED Decision 2017/001/R

TRAINING

If the change modifies the way people interact with the rest of the functional system, then a training might be required before the change becomes operational. Care should be taken when training operational staff before the change is operational, as the training may change the behaviour of the operational staff when they interact with the existing functional system before any other part of the change is made, and so may have to be treated as a transitional stage of the change.

For example, as a result of training, air traffic controllers (ATCOs) may come to expect information or alerts to be presented differently. People may also need refreshment training periodically in order to ensure that their performance does not degrade over time. The training needed before operation forms part of the design of the change, while the refreshment training is part of the maintenance of the functional system after the change is in operation.

GM4 ATS.OR.205(a)(1) Safety assessment and assurance of changes to the functional system

ED Decision 2017/001/R

DESCRIPTION OF THE SCOPE — 'MULTI-ACTOR CHANGE'

In reference to 'multi-actor change', please refer to GM1 ATM/ANS.OR.C.005(b)(1) Safety support assessment and assurance of changes to the functional system.

GM1 ATS.OR.205(a)(1)(iii) Safety assessment and assurance of changes to the functional system

ED Decision 2017/001/R

INTERACTIONS

The identification of changed interactions is necessary in order to identify the scope of the change because any changed behaviour in the system comes about via a changed interaction. Changed interaction happens via an interaction at an interface of the functional system and the context in which it operates. Consequently, identification of both interfaces and interactions is needed to be sure that all interactions have identified interfaces and all interfaces have identified interactions. From this, all interactions and interfaces that will be changed can be identified.

AMC1 ATS.OR.205(a)(2) Safety assessment and assurance of changes to the functional system

ED Decision 2017/001/R

FORM OF ASSURANCE

The air traffic services provider should ensure that the assurance required by ATS.OR.205(a)(2) is documented in a safety case.

AMC2 ATS.OR.205(a)(2) Safety assessment and assurance of changes to the functional system

ED Decision 2017/001/R

COMPLETENESS OF THE ARGUMENT

The argument should be considered complete when it shows, as applicable, that:

(a) the safety assessment in ATS.OR.205(b) has produced a sufficient set of non-contradictory valid safety criteria;

(b) safety requirements have been placed on the elements changed and on those elements affected by the change;

(c) the safety requirements as implemented meet the safety criteria;

(d) all safety requirements have been traced from the safety criteria to the level of the architecture at which they have been satisfied;

(e) each component satisfies its safety requirements;

(f) each component operates as intended, without adversely affecting the safety; and

(g) the evidence is derived from known versions of the components and the architecture and known sets of products, data and descriptions that have been used in the production or verification of those versions.

GM1 to AMC2 ATS.OR.205(a)(2) Safety assessment and assurance of changes to the functional system

ED Decision 2017/001/R

COMPLETENESS OF THE ARGUMENT

(a) Sufficiency of safety criteria

(1) A sufficient set of safety criteria is one where the safety goal of the change is validly represented by the set of individual safety criteria, each criterion of which must be valid in its own right and not contradict another criterion or any other subset of criteria. A valid criterion is a correct, complete and unambiguous statement of the desired property. An individual valid criterion does not necessarily represent a complete safety criterion. An example of an invalid criterion is that the maximum take-off weight must not exceed 225 Tonnes because weight is measured in Newtons and not in Tonnes. An example of an incomplete criterion is that the accuracy must be 5 m because no reliability attribute is present. This implies it must always be within 5 m, which is impossible in practice.

(2) Optimally, a sufficient set of criteria would consist of the minimum set of non-overlapping valid criteria and it is preferable to a set containing overlapping criteria.

(3) Criteria that are not relevant, i.e. ones that do not address the safety goal of the change at all, should be removed from the set as they contribute nothing, may contradict other valid criteria and may serve to confuse.

(4) There are two forms of overlap: complete overlap and partial overlap.

(i) In the first case, one or more criteria can be removed and the set would remain sufficient, i.e. there are unnecessary criteria.

(ii) In the second case, (partially overlapping criteria) if any criterion were to be removed, the set would not be sufficient. Consequently, all criteria are necessary; however, validating the set would be much more difficult. Showing that a set of criteria with significant overlap do not contradict each other is extremely difficult and consequently prone to error.

(5) It may, in fact, be simpler to develop an architecture that supports non-overlapping criteria than to attempt to validate a partially overlapping set of criteria.

(b) Safety requirements

(1) The safety requirements are design characteristics/items of the functional system to ensure that the system operates as specified. Based on the verification/demonstration of these characteristics/items, it could be concluded that the safety criteria are met.

(2) The highest layer of safety requirements represents the desired safety behaviour of the change at its interface with the operational context.

(3) In almost all cases, verification that a system behaves as specified cannot be accomplished, to an acceptable level of confidence, at the level of its interface with its operational environment. To this end, the system verification should be decomposed into verifiable parts, taking into account the following principles:

(i) Verification relies on requirements placed on these parts via a hierarchical decomposition of the top level requirements, in accordance with the constraints imposed by the chosen architecture.

(ii) At the lowest level, this decomposition places requirements on elements, where verification that the implementation satisfies its requirements can be achieved by testing.

(iii) At higher levels in the architecture, during integration, verified elements of different types are combined into subsystems/components, in order to verify more complete parts of the system.

(iv) While they cannot be fully tested, other verification techniques may be used to provide sufficient levels of confidence that these subsystems/components do what they are supposed to do.

(v) Consequently, since decomposing the system into verifiable parts relies on establishing requirements for those parts, then safety requirements are necessary.

(4) The architecture may not have requirements. During development, the need to argue satisfaction of safety criteria, which cannot be performed at the system level for any practical system, drives the architecture because verifiability depends on the decomposition of the system into verifiable parts.

(c) Satisfaction of safety criteria

(1) The concept laid down in AMC2 ATS.OR.205(a)(2) is that, provided each element meets its safety requirements, the system will meet its safety criteria. This will be true provided (2) and (3) below are met.

(2) The activity needed to meet this objective consists of obtaining sufficient confidence that the set of safety requirements is complete and correct, i.e. that:

(i) the architectural decomposition of the elements leads to a complete and correct set of safety requirements being allocated to each sub-element;

(ii) each safety requirement is a correct, complete and unambiguous statement of the desired behaviour and does not contradict another requirement or any other subset of requirements; and

(iii) the safety requirements allocated to an element necessitate the complete required safety behaviour of the element in the target environment.

(3) This should take into account specific aspects such as:

(i) the possible presence of functions within the element that produce unnecessary behaviour. For instance, in the case where a previously developed element is used, activities should be undertaken to identify all the possible behaviours of the element. If any of these behaviours is not needed for the foreseen use, then additional requirements may be needed to make sure that these functions will not be solicited or inadvertently activated in operation or that the effects of any resulting behaviour are mitigated;

(d) other requirements that are not directly related to the desired behaviour of the functional system. These requirements often relate to technical aspects of the system or its components. Activities should ensure that each of these requirements does not compromise the safety of the system, i.e. does not contradict the safety requirements or criteria.

(e) Traceability of requirements

The traceability requirement can be met by tracing to the highest-level element in the architectural hierarchy that has been shown to satisfy its requirements, by verifying it in isolation.

(f) Satisfaction of safety requirements

(1) The component view taken must be able to support verification, i.e. the component must be verifiable.

(2) Care should be taken in selecting subsystems that are to be treated as components for verification to ensure that they are small and simple enough to be verifiable.

(g) Adverse effects on safety

(1) Interactions of all changed components or components affected by the change, operating in their defined context, have to be identified and assessed for safety in order to be able to show that they do not adversely affect safety. This assessment must include the failure

conditions for all components and the behaviour of the services delivered to the component including failures in those services.

(2) Interactions between changing components, as they are installed during transitions into operation, and the context in which they operate have to be identified and assessed for safety in order to be able to show that they do not adversely affect safety. This assessment must include the failure conditions for all installation activities.

In some cases, installing components during transition into operation may cause disruption to services other than the one being changed. These services fall within the scope of the change (see GM1 ATM/ANS.OR.A.045(c); (d)), and consequently the safety effects failures of these services, due to failures of the installation activities, have to be assessed as well and, if necessary, their impacts mitigated.

(3) Interactions in complex systems are dealt with in ATM/ANS.OR.A.045(e)(1).

(h) Configuration identification

(1) AMC2 ATS.OR.205(a)(2), point (f) is only about configuration of the evidence and should not be interpreted as configuration management of the changed functional system. However, since the safety case is based on a set of elements and the way they are joined together, the safety case will only be valid if the configuration remains as described in the safety case.

(2) Evidence for the use of a component should rely on testing activities considering the actual usage domains and contexts. When the same component is used in different parts of the system or in different systems, it may not be possible to rely on testing in a single context since it is unlikely that the contexts for each use will be the same or can be covered by a single set of test conditions. This applies equally to the reuse of evidence gathered from testing subsystems.

GM1 ATS.OR.205(a)(2) Safety assessment and assurance of changes to the functional system

ED Decision 2017/001/R

SAFETY CRITERIA

'Safety criteria will remain satisfied' means that the safety criteria continue to be satisfied after the change is implemented and put into operation. The safety case needs to provide assurance that the monitoring requirements of ATS.OR.205(b)(6) are suitable for demonstrating, during operation, that the safety criteria remain satisfied and, therefore, the argument remains valid.

GM2 ATS.OR.205(a)(2) Safety assessment and assurance of changes to the functional system

ED Decision 2017/001/R

ASSURANCE LEVELS

The use of assurance level concepts, e.g. design assurance levels (DAL), software assurance levels (SWAL), hardware assurance levels (HWAL), can be helpful in generating an appropriate and sufficient body of evidence to help establish the required confidence in the argument.

GM3 ATS.OR.205(a)(2) Safety assessment and assurance of changes to the functional system

ED Decision 2017/001/R

SAFETY REQUIREMENTS

The following non-exhaustive list contains examples of safety requirements that specify:

(a) for equipment, the complete behaviour, in terms of functions, accuracy, timing, order, format, capacity, resource usage, robustness to abnormal conditions, overload tolerance, availability, reliability, confidence and integrity;

The complete behaviour is limited to the scope of the change. Safety requirements should only apply to the parts of a system affected by the change. In other words, if parts of a system can be isolated from each other and only some parts are affected by the change, then these are the only parts that are of concern;

(b) for people, their performance in terms of tasks (e.g. accuracy, response times, acceptable workload, reliability, confidence, skills, and knowledge in relation to their tasks);

(c) for procedures, the circumstances for their enactment, the resources needed to perform the procedure (i.e. people and equipment), the sequence of actions to be performed and the timing and accuracy of the actions; and

(d) interactions between all parts of the system.

GM1 ATS.OR.205(b) Safety assessment and assurance of changes to the functional system

ED Decision 2017/001/R

SAFETY ASSESSMENT METHODS

(a) The air traffic services provider can use a standard safety assessment method or it can use its own safety assessment method to assist with structuring the process. However, the application of a method is not a guarantee of the quality of the results. It is therefore not sufficient for a safety case to claim that the assurance provided is adequate due to compliance with a standard or method.

(b) There are databases available that describe different safety assessment methods, tools and techniques[1] that can be used by the air traffic services provider. The provider must ensure that the safety assessment method is adequate for the change being assessed and that the assumptions inherent in the use of the method are recognised and accommodated appropriately.

[1] For example, http://www.nlr.nl/downloads/safety-methods-database.pdf or http://www.scsc.org.uk/

AMC1 ATS.OR.205(b)(1) Safety assessment and assurance of changes to the functional system

ED Decision 2017/001/R

COMPLETENESS OF HAZARD IDENTIFICATION

The air traffic services provider should ensure that hazard identification:

(a) targets complete coverage of any condition, event, or circumstance related to the change, which could, individually or in combination, induce a harmful effect;

(b) has been performed by personnel trained and competent for this task; and

(c) need only include hazards that are generally considered as credible.

AMC2 ATS.OR.205(b)(1) Safety assessment and assurance of changes to the functional system

ED Decision 2017/001/R

HAZARDS TO BE IDENTIFIED

The following hazards should be identified:

(a) New hazards, i.e. those introduced by the change relating to the:

  (1) failure of the functional system; and

  (2) normal operation of the functional system; and

(b) Already existing hazards that are affected by the change and are related to:

  (1) the existing parts of the functional systems; and

  (2) hazards outside the functional system, for example, those inherent to aviation.

GM1 ATS.OR.205(b)(1) Safety assessment and assurance of changes to the functional system

ED Decision 2017/001/R

HAZARD IDENTIFICATION

(a) Completeness of hazard identification

In order to achieve completeness in the identification of hazards, it might be beneficial to aggregate hazards and to formulate them in a more abstract way, e.g. at the service level. This might in turn have drawbacks when analysing and evaluating the risk of the hazards. The appropriate level of detail in the set of hazards and their formulation, therefore, depends on the change and the way the safety assessment is executed.

Only credible hazards need to be identified. A credible hazard is one that has a material effect on the risk assessment. A hazard will not be considered credible when it is either highly improbable that the hazard will occur or that the accident trajectories it initiates will materialise. In other words, a hazard need not be considered if it can be shown that it induces an insignificant risk.

(b) Sources of hazards

(1) Hazards introduced by failures or nominal operations of the ATM/ANS functional systems may include the following factors and processes:

(i) design factors, including equipment, procedural and task design;

(ii) operating practices, including the application of procedures under actual operating conditions and the unwritten ways of operating;

(iii) communications, including means, terminology, order, timing and language and including human–human, human–machine and machine–machine communications;

(iv) installation issues;

(v) equipment and infrastructure, including failures, outages, error tolerances, nuisance alerts, defect defence systems and delays; and

(vi) human performance, including restrictions due to fatigue and medical conditions, and physical limitations, when considered relevant to the change assessment.

(2) Hazards introduced in the context in which the ATM/ANS functional system operates may include the following factors and processes:

(i) wrong, insufficient or delayed information and inadequate services delivered by third parties;

(ii) personnel factors, including working conditions, company policies for and actual practice of recruitment, training and allocation of resources, when considered relevant to the change;

(iii) organisational factors, including the incompatibility of production and safety goals, the allocation of resources, operating pressures and the safety culture;

(iv) work environment factors such as ambient noise, temperature, lighting, annoyance, ergonomics and the quality of man–machine interfaces; and

(v) external threats such as fire, electromagnetic interference and sources of distraction, when considered relevant to the change.

(3) The hazards introduced in the context in which the ATM/ANS services are delivered may include the following factors and processes:

(i) errors, failures, non-compliance and misunderstandings between the airborne and ground domains;

(ii) traffic complexity, including traffic growth, fleet mix and different types of traffic, when considered relevant to the change;

(iii) wrong, insufficient or delayed information delivered by third parties;

(iv) inadequate service provisioning by third parties; and

(v) external physical factors, including terrain, weather phenomena, volcanoes and animal behaviour, when considered relevant to the change.

(c) Methods to identify hazards

(1) The air traffic services provider may use a combination of tools and techniques, including functional analysis, what if techniques, brainstorming sessions, expert judgement, literature search (including accident and incident reports), queries of accident and incident databases in order to identify hazards.

(2) The air traffic services provider needs to make sure that the method is appropriate for the change and produces (either individually or in combination) a valid (necessary and sufficient) set of hazards. This may be aided by drawing up a list of the functions associated with part of the functional system being changed. The air traffic services provider needs to make sure their personnel that use these techniques are appropriately trained to apply these methods and techniques.

AMC1 ATS.OR.205(b)(2) Safety assessment and assurance of changes to the functional system

ED Decision 2017/001/R

DETERMINATION OF THE SAFETY CRITERIA FOR THE CHANGE

When determining the safety criteria for the change being assessed, the air traffic services provider should, in accordance with ATS.OR.210, ensure that:

(a) the safety criteria support a risk analysis that is:

(1) relative or absolute, i.e. refers to:

(i) the difference in safety risk of the system due to the change (relative); or

(ii) the difference in safety risk of the system and a similar system (can be absolute or relative); and

(iii) the safety risk of the system after the change (absolute); and

(2) objective, whether risk is expressed numerically or not;

(b) the safety criteria are measurable to an adequate degree of certainty;

(c) the set of safety criteria can be represented totally by safety risks, by other measures that relate to safety risk or a mixture of safety risks and these other measures;

(d) the set of safety criteria should cover the change; the safety criteria selected are consistent with the overall safety objectives established by the air traffic services provider through its SMS and represented by its annual and business plan and safety key performance indicators; and

(e) where a safety risk or a proxy cannot be compared against its related safety criteria with acceptable certainty, the safety risk should be constrained and actions should be taken, in the long term, so as to manage safety and ensure that the air traffic services provider's overall safety objectives are met.

AMC1 ATS.OR.205(b)(3) Safety assessment and assurance of changes to the functional system

ED Decision 2017/001/R

COMPLETENESS OF RISK ANALYSIS

The air traffic services provider should ensure that the risk analysis is carried out by personnel trained and competent to perform this task and should also ensure that:

(a) a complete list of harmful effects in relation to the identified:

(1) hazards, when the safety criteria are expressed in terms of safety risk, or proxies, when the safety criteria are expressed in relation to proxies; and

(2) hazards introduced due to implementation

is produced; and

(b) the risk contributions of all hazards and proxies are evaluated; and

(c) risk analysis is conducted in terms of risk or in terms of proxies or a combination of them, using specific measurable properties that are related to operational safety risk; and

(d) results can be compared against the safety criteria.

AMC2 ATS.OR.205(b)(3) Safety assessment and assurance of changes to the functional system

ED Decision 2017/001/R

SEVERITY CLASSIFICATION OF ACCIDENTS LEADING TO HARMFUL EFFECTS

When performing a risk analysis in terms of risk, the air traffic services provider should ensure that the harmful effects of all hazards are allocated a safety severity category and that, where there is more than one safety severity category of harm, any severity classification scheme satisfies the following criteria:

(a) The scheme is independent of the causes of the accidents that it classifies, i.e. the severity of the worst accident does not depend upon whether it was caused by an equipment malfunction or human error;

(b) The scheme permits unique assignment of every harmful effect to a severity category;

(c) The severity categories are expressed in terms of a single scalar quantity and in terms relevant to the field of their application;

(d) The level of granularity (i.e. the span of the categories) is appropriate to the field of their application;

(e) The scheme is supported by rules for assigning a harmful effect unambiguously to a severity category; and

(f) The scheme is consistent with the air traffic services providers views of the severity of the harmful effects covered and can be shown to incorporate societal views of their severity.

AMC1 ATS.OR.205(b)(4) Safety assessment and assurance of changes to the functional system

ED Decision 2017/001/R

RISK EVALUATION

The air traffic services provider should ensure that the risk evaluation includes:

(a) an assessment of the identified hazards for a notified change, including possible mitigation means, in terms of risk or in terms of proxies or a combination of them;

(b) a comparison of the risk analysis results against the safety criteria taking the uncertainty of the risk assessment into account; and

(c) the identification of the need for risk mitigation or reduction in uncertainty or both.

GM1 to AMC1 ATS.OR.205(b)(4) Safety assessment and assurance of changes to the functional system

ED Decision 2017/001/R

RISK ANALYSIS IN TERMS OF PROXIES — EXAMPLES

Point (c) of AMC1 ATS.OR.205(b)(2) allows safety assessment to be performed in terms of risk, proxies or a combination of risk and proxies. This GM provides two examples to illustrate the use of proxies in safety analysis.

(a) Use of proxies when assessing the safety of a wind farm installation

(1) A wind farm is to be introduced on or near an aerodrome. It is assumed that before the introduction of the wind farm, the safety risk of the air traffic services being provided at the aerodrome was acceptable. To return to this level after the introduction of the farm, the change would also be acceptable.

A diagram showing the effects this has on the risk at the aerodrome is shown below:

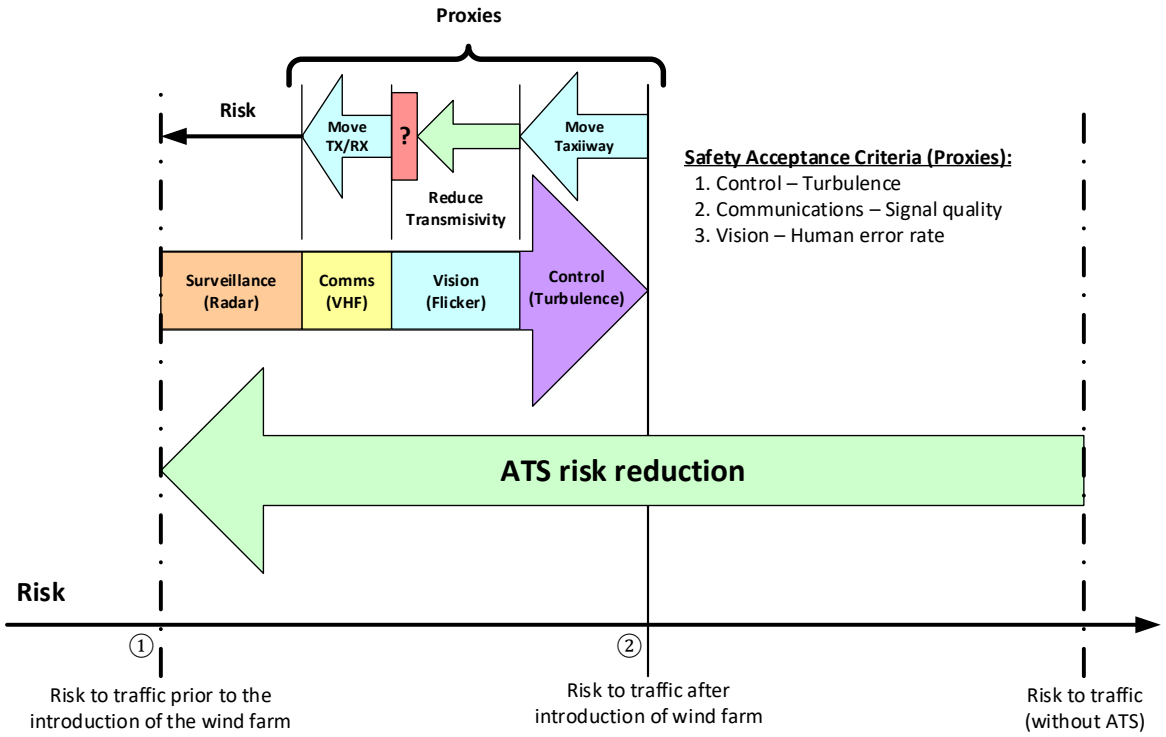


Figure 1: Evaluation of risks after the introduction of wind farm

(2) The risk due to the introduction of the wind farm will rise from ① to ②, if not mitigated, because:

(i) turbulence will increase and so may destabilise manoeuvring of aircraft;

(ii) the movement of the blades will cause radio interference (communications radio and surveillance radar) and so communications may be lost or aircraft may be hidden from view on the radar screen; and

(iii) the flicker in the peripheral vision of ATCOs, caused by the rotation of the blades, may capture attention and increase their perception error rate.

(3) The problem of analysing the safety impact can be split into these areas of concern since they do not interact or overlap and so satisfy the independence criterion (b) of AMC2 ATS.OR.210(a). However, whilst it can be argued that each is a circumstantial hazard and that in each case a justifiable qualitative relationship can be established linking the hazard with the resulting accident (so satisfying the causality criterion (a) of AMC2 ATS.OR.210(a)), the actual or quantitative logical relationship is, in each case, extremely difficult to determine. Conditions for seeking proxies have, therefore, been established:

– Performing a risk evaluation using actual risk may not be worthwhile due to the considerable cost and effort involved; and

– The first two criteria for proxies have been satisfied.

Consequently, it may be possible to find proxies that can be used more simply and effectively than performing an analysis based on risk.

(4) The solutions proposed below are for illustrative purposes only. There are many other solutions and, for each change, several should be investigated. In this example, the following proxies, which satisfy the measurability criterion (c) of AMC2 ATS.OR.210(a), are used to set safety criteria:

(i) Turbulence can be measured and predicted by models so the level of turbulence can be a proxy.

In this example, let's assume the only significant effect of turbulence is to light aircraft using a particular taxiway. It is possible to predict the level of turbulence at different sites on the aerodrome and an alternative taxiway is found where the level of turbulence after the introduction of the wind farm will be less than that currently encountered on the present taxiway. This can be confirmed during operation after the change by monitoring.

(ii) Signal quality can be also be predicted by models and measured so it can be used as a proxy.

In this example, it is possible to move the communications transmitter and receiver aerials so that communications are not affected by interference. Sites can be found using modelling and the signal quality confirmed prior to moving the aerials by trial installations during periods when the aerodrome is not operating.

(iii) Human error rate in detecting events on the manoeuvring area can be measured in simulations and can be used as a proxy.

It is suggested that increasing the opaqueness of the glass in the control tower will reduce the effects of flicker on the ATCOs, but there is no direct relationship between the transmissivity and the effects of flicker. It is, therefore, decided to make a simulation of the control tower and measure the effects of flicker on human error rate using glass of different levels of transmissivity.

However, there is a conflict between increasing the opaqueness of the glass to reduce the effects of flicker and decreasing it to improve direct vision, which is needed so that manoeuvring aircraft can be seen clearly. In other words, the simulation predicts a minimum for the human error rate that relates to a decrease, as the effects of flicker decrease, followed by an increase, as the effects of a lack of direct vision increase. This minimum is greater than the human error rate achieved by the current system and so the risk of the wind farm, in respect of flicker, cannot be completely mitigated. This is shown by the red box with a question mark in it on the diagram.

(5) Finally, the argument for the performance of surveillance radars is commonly performed using risk. This can be repeated in this case since the idea is to filter the effects of the interference without increasing the risk. Moreover, if necessary, a system may be added (or a current one improved) to reduce the risk simply and economically and the effects of the additional system may be argued using risk.

(6) Since risks can be combined, the safety impacts of the changes to the surveillance radar by filtering the effects of the interference together with the addition of another system or the improvement of the current system can be established by summing the risks associated with these two kinds of change.

(7) In these circumstances, it is not possible to argue objectively that the risk of introducing the wind farm has been mitigated, as risks cannot be summed with proxies. This demonstrates the difficulties of using proxies. However, it may be possible to argue convincingly, albeit subjectively, that installing another system or improving the current system improves the current level of risk by a margin large enough to provide adequate compensation for the unmitigated effects of flicker.

(8) In summary, this example shows how proxies and risks can be combined in a single assurance case to argue that a change to a functional system can be introduced safely. It also demonstrates that the strategies available to demonstrate safety are not generic, but are dependent on identifying analysable qualities or quantities related to specific properties of the system or service that are impacted by the change.

(b) Use of proxies when changing to electronic flight strips

(1) An air traffic services provider considers the introduction of a digital strip system in one of its air traffic control towers to replace the paper flight progress strips currently in use. This change is expected to have an impact on several aspects of the air traffic control service that is provided such as the controller's recollection of the progress of the flight, the mental modelling of the traffic situation and the communication and task allocation between controllers. A change of the medium, from paper to digital, might, therefore, have implications on the tower operations, and, hence, on the safety of the air traffic. The actual relation between the change of the strip medium and the risk for the traffic is, however, difficult to establish.

(2) The influence of the quantity on the risk is globally known, but cannot easily be quantified. One difficulty is that strip management is at the heart of the air traffic control operations: the set of potential sequences of events from a strip management error to an accident or incident is enormous. This set includes, for example, the loss of the call sign at the moment a ground controller needs to intervene in a taxiway conflict, and whether this results in an incident depends, for example, on the visibility. This set also includes the allocation of a wrong standard instrument departure (SID) to an aircraft, and whether this results in an accident depends, for example, on the runway configuration.

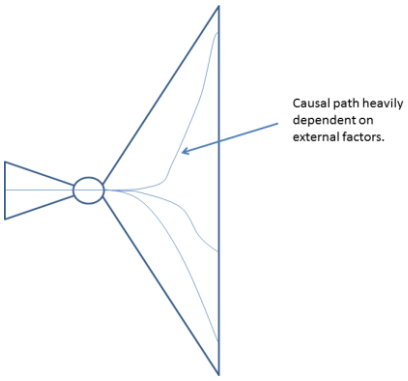


Figure 2: Notional Bow Tie Model of a strip management error

(3) The Bow Tie Model of a strip management error has, figuratively speaking, a vertically stretched right part. This expresses that a hazard — such as the loss of a single strip — may have many different outcomes which heavily depend on factors that have nothing to do with the cause of the hazard — factors such as the status of the aircraft corresponding to the absent strip, that aircraft's position on the aerodrome, the traffic situation and the visibility.

(4) Another difficulty with the relationship between the change of the medium and the risk to the air traffic is that several human and cultural aspects are involved. The difficulty lies in the largely unknown causal relationship between these human and cultural aspects and the occurrences of accidents and incidents. As an example of this, it is noted that strip manipulation — like moving a strip into another bay, or making a mark to indicate that a landing clearance is given — assists a controller in distinguishing the potential from the actual developments. The way of working with paper strips generates impressions in a wider variety than digital strips by their physical nature: handling paper strips has tactile, auditory and social aspects. This difference in these aspects may lead to a difference in the quality of the controller's situation awareness which may lead to a difference in the efficacy of the controller's instructions and advisories, which may lead to a difference in the occurrence of accidents and incidents. However, the relation between the change of the medium and the risk for the air traffic is difficult to assess and would require a great deal of effort, time and experimentation to quantify.

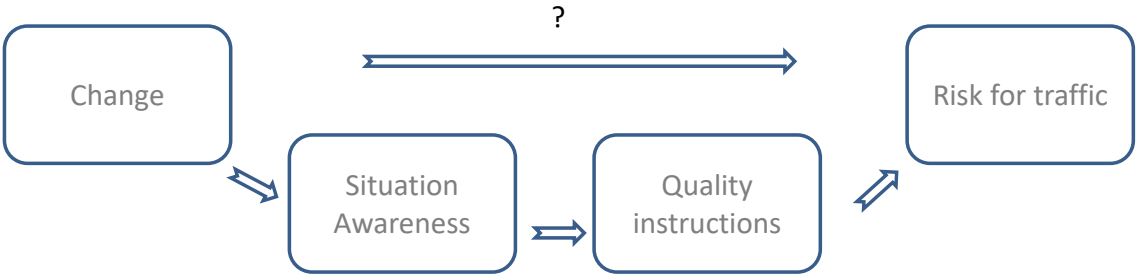


Figure 3: Relation between the change of flight strip and the risk

(5) There is probably a relation between the change of the flight progress strip medium and the risk for air traffic: a new human–machine interface may have an effect on the situation awareness of some individual controllers in some circumstances, which might have an effect on whether, when and what instructions are given, and this in turn influences the aircraft movements, and, hence, the risks. The question by what amount risks increase or decrease is very hard to answer.

(6) Performing a risk evaluation using actual risk may not be worthwhile due to the difficulties and considerable cost and effort involved in assessing the risk of the change directly. Therefore, the use of proxies might be preferred. A quantity is only considered an appropriate proxy if it satisfies the criteria in point AMC2 ATS.OR.210(a):

(i) Causality: The quantity used as proxy can be expected to be influenced by the change, and the risk can be expected to be influenced by the quantity. In addition to this causal relationship, a criterion can be formulated and agreed upon that expresses by which amount the value of the quantity may shift due to the change. Note that the influence of the proxy on the risk cannot easily be quantified,

otherwise it might be more beneficial to use risk as a measure and the quantity as an auxiliary function.

(ii) Measurability: The influence of the change on the quantity can be assessed before as well as after the change.

(iii) Independence: When the proxy selected does not cover all hazards, a set of proxies should be used. Any proxy of that set should be sufficiently isolated from other proxies to be treated independently.

Figure 4: Relation between proxy and risk

(7) There is a relationship between the change and the proxy, and there is a relationship between the proxy and the risk to traffic. The first relationship can be assessed (indicated by the '!'), while the second cannot (indicated by the '?'). An acceptance criterion is typically formulated for the amount the proxy value might increase or decrease.

(8) Proxy 1: Head-down time. The head-down time is a good proxy as it satisfies the conditions of:

(i) Causality: It is known that more head-down time leads to a higher risk but there is no well-established or generally accepted statement in literature in terms of: 'x % more head-down time implies y% more accidents', not to mention for the specific circumstances of the specific air traffic control tower. The causal relationship indicated in Figure 4 can be established because:

(A) the head-down time can be expected to change as the manipulation, writing and reading of digital strips might cost more, or perhaps less, attention and effort than the handling of paper strips;

(B) the loss of head-up time of ground and runway controllers implies less surveillance, at least less time for the out-of-the-window-view in good visibility, and this implies a later or less probable detection of conflicts; and

(C) an example of an acceptance criterion reads: 'The introduction of the digital strip system does not lead to a significant increase in the head down time'.

(ii) Measurability: The influence of the change on the head-down time can be assessed before the change by means of real-time human-in-the-loop experiments in which controllers are tasked to handle equal amounts of traffic in equal circumstances, one time using paper strips and another time using digital strips. The percentage of head-down time can then be determined by observing the controllers by cameras and eye-trackers.

(9) Proxy 2: Fraction of erroneous SID allocations. The fraction of erroneous SID allocations is a good proxy as it satisfies the conditions of:

(i) Causality: It can be imagined that an erroneous SID selected in the flight management system (FMS) might lead to accidents, but the precise conditional

probability is small and difficult to estimate as it depends on several external factors such as the flight paths of the correct and incorrect SIDs, the presence of other traffic, the timing and geometry of the trajectories, the cloud base or the vigilance of the controller. The causal relationship indicated in Figure 4 can be established because:

(A) the number of incorrect SIDs indicated on electronic strips can be expected to be less than on paper strips, because of the possibilities of systematic checks with respect to runway allocation, runway configuration, SID allocation of the predecessor and destination in the flight plan;

(B) the allocation of an incorrect SID to an aircrew might lead to a situation in which the aircraft manoeuvres in an unanticipated way, possibly leading to a conflict with another aircraft, for example departing from a parallel runway; and

(C) an example of an acceptance criterion reads: 'The introduction of the digital strip system should lead to a decrease of the fraction of erroneous SID allocations of more than 20 %'.

(ii) Measurability: The influence of the change on the fraction of erroneous SID allocations can be assessed before the change by means of an analysis of the causes and occurrences of such errors and the estimated efficacy of the systematic checks. The fractions can be assessed after the change by the statistics of the event reports.

(10) Finally, the last condition of independence of proxies is also satisfied. For the purpose of this example, the proxies in (5) and (6) form a set of independent proxies that are complete, i.e. they cover all identified hazards introduced by the replacement of paper strips by a digital strip system.

AMC2 ATS.OR.205(b)(4) Safety assessment and assurance of changes to the functional system

ED Decision 2017/001/R

RISK MITIGATION

When the risk evaluation results show that the safety criteria cannot be satisfied, then the air traffic services provider should either abandon the change or propose additional means of mitigating the risk. If risk mitigation is proposed, then the air traffic services provider should ensure that it identifies:

(a) all of the elements of the functional system, e.g. training, procedures that need to be reconsidered; and

(b) for each part of the amended change, those parts of the safety assessment (requirements from (a) to (f)) that need to be repeated in order to demonstrate that the safety criteria will be satisfied.

GM1 ATS.OR.205(b)(4) Safety assessment and assurance of changes to the functional system

ED Decision 2017/001/R

RISK ANALYSIS IN TERMS OF SAFETY RISK

(a) Risk analysis

When a risk assessment of a set of hazards is executed, in terms of risk:

(1) the frequency or probability of the occurrence of the hazard should be determined;

(2) the possible sequences of events from the occurrence of a hazardous event to the occurrence of an accident, which may be referred to as accident trajectories, should be identified. The contributing factors and circumstances that distinguish the different trajectories from one another should also be identified, as should any mitigations between a hazardous event and the associated accident;

(3) the potential harmful effects of the accident, including those resulting from a simultaneous occurrence of a combination of hazards, should be identified;

(4) the severity of these harmful effects should be assessed, using a defined severity scheme according to point (f) of AMC2 ATS.OR.205(b)(3); and

(5) the risk of the potential harmful effects of all the accidents, given the occurrence of the hazard, should be determined, taking into account the probabilities that the mitigations may fail as well as succeed, and that particular accident trajectories will be followed when particular contributing factors and circumstances occur.

(b) Severity schemes

The severity determination should take place according to a severity classification scheme.

The purpose of a severity classification scheme is to facilitate the management and control of risk. A severity class is, in effect, a container within which accidents can be placed if their severities are considered similar. Each container can be given a value which represents the consequences, i.e. small for accidents causing little harm and big for accidents causing a lot of harm. The sum of the probabilities of all the accidents assigned to a severity class multiplied by the value that is related to the severity class, is the risk associated with that class. If the value that represents severity for all classes is scalar, then the total risk is the sum of the risks in each severity class.

(1) Single-risk value severity schemes

Such schemes use a single severity category to represent harm to humans. Other categories representing other kinds of harm e.g. damage to aircraft and loss of separation, may be present but do not represent harm to humans. In these circumstances, risk analysis would actually be reduced to frequency/probability analysis.

(2) Multiple-risk value severity schemes

Multiple-risk value severity schemes, which use a number of severity categories to classify different levels of harm, facilitate the management and control of risk in a number of ways. At the simplest level, the distribution of accidents across the severity classes gives a picture of whether the risk profile of a system is well balanced. For example, many accidents in the top and bottom severity classes with few in between suggests an imbalance in risk, perhaps due to an undue amount of attention having been paid to some

types of accident at the expense of others. More detailed management and control of risk includes:

(i) Severity classes may be used as the basis for reporting accident statistics.

(ii) Severity classes combined with frequency (or probability) classes can be used to define criteria for decision-making regarding risk acceptance.

(iii) The total risk associated with one or more severity classes can be managed and controlled. For example, the sum of the risk from all severity classes represents the total risk and may be used as a basis for making decisions about changes.

(iv) Similarly, the risk associated with accident types of different levels of severity can be compared. For example, comparing runway infringement accidents with low speed taxiway accidents would allow an organisation to focus their efforts on mitigating the accident type with greatest risk.

(c) The air traffic services provider should coordinate its severity scheme(s) when performing multi-actor changes to ensure adequate assessment. This includes coordination with air traffic services providers outside of the EU.

AMC1 ATS.OR.205(b)(5) Safety assessment and assurance of changes to the functional system

ED Decision 2017/001/R

VERIFICATION

The air traffic services provider should ensure that verification activities of the safety assessment process include verification that:

(a) the full scope of the change is addressed throughout the whole assessment process, i.e. all the elements of the functional system or environment of operation that are changed and those unchanged elements that depend upon them and on which they depend are identified;

(b) the way the service behaves complies with and does not contradict any applicable requirements placed on the changed service or the conditions attached to the providers certificate;

(c) the specification of the way the service behaves is complete and correct;

(d) the specification of the operational context is complete and correct;

(e) the risk analysis is complete as per AMC1 ATS.OR.205(b)(3);

(f) the safety requirements are correct and commensurate with the risk analysis;

(g) the design is complete and correct with reference to the specification and correctly addresses the safety requirements;

(h) the design was the one analysed; and

(i) the implementation, to the intended degree of confidence, corresponds to that design and behaves only as specified in the given operational context.

GM1 ATS.OR.205(b)(5) Safety assessment and assurance of changes to the functional system

ED Decision 2017/001/R

OUTCOME OF RISK EVALUATION

The purpose of risk evaluation is to evaluate the risk of the change and to compare that against the safety criteria with the following outcomes in mind:

(a) A possible (desired) outcome is that the assessed risk satisfies the safety criteria. This implies that the change is assessed as sufficiently safe to implement.

(b) Another possible outcome is that the assessed risk does not satisfy the safety criteria. This might lead to the decision to refine the risk analysis, to the decision to add mitigating means, or to the decision to abandon the change.

GM2 ATS.OR.205(b)(5) Safety assessment and assurance of changes to the functional system

ED Decision 2017/001/R

RISK EVALUATION — UNCERTAINTY

(a) The outcome of a risk analysis is uncertain due to modelling, estimates, exclusion of rare circumstances or contributing factors, incident and safety event underreporting, false or unclear evidence, different expert opinions, etc. The uncertainty may be indicated explicitly, e.g. by means of an uncertainty interval, or implicitly, e.g. by means of a reference to the sources the estimates are based upon.

(b) Where possible sequences of events, contributing factors and circumstances are excluded in order to simplify the risk estimate, which may be necessary to make the estimate of risks feasible, arguments and evidence justifying this should be provided in the safety case. This may result in increasing the uncertainty of the risk estimations.

GM3 ATS.OR.205(b)(5) Safety assessment and assurance of changes to the functional system

ED Decision 2017/001/R

RISK EVALUATION — FORMS OF RISK EVALUATION

The risk evaluation can take several forms, even within the safety assessment of a single change, depending on the nature of the risk analysis and the safety criteria:

(a) If a set of safety requirements has been created and can be unambiguously and directly related to the safety criteria, then the risk evaluation takes the form of justifying that these requirements satisfy the safety criteria;

(b) If the safety criteria have been established in terms of the likelihood of the hazards and the severity of their effects, then the risk evaluation takes the form of verifying that the assessed risks satisfy the safety criteria in terms of risks; and

(c) If the values of all relevant proxies have been determined, then the risk evaluation takes the form of verifying that these values satisfy the safety criteria in terms of proxies.

GM4 ATS.OR.205(b)(5) Safety assessment and assurance of changes to the functional system

ED Decision 2017/001/R

TYPE OF RISK MITIGATION

Risk mitigation may be achieved in the following ways:

(a) an improvement of the performance of a functional subsystem;

(b) an additional change of the ATM/ANS functional system;

(c) an improvement of the services delivered by third parties;

(d) a change in the physical environment; or

(e) any combination of the above-mentioned methods.

GM1 ATS.OR.205(b)(5)(ii) Safety assessment and assurance of changes to the functional system

ED Decision 2017/001/R

VERIFICATION OF SAFETY CRITERIA

As the complete behaviour of the change is reflected in satisfying the safety criteria for the change, no safety requirements are set at system or change level. Nevertheless, safety requirements can be placed on the architecture and the components affected by the change.

AMC1 ATS.OR.205(b)(6) Safety assessment and assurance of changes to the functional system

ED Decision 2017/001/R

MONITORING OF INTRODUCED CHANGE

The air traffic services provider should ensure that within the safety assessment process for a change, the monitoring criteria, that are to be used to demonstrate that the safety case remains valid during the operation of the changed functional system, are identified and documented. These criteria are specific to the change and should be such that they indicate that:

(a) the assumptions made in the argument remain valid;

(b) critical proxies remain as predicted in the safety case and are no more uncertain; and

(c) other properties that may be affected by the change remain within the bounds predicted by the safety case.

GM1 ATS.OR.205(b)(6) Safety assessment and assurance of changes to the functional system

ED Decision 2017/001/R

MONITORING OF INTRODUCED CHANGE

(a) Monitoring is intended to maintain confidence in the safety case during operation of the changed functional system. At entry into service, the safety criteria become performance

criteria rather than design criteria. Monitoring is, therefore, only applicable following entry into service of the change.

(b) Monitoring is likely to be of internal parameters of the functional system that provide a good indication of the performance of the service. These parameters may not be directly observable at the service level, i.e. at the interface of the service with the operational context. For example, where a function is provided by multiple redundant resources, the availability of the function will be so high that monitoring it may not be useful. However, monitoring the availability of individual resources, which fail much more often, may be a useful indicator of the performance of the overall function.

ATS.OR.210 Safety criteria

Regulation (EU) 2017/373

(a) An air traffic services provider shall determine the safety acceptability of a change to a functional system, based on the analysis of the risks posed by the introduction of the change, differentiated on basis of types of operations and stakeholder classes, as appropriate.

(b) The safety acceptability of a change shall be assessed by using specific and verifiable safety criteria, where each criterion is expressed in terms of an explicit, quantitative level of safety risk or another measure that relates to safety risk.

(c) An air traffic services provider shall ensure that the safety criteria:

(1) are justified for the specific change, taking into account the type of change;

(2) when fulfilled, predict that the functional system after the change will be as safe as it was before the change or the air traffic services provider shall provide an argument justifying that:

(i) any temporary reduction in safety will be offset by future improvement in safety; or

(ii) any permanent reduction in safety has other beneficial consequences;

(3) when taken collectively, ensure that the change does not create an unacceptable risk to the safety of the service;

(4) support the improvement of safety whenever reasonably practicable.

AMC1 ATS.OR.210(a) Safety criteria

ED Decision 2017/001/R

OTHER MEASURES RELATED TO SAFETY RISKS

When the air traffic services provider specifies the safety criteria with reference to another measure that relates to safety risk, it should use one or more of the following:

(a) proxies;

(b) recognised standards and/or codes of practice; and

(c) the safety performance of the existing functional system or a similar system elsewhere.

AMC2 ATS.OR.210(a) Safety criteria

ED Decision 2017/001/R

OTHER MEASURES RELATED TO SAFETY RISKS — PROXIES

Proxies for safety risk, used as safety criteria for those parts of the functional system affected by the change, can only be employed when:

(a) a justifiable causal relationship exists between the proxy and the harmful effect, e.g. proxy increase/decrease causes risk increase/decrease;

(b) a proxy is sufficiently isolated from other proxies to be treated independently; and

(c) the proxy is measurable, quantitatively or qualitatively, to an adequate degree of certainty.

GM1 ATS.OR.210(a) Safety criteria

ED Decision 2017/001/R

SAFETY CRITERIA IN TERMS OF PROXIES FOR SAFETY RISKS

(a) In the safety assessment of functional systems, it may not always be possible or desirable to specify safety criteria in terms of quantitative values of risk. Instead, safety criteria may be defined in terms of other measures that are related to risk. These measures are called proxies and they need to meet the requirements for a proxy as stated in AMC2 ATS.OR.210(a). For examples of their use, see GM1 to AMC1 ATS.OR.205(b)(4).

(b) A proxy is some measurable property that can be used to represent the value of something else. In the safety assessment of functional systems, the value of a proxy may be used as a substitute for a value of risk, providing it meets the requirements for a proxy as stated in AMC2 ATS.OR.210(a). Examples of proxies are the frequency of airspace infringements, runway incursions, false alert rate, head-down time, limited sight, level of situation awareness, fraction of read back errors, reduced vigilance, amount of turbulence, distraction of controller's attention, inappropriate pilot behaviour, system availability, information integrity and service continuity.

An example of the concept of using a different but specific quantity to assess an actually relevant quantity is the transposition/measure of an aircraft's altitude which is in terms of barometric pressure or the transposition/measure of an aircraft's airspeed which is in terms of dynamic pressure.

(c) A proxy is a measure of a certain property along the causal trajectory between the hazard/event and the harmful effects of the hazard/event in question (see Figure 5). The causal relationship between the proxy and the accident must be justified in the safety case, i.e. it must satisfy AMC2 ATS.OR.210(a). This means that the accident trajectory must be modelled and analysed such that the causal relationship can be assured but without the need to evaluate the quantitative nature of this relationship. It is assumed that since the proxy lies between the hazard/event and the accident, then there is a quantitative causal relationship between the rate of the hazard/event's occurrence and the rate of the proxy's occurrence. As a consequence, the variation of values of the proxy correlates with values of the hazards/events rate of occurrence and the value of the rate at which the harmful effects occur, i.e. the accident rate, and this relationship is a monotonically increasing one. This means that when the proxy value, e.g. $Proxy_1$, increases/decreases, the associated risk value of the related accident, e.g. $Accident_1$, increases/decreases accordingly.

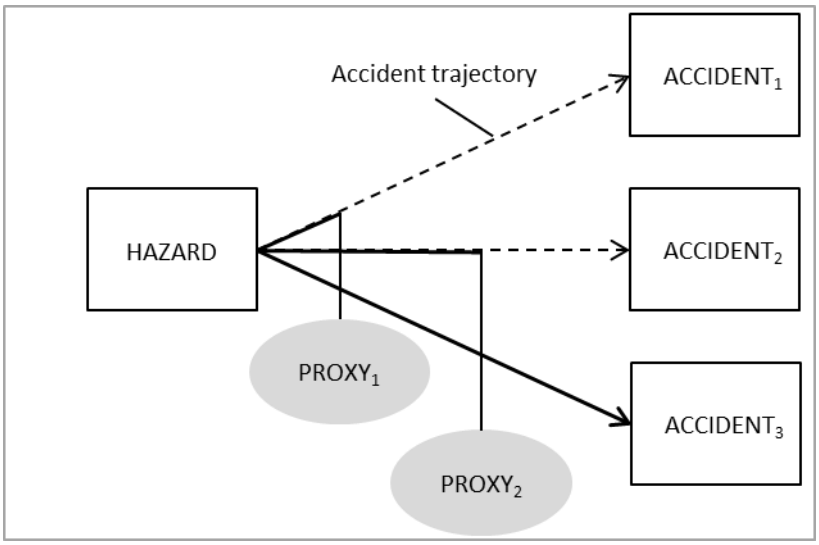


Figure 5: Use of proxies along accident trajectories

(d) Proxies might be preferred where the extra effort needed to identify, describe and analyse a complete set of sequences of events from the occurrence of a hazard to the occurrence of an accident or incident has no added value in the safety assessment. The intrinsic reasons for the amount of the extra effort are the number of significantly different event sequences, the complexity of some accident scenarios, the existence of many barriers preventing the occurrence of a hazard developing into an accident and the lack of evidence on the probability of some events or the frequency of occurrence of some external circumstances and factors. The usage of proxies might then make the safety assessment more tractable and comprehensible and increase the quality of the risk analysis.

(e) The main advantages of proxies are the easy recognition of safety issues by operational staff involved in the safety assessment, and the direct focus on the analysis and mitigation of the identified hazards and safety issues introduced or affected by the change.

(f) The main disadvantage of using proxies is that it is not possible to express risk by a uniform measure. However, the value of the proxy should be measurable.

(g) For further details on the use of proxies, please refer to GM1 to AMC1 ATS.OR.205(b)(4), which contains two examples to assist in the selection and use of proxies in safety analysis.

ATS.OR.215 Licensing and medical certification requirements for air traffic controllers

Regulation (EU) 2017/373

An air traffic services provider shall ensure that air traffic controllers are properly licensed and hold a valid medical certificate, in accordance with Regulation (EU) 2015/340.

SECTION 3 — SPECIFIC HUMAN FACTORS REQUIREMENTS FOR AIR TRAFFIC CONTROL SERVICE PROVIDERS

ATS.OR.300 Scope

Regulation (EU) 2017/373

This section establishes the requirements to be met by the air traffic control service provider with regard to human performance in order to:

(a) prevent and mitigate the risk that air traffic control service is provided by air traffic controllers with problematic use of psychoactive substances;

(b) prevent and mitigate the negative effects of stress on air traffic controllers to ensure the safety of air traffic;

(c) prevent and mitigate the negative effects of fatigue on air traffic controllers to ensure the safety of air traffic.

ATS.OR.305 Responsibilities of air traffic control service providers with regard to the problematic use of psychoactive substances by air traffic controllers

Regulation (EU) 2017/373

(a) An air traffic control service provider shall develop and implement a policy, with related procedures, in order to ensure that the problematic use of psychoactive substances does not affect the provision of air traffic control service.

(b) Without prejudice to provisions laid down in Directive 95/46/EC of the European Parliament and of the Council[1] and to the applicable national legislation on testing of individuals, the air traffic control service provider shall develop and implement an objective, transparent and non-discriminatory procedure for the detection of cases of problematic use of psychoactive substances by air traffic controllers. This procedure shall take into account provisions laid down in point ATCO.A.015 of Regulation (EU) 2015/340.

(c) The procedure in point (b) shall be approved by the competent authority.

[1] Directive 95/46/EC of the European Parliament and of the Council of 24 October 1995 on the protection of individuals with regard to the processing of personal data and on the free movement of such data (OJ L 281, 23.11.1995, p. 31).

AMC1 ATS.OR.305(a) Responsibilities of air traffic control service providers with regard to the problematic use of psychoactive substances by air traffic controllers

ED Decision 2017/001/R

POLICY AND PROCEDURES

Within the context of the policy, the air traffic control service provider should:

(a) provide training or educational material to air traffic controllers relating to:

(1) the effects of psychoactive substances on individuals and subsequently on air traffic control service provision;

(2) established procedures within its organisation regarding this issue; and

(3) their individual responsibilities with regard to legislation and policies on psychoactive substances.

(b) make available appropriate support for air traffic controllers who are dependent on psychoactive substances;

(c) encourage air traffic controllers who think that they may have such a problem to seek and accept help made available by their air traffic control service provider;

(d) ensure that air traffic controllers are treated in a consistent, just and equitable manner as regards the problematic use of psychoactive substances; and

(e) establish and implement principles and procedures for occurrence investigation and analysis to consider the problematic use of psychoactive substances as a contributing factor.

GM1 ATS.OR.305(a) Responsibilities of air traffic control service providers with regard to the problematic use of psychoactive substances by air traffic controllers

ED Decision 2017/001/R

POLICY

(a) Guidance for the development and implementation of the policy is contained in ICAO Doc 9654 'Manual on Prevention of Problematic Use of Substances in the Aviation Workplace', First Edition - 1995, and in particular:

(1) Attachment A (pp. 27–34) as regards elements for the definition and the implementation of policy and programme;

(2) Chapter 3 (pp. 9–12) as regards the identification, treatment, and rehabilitation of staff, with related supporting material, available in Attachment C (pp. 61–68); and

(3) Attachment D (pp. 69–75) as regards the employment consequences of problematic use of substances.

TRAINING AND EDUCATION PROGRAMMES

(b) Guidance for the development and implementation of training and education programmes is contained in ICAO Doc 9654 'Manual on Prevention of Problematic Use of Substances in the Aviation Workplace', First Edition - 1995, in particular:

(1) Chapter 2 (pp. 6–7) as regards the education of the workforce and educational material, with related supporting material available in Attachment A (pp. 35–48); and

(2) Attachment B (pp. 49–59) and Attachment F (pp. 87–94), where extracts from the ICAO Manual of Civil Aviation Medicine are provided

GM2 ATS.OR.305(a) Responsibilities of air traffic control service providers with regard to the problematic use of psychoactive substances by air traffic controllers

ED Decision 2017/001/R

THIRD PARTY ASSISTANCE TO AIR TRAFFIC CONTROLLERS

The air traffic control service provider may employ third-party assistance. Such assistance should be made freely available to air traffic controllers who are dependent on psychoactive substances.

AMC1 ATS.OR.305(b) Responsibilities of air traffic control service providers with regard to the problematic use of psychoactive substances by air traffic controllers

ED Decision 2017/001/R

PROCEDURE FOR THE DETECTION OF CASES OF PROBLEMATIC USE OF PSYCHOACTIVE SUBSTANCES

The objective, transparent and non-discriminatory procedure should specify:

(a) the mechanisms and responsibilities for its initiation;

(b) its applicability in terms of timing and locations;

(c) the person(s)/body responsible for testing the individual;

(d) the testing process;

(e) thresholds for psychoactive substances;

(f) the process to be followed in case of detection of problematic use of psychoactive substances by an air traffic controller; and

(g) the appeal process.

GM1 ATS.OR.305(b) Responsibilities of air traffic control service providers with regard to the problematic use of psychoactive substances by air traffic controllers

ED Decision 2017/001/R

PROCEDURE FOR THE DETECTION OF CASES OF PROBLEMATIC USE OF PSYCHOACTIVE SUBSTANCES

Guidance for the development and implementation of the procedure for detection of cases of psychoactive substances is contained in ICAO Doc 9654 'Manual on Prevention of problematic use of Substances in the Aviation Workplace', First Edition - 1995, particularly in Chapter 5 (pp. 15–23) and Attachment E (pp. 77–85) as regards biochemical testing programmes, with related supporting material.

ATS.OR.310 Stress

Regulation (EU) 2017/373

In accordance with point ATS.OR.200, an air traffic control service provider shall:

(a) develop and maintain a policy for the management of air traffic controllers' stress, including the implementation of a critical incident stress management programme;

(b) provide air traffic controllers with education and information programmes on the prevention of stress, including critical incident stress, complementing human factors training provided in accordance with Sections 3 and 4 of Subpart D of Annex I to Regulation (EU) 2015/340.

GM1 ATS.OR.310 Stress

ED Decision 2017/001/R

EXPLANATION OF THE FUNDAMENTALS OF STRESS

(a) Introduction

(1) The job of an air traffic controller is considered to be responsible and demanding, and at times can lead to the experience of high levels of stress. The combination of skills and knowledge required to complete air traffic control tasks is wide. Visual spatial skills, perception, information processing, image and pattern recognition, prioritising, logical problem-solving, application of rules and procedures and decision-making form core skills to which we can add interpersonal communication, teamwork and technical vocabulary usage.

(2) Air traffic control also requires to constantly adapt to an ever-changing traffic picture and work environment within restricted time constraints. This has the potential to lead to considerable work pressure. In contrast, there may be times when traffic flows are low and controllers experience relatively low levels of activity. For some controllers, this may bring its own kind of stress due to the increased efforts required to maintain vigilance under light traffic load.

(3) Thus, the work of an air traffic controller has the potential to induce high levels of stress; however, the stress experienced by controllers is always unique to the individual and their interaction with their environment.

(4) 'Stress' is a term that is in common use within everyday language and can mean different things to different people depending on the context in which it is used. In lay terms, stress is often used to describe an external pressure experienced by an individual whilst at the

same time encompassing the subjective experience of this pressure. Usually the term is used in a negative way. In this sense, the lay use of the term 'stress' encompasses both the cause and the effect, and this can lead to confusion as to its meaning.

(b) Technical definitions of stress

(1) Even in its technical use, the word 'stress' is sometimes used when the term 'stressor' (or pressure) would be more appropriate, referring to the cause of a stress experience. Stressors can be internal (cognitive or physical) or external (environmental) to the individual and may be defined as any activity, event or other stimulus that causes the individual to experience stress.

(2) It is helpful to clarify the way the term 'stress' and other technical terms are used. For the purposes of this guidance material, stress is defined following the Transactional Model of Stress. This views stress as the outcomes experienced by an individual when faced with a potentially stressful event. The experience of the event as negatively stressful (distress), neutral or positive (eustress) is based on the individual's perception of their ability to manage the event. Under this definition, stress is a manifestation in the individual of usually negative effects, which can lead to a decrease in performance and negative health effects.

(3) A stressor can also act to improve performance when it is a stimulus to increase arousal and improves the outputs of an individual in the short to medium term. Too much arousal paradoxically leads to an inverse effect and subsequent detriment in performance.

(4) Acute stress is, as its name suggests, episodic and occurring for short periods of time. In most cases, the cause of the stress is eliminated by the air traffic controller taking action to manage the situation leading to stress. High levels of acute stress may lead to hyper-arousal and may leave an air traffic controller feeling exhausted. It is important to identify work situations that lead to this acute stress and manage this within the work schedule.

(5) Chronic stress differs from acute stress only in that it is ongoing and even low levels of continuous chronic stress can lead to performance degradation and serious health implications, if it is not addressed. Chronic stress is insidious in its nature and a sufferer may become so accustomed to the sensations that they are unaware of the long-term negative effects. Chronic stress commonly leads to a sense of inability to cope.

(6) Both acute and chronic stresses have the potential to lead individuals into hyper-aroused states which may result in panic where task and skill performance, planning, reasoning and judgement are significantly impaired. In such instances, a well-practised but incorrect action, for that particular circumstance, may be performed when an alternative and more appropriate response is required.

(7) Chronic stress may result in a condition known as burnout. Burnout is generally identified by the following characteristics: disaffection with the job leading to a decrease in motivation with an associated decrease, perceived or otherwise, in performance.

(c) Sources of stress

Broadly speaking, the stress experienced by an air traffic controller at work is a function of their underlying background levels of stress, related to lifestyle, health and well-being, personality, organisational/work environment, levels of satisfaction with life generally, and the acute stress imposed by and operational conditions at any given time. There are three major sources of stress: environmental, work-related, and personal.

(1) Environmental/physical stressors

(i) Physical stressors are underlying conditions that can either be internal to the body (e.g. pain, hunger, lack of sleep, exhaustion), or external environmental factors (e.g. noise pollution, overcrowding, excess heat). The common factor among all of these stressors is that they all create a physically uncomfortable environment that can cause stress. Stress is not solely dependent on the intensity of a stimulus, but also on the duration of exposure. For example, a low-pitched but persistent noise can cause as much stress as a sudden loud noise.

(ii) In the air traffic control room, some common environmental/physical stressors could be:

(A) uncomfortable temperature;

(B) cramped workspace;

(C) air quality;

(D) lighting conditions; and

(E) intrusive noise or vibration.

(2) Work-related stressors

(i) Stress in the workplace can come from a variety of sources besides physical stimuli. Some of these include:

(A) continuing high levels of workload near or above the maximum traffic handling capacity of an air traffic controller;

(B) a heterogeneous traffic mix where aircraft have varying levels of equipment and considerable variability in pilot skills;

(C) unsuitable or unreliable equipment;

(D) inappropriate, vague procedures;

(E) complex equipment which is insufficiently understood or mistrusted;

(F) supervision of trainees or less experienced colleagues;

(G) workload and task breakdown not being matched to the level of technical skill of the controller, lack of support or too much support (interference);

(H) role ambiguity, where it is unclear where the responsibilities lie;

(I) interpersonal conflict with colleagues, other professionals;

(J) poor management relations (social dialogue), working conditions, e.g. rostering; and

(K) unusual or emergency situations.

(ii) Incidents, including emergencies and accidents, that lead controllers to feel that they are not coping may lead to the experience of critical incident stress; this, in turn, may impair performance in varying degrees.

(3) Personal stressors

(i) Personal stressors include the range of events that occur throughout people's lives but external to the workplace. The belief that such stressors can be left at home, however, is a myth, and these personal stressors accompany air traffic controllers to work every day.

(ii) Personal issues such as health, personal life, living situation and major life events (deaths, births, marriages, and moving house) add to the background level of stress that individuals have to cope with. Where these are excessive, they can interfere with work due to the distraction they cause and the mental effort they require to resolve them.

(iii) Stress is also considered to have a contagious quality, which happens when a stressed person or stressed persons create stressful situations for those around them.

(d) Signs of stress in the individual

Signs of stress are many and varied. Some of the most commonly observed are shown below:

(1) Physiological

(i) Cardiovascular: increased pulse rate, elevated blood pressure, chest pains;

(ii) Respiratory: shortness of breath, tightness of chest, hyperventilation, dizziness;

(iii) Gastrointestinal: loss of appetite, gas pain, abdominal cramps, indigestion, diarrhoea, nausea;

(iv) Sweaty palms;

(v) Aching neck, jaw and back muscles;

(vi) Trembling;

(vii) Sleep disturbance, tiredness;

(viii) Itching;

(ix) Getting easily startled;

(x) Susceptibility to minor illnesses; and

(xi) Other: headaches, muscular tension, general weakness, psychosomatic symptoms.

(2) Psychological

(i) Emotional: anger, guilt, mood swings, low self-esteem, depression and anxiety;

(ii) Concentration problems, forgetfulness;

(iii) Pessimism;

(iv) Difficulty in making decisions;

(v) Irritability;

(vi) Loss of interest;

(vii) Loss of self-control; and

(viii) Loss of confidence.

(3) Behavioural

(i) Self-medication, drugs or alcohol;

(ii) Excess fatigue;

(iii) Sleep disruption;

(iv) Social withdrawal;

(v) Absenteeism;

(vi) Staff turnover rates; and

(vii) Job performance decrements.

(e) Impact of stress on air traffic controllers' performance of air traffic control tasks

Any source of stress has the potential to create unique subjective experiences in different individuals, and these may be positive or negative experiences or something in between.

(f) Negative experiences of stress

There is a number of ways in which stress experienced by air traffic controllers can be manifested in the performance of air traffic control tasks. Some of these are listed in Table 1, but, in general terms, performance of tasks decreases due to the detrimental effects that high levels of stress can have on perception, awareness, decision-making and judgement. In the longer term, health and well-being may also be compromised, leading to decreased performance of air traffic controllers.

Table 1 below shows the effects on air traffic controller performance which can be linked to stress and which can potentially have very significant implications for the safety performance of an operation.

Difficulty in concentrating and reduced vigilance — easily distracted.
Errors, omissions, mistakes, incorrect actions, poor judgment and memory.
Tendency to cut corners, skip items and look for the easiest way out.
Either slowness (due to lack of interest) or hyperactivity (due to adrenaline).
Focusing on easily manageable details while ignoring serious threats.
Tendency to pass responsibility on to others.
Fixation on single issues or even a mental block.
Unwillingness to make decisions — decisions are postponed or take longer to be made.
Fewer plans and backup plans are made.
Increase in risk-taking, leading to an increase in the number of violations, especially when frustrated with failures.
Excessively hurried actions — due to adrenaline and alertness level, there is a tendency to act very quickly even when there is no time pressure. Hurried actions increase the chance of errors.
In cases of significantly high stress, a controller will often: (1) return to old procedures that may no longer be applicable, appropriate or safe; (2) use non-standard phraseology when communicating; (3) return to the use of one's native language; and/or (4) look for items in a place where they used to be, but are no longer located.

Table 1: Effects of stress on physical and mental performance of air traffic control tasks

(g) Mitigation of stress in the individual and the organisation

Air traffic control service providers have a duty to take care of their employees and the customers of their services. They should aim at mitigating the negative effects of stress. This is best achieved by ensuring that a range of preventative measures as well as countermeasures are in place. These include:

(1) adoption of a stress policy and/or a critical incident stress management policy within the organisation;

(2) completion of regular risk assessment of sources of occupational stress and its effects on individuals and operations;

(3) employee stress level monitoring;

(4) adoption of stress intervention/mitigation/prevention practices and, where the organisation identifies a source of stress, use of a stress team/committee;

(5) stress management training for all levels of employees;

(6) education and prevention programmes on stress; and

(7) staff support mechanisms (e.g. peer counselling, professional support from health practitioners, critical incident stress management (CISM) programmes);

(8) adequate rostering allowing time to evacuate stress; and

(9) promotion of sports or relaxation activities.

AMC1 ATS.OR.310(a) Stress

ED Decision 2017/001/R

STRESS MANAGEMENT POLICY

(a) The air traffic controllers' stress management policy should:

(1) declare the commitment to proactively and systematically monitor and manage stress, and describe the expected benefits for the safety of operations;

(2) be signed by the accountable manager;

(3) reflect organisational commitments regarding the implementation of a critical incident stress management programme;

(4) be communicated, with visible endorsement, throughout the air traffic control service provider;

(5) include the commitment to:

(i) provide appropriate resources;

(ii) consider the best practices;

(iii) enforce stress management programme(s) as a responsibility of managers, staff involved in stress management and air traffic controllers;

(6) be periodically reviewed to ensure it remains relevant and appropriate.

(b) In accordance with the policy in point (a), the air traffic control service provider should establish and implement:

(1) procedures for critical incident stress management;

(2) principles and procedures to enable stress reporting;

(3) principles and procedures for occurrence investigation and analysis to consider stress as contributing factor; and

(4) method(s) for the identification and management of the effect of air traffic controllers' stress on the safety of operations.

GM1 ATS.OR.310(a) Stress

ED Decision 2017/001/R

CRITICAL INCIDENT STRESS MANAGEMENT

The purpose of critical incident stress management (CISM) programmes is to prepare an organisation for the potential aftermath of an incident. These programmes come in a number of different forms, but have the added benefit of providing education on the effects of stress, how stress affects performance and stress management, even when the incident is relatively minor and perhaps personal to the individual.

Guidance for the implementation of a CISM programme may be found in the EUROCONTROL document: 'Human Factors — Critical Incident Stress Management: User Implementation Guidelines', edition 2.0 of 24 October 2008.

GM1 ATS.OR.310(b) Stress

ED Decision 2017/001/R

INFORMATION AND EDUCATION PROGRAMMES

Scientific material proposed as guidance for information and education programmes on stress may be found in the EUROCONTROL document 'Human Factors Module — Stress', edition 1.0 of 15 March 1996.

ATS.OR.315 Fatigue

Regulation (EU) 2017/373

In accordance with point ATS.OR.200, an air traffic control service provider shall:

(a) develop and maintain a policy for the management of air traffic controllers' fatigue;

(b) provide air traffic controllers with information programmes on the prevention of fatigue, complementing human factors training provided in accordance with Sections 3 and 4 of Subpart D of Annex I to Regulation (EU) 2015/340.

GM1 ATS.OR.315 Fatigue

ED Decision 2017/001/R

EFFECTS OF FATIGUE

Guidance material on fatigue and its effects on safety-relevant aviation professionals may be found in Chapter 2 'Scientific principles for fatigue management' of ICAO Doc 9966 'Manual for the Oversight of Fatigue Management Approaches', second edition 2016.

AMC1 ATS.OR.315(a) Fatigue

ED Decision 2017/001/R

FATIGUE MANAGEMENT POLICY

(a) The air traffic controllers' fatigue management policy should:

(1) declare the commitment to proactively and systematically monitor and manage fatigue and describe the expected benefits for the safety of operations;

(2) be signed by the accountable manager;

(3) address the mitigation of the operational impact of air traffic controllers' fatigue;

(4) be communicated, with visible endorsement, throughout the air traffic control service provider;

(5) include a commitment to:

(i) consider the best practices;

(ii) provide appropriate resources; and

(iii) enforce fatigue management as a responsibility of managers, staff involved in fatigue management procedures and air traffic controllers;

(6) be periodically reviewed to ensure it remains relevant and appropriate.

(b) In accordance with the policy in point (a), the air traffic control service provider should establish and implement:

(1) principles and procedures to enable fatigue reporting;

(2) principles and procedures for occurrence investigation and analysis to consider fatigue as contributing factor;

(3) procedures for the identification and management of the effect of fatigue on the safety of operations.

GM1 to AMC1 ATS.OR.315(a) Fatigue

ED Decision 2017/001/R

FATIGUE TAXONOMY

When establishing procedures to enable air traffic controllers to report when fatigued, an associated taxonomy for fatigue should be established.

GM2 to AMC1 ATS.OR.315(a) Fatigue

ED Decision 2017/001/R

FATIGUE IN OCCURRENCE INVESTIGATION AND ANALYSIS

Fatigue may have a significant impact on the performance of air traffic controllers and consequently on the safety of air operations. Therefore, when investigating occurrences, the air traffic control service providers should analyse the occurrence for fatigue as a contributing factor.

The analysis of available occurrence reports where fatigue was identified as contributing factor, generated by the air traffic control service providers or by other sources, could support the implementation and the improvement of fatigue management.

GM3 to AMC1 ATS.OR.315(a) Fatigue

ED Decision 2017/001/R

IDENTIFICATION AND MANAGEMENT OF THE EFFECT OF FATIGUE ON THE SAFETY OF OPERATIONS

(a) The following non exhaustive list contains some of the initiatives that the air traffic control service provider may undertake in order to identify air traffic controllers' fatigue:

(1) establishment of a procedure allowing air traffic controllers to report when fatigued, and promotion of its use. Templates for such reporting procedure could be established;

(2) utilisation of system support to manage rostering principles and thresholds established in accordance with ATS.OR.320, also highlighting criticalities in advance;

(3) undertaking fatigue surveys;

(4) application of scientific principles on fatigue and fatigue management and their effect on the operational and organisational context.

(b) The knowledge and understanding of the underlying scientific principles of fatigue, as well of its potential impact on the safety of operations, may represent a considerable added value for the effectiveness of fatigue management arrangements established within the organisation. For this purpose, the air traffic control service provider might consider making available education and information programmes for staff involved in fatigue management, such as operational and safety managers, staff in charge of managing the rostering system, staff in charge of occurrence investigation.

(c) Activities air traffic control service providers could undertake to monitor the effectiveness of the established fatigue management arrangements may be but are not limited to the following:

(1) verification of the allocation and implementation of duty and rest periods in accordance with the rostering principles established in ATS.OR.320;

(2) collection and analysis of data related to planned versus achieved rosters, and in particular:

(i) exceedances of planned working hours and reasons generating exceedances;

(ii) variation of the nature of the duty (office work, operational air traffic control service provision, training, etc.);

(iii) operational circumstances which required a modification of established duty and rest periods; and

(iv) swapped shifts between air traffic controllers and impact on the established fatigue management principles;

(3) verification of the use and of the effectiveness of the procedure allowing air traffic controllers to self-declare fatigue, when such procedure is established; and

(4) analysis if specific roster patterns generate fatigue and, as a consequence, sickness or cases of provisional inability in accordance with Commission Regulation (EU) 2015/340.

GM1 ATS.OR.315(b) Fatigue

ED Decision 2017/001/R

INFORMATION PROGRAMMES

Information programmes may consist of lectures, leaflets, posters, CDs, and any other informative material to raise the awareness of the effects of fatigue on the individuals and on air traffic control service provision, and to advise on the need and the means to manage it. When choosing the most appropriate information programme and the medium, the air traffic control service provider should evaluate the level of awareness of its staff of fatigue management, the type of operations (e.g. single-person operations, nightshifts), and the periodicity of human factors training in the scope of refresher training.

GM2 ATS.OR.315(b) Fatigue

ED Decision 2017/001/R

INFORMATION PROGRAMMES

Scientific material proposed as guidance for information programmes on fatigue may be found in the document 'Fatigue and Sleep Management: Personal strategies for decreasing the effects of fatigue in air traffic control' (Brussels: Human Factors Management Business Division (DAS/HUM), EUROCONTROL, 2005).

ATS.OR.320 Air traffic controllers' rostering system(s)

Regulation (EU) 2017/373

(a) An air traffic control service provider shall develop, implement and monitor a rostering system in order to manage the risks of occupational fatigue of air traffic controllers through a safe alternation of duty and rest periods. Within the rostering system, the air traffic control service provider shall specify the following elements:

(1) maximum consecutive working days with duty;

(2) maximum hours per duty period;

(3) maximum time providing air traffic control service without breaks;

(4) the ratio of duty periods to breaks when providing air traffic control service;

(5) minimum rest periods;

(6) maximum consecutive duty periods encroaching the night time, if applicable, depending upon the operating hours of the air traffic control unit concerned;

(7) minimum rest period after a duty period encroaching the night time;

(8) minimum number of rest periods within a roster cycle.

(b) An air traffic control services provider shall consult those air traffic controllers who will be subject to the rostering system, or, as applicable, their representatives, during its development and its application, to identify and mitigate risks concerning fatigue which could be due to the rostering system itself.

GM1 ATS.OR.320(a) Air traffic controllers' rostering system(s)

ED Decision 2017/001/R

STRUCTURE AND VALUES OF THE ROSTERING SYSTEM

The selection and the regular revision of an appropriate structure and of appropriate values of the rostering system, in accordance with ATS.OR.320(a) and which fit the intended operations, should be based upon:

(1) scientific principles;

(2) data gathered by the air traffic control service provider; and

(3) best practices.

AMC1 ATS.OR.320(a)(6);(7) Air traffic controllers' rostering system(s)

ED Decision 2017/001/R

NIGHT TIME

Night time should be considered as the time between midnight and 05.59.

GM1 ATS.OR.320(b) Air traffic controllers' rostering system(s)

ED Decision 2017/001/R

AIR TRAFFIC CONTROLLERS' INVOLVEMENT

Additional guidance concerning the involvement of air traffic controllers in the definition of rostering systems is available in EUROCONTROL Study on Shiftwork practices — ATM and related Industries, edition 1.0 of 14 April 2006.

SUBPART B — TECHNICAL REQUIREMENTS FOR PROVIDERS OF AIR TRAFFIC SERVICES (ATS.TR)

SECTION 1 — GENERAL REQUIREMENTS

ATS.TR.100 Working methods and operating procedures for providers of air traffic services

Regulation (EU) 2017/373

(a) An air traffic services provider shall be able to demonstrate that its working methods and operating procedures are compliant with:

(1) Implementing Regulation (EU) No 923/2012; and

(2) the standards laid down in the following Annexes to the Chicago Convention, as far as they are relevant to the provision of air traffic services in the airspace concerned:

(i) Annex 10 on aeronautical telecommunications, Volume II on communication procedures including those with PANS Status in its 6th edition of October 2001, including all amendments up to and including No 89;

(ii) without prejudice to Regulation (EU) No 923/2012, Annex 11 on air traffic services in its 13th edition of July 2001, including all amendments up to and including No 49.

(b) Notwithstanding point (a), for air traffic services units providing services for flight testing, the competent authority may specify additional or alternative conditions and procedures to those contained in point (a) when so required for the provision of services for flight testing.

GM1 ATS.TR.100(b) Working methods and operating procedures for providers of air traffic services

ED Decision 2017/001/R

SPECIAL AND ALTERNATIVE CONDITIONS AND OPERATING PROCEDURES FOR ATS PROVIDERS PROVIDING SERVICES TO FLIGHT TESTS

(a) While flight tests are regularly conducted in compliance with the standards and the provision specified in ATS.TR.100(a), some of them need to follow specific additional or alternative conditions and procedures approved by the competent authority to meet the needs of flight tests carried out during the flight. This is also the case for flight tests involving more than one aircraft in the same flight test. These special provisions will not jeopardise the safety of the other airspace users and the population in the area overflown.

(b) In order to ensure safe operations within the provision of air traffic service for flight tests control, the air traffic controllers providing these services may need to have specific knowledge of flight tests and/or be briefed, depending on the specificities of the flight profiles.

(c) Air traffic controllers that provide air traffic services to flight tests (flight test ATCOs) may need to obtain their specific competence through a dedicated training as specified in Commission Regulation (EU) 2015/340.

(d) Air traffic services for flight test should be provided through dedicated and specific procedures. These procedures should address:

(1) Compatibility with other airspace users

(i) In order to ensure the compatibility of the flight test with other airspace users and to ensure safe operations and an acceptable rate of success of flight test, the air traffic services provider should ensure proper coordination at all levels, including strategic, pre-tactical and real-time coordination.

(ii) An air traffic services unit providing services to flight test is responsible for ensuring compatibility of their activities with other airspace users.

(2) Flight plan

The air traffic services unit should obtain all the necessary details related to flight tests (e.g. from the design organisation or the entity wishing to carry out the flight test).

(3) Flight tests with limited manoeuvrability

During certain phases of the flight test, the capability to normally perform manoeuvres may only be possible after a necessary period of time (e.g. for the flight crew to get into a configuration that allows the execution of these manoeuvres).

The air traffic services provider should obtain the necessary information about the phases of flight and the duration if known.

For the conduct of these flights, the use of a temporarily reserved area is preferred. If unable, after prior coordination with the relevant air traffic services units neighbouring the flight tests, the use of a transponder should be mandated.

This real-time information does not relieve the air traffic services unit responsible for providing services to the flight tests from the obligation to ensure traffic separation and assure compatibility with all airspace users.

(e) The above-mentioned procedures are not exhaustive and additional provisions may be necessary to meet the needs of flight tests. The paramount principle is anyhow to make provisions without contradicting the standards and the provision specified in ATS.TR.100(a).

ANNEX V — PART-MET

SPECIFIC REQUIREMENTS FOR PROVIDERS OF METEOROLOGICAL SERVICES

SUBPART A — ADDITIONAL ORGANISATION REQUIREMENTS FOR PROVIDERS OF METEOROLOGICAL SERVICES (MET.OR)

SECTION 1 — GENERAL REQUIREMENTS

MET.OR.100 Meteorological data and information

Regulation (EU) 2017/373

(a) A meteorological services provider shall provide operators, flight crew members, air traffic services units, search and rescue services units, aerodrome operators, accident and incident investigation bodies, and other service providers and aviation entities with the meteorological information necessary for the performance of their respective functions, as determined by the competent authority.

(b) A meteorological services provider shall confirm the operationally desirable accuracy of the information distributed for operations, including the source of such information, whilst also ensuring that such information is distributed in a timely manner and updated, as required.

GM1 MET.OR.100 Meteorological data and information

ED Decision 2017/001/R

DATA AND INFORMATION RELIABILITY

Owing to the variability of meteorological elements in space and time, to limitations of observing techniques and to limitations caused by the definitions of some of the elements, the specific value of any of the elements given in a forecast is understood to be the most probable value which the element is likely to assume during the period of the forecast. Similarly, when the time of occurrence or change of an element is given in a forecast, this time is understood to be the most probable time.

AMC1 MET.OR.100(a) Meteorological data and information

ED Decision 2017/001/R

INFORMATION TO BE PROVIDED

An agreement between the meteorological services provider and the appropriate ATS unit should be established to cover:

(a) the provision in air traffic services units of displays related to integrated automatic systems;

(b) the calibration and maintenance of these displays/instruments;

(c) the use to be made of these displays/instruments by air traffic services personnel;

(d) as and where necessary, supplementary visual observations, such as meteorological phenomena of operational significance in the climb-out and approach areas, if and when made

by air traffic services personnel to update or supplement the information supplied by the meteorological station;

(e) meteorological information obtained from aircraft taking off or landing such as on wind shear; and

(f) if available, meteorological information obtained from ground weather radar.

GM1 MET.OR.100(a) Meteorological data and information

ED Decision 2017/001/R

OTHER AVIATION ENTITIES

The competent authority determines who may be the 'other service providers and aviation entities' that could be provided with the necessary meteorological information.

MET.OR.105 Retention of meteorological information

Regulation (EU) 2017/373

(a) A meteorological services provider shall retain meteorological information issued for a period of at least 30 days from the date of issue.

(b) This meteorological information shall be made available, on request, for inquiries or investigations and, for these purposes, shall be retained until the inquiry or investigation is completed.

MET.OR.110 Meteorological information exchange requirements

Regulation (EU) 2017/373

A meteorological services provider shall ensure it has systems and processes in place, as well as access to suitable telecommunications facilities to:

(a) enable the exchange of operational meteorological information with other meteorological services providers;

(b) provide the required meteorological information to the users in a timely manner.

GM1 MET.OR.110 Meteorological information exchange requirements

ED Decision 2017/001/R

GENERAL

Operational meteorological information is disseminated to international OPMET databanks and the centres for the operation of aeronautical fixed service satellite distribution systems.

GM2 MET.OR.110 Meteorological information exchange requirements

ED Decision 2017/001/R

OPMET DATABANK

The list of relevant meteorological exchange requirements for OPMET can be found in the FASID tables in ICAO Doc 7754 (EUR ANP).

GM1 MET.OR.110(a) Meteorological information exchange requirements

ED Decision 2017/001/R

AREA FORECASTS — LOW-LEVEL FLIGHTS

Area forecasts for low-level flights prepared in support of the issuance of AIRMET information are exchanged between aerodrome meteorological offices and/or meteorological watch offices responsible for the issuance of flight documentation for low-level flights in the flight information regions concerned.

MET.OR.115 Meteorological bulletins

Regulation (EU) 2017/373

The meteorological services provider responsible for the area concerned shall provide meteorological bulletins to the relevant users, via the aeronautical fixed service or the internet.

MET.OR.120 Notification of discrepancies to the world area forecast centres (WAFC)

Regulation (EU) 2017/373

The meteorological services provider responsible for the area concerned shall, using WAFS BUFR data, notify the WAFC concerned immediately if significant discrepancies are detected or reported in respect of WAFS significant weather (SIGWX) forecasts, concerning:

(a) icing, turbulence, cumulonimbus clouds that are obscured, frequent, embedded, or occurring at a squall line, and sandstorms/dust storms;

(b) volcanic eruptions or a release of radioactive materials into the atmosphere of significance to aircraft operations.

GM1 MET.OR.120 Notification of discrepancies to the world area forecast centres (WAFCs)

ED Decision 2017/001/R

REPORTING — SIGNIFICANT DISCREPANCIES

Guidance on reporting significant discrepancies is provided in the Manual of Aeronautical Meteorological Practice (ICAO Doc 8896).

SECTION 2 — SPECIFIC REQUIREMENTS

CHAPTER 1 — REQUIREMENTS FOR AERONAUTICAL METEOROLOGICAL STATIONS

MET.OR.200 Meteorological reports and other information

Regulation (EU) 2017/373

(a) An aeronautical meteorological station shall disseminate:

(1) local routine reports at fixed intervals, only for dissemination at the aerodrome of origin;

(2) local special reports, only for dissemination at the aerodrome of origin;

(3) METAR at half-hourly intervals at aerodromes serving scheduled international commercial air transport operations for dissemination beyond the aerodrome of origin.

(b) An aeronautical meteorological station shall inform the air traffic service units and aeronautical information service of an aerodrome of changes in the serviceability status of the automated equipment used for assessing runway visual range.

(c) An aeronautical meteorological station shall report to the associated air traffic services unit, aeronautical information services unit, and meteorological watch office the occurrence of pre-eruption volcanic activity, volcanic eruptions and volcanic ash cloud.

(d) An aeronautical meteorological station shall establish a list of criteria to provide local special reports in consultation with the appropriate ATS units, operators and others concerned.

GM1 MET.OR.200(a) Meteorological reports and other information

ED Decision 2017/001/R

OBSERVATIONS AND REPORTS

The observations form the basis for the preparation of reports. At aerodromes, the routine observations are supplemented by special observations whenever specified changes occur in respect of surface wind, visibility, runway visual range, present weather, clouds and/or air temperature.

AMC1 MET.OR.200(a)(1) Meteorological reports and other information

ED Decision 2017/001/R

ROUTINE OBSERVATIONS

Meteorological stations should make routine observations throughout the 24 hours of each day or as determined by the competent authority.

GM1 MET.OR.200(a)(2) Meteorological reports and other information

ED Decision 2017/001/R

LOCAL SPECIAL REPORTS

By agreement between the aeronautical meteorological station and the appropriate ATS unit, local special reports may not be disseminated in respect of:

(a) any element for which there is in the local air traffic services unit a display corresponding to the one in the meteorological station, and where arrangements are in force for the use of this display to update information included in local routine reports and local special reports; and

(b) runway visual range, when all changes of one or more steps on the reporting scale in use are being reported to the local air traffic services unit by an observer on the aerodrome.

AMC1 MET.OR.200(a)(3) Meteorological reports and other information

ED Decision 2017/001/R

METAR

At aerodromes that are not operational throughout the 24 hours, the issuance of a METAR should commence at least 3 hours prior to the aerodrome resuming operations, or as agreed between the meteorological services provider and the operators concerned to meet pre-flight and in-flight planning requirements for flights due to arrive at the aerodrome as soon as it is opened for use.

AMC2 MET.OR.200(a)(3) Meteorological reports and other information

ED Decision 2017/001/R

METAR INTERVALS — NON-SCHEDULED INTERNATIONAL CAT

For aerodromes not serving scheduled international commercial air transport operations, the dissemination of hourly METAR and SPECI, as well as the criteria to provide SPECI, should be agreed between the competent authority and the meteorological services provider.

AMC1 MET.OR.200(c) Meteorological reports and other information

ED Decision 2017/001/R

VOLCANIC ACTIVITY REPORT

The report of occurrence of pre-eruption volcanic activity, volcanic eruptions and volcanic ash clouds should be made in the format of a volcanic activity report comprising the following meteorological information in the order indicated:

(a) message type, VOLCANIC ACTIVITY REPORT;

(b) station identifier, location indicator or name of station;

(c) date/time of message;

(d) location of volcano and name, if known; and

(e) concise description of the event including, as appropriate, level of intensity of volcanic activity, occurrence of an eruption and its date and time and the existence of a volcanic ash cloud in the area together with direction of ash cloud movement and height.

MET.OR.205 Reporting of meteorological elements

Regulation (EU) 2017/373

At aerodromes serving scheduled international commercial air transport operations, an aeronautical meteorological station shall report:

(a) surface wind direction and speed;

(b) visibility;

(c) runway visual range, if applicable;

(d) present weather at the aerodrome and its vicinity;

(e) clouds;

(f) air temperature and dew point temperature;

(g) atmospheric pressure;

(h) supplementary information when applicable.

Where authorised by the competent authority, at aerodromes not serving scheduled international commercial air transport operations, an aeronautical meteorological station may report only a subset of the meteorological elements as relevant to the types of flights at that aerodrome. This data set shall be published in the aeronautical information publication.

MET.OR.210 Observing meteorological elements

Regulation (EU) 2017/373

At aerodromes serving scheduled international commercial air transport operations, an aeronautical meteorological station shall observe and/or measure:

(a) surface wind direction and speed;

(b) visibility;

(c) runway visual range, if applicable;

(d) present weather at the aerodrome and its vicinity;

(e) clouds;

(f) air temperature and dew point temperature;

(g) atmospheric pressure;

(h) supplementary information, when applicable:

Where authorized by the competent authority, at aerodromes not serving scheduled international commercial air transport operations, an aeronautical meteorological station may observe and/or measure only a subset of the meteorological elements as relevant to the types of flights at that aerodrome. This data set shall be published in the aeronautical information publication.

AMC1 MET.OR.210 Observing meteorological elements

ED Decision 2017/001/R

DISPLAY

Where automated equipment forms part of an integrated semi-automatic observing system, displays of data which are made available to the local ATS units should be a subset of and displayed parallel to those available in the aeronautical meteorological stations or meteorological offices. In those displays, each meteorological element should be annotated to identify, as appropriate, the locations for which the element is representative.

AMC2 MET.OR.210 Observing meteorological elements

ED Decision 2017/001/R

PROCESSING OF METEOROLOGICAL OBSERVATIONS

(a) Meteorological observations for regular and alternate aerodromes should be collected, processed and stored in a form suitable for the preparation of aerodrome climatological information.

(b) Aeronautical climatological information should be exchanged on request between meteorological services providers.

CHAPTER 2 — REQUIREMENTS FOR AERODROME METEOROLOGICAL OFFICES

MET.OR.215 Forecasts and other information

Regulation (EU) 2017/373

An aerodrome meteorological office shall:

(a) prepare and/or obtain forecasts and other relevant meteorological information necessary for the performance of its respective functions for flights with which it is concerned, as determined by the competent authority;

(b) provide forecasts and/or warnings for local meteorological conditions on aerodromes for which it is responsible;

(c) keep the forecasts and warnings under continuous review and issue amendments promptly when necessary, and cancel any forecast of the same type previously issued for the same place and for the same period of validity or part thereof;

(d) provide briefing, consultation and flight documentation to flight crew members and/or other flight operations personnel;

(e) provide climatological information;

(f) provide its associated air traffic services unit, aeronautical information service unit and meteorological watch office with information received on pre-eruption volcanic activity, a volcanic eruption or volcanic ash cloud;

(g) provide, if applicable, meteorological information to search and rescue services units and maintain liaison with the search and rescue services unit(s) throughout a search and rescue operation;

(h) provide meteorological information to relevant aeronautical information services units, as necessary, for the conduct of their functions;

(i) prepare and/or obtain forecast and other relevant meteorological information necessary for the performance of the ATS units functions in accordance with point MET.OR.242;

(j) provide its associated air traffic services unit, aeronautical information service unit and meteorological watch offices with information received on the release of radioactive materials into the atmosphere.

AMC1 MET.OR.215(a) Forecasts and other information

ED Decision 2017/001/R

METEOROLOGICAL DATA TYPE

On request by the operator, the meteorological information supplied for flight planning should include data for the determination of the lowest usable flight level.

GM1 MET.OR.215(a) Forecasts and other information

ED Decision 2017/001/R

PREPARATION OF FORECASTS

The extent of the aerodrome meteorological office responsibilities to prepare forecasts may relate to the local availability and use of en-route and aerodrome forecast material received from other offices.

GM2 MET.OR.215(a) Forecasts and other information

ED Decision 2017/001/R

COMPETENT AUTHORITY

The competent authority identifies the types of forecasts and other meteorological information that need to be provided by the aerodrome meteorological office to flights with which it is concerned.

AMC1 MET.OR.215(c) Forecasts and other information

ED Decision 2017/001/R

FORMAT OF FORECASTS

The length of the forecast messages and the number of changes indicated in the forecast should be kept to a minimum.

GM1 MET.OR.215(c) Forecasts and other information

ED Decision 2017/001/R

AUTOMATIC CANCELLATION

The issue of a new forecast by an aerodrome meteorological office, such as a routine aerodrome forecast, automatically cancels any forecast of the same type previously issued for the same place and for the same period of validity or part thereof.

GM2 MET.OR.215(c) Forecasts and other information

ED Decision 2017/001/R

TAF CONTINUOUS REVIEW GUIDANCE

Guidance on methods to keep Terminal Aerodrome Forecasts (TAF) under continuous review is given in Chapter 3 of the Manual of Aeronautical Meteorological Practice (ICAO Doc 8896).

GM3 MET.OR.215(c) Forecasts and other information

ED Decision 2017/001/R

AMENDMENTS TO WARNINGS

If it is known that an existing warning no longer accurately describes the existing or expected future evolution of the phenomena, a new warning, correctly describing the hazard should be issued (avoiding the use of the code word 'AMD', not included in the templates for warnings), followed immediately by the cancellation of the original, erroneous one. The new warning should be issued before the cancellation in order to ensure there is always a warning in force and that the cancellation is not mistakenly understood to mean the hazard has completely dissipated.

GM1 MET.OR.215(d) Forecasts and other information

ED Decision 2017/001/R

BRIEFING AND CONSULTATION

(a) Briefing should be understood as being preparatory meteorological information on existing and/or expected meteorological conditions.

(b) Consultation should be understood as discussion, including answers to questions, with a meteorologist or another qualified person of existing and/or expected meteorological conditions relating to flight operations.

(c) The purpose of briefing and consultation is to provide the latest available information on existing and expected meteorological conditions along the route to be flown and at the aerodrome of intended landing, and on alternate aerodromes and other aerodromes as relevant, in order to either explain or amplify the information contained in the flight documentation.

GM2 MET.OR.215(d) Forecasts and other information

ED Decision 2017/001/R

PRE-FLIGHT PLANNING

The service for pre-flight planning should be confined to flights originating within the territory of the State concerned.

GM3 MET.OR.215(d) Forecasts and other information

ED Decision 2017/001/R

FLIGHT DOCUMENTATION

'Flight documentation', for the purpose of meteorology, is understood as being documents, including charts or forms, containing meteorological information for a flight.

AMC1 MET.OR.215(e) Forecasts and other information

ED Decision 2017/001/R

CLIMATOLOGICAL INFORMATION

The aerodrome meteorological office should make available such climatological tables within a time period as agreed between the competent authority and the relevant user.

AMC1 MET.OR.215(f) Forecasts and other information

ED Decision 2017/001/R

AIS — NOTAM/ASHTAM AND AIC

The aerodrome meteorological office should provide the relevant aeronautical information service provider with meteorological information:

(a) necessary for the preparation of NOTAM or ASHTAM, including, in particular, information on the establishment, withdrawal and significant changes in operation of aeronautical meteorological services sufficiently in advance of the effective date to permit issuance of NOTAM; and

(b) necessary for the preparation of aeronautical information circulars, including, in particular, meteorological information on expected important changes in aeronautical meteorological procedures, services and facilities provided.

AMC1 MET.OR.215(g) Forecasts and other information

ED Decision 2017/001/R

SEARCH AND RESCUE

To facilitate search and rescue operations, the aerodrome meteorological office or meteorological watch office should provide:

(a) complete and detailed meteorological information on the current and forecast meteorological conditions in the search area;

(b) current and forecast conditions en-route, covering flights by search aircraft from and returning to the aerodrome from which the search is being conducted; and

(c) on request from the rescue coordination centre, meteorological information required by ships undertaking search and rescue operations.

MET.OR.220 Aerodrome forecasts

Regulation (EU) 2017/373

(a) An aerodrome meteorological office shall issue aerodrome forecasts as a TAF at a specified time.

(b) When issuing TAF, the aerodrome meteorological office shall ensure that not more than one TAF is valid at an aerodrome at any given time.

GM1 MET.OR.220(a) Aerodrome forecasts

ED Decision 2017/001/R

DISSEMINATION OF TAF

TAF and amendments thereto are disseminated to international OPMET databanks and the centres designated for the operation of aeronautical fixed service satellite distribution systems.

MET.OR.225 Forecasts for landing

Regulation (EU) 2017/373

(a) An aerodrome meteorological office shall prepare forecasts for landing as determined by the competent authority.

(b) This forecast for landing shall be issued in the form of a TREND forecast.

(c) The period of validity of a TREND forecast shall be 2 hours from the time of the report which forms part of the landing forecast.

GM1 MET.OR.225 Forecasts for landing

ED Decision 2017/001/R

RANGE

Landing forecasts are intended to meet the requirements of local users and of aircraft within about one hour’s flying time from the aerodrome.

GM1 MET.OR.225(a) Forecasts for landing

ED Decision 2017/001/R

PREPARATION

As all the aerodromes do not need to be provided with forecasts for landing, the competent authority determines on which aerodromes these types of forecasts will be provided by the aerodrome meteorological office.

GM1 MET.OR.225(b) Forecasts for landing

ED Decision 2017/001/R

TREND FORECAST

A TREND forecast is understood as being a concise statement of the expected significant changes in the meteorological conditions at that aerodrome to be appended to a METAR, and if agreed between the aeronautical meteorological station and the appropriate ATS unit as well in a local routine report and local special report.

MET.OR.230 Forecasts for take-off

Regulation (EU) 2017/373

An aerodrome meteorological office shall:

(a) prepare forecasts for take-off as determined by the competent authority;

(b) supply forecasts for take-off to operators and flight crew members on request within the 3 hours before the expected time of departure.

MET.OR.235 Aerodrome warnings and wind shear warnings and alerts

Regulation (EU) 2017/373

An aerodrome meteorological office shall:

(a) provide aerodrome warnings information;

(b) prepare wind shear warnings for aerodromes where wind shear is considered a factor, in accordance with local arrangements with the appropriate ATS unit and operators concerned;

(c) issue, at aerodromes where wind shear is detected by automated, ground-based, wind shear remote-sensing or detection equipment, wind shear alerts generated by these systems;

(d) cancel warnings when the conditions are no longer occurring and/or no longer expected to occur at the aerodrome.

GM1 MET.OR.235 Aerodrome warnings and wind shear warnings and alerts

ED Decision 2017/001/R

AUTOMATED DETECTION EQUIPMENT

The decision to install an automated wind shear detection equipment should be based on the local meteorological and air traffic considerations. Where such equipment is installed, wind shear alerts should be issued in accordance with MET.OR.235(c).

AMC1 MET.OR.235(b) Aerodrome warnings and wind shear warnings and alerts

ED Decision 2017/001/R

WIND SHEAR FOLLOW-UP

Wind shear alerts should be updated at least every minute. They should be cancelled as soon as the headwind/tailwind change falls below 15 kt (7.5 m/s).

GM1 MET.OR.235(d) Aerodrome warnings and wind shear warnings and alerts

ED Decision 2017/001/R

WIND SHEAR ALERTS

Wind shear alerts are expected to complement wind shear warnings and together are intended to enhance situational awareness of wind shear.

GM2 MET.OR.235(d) Aerodrome warnings and wind shear warnings and alerts

ED Decision 2017/001/R

CANCELLATION OF WARNINGS

The criteria for the cancellation of a wind shear warnings are defined locally for each aerodrome, as agreed between the aerodrome meteorological office, the appropriate ATS units and the operators concerned.

MET.OR.240 Information for use by operator or flight crew

Regulation (EU) 2017/373

(a) An aerodrome meteorological office shall provide operators and flight crew members with:

(1) forecasts, originating from the WAFS, of the elements listed in points (1) and (2) of point MET.OR.275(a);

(2) METAR or SPECI, including TREND forecasts, TAF or amended TAF for the aerodromes of departure and intended landing, and for take-off, en-route and destination alternate aerodromes;

(3) aerodrome forecasts for take-off;

(4) SIGMET and special air-reports relevant to the whole route;

(5) volcanic ash and tropical cyclone advisory information relevant to the whole route;

(6) area forecasts for low-level flights in chart form prepared in support of the issuance of an AIRMET message, and an AIRMET message for low-level flights relevant to the whole route;

(7) aerodrome warnings for the local aerodrome;

(8) meteorological satellite images;

(9) ground-based weather radar information.

(b) Whenever the meteorological information to be included in the flight documentation differs materially from that made available for flight planning, the aerodrome meteorological office shall:

(1) advise immediately the operator or flight crew concerned;

(2) if practicable, provide the revised meteorological information in agreement with the operator.

GM1 MET.OR.240(a)(1) Information for use by operator or flight crew

ED Decision 2017/001/R

GENERAL

Forecasts of upper-air humidity and geopotential altitude of flight levels are used only in automatic flight planning and do not need to be displayed.

GM1 MET.OR.240(a)(4) Information for use by operator or flight crew

ED Decision 2017/001/R

SIGMET

Special air-reports supplied to operators and flight crew members will be those not already used in the preparation of SIGMET.

MET.OR.242 Information to be provided to air traffic services units

Regulation (EU) 2017/373

(a) An aerodrome meteorological office shall provide, as necessary, its associate aerodrome control tower with:

(1) local routine and special reports, METAR, TAF and TREND forecasts and amendments thereto;

(2) SIGMET and AIRMET information, wind shear warnings and alerts and aerodrome warnings;

(3) any additional meteorological information agreed upon locally, such as forecasts of surface wind for the determination of possible runway changes;

(4) information received on volcanic ash cloud, for which a SIGMET has not already been issued, as agreed between the aerodrome meteorological office and the aerodrome control tower concerned;

(5) information received on pre-eruption volcanic activity and/or a volcanic eruption as agreed between the aerodrome meteorological office and the aerodrome control tower concerned.

(b) An aerodrome meteorological office shall provide its associate approach control unit with:

(1) local routine and special reports, METAR, TAF and TREND forecasts and amendments thereto;

(2) SIGMET and AIRMET information, wind shear warnings and alerts and appropriate special air-reports and aerodrome warnings;

(3) any additional meteorological information agreed upon locally;

(4) information received on volcanic ash cloud, for which a SIGMET has not already been issued, as agreed between the aerodrome meteorological office and the approach control unit concerned;

(5) information received on pre-eruption volcanic activity and/or a volcanic eruption as agreed between the aerodrome meteorological office and the approach control unit concerned.

CHAPTER 3 — REQUIREMENTS FOR METEOROLOGICAL WATCH OFFICES

MET.OR.245 Meteorological watch and other information

Regulation (EU) 2017/373

Within its area of responsibility, the meteorological watch office shall:

(a) maintain continuous watch over meteorological conditions affecting flight operations;

(b) coordinate with the organisation responsible for the provision of NOTAM and/or ASHTAM to ensure that meteorological information on volcanic ash included in SIGMET and NOTAM and/or ASHTAM messages is consistent;

(c) coordinate with selected volcano observatories to ensure that information on volcanic activity is received in an efficient and timely manner;

(d) provide its associated VAAC with information received on pre-eruption volcanic activity, a volcanic eruption and volcanic ash cloud for which a SIGMET has not already been issued;

(e) provide its aeronautical information service units with information received on the release of radioactive materials into the atmosphere in the area or adjacent areas for which it maintains watch and for which a SIGMET has not already been issued;

(f) provide its associated area control centre and flight information centre (ACC/FIC), as necessary, with relevant:

(1) METAR, including current pressure data for aerodromes and other locations, TAF and trend forecasts and amendments thereto;

(2) forecasts of upper winds, upper-air temperatures and significant en-route weather phenomena and amendments thereto, SIGMET and AIRMET information and appropriate special air-reports;

(3) any other meteorological information required by the ACC/FIC to meet requests from aircraft in flight;

(4) information received on volcanic ash cloud, for which a SIGMET has not already been issued, as agreed between the meteorological watch office and the ACC/FIC;

(5) information received concerning the release of radioactive material into the atmosphere, as agreed between the meteorological watch office and the ACC/FIC;

(6) tropical cyclone advisory information issued by a TCAC in its area of responsibility;

(7) volcanic ash advisory information issued by a VAAC in its area of responsibility;

(8) information received on pre-eruption volcanic activity and/or a volcanic eruption as agreed between the meteorological watch office and the ACC/FIC.

AMC1 MET.OR.245(a) Meteorological watch and other information

ED Decision 2017/001/R

BOUNDARIES

The boundaries of the area over which meteorological watch is to be maintained by a meteorological watch office should be coincident with the boundaries of a flight information region or a control area or a combination of flight information regions and/or control areas.

AMC1 MET.OR.245(f)(3) Meteorological watch and other information

ED Decision 2017/001/R

AIRCRAFT IN FLIGHT

If the information requested from an aircraft in flight is not available in the associated meteorological watch office, that meteorological watch office should request the assistance of another meteorological office in providing it.

MET.OR.250 SIGMET messages

Regulation (EU) 2017/373

A meteorological watch office shall:

(a) provide and disseminate SIGMET messages;

(b) ensure that the SIGMET message is cancelled when the phenomena are no longer occurring or are no longer expected to occur in the area covered by the SIGMET message;

(c) ensure that the period of validity of a SIGMET message is not more than 4 hours, and in the special case of SIGMET messages for volcanic ash cloud and tropical cyclones, it shall be extended up to 6 hours;

(d) ensure that SIGMET messages are issued not more than 4 hours before the commencement of the period of validity, and in the special case of SIGMET messages for volcanic ash cloud and tropical cyclones, as soon as practicable, but not more than 12 hours before the commencement of the period of validity, and updated at least every 6 hours.

AMC1 MET.OR.250(a) SIGMET messages

ED Decision 2017/001/R

FIR AND CTA

Meteorological watch offices whose area of responsibility encompasses more than one FIR and/or CTA should provide separate SIGMET messages for each FIR and/or CTA.

AMC2 MET.OR.250(a) SIGMET messages

ED Decision 2017/001/R

DIGITAL FORMAT

In addition to the issuance of SIGMET information in abbreviated plain language, SIGMET information should be issued in a digital format.

GM1 MET.OR.250(a) SIGMET messages

ED Decision 2017/001/R

DISSEMINATION

(a) SIGMET messages are disseminated to meteorological watch offices and WAFCs and to other meteorological offices. SIGMET messages for volcanic ash are also disseminated to VAACs.

(b) SIGMET messages are disseminated to international OPMET databanks and the centres designated for the operation of aeronautical fixed service satellite distribution systems.

AMC1 MET.OR.250(c) SIGMET messages

ED Decision 2017/001/R

SOURCE

SIGMET messages concerning volcanic ash clouds and tropical cyclones should be based on advisory information provided by VAACs and Tropical Cyclone Advisory Centres (TCACs), respectively.

MET.OR.255 AIRMET messages

Regulation (EU) 2017/373

A meteorological watch office shall:

(a) provide and disseminate AIRMET messages when the competent authority has determined that the density of traffic operating below flight level 100, or up to flight level 150 in mountainous areas, or higher, where necessary, warrants the issue and dissemination of area forecasts for such operations;

(b) cancel the AIRMET message when the phenomena are no longer occurring or are no longer expected to occur in the area;

(c) ensure that the period of validity of an AIRMET message is not more than 4 hours.

AMC1 MET.OR.255(a) AIRMET messages

ED Decision 2017/001/R

DIGITAL FORMAT

In addition to the issuance of AIRMET information in abbreviated plain language, AIRMET information should be issued in a digital format.

GM1 MET.OR.255(a) AIRMET messages

ED Decision 2017/001/R

DISSEMINATION

(a) AIRMET messages are disseminated to meteorological watch offices in adjacent flight information regions and to other meteorological watch offices or aerodrome meteorological offices, as agreed by the competent authorities concerned.

(b) AIRMET messages are transmitted to international operational meteorological databanks and the centres for the operation of aeronautical fixed service internet-based services.

MET.OR.260 Area forecasts for low-level flights

Regulation (EU) 2017/373

A meteorological watch office shall:

(a) provide area forecast for low-level flights when the density of traffic operating below flight level 100, or up to flight level 150 in mountainous areas, or higher, where necessary, warrants the routine issue and dissemination of area forecasts for such operations;

(b) ensure that the frequency of issue, the form, and the fixed time or period of validity of area forecast for low-level flights and the criteria for amendments thereto, are as determined by the competent authority;

(c) ensure that area forecasts for low-level flights prepared in support of the issuance of an AIRMET message are issued every 6 hours for a period of validity of 6 hours and transmitted to the meteorological watch offices concerned not later than 1 hour prior to the beginning of their validity period.

CHAPTER 4 — REQUIREMENTS FOR VOLCANIC ASH ADVISORY CENTRE (VAAC)

MET.OR.265 Volcanic ash advisory centre responsibilities

Regulation (EU) 2017/373

In its area of responsibility, the VAAC shall:

(a) when a volcano has erupted, or is expected to erupt, or volcanic ash is reported, provide advisory information regarding the extent and forecast movement of the volcanic ash cloud to:

(1) the European aviation crisis coordination cell;

(2) meteorological watch offices serving flight information regions in its area of responsibility which may be affected;

(3) operators, area control centres, and flight information centres serving flight information regions in its area of responsibility which may be affected;

(4) world area forecast centres, international OPMET databanks, international NOTAM offices and centres designated by regional air navigation agreement for the operation of aeronautical fixed service satellite distribution systems;

(5) other VAACs whose areas of responsibility may be affected.

(b) coordinate with selected volcano observatories to ensure that information on volcanic activity is received in an efficient and timely manner;

(c) provide the advisory meteorological information referred to in point (a) at least every 6 hours until such time as the volcanic ash cloud is no longer identifiable from satellite data, no further meteorological reports of volcanic ash are received from the area and no further eruptions of the volcano are reported; and

(d) maintain a 24-hour watch.

GM1 MET.OR.265(a) Volcanic ash advisory centres (VAACs) responsibilities

ED Decision 2017/001/R

DISTRIBUTION OF METEOROLOGICAL DATA

The AFTN address to be used by the VAACs is given in the Handbook on the International Airways Volcano Watch (IAVW) (ICAO Doc 9766) which is available on the ICAO IAVWOPSG website.

CHAPTER 5 — REQUIREMENTS FOR TROPICAL CYCLONE ADVISORY CENTRE (TCAC)

MET.OR.270 Tropical cyclone advisory centre responsibilities

Regulation (EU) 2017/373

A TCAC shall issue:

(a) advisory information concerning the position of the cyclone centre, its direction and speed of movement, central pressure and maximum surface wind near the centre in abbreviated plain language to:

(1) meteorological watch offices in its area of responsibility;

(2) other TCACs whose areas of responsibility may be affected;

(3) world area forecast centres, international OPMET databanks and centres responsible for the operation of aeronautical fixed service satellite distribution systems;

(b) updated advisory information to meteorological watch offices for each tropical cyclone, as necessary, but at least every 6 hours.

CHAPTER 6 — REQUIREMENTS FOR WORLD AREA FORECAST CENTRE (WAFC)

MET.OR.275 World area forecast centre responsibilities

Regulation (EU) 2017/373

(a) The WAFC shall provide, in a digital form:

(1) gridded global forecasts of:

(i) upper wind;

(ii) upper-air temperature and humidity;

(iii) geopotential altitude of flight levels;

(iv) flight level and temperature of tropopause;

(v) direction, speed and flight level of maximum wind;

(vi) cumulonimbus clouds;

(vii) icing;

(viii) turbulence;

(2) global forecasts of significant weather (SIGWX) phenomena, including volcanic activity and release of radioactive materials.

(b) The WAFC shall ensure that world area forecast system products in digital form are transmitted using binary data communications techniques.

SUBPART B — TECHNICAL REQUIREMENTS FOR PROVIDERS OF METEOROLOGICAL SERVICES (MET.TR)

SECTION 1 — GENERAL REQUIREMENTS

MET.TR.115 Meteorological bulletins

Regulation (EU) 2017/373

(a) Meteorological bulletins shall contain a heading consisting of:

(1) an identifier of four letters and two figures;

(2) the ICAO four-letter location indicator corresponding to the geographical location of the meteorological service provider originating or compiling the meteorological bulletin;

(3) a day-time group;

(4) if required, a three-letter indicator.

(b) Meteorological bulletins containing operational meteorological information to be transmitted via the AFTN shall be encapsulated in the text part of the AFTN message format.

GM1 MET.TR.115(a) Meteorological bulletins

ED Decision 2017/001/R

ALPHANUMERICAL FORMAT

The format of the meteorological bulletins is understood to be that in alphanumerical format.

GM2 MET.TR.115(a) Meteorological bulletins

ED Decision 2017/001/R

COMPOSITION AND FILING TIMES OF BULLETINS

(a) Whenever possible, exchanges of operational meteorological information should be made in consolidated bulletins of the same types of meteorological information.

(b) Meteorological bulletins required for scheduled transmissions should be filed regularly and at the prescribed scheduled times.

GM3 MET.TR.115(a) Meteorological bulletins

ED Decision 2017/001/R

HEADING

Detailed specifications on format and contents of the heading are given in the WMO Publication No 386, Manual on the Global Telecommunication System, Volume I, and in the ICAO Manual of Aeronautical Meteorological Practice (ICAO Doc 8896).

GM1 MET.TR.115(a)(2) Meteorological bulletins

ED Decision 2017/001/R

LOCATION INDICATOR

ICAO location indicators are listed in ICAO Doc 7910 - Location Indicators.

SECTION 2 — SPECIFIC REQUIREMENTS

CHAPTER 1 — TECHNICAL REQUIREMENTS FOR AERONAUTICAL METEOROLOGICAL STATIONS

MET.TR.200 Meteorological reports and other information

Regulation (EU) 2017/373

(a) Local routine and local special reports and METAR shall contain the following elements in the order indicated:

(1) identification of the type of report;

(2) location indicator;

(3) time of the observation;

(4) identification of an automated or missing report, when applicable;

(5) surface wind direction and speed;

(6) visibility;

(7) runway visual range, when the reporting criteria are met;

(8) present weather;

(9) cloud amount, cloud type only for cumulonimbus and towering cumulus clouds and height of cloud base or, where measured, vertical visibility;

(10) air temperature and dew-point temperature;

(11) QNH and, when applicable, in local routine and local special reports, QFE;

(12) supplementary information, when applicable.

(b) In local routine and local special reports:

(1) if the surface wind is observed from more than one location along the runway, the locations for which these values are representative shall be indicated;

(2) when there is more than one runway in use and the surface wind related to these runways is observed, the available wind values for each runway shall be given, and the runways to which the values refer shall be reported;

(3) when variations from the mean wind direction are reported in accordance with point MET.TR.205(a)(3)(ii)(B), the two extreme directions between which the surface wind has varied shall be reported;

(4) when variations from the mean wind speed (gusts) are reported in accordance with point MET.TR.205(a)(3)(iii), they shall be reported as the maximum and minimum values of the wind speed attained.

(c) METAR

(1) METAR shall be issued in accordance with the template shown in Appendix 1 and disseminated in the METAR code form prescribed by the World Meteorological Organisation.

(2) If disseminated in digital form, METAR shall be:

(i) formatted in accordance with a globally interoperable information exchange model and shall use geography markup language (GML);

(ii) accompanied by the appropriate metadata.

(3) METAR shall be filed for transmission not later than 5 minutes after the actual time of observation.

(d) Information on visibility, runway visual range, present weather and cloud amount, cloud type and height of cloud base shall be replaced in all meteorological reports by the term 'CAVOK' when the following conditions occur simultaneously at the time of observation:

(1) visibility, 10 km or more, and the lowest visibility is not reported;

(2) no cloud of operational significance;

(3) no weather of significance to aviation.

(e) The list of criteria to provide local special reports shall include:

(1) those values which most closely correspond to the operating minima of the operators using the aerodrome;

(2) those values which satisfy other local requirements of the ATS units and of the operators;

(3) an increase in air temperature of 2 °C or more from that given in the latest local report, or an alternative threshold value as agreed between the meteorological service providers, the appropriate ATS unit and the operators concerned;

(4) the available supplementary information concerning the occurrence of significant meteorological conditions in the approach and climb-out areas;

(5) when noise abatement procedures are applied and the variation from the mean surface wind speed has changed by 5 kt (2,5 m/s) or more from that at the time of the latest local report, the mean speed before and/or after the change being 15 kt (7,5 m/s) or more;

(6) when the mean surface wind direction has changed by 60° or more from that given in the latest report, the mean speed before and/or after the change being 10 kt (5 m/s) or more;

(7) when the mean surface wind speed has changed by 10 kt (5 m/s) or more from that given in the latest local report;

(8) when the variation from the mean surface wind speed (gusts) has changed by 10 kt (5 m/s) or more from that at the time of the latest local report, the mean speed before and/or after the change being 15 kt (7,5 m/s) or more;

(9) when the onset, cessation or change in intensity of any of the following weather phenomena occurs:

(i) freezing precipitation;

(ii) moderate or heavy precipitation, including showers thereof; and

(iii) thunderstorm, with precipitation;

(10) when the onset or cessation of any of the following weather phenomena occurs:

(i) freezing fog;

(ii) thunderstorm, without precipitation;

(11) when the amount of a cloud layer below 1 500 ft (450 m) changes:

(i) from scattered (SCT) or less to broken (BKN) or overcast (OVC); or

(ii) from BKN or OVC to SCT or less.

(f) When so agreed between the meteorological services provider and the competent authority, local special reports shall be issued whenever the following changes occur:

(1) when the wind changes through values of operational significance. The threshold values shall be established by the meteorological service provider in consultation with the appropriate ATS unit and operators concerned, taking into account changes in the wind which would:

(i) require a change in runway(s) in use;

(ii) indicate that the runway tailwind and crosswind components have changed through values representing the main operating limits for typical aircraft operating at the aerodrome;

(2) when the visibility is improving and changes to or passes through one or more of the following values, or when the visibility is deteriorating and passes through one or more of the following values:

(i) 800, 1 500 or 3 000 m;

(ii) 5 000 m, in cases where significant numbers of flights are operated in accordance with the visual flight rules;

(3) when the runway visual range is improving and changes to or passes through one or more of the following values, or when the runway visual range is deteriorating and passes through one or more of the following values: 50, 175, 300, 550 or 800 m;

(4) when the onset, cessation or change in intensity of any of the following weather phenomena occurs:

(i) dust storm;

(ii) sandstorm;

(iii) funnel cloud (tornado or waterspout);

(5) when the onset or cessation of any of the following weather phenomena occurs:

(i) low drifting dust, sand or snow;

(ii) blowing dust, sand or snow;

(iii) squall;

(6) when the height of base of the lowest cloud layer of BKN or OVC extent is lifting and changes to or passes through one or more of the following values, or when the height of base of the lowest cloud layer of BKN or OVC extent is lowering and passes through one or more of the following values:

(i) 100, 200, 500 or 1 000 ft (30, 60, 150 or 300 m);

(ii) 1 500 ft (450 m), in cases where significant numbers of flights are operated in accordance with the visual flight rules;

(7) when the sky is obscured and the vertical visibility is improving and changes to or passes through one or more of the following values, or when the vertical visibility is deteriorating and passes through one or more of the following values: 100, 200, 500 or 1 000 ft (30, 60, 150 or 300 m);

(8) any other criteria based on local aerodrome operating minima, as agreed between the meteorological services providers and the operators.

AMC1 MET.TR.200(a) Meteorological reports and other information

ED Decision 2017/001/R

TEMPLATE FOR THE LOCAL ROUTINE REPORTS AND LOCAL SPECIAL REPORTS

Local routine reports and local special reports should be issued in abbreviated plain language, in accordance with the below template.

Template for the local routine (MET REPORT) and local special (SPECIAL) reports

Key:

M = inclusion mandatory, part of every message;

C = inclusion conditional, dependent on meteorological conditions;

O = inclusion optional.

Element	Detailed content	Template(s)			Examples
Identification of the type of report (M)	Type of report	MET REPORT or SPECIAL			MET REPORT SPECIAL
Location indicator (M)	ICAO location indicator (M)	nnnn			YUDO
Time of the observation (M)	Day and actual time of the observation in UTC	nnnnnnZ			221630Z
Identification of an automated report (C)	Automated report identifier (C)	AUTO			AUTO
Surface wind (M)	Name of the element (M)	WIND			WIND 240/4MPS (WIND 240/8KT) WIND RWY 18 TDZ 190/6MPS (WIND RWY 18 TDZ 190/12KT) WIND VRB1MPS WIND CALM (WIND VRB2KT) WIND VRB BTN 350/ AND 050/1MPS (WIND VRB BTN 350/ AND 050/2KT) WIND 270/ABV49MPS
	Runway (O)	RWY nn[L] or RWY nn[C] or RWY nn[R]			
	Runway section (O)	TDZ			
	Wind direction (M)	nnn/	VRB BTN nnn/ AND nnn/ or VRB	C A L M	
	Wind speed (M)	[ABV]n[n][n]MPS (or [ABV]n[n]KT)			
	Significant speed variations (C)	MAX[ABV]nn[n] MNMn[n]			
	Significant directional variations (C)	VRB BTN nnn/ AND nnn/	—		
	Runway section (O)	MID			

Element	Detailed content	Template(s)			Examples
	Wind direction (O)	nnn/	VRB BTN nnn/ AND nnn/ or VRB	CALM	(WIND 270/ABV99KT) WIND 120/3MPS MAX9 MNM2 (WIND 120/6KT MAX18 MNM4) WIND 020/5MPS VRB BTN 350/ AND 070/ (WIND 020/10KT VRB BTN 350/ AND 070/) WIND RWY 14R MID 140/6MPS (WIND RWY 14R MID 140/12KT) WIND RWY 27 TDZ 240/8MPS MAX14 MNM5 END 250/7MPS (WIND RWY 27 TDZ 240/16KT MAX28 MNM10 END 250/14KT)
	Wind speed (O)	[ABV]n[n][n]MPS (or [ABV]n[n]KT)			
	Significant speed variations (C)	MAX[ABV]nn[n] MNMn[n]			
	Significant directional variations (C)	VRB BTN nnn/ AND nnn/	—		
	Runway section (O)	END			
	Wind direction (O)	nnn/	VRB BTN nnn/ AND nnn/ or VRB	CALM	
	Wind speed (O)	[ABV]n[n][n]MPS (or [ABV]n[n]KT)			
	Significant speed variations (C)	MAX[ABV]nn[n] MNMn[n]			
	Significant directional variations (C)	VRB BTN nnn/ AND nnn/	—		
Visibility (M)	Name of the element (M)	VIS		CAVOK	VIS 350M CAVOK VIS 7KM VIS 10KM VIS RWY 09 TDZ 800M END 1200M VIS RWY 18C TDZ 6KM RWY 27 TDZ 4000M
	Runway (O)	RWY nn[L] or RWY nn[C] or RWY nn[R]			
	Runway section (O)	TDZ			
	Visibility (M)	n[n][n][n]M or n[n]KM			
	Runway section (O)	MID			
	Visibility (O)	n[n][n][n]M or n[n]KM			
	Runway section (O)	END			
	Visibility (O)	n[n][n][n]M or n[n]KM			
Runway visual range (C)	Name of the element (M)	RVR			RVR RWY 32 400M RVR RWY 20 1600M RVR RWY 10L BLW 50M RVR RWY 14 ABV 2000M RVR RWY 10 BLW 150M RVR RWY 12 ABV 1200M RVR RWY 12 TDZ 1100M MID ABV 1400M
	Runway (C)	RWY nn[L] or RWY nn[C] or RWY nn[R]			
	Runway section (C)	TDZ			
	Runway visual range (M)	[ABV or BLW] nn[n][n]M			
	Runway section (C)	MID			
	Runway visual range (C)	[ABV or BLW] nn[n][n]M			
	Runway section (C)	END			

Element	Detailed content	Template(s)			Examples
	Runway visual range (C)	[ABV or BLW] nn[n][n]M			RVR RWY 16 TDZ 600M MID 500M END 400M RVR RWY 26 500M RWY 20 800M
Present weather (C)	Intensity of present weather (C)	FBL or MOD or HVY		—	
	Characteristics and type of present weather (C)	DZ or RA or SN or SG or PL or DS or SS or FZDZ or FZUP or FC or FZRA or SHGR or SHGS or SHRA or SHSN or SHUP or TSGR or TSGS or TSRA or TSSN or TSUP12 or UP		FG or BR or SA or DU or HZ or FU or VA or SQ or PO or TS or BCFG or BLDU or BLSA or BLSN or DRDU or DRSA or DRSN or FZFG or MIFG or PRFG or //	MOD RA HVY TSRA HVY DZ FBL SN HZ FG VA MIFG HVY TSRASN FBL SNRA FBL DZ FG HVY SHSN BLSN HVY TSUP //
Cloud (M)	Name of the element (M)	CLD			CLD NSC CLD SCT 300M OVC 600M (CLD SCT 1000FT OVC 2000FT) CLD OBSC VER VIS 150M (CLD OBSC VER VIS 500FT) CLD BKN TCU 270M (CLD BKN TCU 900FT) CLD RWY 08R BKN 60M RWY 26 BKN 90M (CLD RWY 08R BKN 200FT RWY 26 BKN 300FT) CLD /// CB ///M (CLD /// CB ///FT) CLD /// CB 400M (CLD /// CB 1200FT) CLD NCD
	Runway (O)	RWY nn[L] or RWY nn[C] or RWY nn[R]			
	Cloud amount (M) or vertical visibility (O)	FEW or SCT or BKN or OVC or ///	OBSC	NSC or NCD	
	Cloud type (C)	CB or TCU or ///	—		
	Height of cloud base or the value of vertical visibility (C)	n[n][n][n]M (or n[n][n][n]FT) or ///M (or ///FT)	[VER VIS n[n][n]M(or VER VIS n[n][n][n]FT)] or VER VIS ///M (or VER VIS ///FT)		
	Name of the element (M)	T			T17 TMS08

Element	Detailed content	Template(s)					Examples
Air temperature (M)	Air temperature (M)	[MS]nn					
Dew-point temperature (M)	Name of the element (M)	DP					DP15 DPMS18
	Dew-point temperature (M)	[MS]nn					
Pressure values (M)	Name of the element (M)	QNH					QNH 0995HPA QNH 1009HPA
	QNH (M)	nnnnHPA					
	Name of the element (O)	QFE					QNH 1022HPA QFE 1001HPA QNH 0987HPA QFE RWY 18 0956HPA RWY 24 0955HPA
	QFE (O)	[RWY nn[L] or RWY nn[C] or RWY nn[R]] nnnnHPA [RWY nn[L] or RWY nn[C] or RWY nn[R] nnnnHPA]					
Supplementary information (C)	Significant meteorological phenomena (C)	CB or TS or MOD TURB or SEV TURB or WS or GR or SEV SQL or MOD ICE or SEV ICE or FZDZ or FZRA or SEV MTW or SS or DS or BLSN or FC					FC IN APCH WS IN APCH 60M-WIND 360/13MPS WS RWY 12 REFZRA CB IN CLIMB-OUT RETSRA
	Location of the phenomena (C)	IN APCH [n[n][n][n]M-WIND nnn/n[n]MPS] or IN CLIMB-OUT [n[n][n][n]M-WIND nnn/n[n]MPS] (IN APCH [n[n][n][n]FT-WIND nnn/n[n]KT] or IN CLIMB-OUT [n[n][n][n]FT-WIND nnn/n[n]KT]) or RWY nn[L] or RWY nn[C] or RWY nn[R]						
	Recent weather (C)	REFZDZ or REFZRA or REDZ or RE[SH]RA or RE[SH]SN or RESG or RESHGR or RESHGS or REBLSN or RESS or REDS or RETSRA or RETSSN or RETSGR or RETSGS or REFC or REPL or REUP or REFZUP or RETSUP or RESHUP or REVA or RETS					
Trend forecast (O)	Name of the element (M)	TREND					TREND NOSIGTREND BECMG FEW 600M (TREND BECMG FEW 2000FT) TREND TEMPO 250/18 MPS MAX25 (TREND TEMPO 250/36KT MAX50) TREND BECMG AT1800 VIS 10KM NSW TREND BECMG TL1700 VIS 800M FG
	Change indicator (M)	NOSIG	BECMG or TEMPO				
	Period of change (C)		FMnnnn and/or TLnnnn or ATnnnn				
	Wind (C)		nnn/[ABV]n[n][n]MPS [MAX[ABV]nn[n]] (or nnn/[ABV]n[n]KT [MAX[ABV]nn])				
	Visibility (C)		VIS n[n][n][n]M or VIS n[n]KM			CAVOK	
	Weather phenomenon: intensity (C)		FBL or MOD or HVY	—	NSW		
	Weather phenomenon:		DZ or RA or	FG or BR or			

Element	Detailed content	Template(s)					Examples
	characteristics and type (C)		SN or SG or PL or DS or SS or FZDZ or FZRA or SHGR or SHGS or SHRA or SHSN or TSGR or TSGS or TSRA or TSSN	SA or DU or HZ or FU or VA or SQ Or PO or FC or TS or BCFG or BLDU or BLSA or BLSN or DRDU or DRSA or DRSN or FZFG or MIFG or PRFG			TREND BECMG FM1030 TL1130 CAVOK TREND TEMPO TL1200 VIS 600M BECMG AT1230 VIS 8KM NSW CLD NSC TREND TEMPO FM0300 TL0430 MOD FZRA TREND BECMG FM1900 VIS 500M HVY SNRA TREND BECMG FM1100 MOD SN TEMPO FM1130 BLSN TREND BECMG AT1130 CLD OVC 300M (TREND BECMG AT1130 CLD OVC 1000FT) TREND TEMPO TL1530 HVY SHRA CLD BKN CB 360M (TREND TEMPO TL1530 HVY SHRA CLD BKN CB 1200FT)
	Name of the element (C)		CLD				
	Cloud amount and vertical visibility (C)		FEW or SCT or BKN or OVC	OBSC	NSC		
	Cloud type (C)		CB or TCU	—			
	Height of cloud base or the value of vertical visibility (C)		n[n][n][n]M (or n[n][n][n]FT)	[VER VIS n[n][n]M (or VER VIS n[n][n][n]FT)]			

GM1 MET.TR.200(a) Meteorological reports and other information

ED Decision 2017/001/R

RANGES AND RESOLUTIONS — LOCAL ROUTINE REPORTS AND LOCAL SPECIAL REPORTS

(a) The ranges and resolutions for the numerical elements included in the local routine reports and local special reports are shown below.

Ranges and resolutions for the numerical elements included in local routine reports and local special reports			
Element elements included in the local routine reports and local special reports		**Range**	**Resolution**
Runway:		01–36	1
Wind direction:	°true	010–360	10
Wind speed:	MPS	1– 99*	1
KT		1– 199*	1
Visibility:	M	0– 750	50
	M	800– 4 900	100
	KM	5– 9	1
	KM	10–	0 (fixed value: 10 KM)
Runway visual range:	M	0– 375	25
	M	400–750	50
	M	800–2 000	100
Vertical visibility:	M	0–75	15
	M	90–600	30
	FT	0–250	50
	FT	300–2 000	100
Clouds: height of cloud base:	M	0–75	15
	M	90–3 000	30
	FT	0–250	50
	FT	300–10 000	100
Air temperature;	°C	–80 – +60	1
Dew-point temperature:			
QNH; QFE:	hPa	0500–1 100	1
* There is no aeronautical requirement to report surface wind speeds of 100 kt (50 m/s) or more; however, provision has been made for reporting wind speeds up to 199 kt (99 m/s) for non-aeronautical purposes, as necessary. ** Under circumstances as specified in AMC1 MET.TR.205(e)(1); otherwise a resolution of 100 ft (30 m) is to be used.			

(b) The explanations for the abbreviations can be found in the Procedures for Air Navigation Services — ICAO Abbreviations and Codes (PANS-ABC, ICAO Doc 8400).

GM1 MET.TR.200(a)(2) Meteorological reports and other information

ED Decision 2017/001/R

LOCATION INDICATORS

The location indicators and their significations are published in ICAO Doc 7910 - Location Indicators.

AMC1 MET.TR.200(a)(4) Meteorological reports and other information

ED Decision 2017/001/R

AUTOMATED REPORTING

Local routine reports and local special reports and METAR from automatic observing systems should be identified with the word 'AUTO'.

GM1 MET.TR.200(a)(4) Meteorological reports and other information

ED Decision 2017/001/R

AUTOMATED REPORTING

METAR, local routine reports and local special reports from automatic observing systems may be used as agreed between the aeronautical meteorological stations and the users.

AMC1 MET.TR.200(a)(12) Meteorological reports and other information

ED Decision 2017/001/R

SUPPLEMENTARY INFORMATION — SEMI-AUTOMATIC OBSERVING SYSTEM

(a) In local routine reports and local special reports and in METAR when reported by a semi-automatic observing system, the following recent weather phenomena should be reported, up to a maximum of three groups, in the supplementary information:

(1) freezing precipitation;

(2) moderate or heavy precipitation, including showers thereof;

(3) blowing snow;

(4) dust storm, sandstorm;

(5) thunderstorm;

(6) funnel cloud, tornado or water spout; and

(7) volcanic ash.

(b) In local routine reports and local special reports when reported by a semi-automatic observing system, the following significant meteorological conditions, or combinations thereof, should be reported in the supplementary information:

(1) cumulonimbus clouds (CB);

(2) thunderstorm (TS);

(3) moderate or severe turbulence (MOD TURB, SEV TURB);

(4) wind shear (WS);

(5) hail (GR);

(6) severe squall line (SEV SQL);

(7) moderate or severe icing (MOD ICE, SEV ICE);

(8) freezing precipitation (FZDZ, FZRA);

(9) severe mountain waves (SEV MTW);

(10) dust storm, sandstorm (DS, SS);

(11) blowing snow (BLSN); and

(12) funnel cloud (tornado or water spout) (FC).

The location of the condition should be indicated. Where necessary, additional information should be included using abbreviated plain language.

GM1 to AMC1 MET.TR.200(a)(12) Meteorological reports and other information

ED Decision 2017/001/R

SUPPLEMENTARY INFORMATION — RECENT WEATHER PHENOMENA

'Recent weather phenomena' is understood as being the weather phenomena observed at the aerodrome during the period since the last issued routine report or last hour, whichever is the shorter, but not at the time of observation.

GM2 to AMC1 MET.TR.200(a)(12) Meteorological reports and other information

ED Decision 2017/001/R

SUPPLEMENTARY INFORMATION — LOCAL CIRCUMSTANCES

Local circumstances include but are not necessarily limited to wind shear of non-transitory nature such as might be associated with low-level temperature inversions or local topography.

AMC2 MET.TR.200(a)(12) Meteorological reports and other information

ED Decision 2017/001/R

SUPPLEMENTARY INFORMATION — AUTOMATIC OBSERVING SYSTEM

In local routine reports and local special reports and in METAR reported by an automatic observing system, the following recent weather phenomena should be reported, up to a maximum of three groups, in the supplementary information:

(a) FZDZ, FZRA and FZUP;

(b) moderate or heavy DZ, RA and SN;

(c) thunderstorm; and

(d) moderate or heavy unknown precipitation (UP).

AMC3 MET.TR.200(a)(12) Meteorological reports and other information

ED Decision 2017/001/R

SUPPLEMENTARY INFORMATION — WIND SHEAR

Information on wind shear should be included as supplementary information in local routine reports and local special reports and in METAR, where local circumstances so warrant.

AMC4 MET.TR.200(a)(12) Meteorological reports and other information

ED Decision 2017/001/R

SUPPLEMENTARY INFORMATION — SEA-SURFACE TEMPERATURE AND STATE OF THE SEA AND OF THE RUNWAY

In METAR, information on sea-surface temperature and the state of the sea or the significant wave height, from aeronautical meteorological stations established on offshore structures in support of helicopter operations, should be included in the supplementary information.

AMC5 MET.TR.200(a)(12) Meteorological reports and other information

ED Decision 2017/001/R

SUPPLEMENTARY INFORMATION — SIGNIFICANT METEOROLOGICAL CONDITIONS

(a) Observations made at aerodromes should include the available supplementary information concerning significant meteorological conditions, particularly those in the approach and climb-out areas.

(b) Where practicable, the information should identify the location of the meteorological condition.

GM1 MET.TR.200(b) & (c) Meteorological reports and other information

ED Decision 2017/001/R

EXAMPLE OF METAR AND LOCAL ROUTINE REPORT

(a) Local routine report (same location and weather conditions as METAR):

MET REPORT YUDO 221630Z WIND 240/4KT VIS 600M RVR RWY 12 TDZ 1000M MOD DZ FG CLD SCT 1000FT OVC 2000FT T17 DP16 QNH 1018HPA TREND BECMG TL1700 VIS 800M FG BECMG AT1800 VIS 10KM NSW

(b) METAR for YUDO (Donlon/International)*:

METAR YUDO 221630Z 24004KT 0600 R12/1000U DZ FG SCT010 OVC020 17/16 Q1018 BECMG TL1700 0800 FG BECMG AT 1800 9999 NSW

Meaning of both reports:

Routine report for Donlon/International* issued on the 22nd of the month at 1630 UTC; surface wind direction 240 degrees; wind speed 4 knots; visibility (along the runway(s) in the local routine report; prevailing visibility in METAR) 600 metres; runway visual range representative of the touchdown zone for runway 12 is 1 000 metres and the runway visual range values have shown an upward tendency during previous 10 minutes (Runway visual range tendency to be included in METAR only); and moderate drizzle and fog; scattered cloud at 1 000 feet; overcast at 2 000 feet; air temperature 17 degrees Celsius; dew-point temperature 16 degrees Celsius; QNH 1 018 hectopascals; TREND during next 2 hours; visibility (along the runway(s) in the local routine report; prevailing visibility in METAR) becoming 800 metres in fog by 1700 UTC; at 1800 UTC visibility (along the runway(s) in the local routine report; prevailing visibility in METAR) becoming 10 kilometres or more and nil significant weather.

** Fictitious location*

GM1 MET.TR.200(b) Meteorological reports and other information

ED Decision 2017/001/R

EXAMPLE OF LOCAL SPECIAL REPORT

Local special report:

SPECIAL YUDO 151115Z WIND 050/25KT MAX37 MNM10 VIS 1200M RVR RWY 05 ABV 1800M HVY TSRA CLD BKN CB 500FT T25 DP22 QNH 1018HPA TREND TEMPO TL1200 VIS 600M BECMG AT1200 VIS 8KM NSW NSC

Meaning:

Special report for Donlon/International* issued on the 15th of the month at 1115 UTC; surface wind direction 050 degrees; wind speed 25 knots gusting between 10 and 37 knots; visibility 1 200 metres along the runway; Runway visual range above 1 800 metres at the threshold on runway 05; thunderstorm with heavy rain; broken cumulonimbus cloud at 500 feet; air temperature 25 degrees Celsius; dew-point temperature 22 degrees Celsius; QNH 1 008 hectopascals; TREND during next 2 hours; visibility along the runway temporarily 600 metres from 1 115 to 1 200, becoming at 1200 UTC visibility along the runway 8 kilometres, thunderstorm ceases and nil significant weather and nil significant cloud.

** Fictitious location*

GM1 MET.TR.200(c)(1) Meteorological reports and other information

ED Decision 2017/001/R

METAR — CODE FORM

The METAR code form is contained in the WMO Publication No 306, Manual on Codes, Volume I.1, Part A — Alphanumeric Codes.

AMC1 MET.TR.200(c)(2) Meteorological reports and other information

ED Decision 2017/001/R

METAR — DIGITAL FORM

METAR should be disseminated in a digital form.

GM1 MET.TR.200(c)(2) Meteorological reports and other information

ED Decision 2017/001/R

METAR — DIGITAL FORM

(a) When METAR is disseminated in a digital form, this is in addition to the METAR code form.

(b) Guidance on the information exchange model, GML, and the metadata profile is provided in the Manual on the Digital Exchange of Aeronautical Meteorological Information (ICAO Doc 10003).

GM1 MET.TR.200(e)(5) Meteorological reports and other information

ED Decision 2017/001/R

NOISE ABATEMENT PROCEDURES

Noise abatement procedures are those in accordance with 7.2.6 of the PANS-ATM (ICAO Doc 4444).

GM1 MET.TR.200(f) Meteorological reports and other information

ED Decision 2017/001/R

ISSUANCE OF LOCAL SPECIAL REPORTS

Point (f) in MET.TR.200 relates to the list of criteria to provide local special reports when a meteorological change occurs. The agreement between the meteorological service provider and the competent authority is introduced as these criteria are usually agreed with the competent authority. Also, in introducing this agreement, the nature of the transposed provision (Appendix 3, 2.3.3) of ICAO Annex 3 – a recommendation – remains.

MET.TR.205 Reporting of meteorological elements

Regulation (EU) 2017/373

(a) Surface wind direction and speed

(1) In local routine and local special reports and in METAR, the surface wind direction and speed shall be reported in steps of 10 degrees true and 1 kt (0,5 m/s) respectively.

(2) Any observed value that does not fit the reporting scale in use shall be rounded to the nearest step in the scale.

(3) In local routine and local special reports and in METAR:

(i) the units of measurement used for the wind speed shall be indicated;

(ii) variations from the mean wind direction during the past 10 minutes shall be reported as follows, if the total variation is 60° or more, alternatively:

(A) when the total variation is 60° or more and less than 180° and the wind speed is 3 kt (1,5 m/s) or more, such directional variations shall be reported as the two extreme directions between which the surface wind has varied;

(B) when the total variation is 60° or more and less than 180° and the wind speed is less than 3 kt (1,5 m/s), the wind direction shall be reported as variable with no mean wind direction;

(C) when the total variation is 180° or more, the wind direction shall be reported as variable with no mean wind direction;

(iii) variations from the mean wind speed (gusts), during the past 10 minutes shall be reported when the maximum wind speed exceeds the mean speed by, alternatively:

(A) 5 kt (2,5 m/s) or more in local routine and local special reports when noise abatement procedures are applied;

(B) 10 kt (5 m/s) or more otherwise;

(iv) when a wind speed of less than 1 kt (0,5 m/s) is reported, it shall be indicated as calm;

(v) when a wind speed of 100 kt (50 m/s) or more is reported, it shall be indicated to be more than 99 kt (49 m/s);

(vi) when variations from the mean wind speed (gusts) are reported in accordance with point MET.TR.205(a), the maximum value of the wind speed attained shall be reported;

(vii) when the 10-minute period includes a marked discontinuity in the wind direction and/or speed, only variations from the mean wind direction and mean wind speed occurring since the discontinuity shall be reported.

(b) Visibility

(1) In local routine and local special reports and in METAR, the visibility shall be reported in steps of 50 m when the visibility is less than 800 m; in steps of 100 m when it is 800 m or more, but less than 5 km; in kilometre steps when the visibility is 5 km or more, but less than 10 km; and it shall be given as 10 km when the visibility is 10 km or more, except when the conditions for the use of CAVOK apply.

(2) Any observed value which does not fit the reporting scale in use shall be rounded down to the nearest lower step in the scale.

(3) In local routine and local special reports, visibility along the runway(s) shall be reported together with the units of measurement used to indicate visibility.

(c) Runway visual range (RVR)

(1) In local routine and local special reports and in METAR, the RVR shall be reported in steps of 25 m when it is less than 400 m; in steps of 50 m when it is between 400 and 800 m; and in steps of 100 m when it is more than 800 m.

(2) Any observed value which does not fit the reporting scale in use shall be rounded down to the nearest lower step in the scale.

(3) In local routine and local special reports and in METAR:

(i) when the RVR is above the maximum value that can be determined by the system in use, it shall be reported using the abbreviation 'ABV' in local routine and local special reports, and the abbreviation 'P' in METAR followed by the maximum value that can be determined by the system;

(ii) when the RVR is below the minimum value that can be determined by the system in use, it shall be reported using the abbreviation 'BLW' in local routine and local special reports, and the abbreviation 'M' in METAR, followed by the minimum value that can be determined by the system.

(4) In local routine and local special reports:

(i) the units of measurement used shall be included;

(ii) if the RVR is observed from only one location along the runway, such as the touchdown zone, it shall be included without any indication of location;

(iii) if the RVR is observed from more than one location along the runway, the value representative of the touchdown zone shall be reported first, followed by the values representative of the mid-point and stop-end, and the locations for which these values are representative shall be indicated;

(iv) when there is more than one runway in use, the available RVR values for each runway shall be reported, and the runways to which the values refer shall be indicated.

(d) Present weather phenomena

(1) In local routine and local special reports, observed present weather phenomena shall be reported in terms of type and characteristics and qualified with respect to intensity, as appropriate.

(2) In METAR, observed present weather phenomena shall be reported in terms of type and characteristics and qualified with respect to intensity or proximity to the aerodrome, as appropriate.

(3) In local routine and local special reports and in METAR, the following characteristics of present weather phenomena, as necessary, shall be reported using their respective abbreviations and relevant criteria, as appropriate:

(i) Thunderstorm (TS)

Used to report a thunderstorm with precipitation. When thunder is heard or lightning is detected at the aerodrome during the 10-minute period preceding the time of observation but no precipitation is observed at the aerodrome, the abbreviation 'TS' shall be used without qualification.

(ii) Freezing (FZ)

Supercooled water droplets or precipitation, used with types of present weather phenomena in accordance with Appendix 1.

(4) In local routine and local special reports and in METAR:

(i) one or more, up to a maximum of three, of the present weather abbreviations shall be used, as necessary, together with an indication, where appropriate, of the characteristics and intensity or proximity to the aerodrome, so as to convey a complete description of the present weather of significance to flight operations;

(ii) the indication of intensity or proximity, as appropriate, shall be reported first followed respectively by the characteristics and the type of weather phenomena;

(iii) where two different types of weather are observed, they shall be reported in two separate groups, where the intensity or proximity indicator refers to the weather phenomenon which follows the indicator. However, different types of precipitation occurring at the time of observation shall be reported as one single group with the dominant type of precipitation reported first and preceded by only one intensity qualifier which refers to the intensity of the total precipitation.

(e) Clouds

(1) In local routine and local special reports and in METAR, the height of cloud base shall be reported in steps of 100 ft (30 m) up to 10 000 ft (3 000 m).

(2) Any observed value which does not fit the reporting scale in use shall be rounded down to the nearest lower step in the scale.

(3) In local routine and local special reports:

(i) the units of measurement used for the height of cloud base and vertical visibility shall be indicated;

(ii) when there is more than one runway in use and the heights of cloud bases are observed by instruments for these runways, the available heights of cloud bases for each runway shall be reported, and the runways to which the values refer shall be indicated.

(f) Air temperature and dew-point temperature

(1) In local routine and local special reports and in METAR, the air temperature and the dew-point temperature shall be reported in steps of whole degrees Celsius.

(2) Any observed value which does not fit the reporting scale in use shall be rounded to the nearest whole degree Celsius, with observed values involving 0,5° rounded up to the next higher whole degree Celsius.

(3) In local routine and local special reports and in METAR, a temperature below 0 °C shall be identified.

(g) Atmospheric pressure

(1) In local routine and local special reports and in METAR, QNH and QFE shall be computed in tenths of hectopascals and reported therein in steps of whole hectopascals, using four digits.

(2) Any observed value which does not fit the reporting scale in use shall be rounded down to the nearest lower whole hectopascal.

(3) In local routine and local special reports:

(i) QNH shall be included;

(ii) QFE shall be included if required by users or, if so agreed locally between the provider of meteorological services, the ATS unit and the operators concerned, on a regular basis;

(iii) the units of measurement used for QNH and QFE values shall be included;

(iv) if QFE values are required for more than one runway, the required QFE values for each runway shall be reported, and the runway(s) to which the values refer shall be indicated.

(4) In METAR, only QNH values shall be included.

GM1 MET.TR.205(a)(3)(iii)(A) Reporting of meteorological elements

ED Decision 2017/001/R

NOISE ABATEMENT PROCEDURE

The noise abatement procedures are those in accordance with 7.2.6 of the PANS-ATM (ICAO Doc 4444).

AMC1 MET.TR.205(b)(1) Reporting of meteorological elements

ED Decision 2017/001/R

VISIBILITY

In METAR, visibility should be reported as prevailing visibility. When the visibility is not the same in different directions and:

(a) when the lowest visibility is different from the prevailing visibility, and (1) less than 1 500 m or 2) less than 50 % of the prevailing visibility, and less than 5 000 m, the lowest visibility observed should also be reported and, when possible, its general direction in relation to the aerodrome reference point indicated by reference to one of the eight points of the compass;

(b) if the lowest visibility is observed in more than one direction, then the most operationally significant direction should be reported; and

(c) when the visibility is fluctuating rapidly, and the prevailing visibility cannot be determined, only the lowest visibility should be reported, with no indication of direction.

AMC1 MET.TR.205(b)(3) Reporting of meteorological elements

ED Decision 2017/001/R

VISIBILITY — VALUES

In local routine reports and local special reports, when instrumented systems are used for the measurement of visibility:

(a) if the visibility is observed from more than one location along the runway, the values representative of the touchdown zone should be reported first, followed, as necessary, by the values representative of the mid-point and stop-end of the runway, and the locations for which these values are representative should be indicated; and

(b) when there is more than one runway in use and the visibility is observed related to these runways, the available visibility values for each runway should be reported, and the runways to which the values refer should be indicated.

AMC1 MET.TR.205(c) Reporting of meteorological elements

ED Decision 2017/001/R

RUNWAY VISUAL RANGE (RVR) — TOUCHDOWN ZONE VALUES

In METAR:

(a) only the value representative of the touchdown zone should be reported and no indication of location on the runway should be included; and

(b) where there is more than one runway available for landing, touchdown zone RVR values should be included for all such runways, up to a maximum of four, and the runways to which the values refer should be indicated.

AMC1 MET.TR.205(c)(1) Reporting of meteorological elements

ED Decision 2017/001/R

RUNWAY VISUAL RANGE (RVR) — THRESHOLD LIMIT

(a) 50 m should be considered the lower limit, and 2 000 m the upper limit for RVR.

(b) Outside of these limits, local routine reports and local special reports and METAR should merely indicate that the RVR is less than 50 or more than 2 000 m.

AMC1 MET.TR.205(c)(3) Reporting of meteorological elements

ED Decision 2017/001/R

RUNWAY VISUAL RANGE (RVR) — VALUES FOR METAR

(a) When instrumented systems are used for the assessment of RVR, the variations in RVR during the 10-minute period immediately preceding the observation should be included if the RVR values during the 10-minute period have shown a distinct tendency, such that the mean during the first 5 minutes varies by 100 m or more from the mean during the second 5 minutes of the period.

(b) When the variation of the RVR values shows an upward or downward tendency, this should be indicated by the abbreviation ‘U’ or ‘D’, respectively. In cases when actual fluctuations during the 10-minute period show no distinct tendency, this should be indicated using the abbreviation ‘N’.

(c) When indications of tendency are not available, no abbreviations should be included.

AMC1 MET.TR.205(c)(4)(iii) Reporting of meteorological elements

ED Decision 2017/001/R

RUNWAY VISUAL RANGE (RVR) — VALUES REPRESENTATION

(a) RVR assessments should be representative of:

(1) the touchdown zone of the runway intended for Category I instrument approach and landing operations;

(2) the touchdown zone and the mid-point of the runway intended for Category II instrument approach and landing operations; and

(3) the touchdown zone, mid-point and stop-end of the runway intended for Category III instrument approach and landing operations.

(b) Where RVR is determined by human observers, it should be reported to the appropriate local ATS units, whenever there is a change in the value to be reported in accordance with the reporting scale.

(c) The transmission of such reports should normally be completed within 15 seconds after the termination of the observation.

AMC1 MET.TR.205(d) Reporting of meteorological elements

ED Decision 2017/001/R

PRESENT WEATHER PHENOMENA — AUTOMATIC OBSERVING SYSTEM

In local routine reports and local special reports and in METAR reported by an automatic observing system, the following types of present weather phenomena should be reported, using their respective abbreviations and relevant criteria, as appropriate:

(a) Precipitation:

(1) drizzle (DZ);

(2) rain (RA);

(3) snow (SN); and

(4) Unidentified precipitation (UP)

(b) Obscurations (hydrometeors);

(c) Fog (FG): reported when visibility is less than 1 000 m ;

(d) Mist (BR): reported when visibility is at least 1 000 m, but not more than 5 000 m;

(e) Obscurations (lithometeors). Haze (HZ) should be used when the obscuration consists predominantly of lithometeors and the visibility is 5 000 m or less; and

(f) Temporary failure of system/sensor: the present weather should be replaced by '//' when it cannot be observed due to a temporary failure of the system/sensor.

AMC2 MET.TR.205(d) Reporting of meteorological elements

ED Decision 2017/001/R

PRESENT WEATHER PHENOMENA — SEMI-AUTOMATIC OBSERVING SYSTEM

In local routine reports and local special reports and in METAR reported by a semi-automatic observing system, the following types of present weather phenomena should be reported, using their respective abbreviations and relevant criteria, as appropriate:

(a) Precipitation:

(1) drizzle (DZ);

(2) rain (RA);

(3) snow (SN);

(4) snow grains (SG);

(5) ice pellets (PL);

(6) hail (GR): reported when the diameter of the largest hailstones is 5 mm or more;

(7) small hail and/or snow pellets (GS): reported when the diameter of the largest hailstones is less than 5 mm.

(b) Obscurations (hydrometeors):

(1) fog (FG): reported when visibility is less than 1 000 m, except when qualified by 'MI', 'BC', 'PR' or 'VC'.

(2) mist (BR): reported when visibility is at least 1 000 m, but not more than 5 000 m;

(c) Obscurations (lithometeors)

The following should be used only when the obscuration consists predominantly of lithometeors and the visibility is 5 000 m or less, except 'SA' when qualified by 'DR' and volcanic ash:

(1) sand (SA);

(2) dust (widespread) (DU);

(3) haze (HZ);

(4) smoke (FU); and

(5) volcanic ash (VA).

(d) Other phenomena:

(1) dust/sand whirls (dust devils) (PO);

(2) squall (SQ);

(3) funnel cloud (tornado or waterspout) (FC);

(4) dust storm (DS);

(5) sandstorm (SS).

AMC3 MET.TR.205(d) Reporting of meteorological elements

ED Decision 2017/001/R

PRESENT WEATHER PHENOMENA — UNIDENTIFIED PRECIPITATION (UP)

In automated local routine reports and local special reports and in METAR, in addition to drizzle (DZ), rain (RA) and snow (SN), the abbreviation 'UP' should be used for unidentified precipitation when the type of precipitation cannot be identified by the automatic observing system.

AMC1 MET.TR.205(d)(3) Reporting of meteorological elements

ED Decision 2017/001/R

PRESENT WEATHER PHENOMENA — ADDITIONAL CHARACTERISTICS

In local routine reports and local special reports and in METAR, only when reported by a semi-automatic observing system, the following characteristics of present weather phenomena, as necessary, should be reported using their respective abbreviations and relevant criteria, as appropriate:

(a) Shower (SH): used to report showers. Showers observed in the vicinity of the aerodrome should be reported as 'VCSH' without qualification regarding type or intensity of precipitation.

(b) Blowing (BL): used with types of present weather phenomena raised by the wind to a height of 6 ft (2 m) or more above the ground.

(c) Low drifting (DR): used with types of present weather phenomena raised by the wind to less than 6 ft (2 m) above ground level.

(d) Shallow (MI): less than 6 ft (2 m) above ground level.

(e) Patches (BC): fog patches randomly covering the aerodrome.

(f) Partial (PR): a substantial part of the aerodrome covered by fog while the remainder is clear.

In automated local routine reports, local special reports and METAR, when showers (SH) referred to above cannot be determined based upon a method that takes account of the presence of convective cloud, the precipitation should not be characterised by 'SH'.

AMC2 MET.TR.205(d)(3) Reporting of meteorological elements

ED Decision 2017/001/R

PRESENT WEATHER PHENOMENA — INTENSITY

In local routine reports and local special reports and METAR, the relevant intensity or, as appropriate, the proximity to the aerodrome of the reported present weather phenomena should be indicated as follows:

	(local routine reports and local special reports)	(METAR)
Light	FBL	–
Moderate	MOD	(no indication)
Heavy	HVY	+

– Used with types of present weather phenomena. Light intensity should be indicated only for precipitation.

Vicinity (VC)

– Between approximately 8 and 16 km of the aerodrome reference point and used only in METAR with present weather when not reported under AMC1 MET.TR.205(d)(3) and MET.TR.205(d)(3).

GM1 MET.TR.205(d)(3)(i) Reporting of meteorological elements

ED Decision 2017/001/R

PRESENT WEATHER PHENOMENA — TS LIGHTNING DETECTION EQUIPMENT

(a) At aerodromes with human observers, lightning detection equipment may supplement human observations.

(b) For aerodromes with automatic observing systems, guidance on the use of lightning detection equipment intended for thunderstorm reporting is given in the Manual on Automatic Meteorological Observing Systems at Aerodromes (ICAO Doc 9837).

AMC1 MET.TR.205(e)(1) Reporting of meteorological elements

ED Decision 2017/001/R

CLOUD — HEIGHT OF CLOUD BASE

In local routine reports and local special reports and in METAR:

(a) the cloud amount should be reported using the abbreviations ‘FEW’ (1 to 2 oktas), ‘SCT’ (3 to 4 oktas), ‘BKN’ (5 to7 oktas) or ‘OVC’ (8 oktas);

(b) cumulonimbus clouds and towering cumulus clouds should be indicated as ‘CB’ and ‘TCU’, respectively;

(c) the vertical visibility should be reported in steps of 100 ft (30 m) up to 2 000 ft (600 m);

(d) if there are no clouds of operational significance and no restriction on vertical visibility and the abbreviation ‘CAVOK’ is not appropriate, the abbreviation ‘NSC’ should be used;

(e) when several layers or masses of cloud of operational significance are observed, their amount and height of cloud base should be reported in increasing order of the height of cloud base, and in accordance with the following criteria:

  (1) the lowest layer or mass, regardless of the amount to be reported as FEW, SCT, BKN or OVC, as appropriate;

  (2) the next layer or mass, covering more than 2/8 to be reported as SCT, BKN or OVC, as appropriate;

  (3) the next higher layer or mass, covering more than 4/8 to be reported as BKN or OVC, as appropriate; and

  (4) cumulonimbus and/or towering cumulus clouds, whenever observed and not reported in (1) to (3).

(f) when the cloud base is diffuse or ragged or fluctuating rapidly, the minimum height of cloud base or cloud fragments, should be reported; and

(g) when an individual layer (mass) of cloud is composed of cumulonimbus and towering cumulus clouds with a common cloud base, the type of cloud should be reported as cumulonimbus only.

AMC2 MET.TR.205(e)(1) Reporting of meteorological elements

ED Decision 2017/001/R

CLOUD — AUTOMATIC OBSERVING SYSTEM

When an automatic observing system is used to report local routine reports and local special reports and METAR:

(a) when the cloud type cannot be observed, the cloud type in each cloud group should be replaced by '///';

(b) when no clouds are detected, it should be indicated by using the abbreviation 'NCD';

(c) when cumulonimbus clouds or towering cumulus clouds are detected and the cloud amount and/or the height of cloud base cannot be observed, the cloud amount and/or the height of cloud base should be replaced by '///'; and

(d) when the sky is obscured and the value of the vertical visibility cannot be determined due to a temporary failure of the system/sensor, the vertical visibility should be replaced by '///'.

AMC1 MET.TR.205(e)(3) Reporting of meteorological elements

ED Decision 2017/001/R

CLOUD — HEIGHT OF CLOUD BASE

At aerodromes where low-visibility procedures are established for approach and landing, as agreed between the meteorological station and the appropriate ATS unit, in local routine reports and local special reports, the height of cloud base should be reported in steps of 50 ft up to and including 300 ft (90 m) and in steps of 100 ft (30 m) between 300 ft (90 m) and 10 000 ft (3 000 m), and the vertical visibility in steps of 50 ft (15 m) up to and including 300 ft (90 m) and in steps of 100 ft (30 m) between 300 ft (90 m) and 2 000 ft (600 m).

MET.TR.210 Observing meteorological elements

Regulation (EU) 2017/373

The following meteorological elements shall be observed and/or measured with specified accuracy and disseminated by automatic or semi-automatic meteorological observing system.

(a) Surface wind direction and speed

The mean direction and the mean speed of the surface wind shall be measured, as well as significant variations of the wind direction and speed (gusts), and reported in degrees true and knots, respectively.

(1) Siting

The meteorological instrument used to measure surface wind direction and speed shall be situated in such a way as to provide data which is representative of the area for which the measurements are required.

(2) Display

Surface wind displays relating to each sensor shall be located in the meteorological station. The displays in the meteorological station and in the air traffic services units shall relate to the same sensors, and where separate sensors are required, the displays shall be clearly marked to identify the runway and section of runway monitored by each sensor.

(3) Averaging

The averaging period for surface wind observations shall be:

(i) 2 minutes for local routine and local special reports and for wind displays in ATS units;

(ii) 10 minutes for METAR, except that when the 10-minute period includes a marked discontinuity in the wind direction and/or speed; only data occurring after the discontinuity shall be used for obtaining mean values; hence, the time interval in these circumstances shall be correspondingly reduced.

(b) Visibility

(1) The visibility shall be measured or observed, and reported in metres or kilometres.

(2) Siting

The meteorological instrument used to measure visibility shall be situated in such a way as to supply data which is representative of the area for which the measurements are required.

(3) Displays

When instrumented systems are used for the measurement of visibility, visibility displays relating to each sensor shall be located in the meteorological station. The displays in the meteorological station and in the air traffic services units shall relate to the same sensors, and where separate sensors are required, the displays shall be clearly marked to identify the area monitored by each sensor.

(4) Averaging

The averaging period shall be 10 minutes for METAR, except that when the 10-minute period immediately preceding the observation includes a marked discontinuity in the visibility, only those values occurring after the discontinuity shall be used for obtaining mean values.

(c) Runway visual range (RVR)

(1) Siting

The meteorological instrument used to assess the RVR shall be situated in such a way as to provide data which is representative of the area for which the observations are required.

(2) Instrumented systems

Instrumented systems based on transmissometers or forward-scatter meters shall be used to assess RVR on runways intended for Categories II and III instrument approach and landing operations, and for Category I instrument approach and landing operations as determined by the competent authority.

(3) Display

Where the RVR is determined by instrumented systems, one display or more, if required, shall be located in the meteorological station. The displays in the meteorological station and in the air traffic services units shall relate to the same sensors, and where separate sensors are required, the displays shall be clearly marked to identify the runway and section of runway monitored by each sensor.

(4) Averaging

(i) Where instrumented systems are used for the assessment of the RVR, their output shall be updated at least every 60 seconds to permit the provision of current, representative values.

(ii) The averaging period for RVR values shall be:

(A) 1 minute for local routine and special reports and for RVR displays in ATS units;

(B) 10 minutes for METAR, except that when the 10-minute period immediately preceding the observation includes a marked discontinuity in RVR values; then only those values occurring after the discontinuity shall be used for obtaining mean values.

(d) Present weather phenomena

(1) The following present weather phenomena shall be reported, as a minimum: rain, drizzle, snow and freezing precipitation, including intensity thereof, haze, mist, fog, freezing fog and thunderstorms, including thunderstorms in the vicinity.

(2) Siting

The meteorological instrument used to measure present weather at the aerodrome and its vicinity shall be situated in such a way as to provide data which is representative of the area for which the measurements are required.

(e) Clouds

(1) Cloud amount, cloud type and height of cloud base shall be observed and reported as necessary to describe the clouds of operational significance. When the sky is obscured, vertical visibility shall be observed and reported, where measured, instead of cloud amount, cloud type and height of cloud base. The height of cloud base and vertical visibility shall be reported in feet.

(2) Siting

The meteorological instrument used to measure clouds amount and height shall be situated in such a way as to provide data which is representative of the area for which the measurements are required.

(3) Display

When automated equipment is used for the measurement of the height of cloud base, at least one display shall be located in the meteorological station. The displays in the meteorological station and in the air traffic services units shall relate to the same sensors, and where separate sensors are required, the displays shall be clearly marked to identify the area monitored by each sensor.

(4) Reference level

(i) The height of cloud base shall be reported above aerodrome elevation.

(ii) When a precision approach runway in use has a threshold elevation of 50 ft (15 m) or more below the aerodrome elevation, local arrangements shall be made in order that the height of cloud bases reported to arriving aircraft shall refer to the threshold elevation.

(iii) In the case of reports from offshore structures, the height of cloud base shall be given above mean sea level.

(f) Air temperature and dew-point temperature

(1) The air temperature and dew-point temperature shall be measured, displayed and reported in degrees Celsius.

(2) When automated equipment is used for the measurement of air temperature and dew-point temperature, the displays shall be located in the meteorological station. The displays in the meteorological station and in the air traffic services units shall relate to the same sensors.

(g) Atmospheric pressure

(1) The atmospheric pressure shall be measured, and QNH and QFE values shall be computed and reported in hectopascals.

(2) Display

(i) When automated equipment is used for the measurement of atmospheric pressure, QNH and, if required in accordance with point MET.TR.205(g)(3)(ii), QFE displays relating to the barometer shall be located in the meteorological station with corresponding displays in the appropriate air traffic services units.

(ii) When QFE values are displayed for more than one runway, the displays shall be clearly marked to identify the runway to which the QFE value displayed refers.

(3) Reference level

A reference level for the computation of QFE shall be used.

AMC1 MET.TR.210 Observing meteorological elements

ED Decision 2017/001/R

HUMAN OBSERVATION

Observers at an aerodrome should be located, as far as practical, so as to provide data which is representative of the area for which the observations are required.

GM1 MET.TR.210 Observing meteorological elements

ED Decision 2017/001/R

HUMAN OBSERVATION

When a semi-automatic observing system is used, the observer should be located, as far as practical, so as to supply data which is representative of the area for which the observations are required.

GM2 MET.TR.210 Observing meteorological elements

ED Decision 2017/001/R

OPERATIONALLY DESIRABLE ACCURACY OF OBSERVATION

Element to be observed	*Operationally desirable accuracy of measurement or observation**
Mean surface wind	*Direction: ± 10°* *Speed: ± 0.5 m/s (1 kt) up to 5 m/s (10 kt)* *± 10 % above 5 m/s (10 kt)*
Variations from the mean surface wind	*± 1 m/s (2 kt), in terms of longitudinal and lateral components*
Visibility	*± 50 m up to 600 m* *± 10 % between 600 m and 1 500 m* *± 20 % above 1 500 m*
Runway visual range	*± 10 m up to 400 m* *± 25 m between 400 m and 800 m* *± 10 % above 800 m*
Cloud amount	*± 1 okta*
Cloud height	*± 10 m (33 ft) up to 100 m (330 ft)* *± 10 % above 100 m (330 ft)*
Air temperature and dew-point temperature	*± 1°C*
Pressure value (QNH, QFE)	*± 0.5 hPa*
Air temperature and dew-point temperature	*± 1°C*
Pressure value (QNH, QFE)	*± 0.5 hPa*

* The operationally desirable accuracy is not intended as an operational requirement; it is to be understood as a goal that has been expressed by the operators.

AMC1 MET.TR.210(a) Observing meteorological elements

ED Decision 2017/001/R

SURFACE WIND

(a) When local routine reports and local special reports are used for departing or arriving aircraft, the surface wind observations for these reports should be representative of conditions along the runway or the touchdown zone respectively.

(b) For METAR, the surface wind observations should be representative of the conditions above the whole runway where there is only one runway and the whole runway complex where there is more than one runway.

GM1 MET.TR.210(a) Observing meteorological elements

ED Decision 2017/001/R

SURFACE WIND — TAKE-OFF AND LANDING

Since, in practice, the surface wind cannot be measured directly on the runway, surface wind observations for take-off and landing are expected to be the best practicable indication of the winds which an aircraft will encounter during take-off and landing.

AMC1 MET.TR.210(a)(1) Observing meteorological elements

ED Decision 2017/001/R

SURFACE WIND — SITING

(a) Reported surface wind should be representative of a wind at a height of 30 ± 3 ft (10 ± 1 m) above the ground.

(b) Representative surface wind observations should be obtained by the use of sensors appropriately sited.

(c) Sensors for surface wind observations for local routine reports and local special reports should be sited to give the best practicable indication of conditions along the runway and touchdown zones.

(d) At aerodromes where topography or prevalent weather conditions cause significant differences in surface wind at various sections of the runway, additional sensors should be provided.

GM1 MET.TR.210(a)(1) Observing meteorological elements

ED Decision 2017/001/R

SURFACE WIND — SITING

Specifications concerning the siting of equipment and installations on operational areas, aiming at reducing the hazard to aircraft to a minimum, are contained in the EASA CS ADR-DSN.T.915 ‘Siting of equipment and installations on operational areas’.

AMC1 MET.TR.210(a)(2) Observing meteorological elements

ED Decision 2017/001/R

SURFACE WIND — DISPLAY

The mean values of, and significant variations in, the surface wind direction and speed for each sensor should be derived and displayed by automated equipment.

AMC1 MET.TR.210(a)(3) Observing meteorological elements

ED Decision 2017/001/R

SURFACE WIND — AVERAGING

The averaging period for measuring variations from the mean wind speed (gusts) reported in accordance with MET.TR.205(a)(3)(iii) should be 3 seconds for local routine reports, local special reports, METAR, and for wind displays used for depicting variations from the mean wind speed (gusts) in ATS units.

GM1 MET.TR.210(a)(3)(ii) Observing meteorological elements

ED Decision 2017/001/R

SURFACE WIND — AVERAGING — MARKED DISCONTINUITY

A marked discontinuity occurs when there is an abrupt and sustained change in wind direction of 30° or more, with a wind speed of 10 kt (5 m/s) before or after the change, or a change in wind speed of 10 kt (5 m/s) or more, lasting at least 2 minutes.

AMC1 MET.TR.210(b)(1) Observing meteorological elements

ED Decision 2017/001/R

VISIBILITY — GENERAL

(a) When instrumented systems are used for the measurement of visibility, their output should be updated at least every 60 seconds to permit provision of current representative values.

(b) When instrumented systems are used for the measurement of visibility, it should be measured at a height of approximately 7.5 ft (2.5 m) above the runway.

(c) When local routine reports and local special reports are used for departing aircraft, the visibility observations for these reports should be representative of the conditions along the runway.

(d) When local routine reports and local special reports are used for arriving aircraft, the visibility observations for these reports should be representative of the touchdown zone of the runway.

(e) For METAR, the visibility observations should be representative of the aerodrome.

AMC1 MET.TR.210(b)(2) Observing meteorological elements

ED Decision 2017/001/R

VISIBILITY — SITING

(a) When instrumented systems are used for the measurement of visibility, representative visibility observations should be obtained by the use of sensors appropriately sited.

(b) Sensors for visibility observations for local routine reports and local special reports should be sited to give the best practicable indications of visibility along the runway and touchdown zone.

AMC1 MET.TR.210(b)(4) Observing meteorological elements

ED Decision 2017/001/R

VISIBILITY — AVERAGING

The averaging period for visibility should be 1 minute for local routine reports and local special reports and for visibility displays in ATS units.

GM1 MET.TR.210(b)(4) Observing meteorological elements

ED Decision 2017/001/R

VISIBILITY — AVERAGING — MARKED DISCONTINUITY

A marked discontinuity occurs when there is an abrupt and sustained change in visibility, lasting at least 2 minutes, which reaches or passes through one or more of the following values: 800, 1 500 or 3 000 and, in cases where significant numbers of flights are operated in accordance with the visual flight rules, 5 000 m.

AMC1 MET.TR.210(c) Observing meteorological elements

ED Decision 2017/001/R

RUNWAY VISUAL RANGE (RVR) — ASSESSMENT

RVR should be assessed:

(a) at a height of approximately 7.5 ft (2.5 m) above the runway for instrument systems or at a height of approximately 15 ft (5 m) above the runway by a human observer;

(b) at a lateral distance from the runway centre line of not more than 120 m.

GM1 MET.TR.210(c) Observing meteorological elements

ED Decision 2017/001/R

RUNWAY VISUAL RANGE (RVR) — ASSESSMENT

A detailed understanding of the assessment of RVR is described in ICAO Doc 9328 Manual on 'RVR — Observing and reporting practices'.

AMC1 MET.TR.210(c)(1) Observing meteorological elements

ED Decision 2017/001/R

RUNWAY VISUAL RANGE (RVR) — SITING

(a) The site for observations to be representative of the touchdown zone should be located about 300 m along the runway from the threshold.

(b) The sites for observations to be representative of the mid-point and stop-end of the runway should be located at a distance of 1 000 to 1 500 m along the runway from the threshold and at a distance of about 300 m from the other end of the runway.

(c) The exact position of these sites and, if necessary, additional sites should be decided after considering aeronautical, meteorological and climatological factors such as long runways, swamps and other fog-prone areas.

AMC1 MET.TR.210(c)(2) Observing meteorological elements

ED Decision 2017/001/R

RUNWAY VISUAL RANGE (RVR) — RUNWAY LIGHT INTENSITY

(a) Instrumented systems should consider the runway light intensity.

(b) When instrumented systems are used for the assessment of RVR, computations should be made separately for each available runway.

(c) For local routine and special reports, the light intensity to be used for the computation should be:

(1) for a runway with the lights switched on and a light intensity of more than 3 % of the maximum light intensity available, the light intensity actually in use on that runway;

(2) for a runway with the lights switched on and a light intensity of 3 % or less of the maximum light intensity available, the optimum light intensity that would be appropriate for operational use in the prevailing conditions; and

(3) for a runway with lights switched off (or at the lowest setting pending the resumption of operations), the optimum light intensity that would be appropriate for operational use in the prevailing conditions.

(e) In METAR, the RVR should be based on the maximum light intensity available on the runway.

GM1 MET.TR.210(c)(2) Observing meteorological elements

ED Decision 2017/001/R

RUNWAY VISUAL RANGE (RVR) — USE OF INSTRUMENTED SYSTEMS

(a) Since accuracy can vary from one instrument design to another, performance characteristics are to be checked before selecting an instrument for assessing the runway visual range.

(b) The calibration of a forward-scatter meter has to be traceable and verifiable to a transmissometer standard, whose accuracy has been verified over the intended operational range.

(c) Guidance on the use of transmissometers and forward-scatter meters in instrumented Runway Visual Range systems is given in the Manual of Runway Visual Range Observing and Reporting Practices (ICAO Doc 9328).

GM2 MET.TR.210(c)(2) Observing meteorological elements

ED Decision 2017/001/R

RUNWAY VISUAL RANGE (RVR)

Instrumented systems based on transmissometer or forward-scatter meters must be used to assess RVR on runways intended for Categories II and III instrument approach and landing operations. For Category I instrument approach, other means to assess RVR exist and the assessment of RVR by means of instrumented systems based on transmissometer or forward-scatter meters are therefore not required. However, if the competent authority considers that an instrument system is required at certain aerodromes, it may decide so. Therefore, the requirement in MET.TR.210(c)(2) provides this option, which is consistent with the ICAO Annex 3 approach.

GM1 MET.TR.210(c)(4)(ii)(B) Observing meteorological elements

ED Decision 2017/001/R

RUNWAY VISUAL RANGE (RVR) — AVERAGING

A marked discontinuity occurs when there is an abrupt and sustained change in RVR, lasting at least 2 minutes, which reaches or passes through the values 800, 550, 300 and 175 m.

AMC1 MET.TR.210(d)(1) Observing meteorological elements

ED Decision 2017/001/R

PRESENT WEATHER — GENERAL

(a) For local routine reports and local special reports, the present weather information should be representative of the conditions at the aerodrome.

(b) For METAR, the present weather information should be representative of the conditions at the aerodrome and, for certain specified present weather phenomena, in its vicinity.

AMC1 MET.TR.210(d)(2) Observing meteorological elements

ED Decision 2017/001/R

PRESENT WEATHER — SITING

When instrumented systems are used for observing present weather phenomena listed under AMC2 MET.TR.205(d), MET.TR.205(d)(3) and AMC1 MET.TR.205(d)(3), representative information should be obtained by the use of sensors appropriately sited.

AMC1 MET.TR.210(e) Observing meteorological elements

ED Decision 2017/001/R

CLOUDS — GENERAL

(a) Cloud observations for local routine reports and local special reports should be representative of the runway threshold(s) in use.

(b) Cloud observations for METAR should be representative of the aerodrome and its vicinity.

AMC1 MET.TR.210(e)(2) Observing meteorological elements

ED Decision 2017/001/R

CLOUDS — SITING

(a) When instrumented systems are used for the measurement of the cloud amount and the height of cloud base, representative observations should be obtained by the use of sensors appropriately sited.

(b) For local routine reports and local special reports, in the case of aerodromes with precision approach runways, sensors for cloud amount and height of cloud base should be sited to give the best practicable indications of the cloud amount and height of cloud base at the threshold of the runway in use. For that purpose, a sensor should be installed at a distance of less than 4 000 ft (1 200 m) before the landing threshold.

AMC1 MET.TR.210(f) Observing meteorological elements

ED Decision 2017/001/R

AIR TEMPERATURE AND DEW-POINT TEMPERATURE

Observations of air temperature and dew-point temperature for local routine reports and local special reports and METAR should be representative of the whole runway complex.

AMC1 MET.TR.210(g)(3) Observing meteorological elements

ED Decision 2017/001/R

ATMOSPHERIC PRESSURE — REFERENCE LEVEL

(a) The reference level for the computation of QFE should be the aerodrome elevation.

(b) For non-precision approach runways, whose thresholds are 7 ft (2 m) or more below the aerodrome elevation, and for precision approach runways, the QFE, if required, should refer to the relevant threshold elevation.

CHAPTER 2 — TECHNICAL REQUIREMENTS FOR AERODROME METEOROLOGICAL OFFICES

MET.TR.215 Forecast and other information

Regulation (EU) 2017/373

(a) Meteorological information for operators and flight crew members shall:

(1) cover the flight in respect of time, altitude and geographical extent;

(2) relate to appropriate fixed times or periods of time;

(3) extend to the aerodrome of intended landing, also covering the meteorological conditions expected between the aerodrome of intended landing and alternate aerodromes designated by the operator;

(4) be up to date.

(b) Meteorological information provided to rescue coordination centres shall include the meteorological conditions that existed in the last known position of a missing aircraft and along the intended route of that aircraft with particular reference to elements which are not being distributed routinely.

(c) Meteorological information provided to aeronautical information services units shall include:

(1) information on meteorological service intended for inclusion in the aeronautical information publication(s) concerned;

(2) information necessary for the preparation of NOTAM or ASHTAM;

(3) information necessary for the preparation of aeronautical information circulars.

(d) Meteorological information included in flight documentation shall be represented as follows:

(1) winds on charts shall be depicted by arrows with feathers and shaded pennants on a sufficiently dense grid;

(2) temperatures shall be depicted by figures on a sufficiently dense grid;

(3) wind and temperature data selected from the data sets received from a world area forecast centre shall be depicted in a sufficiently dense latitude/longitude grid;

(4) wind arrows shall take precedence over temperatures and chart background;

(5) height indications referring to en-route meteorological conditions shall be expressed as determined to be appropriate for the situation, for instance in flight levels, pressure, altitude or height above ground level, whilst all references referring to aerodrome meteorological conditions shall be expressed in height above the aerodrome elevation.

(e) Flight documentation shall comprise:

(1) forecasts of upper-wind and upper-air temperature;

(2) SIGWX phenomena;

(3) METAR or, when issued, SPECI for the aerodromes of departure and intended landing, and for take-off, en-route and destination alternate aerodromes;

(4) TAF or amended TAF for the aerodromes of departure and intended landing, and for take-off, en-route and destination alternate aerodromes;

(5) a SIGMET message, and, when issued, an AIRMET message and appropriate special air-reports relevant to the whole route;

(6) volcanic ash and tropical cyclone advisory information relevant to the whole route.

However, when agreed between the aerodrome meteorological office and the operators concerned, flight documentation for flights of two hours' duration or less, after a short stop or turnaround, may be limited to the information operationally needed, but in all cases the flight documentation shall at least comprise the meteorological information listed in points (3), (4), (5) and (6).

(f) Charts generated from digital forecasts shall be made available, as required by operators, for fixed areas of coverage as shown in Appendix 2.

(g) When forecasts of upper-wind and upper-air temperature listed under point MET.OR.275(a)(1) are supplied in chart form, they shall be fixed-time prognostic charts for flight levels as specified in points MET.TR.260(b), MET.TR.275(c) and MET.TR.275(d). When forecasts of SIGWX phenomena listed under point MET.TR.275(a)(2) are supplied in chart form, they shall be fixed-time prognostic charts for an atmospheric layer limited by flight levels as specified in point MET.TR.275(b)(3).

(h) The forecasts of upper-wind and upper-air temperature and of SIGWX phenomena above flight level 100 shall be supplied as soon as they become available, but not later than 3 hours before departure.

(i) Aeronautical climatological information shall be prepared in the form of aerodrome climatological tables and aerodrome climatological summaries.

AMC1 MET.TR.215(a) Forecasts and other information

ED Decision 2017/001/R

METEOROLOGICAL INFORMATION FOR OPERATORS AND FLIGHT CREW

Meteorological information provided to operators and flight crew members should be provided by means of one or more of the following:

(a) written or printed material, including specified charts and forms;

(b) data in a digital form;

(c) briefing;

(d) consultation;

(e) display; or

(f) an automated pre-flight information system providing self-briefing and flight documentation facilities while retaining access by operators and aircrew members to consultation, as necessary, with the aerodrome meteorological office.

AMC2 MET.TR.215(a) Forecasts and other information

ED Decision 2017/001/R

SPECIFIC INFORMATION FOR HELICOPTER OPERATIONS

(a) Meteorological information for pre-flight planning and in-flight replanning by operators of helicopters flying to offshore structures should include data covering the layers from sea level to flight level 100.

(b) Particular mention should be made of the expected surface visibility, the amount, type, where available, base and tops of cloud below flight level 100, sea state and sea-surface temperature, mean sea-level pressure, and the occurrence and expected occurrence of turbulence and icing.

AMC3 MET.TR.215(a) Forecasts and other information

ED Decision 2017/001/R

AUTOMATED PRE-FLIGHT INFORMATION SYSTEMS

Automated pre-flight information systems for the supply of meteorological information for self-briefing, pre-flight planning and flight documentation should:

(a) provide for the continuous and timely updating of the system database and monitoring of the validity and integrity of the meteorological information stored;

(b) permit access to the system by operators and flight crew members and also by other aeronautical users concerned through suitable telecommunications means;

(c) use access and interrogation procedures based on abbreviated plain language and, as appropriate, ICAO location indicators, and aeronautical meteorological code data-type designators prescribed by WMO, or based on a menu-driven user interface, or other appropriate mechanisms as agreed between the meteorological authority and the operators concerned; and

(d) provide for rapid response to a user request for information.

GM1 to AMC3 MET.TR.215(a) Forecasts and other information

ED Decision 2017/001/R

AUTOMATED PRE-FLIGHT INFORMATION SYSTEMS

(a) ICAO abbreviations and codes and location indicators are given respectively in the Procedures for Air Navigation Services — ICAO Abbreviations and Codes (PANS-ABC, ICAO Doc 8400) and Location Indicators (ICAO Doc 7910).

(b) Aeronautical meteorological code data-type designators are given in the WMO Publication No 386, Manual on the Global Telecommunication System.

GM1 MET.TR.215(b) Forecasts and other information

ED Decision 2017/001/R

RESCUE COORDINATION CENTRES

(a) The elements which are not distributed routinely are:

(1) state of ground, and in particular any snow cover or flooding;

(2) sea-surface temperature, state of the sea, ice cover (if any) and ocean currents, if relevant to the search area; and

(3) sea-level pressure data.

(b) On request from the rescue coordination centre, the designated aerodrome meteorological office or meteorological watch office should arrange to obtain details of the flight documentation which was supplied to the missing aircraft, together with any amendments to the forecast which were transmitted to the aircraft in flight.

GM2 MET.TR.215(b) Forecasts and other information

ED Decision 2017/001/R

RESCUE COORDINATION CENTRES

Information to be supplied to rescue coordination centres includes:

(a) significant en-route weather phenomena;

(b) cloud amount and type, particularly cumulonimbus; height indications of bases and tops;

(c) visibility and phenomena reducing visibility;

(d) surface wind and upper wind;

(e) state of ground, in particular, any snow cover or flooding;

(f) sea-surface temperature, state of the sea, ice cover if any and ocean currents, if relevant to the search area; and

(g) sea-level pressure data.

AMC1 MET.TR.215(d)(5) Forecasts and other information

ED Decision 2017/001/R

HEIGHT INDICATIONS REFERENCES TO EN-ROUTE METEOROLOGICAL CONDITIONS

All references to en-route meteorological conditions, such as height indications of upper winds, turbulence or bases and tops of clouds, should be expressed in flight levels. Height indications referred to en-route meteorological conditions may also be expressed in pressure, altitude or, for low-level flights, in height above ground level.

AMC1 MET.TR.215(e) Forecasts and other information

ED Decision 2017/001/R

FLIGHT DOCUMENTATION

(a) Where the forecasts are supplied in chart form, flight documentation for low-level flights, including those in accordance with the visual flight rules, operating up to flight level 100 or up to flight level 150 in mountainous areas or higher, where necessary, should contain the following as appropriate to the flight:

(1) information from relevant SIGMET and AIRMET messages;

(2) upper wind and upper-air temperature charts; and

(3) significant weather charts.

(b) Where the forecasts are not supplied in chart form, flight documentation for low-level flights, including those in accordance with the visual flight rules, operating up to flight level 100 or up to flight level 150 in mountainous areas or higher, where necessary, should contain the following information as appropriate to the flight: SIGMET and AIRMET information.

AMC1 MET.TR.215(e)(1) & (2) Forecasts and other information

ED Decision 2017/001/R

FLIGHT DOCUMENTATION — LEGEND FOR THE CHARTS

When the flight documentation related to forecasts of upper wind and upper-air temperature and SIGWX phenomena is presented in the form of charts, it should be in accordance with the below sheet of notations used in flight documentation.

1. Symbols for significant weather

	Tropical cyclone		Drizzle
	Severe squall line*		Rain
	Moderate turbulence		Snow
	Severe turbulence		Shower / Hail
	Mountain waves		Widespread blowing snow
	Moderate aircraft icing		Severe sand or dust haze
	Severe aircraft icing		Widespread sandstorm or duststorm
	Widespread fog		Widespread haze
	Radioactive materials in the atmosphere**		Widespread mist
	Volcanic eruption***		Widespread smoke
	Mountain obscuration		Freezing precipitation****

* In-flight documentation for flights operating up to FL 100. This symbol refers to "squall line".

** The following information should be included in a separate text box on the chart: radioactive materials in the atmosphere symbol; latitude/longitude of release site; and (if known) the name of the site of the radioactive source. In addition, the legend of SIGWX charts on which a release of radiation is indicated should contain "CHECK SIGMET AND NOTAM FOR RDOACT CLD". The centre of the radioactive materials in the atmosphere symbol should be placed on significant weather charts at the latitude/longitude site of the radioactive source.

*** The following information should be included in a separate text box on the chart: volcanic eruption symbol; the name of the volcano (if known); and the latitude/longitude of the eruption.

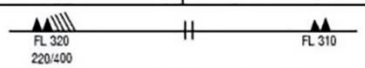
In addition, the legend of SIGWX charts should indicate "CHECK SIGMET, ADVISORIES FOR TC AND VA, AND ASHTAM AND NOTAM FOR VA". The dot on the base of the volcanic eruption symbol should be placed on significant weather charts at the latitude/longitude site of the volcanic event.

**** This symbol does not refer to icing due to precipitation coming into contact with an aircraft which is at a very low temperature.

Note: Height indications between which phenomena are expected, top above base as per chart legend.

2. Fronts and convergence zones and other symbols used

	Cold front at the surface	FL 270	Position, speed and level of maximum wind
	Warm front at the surface		Convergence line
	Occluded front at the surface	0°:100	Freezing level
	Quasi-stationary front at the surface		Intertropical concergence zone
H 460	Tropopause high	10	State of the sea
270 I	Tropopause low	18	Sea-surface temperature
380	Tropopause level	40	Widespread strong surface wind*



Wind arrows indicate the maximum wind in jet and the flight level at which it occurs. If the maximum wind speed is 60 m/s (120 kt) or more, the flight levels between which winds are greater than 40 m/s (80 kt) is placed below the maximum wind level. In the example, winds are greater than 40 m/s (80 kt) between FL 220 and FL 400.

The heavy line delineating the jet axis begins/ends at the points where a wind speed of 40 m/s (80 kt) is forecast.

‡ Symbol used whenever the height of the jet axis changes by +/–3000 ft or the speed changes by +/–20 kt

* This symbol refers to widespread surface wind speeds exceeding 15 m/s (30 kt).

3. Abbreviations used to describe clouds

3.1 Type

CI	= Cirrus	AS	= Altostratus	ST	= Stratus
CC	= Cirrocumulus	NS	= Nimbostratus	CU	= Cumulus
CS	= Cirrostratus	SC	= Stratocumulus	CB	= Cumulonimbus
AC	= Altocumulus				

3.2 Amount

Clouds except CB

FEW	= few (1/8 to 2/8)	BKN	= broken (5/8 to 7/8)
SCT	= scattered (3/8 to 4/8)	OVC	= overcast (8/8)

CB only

ISOL	= individual CBs (isolated)
OCNL	= well-separated CBs (occasional)
FRQ	= CBs with little or no separation (frequent)
EMBD	= CBs embedded in layers of other clouds or concealed by haze (embedded)

3.3 Heights

Heights are indicated on SWH and SWM charts in flight levels (FL), top over base. When XXX is used, tops or bases are outside the layer of the atmosphere to which the chart applies.

In SWL charts:

(a) Heights are indicated as altitudes above mean sea level;

(b) The abbreviation SFC is used to indicate ground level.

4. Depicting of lines and systems on specific charts

4.1 Models SWH and SWM – Significant weather charts (high and medium)

Scalloped line	=	demarcation of areas of significant weather
Heavy broken line	=	delineation of area of CAT
Heavy solid line interrupted by wind arrow and flight level	=	position of jet stream axis with indication of wind direction, speed in kt or m/s and height in flight levels. The vertical extent of the jet stream is indicated (in flight levels), e.g. FL 270 accompanied by 240/290 indicates that the jet extends from FL 240 to FL 290.
Flight levels inside small rectangles	=	height in flight levels of tropopause at spot locations, e.g. 240. Low and high points of the tropopause topography are indicated by the letters L or H, respectively, inside a pentagon with the height in flight levels. Display explicit FL for jet depths and tropopause height even if outside forecast bounds.

4.2 Model SWL – Significant weather chart (low level)

X	=	position of pressure centres given in hectopascals
L	=	centre of low pressure
H	=	centre of high pressure
Scalloped lines	=	demarcation of area of significant weather
Dashed lines	=	altitude of 0°C isotherm in feet (hectofeet) or metres Note: 0°C level may also be indicated by 0°:060, i.e. 0°C level is at an altitude of 6000 ft.
Figures on arrows	=	speed in kt or km/h of movement of frontal systems, depressions or anticyclones
Figure inside the state of the sea symbol	=	total wave height in feet or metres
Figure inside the sea-surface temperature	=	sea-surface temperature in °C
Figures inside the strong surface wind symbol	=	wind in kt or m/s

4.3 Arrows, feathers and pennants

Arrows indicate direction. Number of pennants and/or feathers correspond to speed.

Example: 270°/115 kt (equivalent to 57.5 m/s)

Pennants correspond to 50 kt or 25 m/s

Feathers correspond to 10 kt or 5 m/s

Half-feathers correspond to 5 kt or 2.5 m/s

* A conversion factor of 1 to 2 is used.

GM1 MET.TR.215(e)(1) & (2) Forecasts and other information

ED Decision 2017/001/R

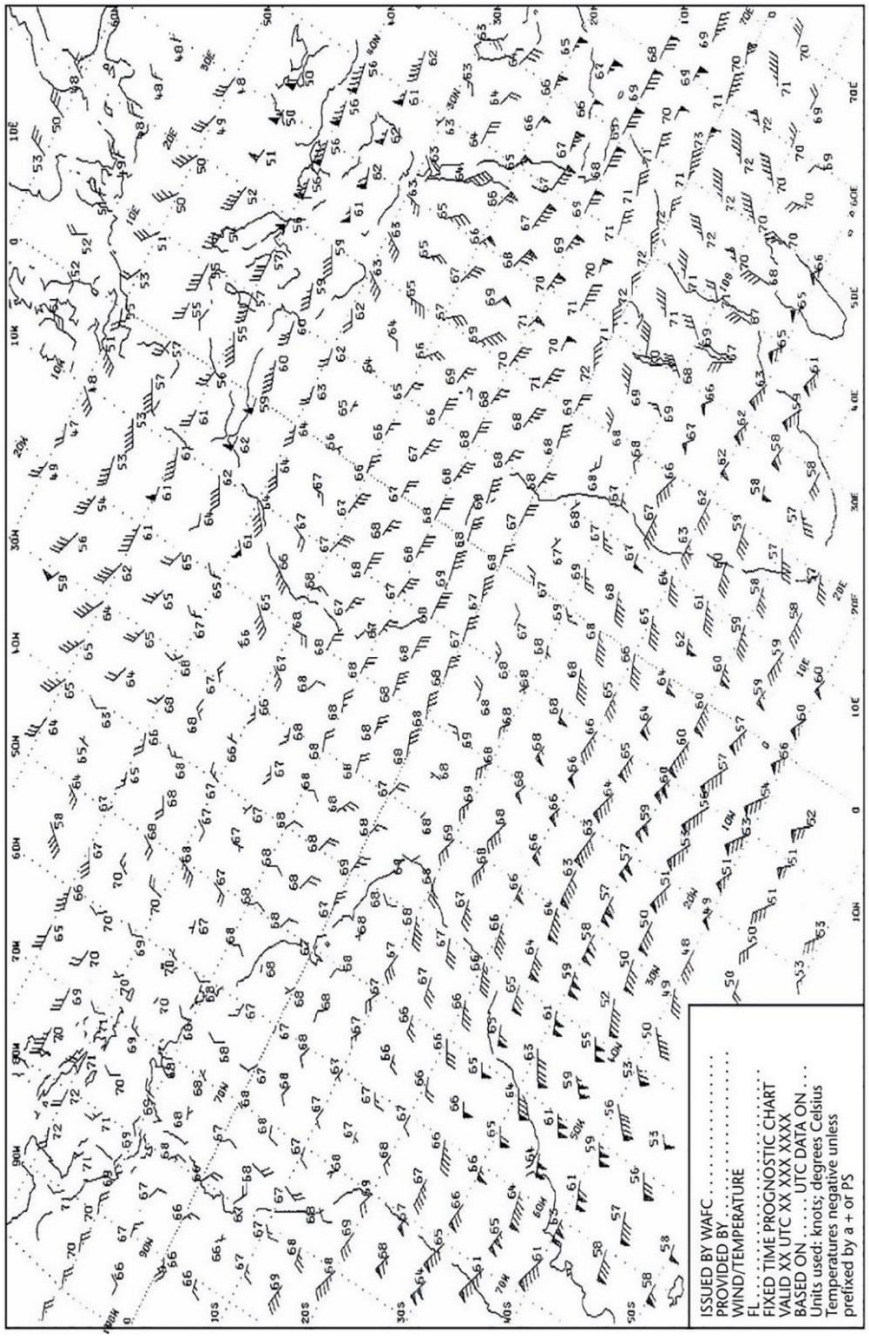
MODEL CHARTS

This guidance provides examples of model charts.

(a) UPPER WIND AND TEMPERATURE CHART FOR STANDARD ISOBARIC SURFACE

MODEL IS

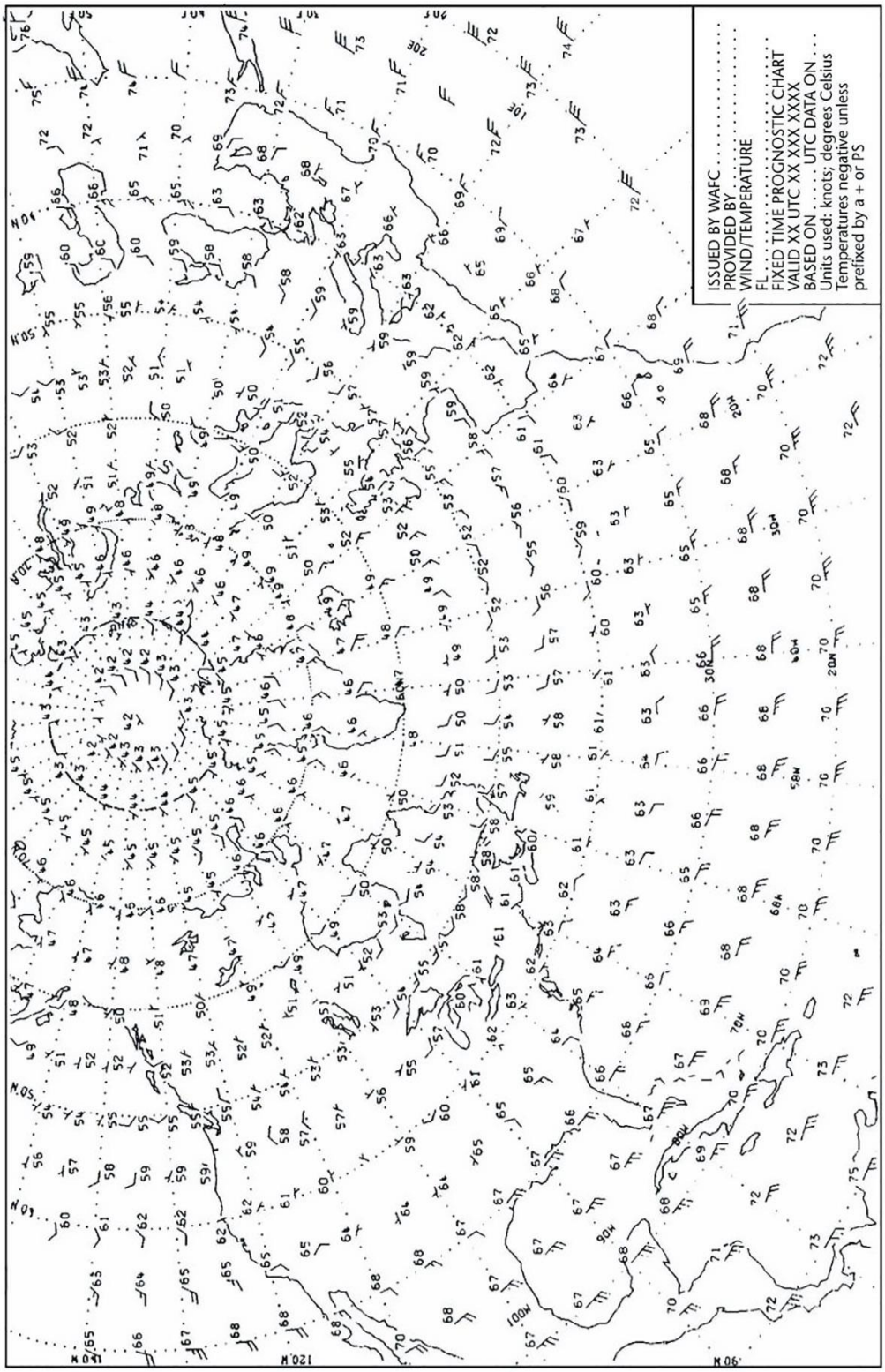
Example 1. Arrows, feathers and pennants (Mercator projection)



(b) UPPER WIND AND TEMPERATURE CHART FOR STANDARD ISOBARIC SURFACE

MODEL IS

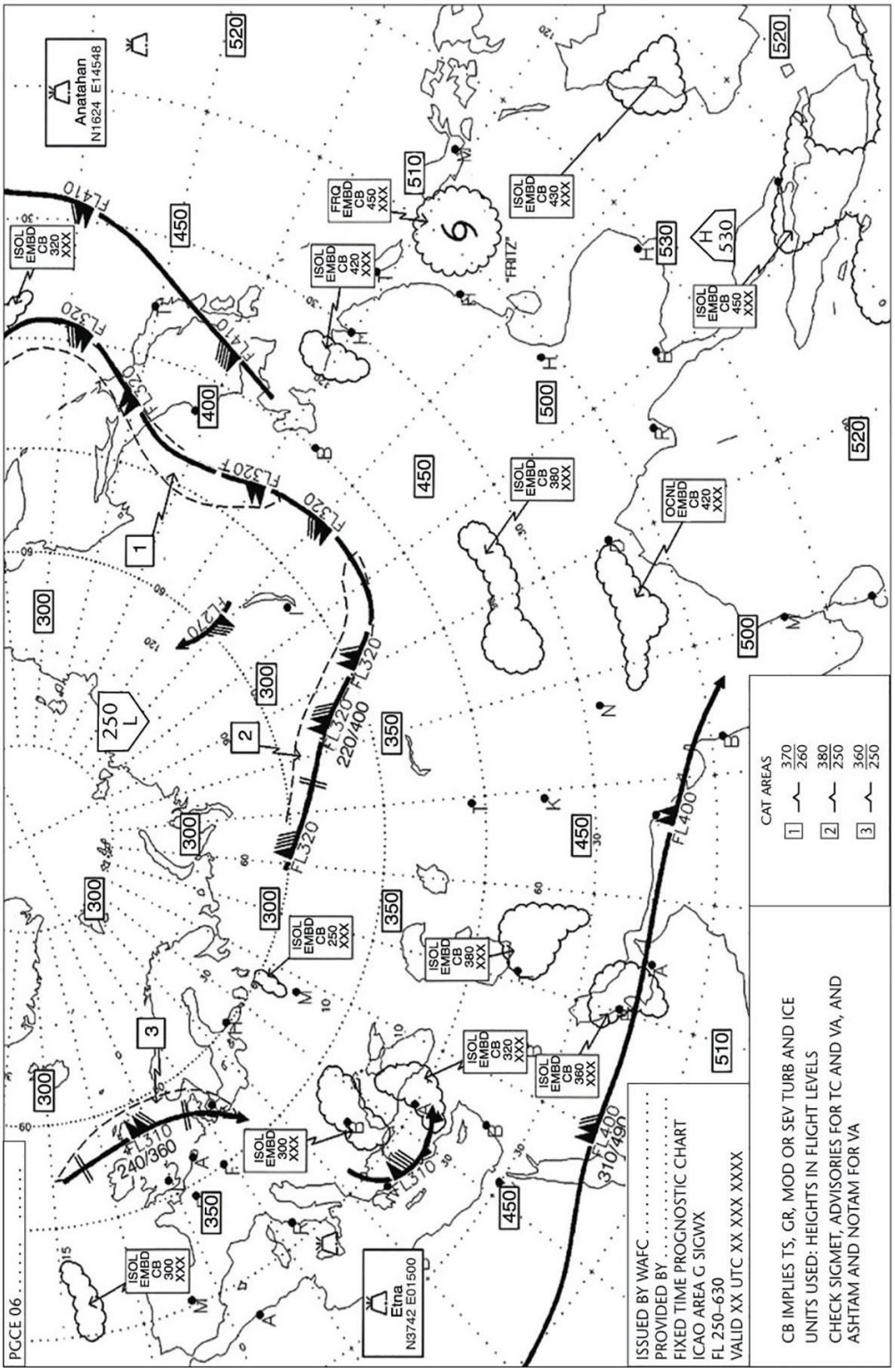
Example 2. Arrows, feathers and pennants (Polar stereographic projection)



(c) SIGNIFICANT WEATHER CHART (HIGH LEVEL)

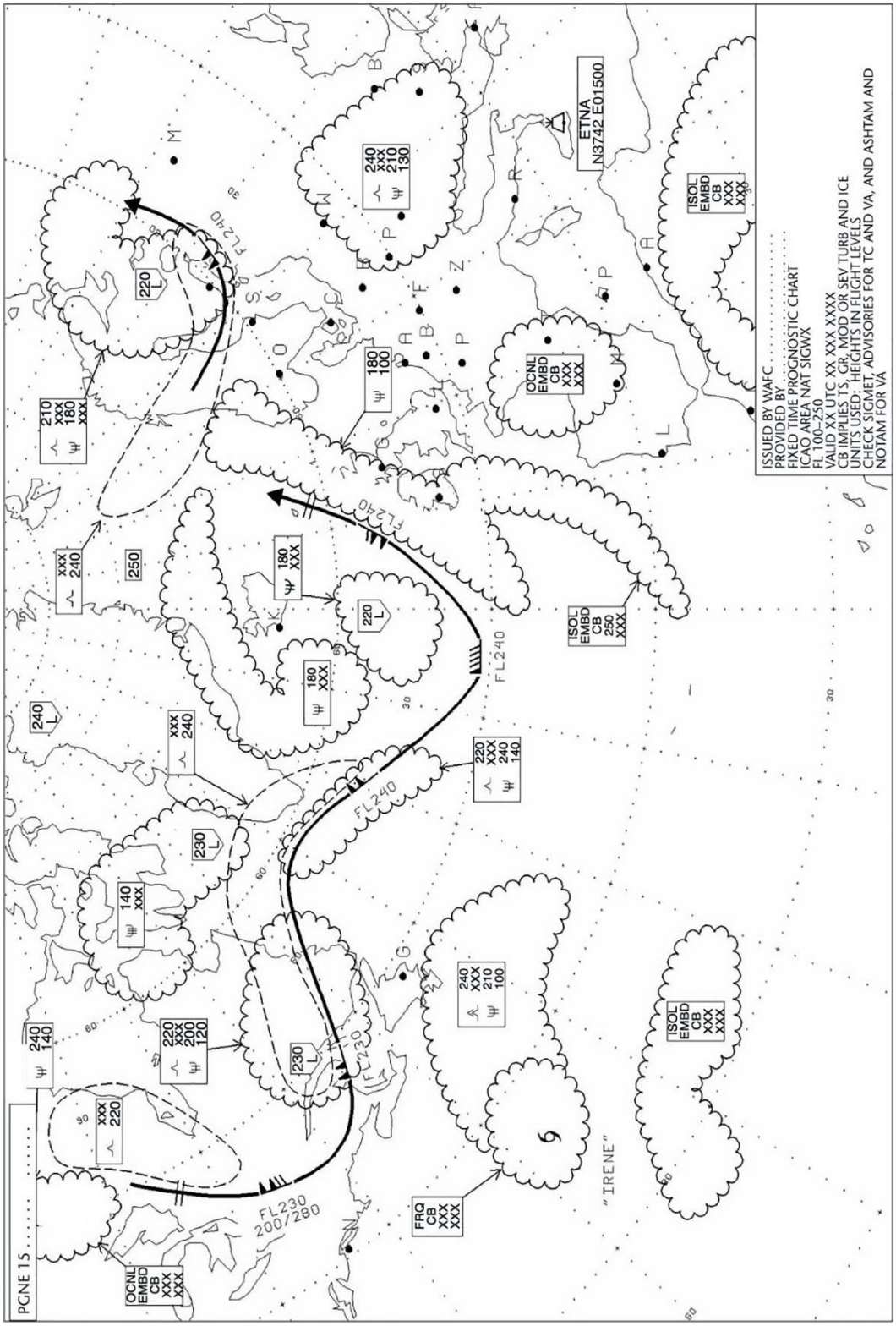
MODEL SWH

Example. Polar stereographic projection (showing the jet stream vertical extent)



(d) SIGNIFICANT WEATHER CHART (MEDIUM LEVEL)

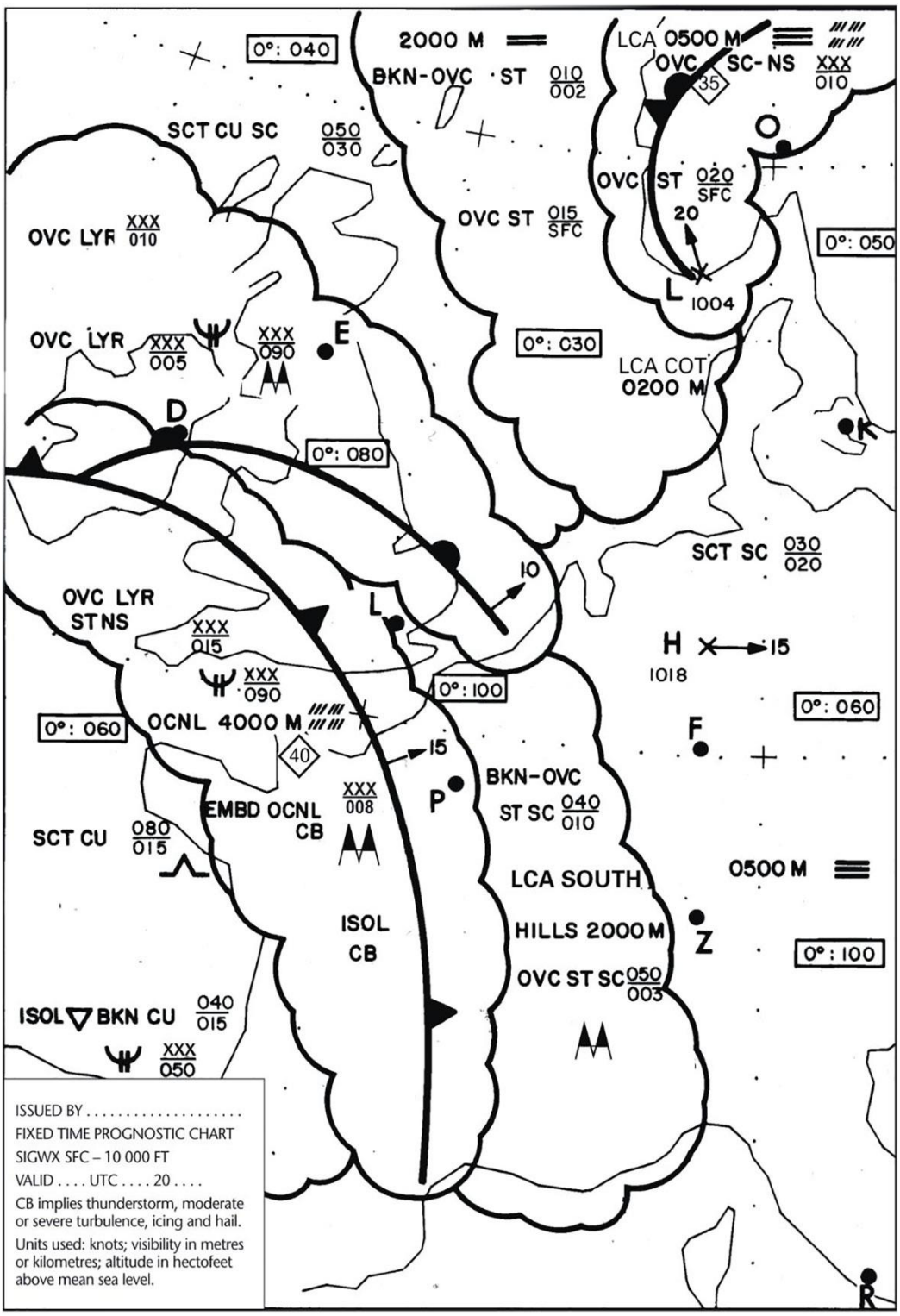
MODEL SWM



(e) SIGNIFICANT WEATHER CHART (LOW LEVEL)

MODEL SWL

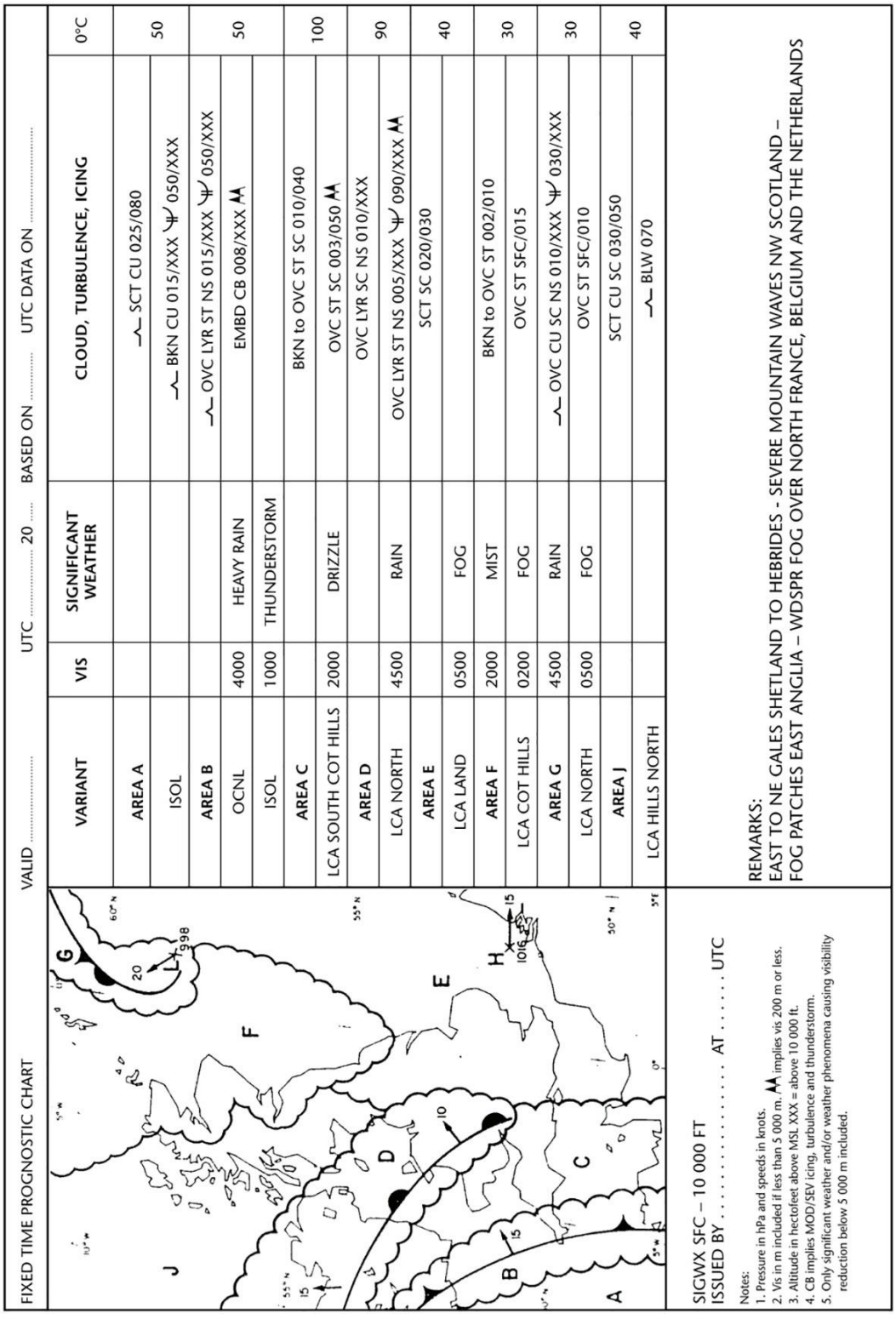
Example 1



(f) SIGNIFICANT WEATHER CHART (LOW LEVEL)

MODEL SWL

Example 2



AMC2 MET.TR.215(e)(1) & (2) Forecasts and other information

ED Decision 2017/001/R

FORMAT OF FLIGHT DOCUMENTATION

The location indicators and the abbreviations used should be explained in the flight documentation.

AMC1 MET.TR.215(f) Forecasts and other information

ED Decision 2017/001/R

CHARTS

Charts included in flight documentation should have a high standard of clarity and legibility and should have the following physical characteristics:

(a) For convenience, the largest size of charts should be about 42 × 30 cm (standard A3 size) and the smallest size should be about 21 × 30 cm (standard A4 size). The choice between these sizes should depend on the route lengths and the amount of detail that needs to be given in the charts as agreed between the meteorological authorities and the users concerned;

(b) Major geographical features, such as coastlines, major rivers and lakes, should be depicted in a way that makes them easily recognisable;

(c) For charts prepared by computer, meteorological data should take preference over basic chart information, the former cancelling the latter wherever they overlap;

(d) Major aerodromes should be shown as a dot and identified by the first letter of the name of the city the aerodrome serves as given in Table AOP of the EUR air navigation plan;

(e) A geographical grid should be shown with meridians and parallels represented by dotted lines at each 10°-latitude and longitude; dots should be spaced one degree apart;

(f) Latitude and longitude values should be indicated at various points throughout the charts; and

(g) Labels on the charts for flight documentation should be clear and simple and should present the name of the world area forecast centre or, for non-WAFS products, the originating centre, the type of chart, date and valid time and, if necessary, the types of units used in an unambiguous way.

AMC2 MET.TR.215(f) Forecasts and other information

ED Decision 2017/001/R

CHARTS

(a) The minimum number of charts for flights between flight level 250 and flight level 630 should include a high-level SIGWX chart (flight level 250 to flight level 630) and a forecast 250 hPa wind and temperature chart.

(b) The actual charts provided for pre-flight and in-flight planning and for flight documentation should be agreed between the meteorological providers and the users concerned.

GM1 MET.TR.215(f) Forecasts and other information

ED Decision 2017/001/R

CHARTS — SHORT-HAUL FLIGHTS

For short-haul flights, charts should be prepared covering limited areas at a scale of $1{:}15 \times 10^6$ as required.

GM1 MET.TR.215(g) Forecasts and other information

ED Decision 2017/001/R

CONCATENATED ROUTE-SPECIFIC FORECASTS

(a) The flight documentation related to concatenated route-specific upper wind and upper-air temperature forecasts should be provided as agreed between the meteorological service provider and the operator concerned.

(b) Guidance on the design, formulation and use of concatenated charts is given in the Manual of Aeronautical Meteorological Practice (ICAO Doc 8896).

AMC1 MET.TR.215(i) Forecasts and other information

ED Decision 2017/001/R

CLIMATOLOGICAL INFORMATION — PERIOD OF OBSERVATION

Aeronautical climatological information should be based on observations made over a period of at least five years. The period should be indicated in the information supplied.

AMC2 MET.TR.215(i) Forecasts and other information

ED Decision 2017/001/R

CLIMATOLOGICAL DATA RELATED TO SITES FOR NEW AERODROMES

Climatological data related to sites for new aerodromes and to additional runways at existing aerodromes should be collected starting as early as possible before the commissioning of those aerodromes or runways.

AMC3 MET.TR.215(i) Forecasts and other information

ED Decision 2017/001/R

CLIMATOLOGICAL SUMMARIES

Aerodrome climatological summaries should follow the procedures prescribed by the World Meteorological Organization and should be made available in a form to meet a specific user request.

AMC4 MET.TR.215(i) Forecasts and other information

ED Decision 2017/001/R

CLIMATOLOGICAL TABLE

An aerodrome climatological table should indicate:

(a) mean values and variations therefrom, including maximum and minimum values, of meteorological elements; and/or

(b) the frequency of occurrence of present weather phenomena affecting flight operations at the aerodrome; and/or

(c) the frequency of occurrence of specified values of one, or of a combination of two or more, elements.

AMC5 MET.TR.215(i) Forecasts and other information

ED Decision 2017/001/R

CLIMATOLOGICAL TABLE

Aerodrome climatological tables should include information required for the preparation of aerodrome climatological summaries.

AMC6 MET.TR.215(i) Forecasts and other information

ED Decision 2017/001/R

CLIMATOLOGICAL SUMMARIES

Aerodrome climatological summaries should cover:

(a) frequencies of the occurrence of runway visual range/visibility and/or height of base of the lowest cloud layer of BKN or OVC extent below specified values at specified times;

(b) frequencies of visibility below specified values at specified times;

(c) frequencies of the height of base of the lowest cloud layer of BKN or OVC extent below specified values at specified times;

(d) frequencies of occurrence of concurrent wind direction and speed within specified ranges;

(e) frequencies of surface temperature in specified ranges of 5°C at specified times; and

(f) mean values and variations therefrom, including maximum and minimum values of meteorological elements required for operational planning purposes, including take-off performance calculations.

GM1 MET.TR.215(i) Forecasts and other information

ED Decision 2017/001/R

CLIMATOLOGICAL INFORMATION

In cases where it is impracticable to meet the requirements for aeronautical climatological information on a national basis, the collection, processing and storage of observational data may be effected through computer facilities available for international use, and the responsibility for the preparation of the required aeronautical climatological information may be delegated by agreement between the competent authorities concerned.

GM2 MET.TR.215(i) Forecasts and other information

ED Decision 2017/001/R

CLIMATOLOGICAL SUMMARIES — MODELS

Models of climatological summaries related to (a) to (e) of AMC6 MET.TR.215(i) are given in the WMO Publication No 49, Technical Regulations, Volume II, C.3.2.

GM3 MET.TR.215(i) Forecasts and other information

ED Decision 2017/001/R

CLIMATOLOGICAL DATA FOR AERODROME PLANNING PURPOSES

Climatological data required for aerodrome planning purposes are set out in GM1 ADR-DSN.B.025 'Data to be used'.

MET.TR.220 Aerodrome forecasts

Regulation (EU) 2017/373

(a) Aerodrome forecasts and amendments thereto shall be issued as a TAF and shall include, in the order indicated, the:

(1) identification of the type of forecast;

(2) location indicator;

(3) time of issue of forecast;

(4) identification of a missing forecast, when applicable;

(5) date and period of validity of forecast;

(6) identification of a cancelled forecast, when applicable;

(7) surface wind;

(8) visibility;

(9) weather;

(10) cloud;

(11) expected significant changes to one or more of these elements during the period of validity.

(b) TAF shall be issued in accordance with the template shown in Appendix 3 and disseminated in the TAF code form.

(c) The period of validity of a routine TAF shall be either 9 or 24 or 30 hours and shall be filed for transmission not earlier than 1 hour before the commencement of their period of validity.

(d) TAF, if disseminated in digital form, shall:

(1) be formatted in accordance with a globally interoperable information exchange model;

(2) use geography markup language (GML);

(3) be accompanied by the appropriate metadata.

(e) The meteorological elements included in TAF shall be:

(1) Surface wind

(i) In forecasting surface wind, the expected prevailing direction shall be given.

(ii) When it is not possible to forecast a prevailing surface wind direction due to its expected variability, the forecasted wind direction shall be indicated as variable using 'VRB'.

(iii) When the wind is forecasted to be less than 1 kt (0,5 m/s), the forecasted wind speed shall be indicated as calm.

(iv) When the forecasted maximum speed exceeds the forecasted mean wind speed by 10 kt (5 m/s) or more, the forecasted maximum wind speed shall be indicated.

(v) When a wind speed of 100 kt (50 m/s) or more is forecasted, it shall be indicated to be more than 99 kt (49 m/s).

(2) Visibility

(i) When the visibility is forecasted to be less than 800 m, it shall be expressed in steps of 50 m; when it is forecasted to be 800 m or more, but less than 5 km, in steps of 100 m; when it is forecasted to be 5 km or more, but less than 10 km, in kilometre steps; and when it is forecasted to be 10 km or more, it shall be expressed as 10 km, except when conditions of CAVOK are forecasted to apply. The prevailing visibility shall be forecasted.

(ii) When visibility is forecasted to vary in different directions and the prevailing visibility cannot be forecasted, the lowest forecasted visibility shall be given.

(3) Weather phenomena

(i) One or more, up to a maximum of three, of the following weather phenomena or combinations thereof, together with their characteristics and, where appropriate, intensity, shall be forecasted if they are expected to occur at the aerodrome:

(A) freezing precipitation;

(B) freezing fog;

(C) moderate or heavy precipitation (including showers thereof);

(D) low drifting dust, sand or snow;

(E) blowing dust, sand or snow;

(F) dust storm;

(G) sandstorm;

(H) thunderstorm (with or without precipitation);

(I) squall;

(J) funnel cloud (tornado or waterspout);

(K) other weather phenomena, as agreed by the aerodrome meteorological office with the ATS units and operators concerned.

(ii) The expected end of occurrence of those phenomena shall be indicated by the abbreviation 'NSW'.

(4) Cloud

(i) The cloud amount shall be forecast using the abbreviations 'FEW', 'SCT', 'BKN' or 'OVC', as necessary. When it is expected that the sky will remain or become obscured and clouds cannot be forecasted and information on vertical visibility is available at the aerodrome, the vertical visibility shall be forecasted in the form 'VV' followed by the forecasted value of the vertical visibility.

(ii) When several layers or masses of cloud are forecasted, their amount and height of base shall be included in the following order:

(A) the lowest layer or mass regardless of amount, to be forecasted as FEW, SCT, BKN or OVC as appropriate;

(B) the next layer or mass covering more than 2/8, to be forecast as SCT, BKN or OVC as appropriate;

(C) the next higher layer or mass covering more than 4/8, to be forecast as BKN or OVC as appropriate;

(D) cumulonimbus clouds and/or towering cumulus clouds, whenever forecasted and not already included under points (A) to (C).

(iii) Cloud information shall be limited to cloud of operational significance; when no cloud of operational significance is forecasted and 'CAVOK' is not appropriate, the abbreviation 'NSC' shall be used.

(f) Use of change groups

(1) The criteria used for the inclusion of change groups in TAF or for the amendment of TAF shall be based on any of the following weather phenomena, or combinations thereof, being forecasted to begin or end or change in intensity:

(i) freezing fog;

(ii) freezing precipitation;

(iii) moderate or heavy precipitation (including showers thereof);

(iv) thunderstorm;

(v) dust storm;

(vi) sandstorm.

(2) When a change in any of the elements given in point (a) is required to be indicated, the change indicators 'BECMG' or 'TEMPO' shall be used followed by the time period during which the change is expected to occur. The time period shall be indicated as the beginning and end of the period in whole hours UTC. Only those elements for which a significant change is expected shall be included following a change indicator. However, in the case of significant changes in respect of cloud, all cloud groups, including layers or masses not expected to change, shall be indicated.

(3) The change indicator 'BECMG' and the associated time group shall be used to describe changes where the meteorological conditions are expected to reach or pass through specified threshold values at a regular or irregular rate and at an unspecified time during the time period. The time period shall not exceed 4 hours.

(4) The change indicator 'TEMPO' and the associated time group shall be used to describe expected frequent or infrequent temporary fluctuations in the meteorological conditions which reach or pass specified threshold values and last for a period of less than 1 hour in each instance and, in the aggregate, cover less than one half of the forecast period during which the fluctuations are expected to occur. If the temporary fluctuation is expected to last 1 hour or longer, the change group 'BECMG' shall be used in accordance with point (3), or the validity period should be subdivided in accordance with point (5).

(5) Where one set of prevailing weather conditions is expected to change significantly and more or less completely to a different set of conditions, the period of validity shall be subdivided into self-contained periods using the abbreviation 'FM' followed immediately by a six-figure time group in days, hours and minutes UTC indicating the time the change is expected to occur. The subdivided period following the abbreviation 'FM' shall be self-contained and all forecasted conditions given before the abbreviation shall be superseded by those following the abbreviation.

(g) The probability of occurrence of an alternative value of a forecast element or elements shall be included when:

(1) a 30 or 40 % probability of alternative meteorological conditions exists during a specific forecast time period; or

(2) a 30 or 40 % probability of temporary fluctuations in meteorological conditions exists during a specific forecast time period.

This shall be indicated in the TAF by using the abbreviation 'PROB' followed by the probability in tens of per cent and, in the case referred to in point (1), the time period during which the values are expected to apply, or in the case referred to in point (2), by using the abbreviation 'PROB' followed by the probability in tens of per cent, the change indicator 'TEMPO' and associated time group.

GM1 MET.TR.220 Aerodrome forecasts

ED Decision 2017/001/R

EXAMPLE OF TAF

TAF for YUDO (Donlon/International)*:

TAF YUDO 151800Z 1600/1618 13005MPS 9000 BKN020 BECMG 1606/1608 SCT015CB BKN020 TEMPO 1608/1612 17006G12MPS 1000 TSRA SCT010CB BKN020 FM161230 15004MPS 9999 BKN020

Meaning of the forecast:

TAF for Donlon/International* issued on the 15th of the month at 1800 UTC valid from 0000 UTC to 1800 UTC on the 16th of the month; surface wind direction 130 degrees; wind speed 5 knots; visibility 9 kilometres, broken cloud at 2 000 feet; becoming between 0600 UTC and 0800 UTC on the 16th of the month, broken cloud at 800 feet; temporarily between 0800 UTC and 1200 UTC on the 16th of the month surface wind direction 170 degrees; wind speed 15 knots gusting to 25 knots; visibility 1 000 metres in a thunderstorm with moderate rain, scattered cumulonimbus cloud at 300 metres and broken cloud at 2 000 feet; from 1230 UTC on the 16th of the month, surface wind direction 150 degrees; wind speed 4 knots; visibility 10 kilometres or more; and broken cloud at 2 000 feet.

** Fictitious location*

GM2 MET.TR.220 Aerodrome forecasts

ED Decision 2017/001/R

EXAMPLE OF CANCELLATION OF TAF

Cancellation of TAF for YUDO (Donlon/International)*:

TAF AMD YUDO 161500Z 1600/1618 CNL

Meaning of the forecast:

Amended TAF for Donlon/International* issued on the 16th of the month at 1500 UTC cancelling the previously issued TAF valid from 0000 UTC to 1800 UTC on the 16th of the month.

** Fictitious location*

GM3 MET.TR.220 Aerodrome forecasts

ED Decision 2017/001/R

ACCURACY OF TAF

Guidance on operationally desirable accuracy of TAF is given below:

Element to be forecast	Operationally desirable accuracy of forecasts	Minimum percentage of cases within range
	TAF	
Wind direction	± 20°	80 % of cases
Wind speed	± 2.5 m/s (5 kt)	80 % of cases
Visibility	± 200 m up to 800 m ± 30 % between 800 m and 10 km	80 % of cases
Precipitation	Occurrence or non-occurrence	80 % of cases
Cloud amount	One category below 450 m (1 500 ft) Occurrence or non-occurrence of BKN or OVC between 450 m (1 500 ft) and 3 000 m (10 000 ft)	70 % of cases
Cloud height	± 30 m (100 ft) up to 300 m (1 000 ft) ± 30 % between 300 m (1 000 ft) and 3 000 m (10 000 ft)	70 % of cases
Air temperature	± 1°C	70 % of cases

GM1 MET.TR.220(a)(8) Aerodrome forecasts

ED Decision 2017/001/R

VISIBILITY

The visibility included in TAF refers to the forecast prevailing visibility.

AMC1 MET.TR.220(b) Aerodrome forecasts

ED Decision 2017/001/R

TAF — DIGITAL FORM

TAF should be disseminated in a digital form.

GM1 MET.TR.220(b) Aerodrome forecasts

ED Decision 2017/001/R

TAF — DIGITAL FORM

When TAF is disseminated in a digital form, this is in addition to the TAF code form.

GM2 MET.TR.220(b) Aerodrome forecasts

ED Decision 2017/001/R

TAF CODE FORM

The TAF code form is contained in the WMO Publication No 306, Manual on Codes, Volume I.1, Part A — Alphanumeric Codes.

AMC1 MET.TR.220(c) Aerodrome forecasts

ED Decision 2017/001/R

PERIOD OF VALIDITY

(a) The periods of validity for 9-hour TAF should commence at 00, 03, 06, 09, 12, 15, 18 and 21 UTC and for 24- and 30-hour TAF at 00, 06, 12 and 18 UTC or 03, 09, 15, and 21 UTC.

(b) The 24- and 30-hour TAF periods of validity should be determined based on the types of operations, as agreed between the aerodrome meteorological office and the operators concerned.

At aerodromes with limited hours of operation, the beginning of the period of validity of a TAF should commence at least 1 hour prior to the aerodrome resuming operations, or more as agreed between the aerodrome meteorological office and the operators concerned, to meet planning requirements for flights that arrive at the aerodromes as soon as it is opened for use.

(c) Routine TAF valid for 9 hours should be issued every 3 hours, and those valid for 24 or 30 hours should be issued every 6 hours.

GM1 MET.TR.220(d) Aerodrome forecasts

ED Decision 2017/001/R

FORMAT OF TAF

Guidance on the information exchange model, XML/GML and the metadata profile is provided in the Manual on the Digital Exchange of Aeronautical Meteorological Information (ICAO Doc 10003).

AMC1 MET.TR.220(f) Aerodrome forecasts

ED Decision 2017/001/R

TAF — USE OF CHANGE GROUPS

The criteria used for the inclusion of change groups in TAF or amendments to TAF should be based on the following:

(a) when the mean surface wind direction is forecasted to change by 60° or more, the mean speed before and/or after the change being 10 kt (5 m/s) or more;

(b) when the mean surface wind speed is forecasted to change by 10 kt (5 m/s) or more;

(c) when the variation from the mean surface wind speed (gusts) is forecasted to change by 10 kt (5 m/s) or more, the mean speed before and/or after the change being 15 kt (7.5 m/s) or more;

(d) when the surface wind is forecasted to change through values of operational significance;

(e) when the visibility is forecasted to improve and change to or pass through one or more of the following values, or when the visibility is forecasted to deteriorate and pass through one or more of the following values:

  (1) 150, 350, 600, 800, 1 500 or 3 000 m; and

  (2) 5 000 m in cases where significant numbers of flights are operated in accordance with the visual flight rules;

(f) when any of the following weather phenomena, or combinations thereof, are forecasted to begin or end:

  (1) low drifting dust, sand or snow;

  (2) blowing dust, sand or snow;

  (3) squall; and

  (4) funnel cloud (tornado or waterspout);

(g) when the height of base of the lowest layer or mass of cloud of BKN or OVC extent is forecasted to lift and change to or pass through one or more of the following values, or when the height of the lowest layer or mass of cloud of BKN or OVC extent is forecasted to lower and pass through one or more of the following values:

  (1) 100, 200, 500 or 1 000 ft (30, 60, 150 or 300 m); or

  (2) 1 500 ft (450 m) in cases where significant numbers of flights are operated in accordance with the visual flight rules;

(h) when the amount of a layer or mass of cloud below 1 500 ft (450 m) is forecasted to change:

  (1) from NSC, FEW or SCT to BKN or OVC; or

  (2) from BKN or OVC to NSC, FEW or SCT;

(i) when the vertical visibility is forecasted to improve and change to or pass through one or more of the following values, or when the vertical visibility is forecasted to deteriorate and pass through one or more of the following values: 100, 200, 500 or 1 000 ft (30, 60, 150 or 300 m); and

(j) any other criteria based on local aerodrome operating minima, as agreed between the aerodrome meteorological office and the operators.

GM1 MET.TR.220(f)(1) Aerodrome forecasts

ED Decision 2017/001/R

TAF — USE OF CHANGE AND TIME INDICATORS

Guidance on the use of change and time indicators in TAF is given below:

Change or time indicator		Time period	Meaning	
FM		ndndnhnhnmnm	Used to indicate a significant change in most weather elements occurring at ndnd day, nhnh hours and nmnm minutes (UTC); all the elements given before 'FM' are to be included following 'FM' (i.e. they are all superseded by those following the abbreviation).	
BECMG		nd1nd1nh1nh1/nd2nd2nh2nh2	The change is forecast to commence at nd1nd1 day and nh1nh1 hours (UTC) and be completed by nd2nd2 day and nh2nh2 hours (UTC); only those elements for which a change is forecast are to be given following 'BECMG'; the time period nd1nd1nh1nh1/nd2nd2nh2nh2 should normally be less than 2 hours and in any case should not exceed 4 hours.	
TEMPO		nd1nd1nh1nh1/nd2nd2nh2nh2	Temporary fluctuations are forecast to commence at nd1nd1 day and nh1nh1 hours (UTC) and cease by nd2nd2 day and nh2nh2 hours (UTC); only those elements for which fluctuations are forecast are to be given following 'TEMPO'; temporary fluctuations should not last more than one hour in each instance, and in the aggregate, cover less than half of the period nd1nd1nh1nh1/nd2nd2nh2nh2.	
PROBnn	—	nd1nd1nh1nh1/nd2nd2nh2nh2	probability of occurrence (in %) of an alternative value of a forecast element or elements; nn = 30 or nn = 40 only; to be placed after the element(s) concerned	—
	TEMPO	nd1nd1nh1nh1/nd2nd2nh2nh2		probability of occurrence of temporary fluctuations

AMC1 MET.TR.220(g) Aerodrome forecasts

ED Decision 2017/001/R

USE OF PROBABILITY INDICATORS

(a) The number of change and probability groups should be kept to a minimum.

(b) The probability of occurrence of an alternative value of a forecast element or elements should be placed after the element or elements forecast and be followed by the alternative value of the element or elements.

GM1 MET.TR.220(g) Aerodrome forecasts

ED Decision 2017/001/R

USE OF PROBABILITY INDICATORS

(a) A probability of an alternative value or change of less than 30 % should not be considered sufficiently significant to be indicated.

(b) A probability of an alternative value or change of 50 % or more should not be considered a probability but, instead, should be indicated, as necessary, by use of the change indicators 'BECMG' or 'TEMPO' or by subdivision of the validity period using the abbreviation 'FM'. The probability group should neither be used to qualify the change indicator 'BECMG' nor the time indicator 'FM'.

MET.TR.225 Forecasts for landing

Regulation (EU) 2017/373

(a) TREND forecasts shall be issued in accordance with Appendix 1.

(b) The units and scales used in the TREND forecast shall be the same as those used in the report to which it is appended.

(c) The TREND forecast shall indicate significant changes in respect of one or more of the elements: surface wind, visibility, weather phenomena and clouds. Only those elements for which a significant change is expected shall be included. However, in the case of significant changes in respect of cloud, all cloud groups, including layers or masses not expected to change, shall be indicated. In the case of a significant change in visibility, the phenomenon causing the reduction of visibility shall also be indicated. When no change is expected to occur, this shall be indicated by the term 'NOSIG'.

(1) Surface wind

The TREND forecast shall indicate changes in the surface wind which involve:

(i) a change in the mean wind direction of 60° or more, the mean speed before and/or after the change being 10 kt (5 m/s) or more;

(ii) a change in mean wind speed of 10 kt (5 m/s) or more;

(iii) changes in the wind through values of operational significance.

(2) Visibility

(i) When the visibility is expected to improve and change to or pass through one or more of the following values, or when the visibility is expected to deteriorate and pass through one or more of the following values: 150, 350, 600, 800, 1 500 or 3000 m, the trend forecast shall indicate the change.

(ii) When significant numbers of flights are conducted in accordance with the visual flight rules, the forecast shall additionally indicate changes to or passing through 5 000 m.

(iii) In TREND forecasts appended to METAR, visibility shall refer to the forecast prevailing visibility.

(3) Weather phenomena

(i) The TREND forecast shall indicate the expected onset, cessation or change in intensity of any of the following weather phenomena or combinations thereof:

(A) freezing precipitation;

(B) moderate or heavy precipitation, including showers thereof;

(C) thunderstorm, with precipitation;

(D) dust storm;

(E) sandstorm;

(F) other weather phenomena as agreed by the aerodrome meteorological office with the ATS units and operators concerned.

(ii) The TREND forecast shall indicate the expected onset or cessation of any of the following weather phenomena or combinations thereof:

(A) freezing fog;

(B) low drifting dust, sand or snow;

(C) blowing dust, sand or snow;

(D) thunderstorm (without precipitation);

(E) squall;

(F) funnel cloud (tornado or waterspout).

(iii) The total number of phenomena reported in points (i) and (ii) shall not exceed three.

(iv) The expected end of occurrence of the weather phenomena shall be indicated by the abbreviation ‘NSW’.

(4) Clouds

(i) When the height of base of a cloud layer of BKN or OVC extent is expected to lift and change to or pass through one or more of the following values, or when the height of base of a cloud layer of BKN or OVC extent is expected to lower and pass through one or more of the following values: 100, 200, 500, 1 000 and 1 500 ft (30, 60, 150, 300 and 450 m), the TREND forecast shall indicate the change.

(ii) When the height of base of a cloud layer is below or is expected to fall below or rise above 1 500 ft (450 m), the TREND forecast shall also indicate changes in cloud amount from FEW, or SCT increasing to BKN or OVC, or changes from BKN or OVC decreasing to FEW or SCT.

(iii) When no clouds of operational significance are forecast and ‘CAVOK’ is not appropriate, the abbreviation ‘NSC’ shall be used.

(5) Vertical visibility

When the sky is expected to remain or become obscured and vertical visibility observations are available at the aerodrome, and the vertical visibility is forecast to improve and change to or pass through one or more of the following values, or when the vertical visibility is forecast to deteriorate and pass through one or more of the following values: 100, 200, 500 or 1 000 ft (30, 60, 150 or 300 m), the TREND forecast shall indicate the change.

(6) Additional criteria

The aerodrome meteorological office and the users may agree on additional criteria to be used, based on local aerodrome operating minima.

(7) Use of change groups

(i) When a change is expected to occur, the TREND forecast shall begin with one of the change indicators 'BECMG' or 'TEMPO'.

(ii) The change indicator 'BECMG' shall be used to describe forecast changes where the meteorological conditions are expected to reach or pass through specified values at a regular or irregular rate. The period during which, or the time at which, the change is forecast to occur shall be indicated using the abbreviations 'FM', 'TL' or 'AT', as appropriate, each followed by a time group in hours and minutes.

(iii) The change indicator 'TEMPO' shall be used to describe forecast temporary fluctuations in the meteorological conditions which reach or pass specified values and last for a period of less than 1 hour in each instance and, in the aggregate, cover less than one half of the period during which the fluctuations are forecast to occur. The period during which the temporary fluctuations are forecast to occur shall be indicated using the abbreviations 'FM' and/or 'TL', as appropriate, each followed by a time group in hours and minutes.

(8) Use of the probability indicator

The indicator 'PROB' shall not be used in TREND forecasts.

AMC1 MET.TR.225(c)(1)(iii) Forecasts for landing

ED Decision 2017/001/R

THRESHOLD VALUES

The threshold values should be established by the aerodrome meteorological office in consultation with the appropriate ATS units and operators concerned, taking into account changes in the wind which would:

(a) require a change in runway(s) in use; and

(b) indicate that the runway tailwind and crosswind components will change through values representing the main operating limits for typical aircraft operating at the aerodrome.

GM1 MET.TR.225(c)(2)(iii) Forecasts for landing

ED Decision 2017/001/R

VISIBILITY

In TREND forecasts appended to local routine reports and local special reports, visibility refers to the forecast visibility along the runway(s).

AMC1 MET.TR.225(c)(7)(ii) Forecasts for landing

ED Decision 2017/001/R

USE OF CHANGE GROUPS — BECMG

(a) When the change is forecast to begin and end wholly within the trend forecast period, the beginning and end of the change should be indicated by using the abbreviations 'FM' and 'TL', respectively, with their associated time groups.

(b) When the change is forecast to commence at the beginning of the trend forecast period but be completed before the end of that period, the abbreviation 'FM' and its associated time group should be omitted and only 'TL' and its associated time group should be used.

(c) When the change is forecast to begin during the trend forecast period and be completed at the end of that period, the abbreviation 'TL' and its associated time group should be omitted and only 'FM' and its associated time group should be used.

(d) When the change is forecast to occur at a specified time during the trend forecast period, the abbreviation 'AT' followed by its associated time group should be used.

(e) When the change is forecast to commence at the beginning of the trend forecast period and be completed by the end of that period, or when the change is forecast to occur within the trend forecast period but the time is uncertain, the abbreviations 'FM', 'TL' or 'AT' and their associated time groups should be omitted and the change indicator 'BECMG' should be used alone.

GM1 MET.TR.225(c)(7)(ii) Forecasts for landing

ED Decision 2017/001/R

TREND FORECASTS — USE OF CHANGE INDICATORS

Guidance on the use of change indicators in trend forecasts is given in the table below.

Change indicator	Time indicator and period	Meaning	
NOSIG	—	no significant changes are forecast	
BECMG	FMn1n1n1n1 TLn2n2n2n2	the change is forecast to	commence at n1n1n1n1 UTC and be completed by n2n2n2n2 UTC
	TLnnnn		commence at the beginning of the trend forecast period and be completed by nnnn UTC
	FMnnnn		commence at nnnn UTC and be completed by the end of the trend forecast period
	ATnnnn		occur at nnnn UTC (specified time)
	—		commence at the beginning of the trend forecast period and be completed by the end of the trend forecast period; or the time is uncertain
TEMPO	FMn1n1n1n1 TLn2n2n2n2	temporary fluctuations are forecast to	commence at n1n1n1n1 UTC and cease by n2n2n2n2 UTC
	TLnnnn		commence at the beginning of the trend forecast period and cease by nnnn UTC
	FMnnnn		commence at nnnn UTC and cease by the end of the trend forecast period
	—		commence at the beginning of the trend forecast period and cease by the end of the trend forecast period

AMC1 MET.TR.225(c)(7)(iii) Forecasts for landing

ED Decision 2017/001/R

USE OF CHANGE GROUPS — TEMPO

(a) When the change is forecast to begin and end wholly within the trend forecast period, the beginning and end of the change should be indicated by using the abbreviations ‘FM’ and ‘TL’ respectively, with their associated time groups.

(b) When the change is forecast to commence at the beginning of the trend forecast period but be completed before the end of that period, the abbreviation ‘FM’ and its associated time group should be omitted and only ‘TL’ and its associated time group should be used.

(c) When the change is forecast to begin during the trend forecast period and be completed at the end of that period, the abbreviation ‘TL’ and its associated time group should be omitted and only ‘FM’ and its associated time group should be used.

(d) When the change is forecast to occur at a specified time during the trend forecast period, the abbreviation ‘AT’ followed by its associated time group should be used.

(e) When the change is forecast to commence at the beginning of the trend forecast period and be completed by the end of that period, or when the change is forecast to occur within the trend

forecast period but the time is uncertain, the abbreviations 'FM', 'TL' or 'AT' and their associated time groups should be omitted and the change indicator 'TEMPO' should be used alone.

MET.TR.230 Forecasts for take-off

Regulation (EU) 2017/373

(a) A forecast for take-off shall refer to a specified period of time and shall contain information on expected conditions over the runway complex in regard to surface wind direction and speed and any variations thereof, temperature, pressure, and any other elements as agreed between the aerodrome meteorological office and the operators.

(b) The order of the elements and the terminology, units and scales used in forecasts for take-off shall be the same as those used in reports for the same aerodrome.

AMC1 MET.TR.230(a) Forecasts for take-off

ED Decision 2017/001/R

AMENDMENTS TO FORECASTS

(a) The criteria for the issuance of amendments to forecasts for take-off for surface wind direction and speed, temperature and pressure, and any other elements agreed locally should be agreed between the aerodrome meteorological office and the operators concerned.

(b) The criteria should be consistent with the corresponding criteria for special reports established for the aerodrome.

MET.TR.235 Aerodrome warnings and wind shear warnings and alerts

Regulation (EU) 2017/373

(a) Wind shear warnings shall be issued in accordance with the template in Appendix 4.

(b) The sequence number referred to in the template in Appendix 4 shall correspond to the number of wind shear warnings issued for the aerodrome since 00.01 UTC on the day concerned.

(c) Wind shear alerts shall give concise, up-to-date information related to the observed existence of wind shear involving a headwind/tailwind change of 15 kt (7,5 m/s) or more which could adversely affect aircraft on the final approach path or initial take-off path and aircraft on the runway during the landing roll or take-off run.

(d) Wind shear alert shall, if practicable, relate to specific sections of the runway and distances along the approach path or take-off path as agreed between the aerodrome meteorological office, the appropriate ATS units and the operators concerned.

AMC1 MET.TR.235 Aerodrome warnings and wind shear warnings and alerts

ED Decision 2017/001/R

AERODROME WARNINGS — FORMAT

(a) Aerodrome warnings should be issued in accordance with the template below or in another format where required by operators or aerodrome meteorological offices.

Template for aerodrome warnings

Key:

M = inclusion mandatory, part of every message;

C = inclusion conditional, included whenever applicable.

Element	Detailed content	Templates	Examples
Location indicator of the aerodrome (M)	Location indicator of the aerodrome	nnnn	YUCC
Identification of the type of message (M)	Type of message and sequence number	AD WRNG [n]n	AD WRNG 2
Validity period (M)	Day and time of validity period in UTC	VALID nnnnnn/nnnnnn	VALID 211230/211530
IF THE AERODROME WARNING IS TO BE CANCELLED, SEE DETAILS AT THE END OF THE TEMPLATE.			
Phenomenon (M)	Description of phenomenon causing the issuance of the aerodrome warning	TC nnnnnnnnnn or [HVY] TS or GR or [HVY] SN [nnCM] or [HVY] FZRA or [HVY] FZDZ or RIME or [HVY] SS or [HVY] DS or SA or DU or SFC WSPD nn[n]MPS MAX nn[n] (SFC WSPD nn[n]KT MAX nn[n]) or SFC WIND nnn/nn[n]MPS MAX nn[n] (SFC WIND nnn/nn[n]KT MAX nn[n]) or SQ or FROST or TSUNAMI or VA[DEPO] or TOX CHEM or Free text up to 32 characters	TC ANDREW HVY SN 25CM SFC WSPD 20MPS MAX 30 VA TSUNAMI
Observed or forecast phenomenon (M)	Indication whether the information is observed and expected to continue, or forecast	OBS [AT nnnnZ] or FCST	OBS AT 1200Z OBS
Changes in intensity (C)	Expected changes in intensity	INTSF or WKN or NC	WKN
OR			
Cancellation of aerodrome warning	Cancellation of aerodrome warning referring to its identification	CNL AD WRNG [n]n nnnnnn/nnnnnn	CNL AD WRNG 2 211230/211530

(b) When the above template is used, the sequence number referred to in the template should correspond to the number of aerodrome warnings issued for the aerodrome since 00.01 UTC on the day concerned.

GM1 MET.TR.235 Aerodrome warnings and wind shear warnings and alerts

ED Decision 2017/001/R

RANGES AND RESOLUTIONS — AERODROME WARNINGS

(a) The ranges and resolutions for the numerical elements included in aerodrome warnings are shown below:

Ranges and resolutions for the numerical elements included in volcanic ash and tropical cyclone advisory messages, SIGMET/AIRMET messages and aerodrome and wind shear warnings

Elements		Range	Resolution
Summit elevation:	M FT	000–8 100 000–27 000	1 1
Advisory number:	for VA (index)* for TC (index)*	000–2 000 00–99	1 1
Maximum surface wind:	MPS KT	00–99 00–199	1 1
Central pressure:	hPa	850–1 050	1
Surface wind speed:	MPS KT	15–49 30–99	1 1
Surface visibility:	M M	0000–0750 0800–5 000	50 100
Cloud: height of base:	M FT	000–300 000–1 000	30 100
Cloud: height of top:	M M FT FT	000–2 970 3 000–20 000 000–9 900 10 000–60 000	30 300 100 1 000
Latitudes:	° (degrees) (minutes)	00–90 00–60	1 1
Longitudes:	° (degrees) (minutes)	000–180 00–60	1 1
Flight levels:		000–650	10
Movement:	KMH KT	0–300 0–150	10 5
* Non-dimensional			

(b) The explanations for the abbreviations can be found in the Procedures for Air Navigation Services — ICAO Abbreviations and Codes (PANS ABC, ICAO Doc 8400).

AMC2 MET.TR.235(a) Aerodrome warnings and wind shear warnings and alerts

ED Decision 2017/001/R

FORMAT OF AERODROME WARNINGS

(a) The additional text should be prepared in abbreviated plain language using approved ICAO abbreviations and numerical values. If no ICAO-approved abbreviations are available, English plain language text should be used.

(b) When quantitative criteria are necessary for the issuance of aerodrome warnings, the criteria used should be as agreed between the aerodrome meteorological office and the users concerned.

AMC1 MET.TR.235(c) Aerodrome warnings and wind shear warnings and alerts

ED Decision 2017/001/R

FORMAT OF WIND SHEAR WARNINGS

(a) The use of text additional to the abbreviations listed in the template in Table 6 of Appendix 1 should be kept to a minimum. The additional text should be prepared in abbreviated plain language using ICAO-approved abbreviations and numerical values.

(b) When an aircraft report is used to prepare a wind shear warning or to confirm a warning previously issued, the corresponding aircraft report, including the aircraft type, should be disseminated unchanged in accordance with the local arrangements to those concerned.

GM1 MET.TR.235(c) Aerodrome warnings and wind shear warnings and alerts

ED Decision 2017/001/R

WIND SHEAR TYPES

Following reported encounters by both arriving and departing aircraft, two different wind shear warnings may exist: one for arriving aircraft and one for departing aircraft.

GM2 MET.TR.235(c) Aerodrome warnings and wind shear warnings and alerts

ED Decision 2017/001/R

REPORTING THE INTENSITY OF WIND SHEAR

Specifications for reporting the intensity of wind shear are still under development. It is recognised, however, that pilots, when reporting wind shear, may use the qualifying terms ‘moderate’, ‘strong’ or ‘severe’, based to a large extent on their subjective assessment of the intensity of the wind shear encountered.

GM3 MET.TR.235(c) Aerodrome warnings and wind shear warnings and alerts

ED Decision 2017/001/R

DETECTION OF WIND SHEAR

Wind shear conditions are normally associated with the following phenomena:

(a) thunderstorms, microbursts, funnel cloud, tornado or waterspout, and gust fronts;

(b) frontal surfaces;

(c) strong surface winds coupled with local topography;

(d) sea breeze fronts;

(e) mountain waves, including low-level rotors in the terminal area;

(f) low-level temperature inversions.

GM1 MET.TR.235(d) Aerodrome warnings and wind shear warnings and alerts

ED Decision 2017/001/R

DISSEMINATION OF WIND SHEAR ALERTS

The wind shear alerts are disseminated from automated, ground-based, wind shear remote-sensing or detection equipment in accordance with local arrangements to those concerned.

CHAPTER 3 — TECHNICAL REQUIREMENTS FOR METEOROLOGICAL WATCH OFFICES

MET.TR.250 SIGMET messages

Regulation (EU) 2017/373

(a) The content and order of elements in a SIGMET message shall be in accordance with the template shown in Appendix 5.

(b) SIGMET messages shall consist of three types:

(1) SIGMET for en-route weather phenomena other than volcanic ash or tropical cyclones, referred as WS SIGMET;

(2) SIGMET for volcanic ash, referred as WV SIGMET;

(3) SIGMET for tropical cyclones, referred as WC SIGMET.

(c) The sequence number of SIGMET messages shall consist of three characters comprising one letter and two numbers.

(d) Only one of the phenomena listed in Appendix 5 shall be included in a SIGMET message, using the appropriate abbreviations and the following threshold value of surface wind speed of 34 kt (17 m/s) or more for tropical cyclone.

(e) SIGMET information concerning thunderstorms or a tropical cyclone shall not include references to associated turbulence and icing.

(f) SIGMET, if disseminated in digital form, shall be:

(1) formatted in accordance with a globally interoperable information exchange model and shall use geography markup language (GML);

(2) accompanied by the appropriate metadata.

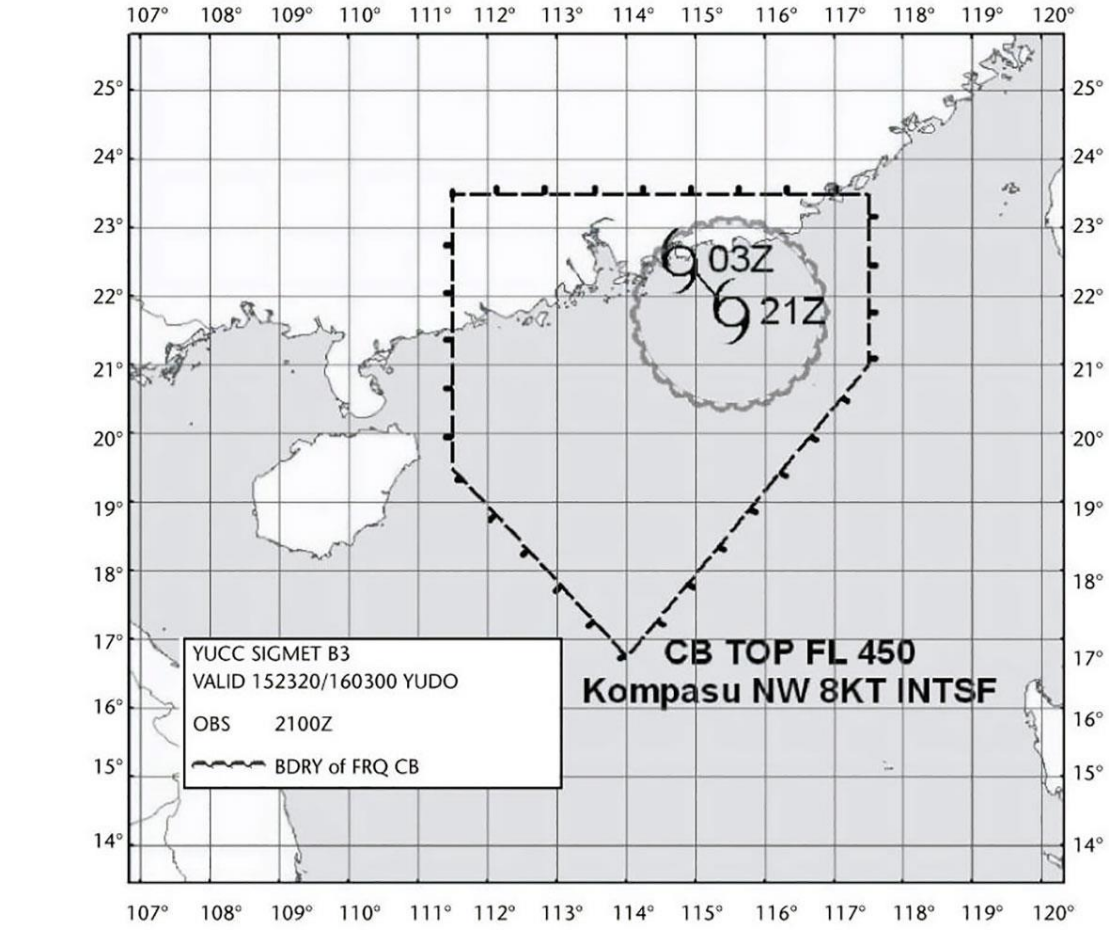
AMC1 MET.TR.250(a) SIGMET messages

ED Decision 2017/001/R

FORMAT

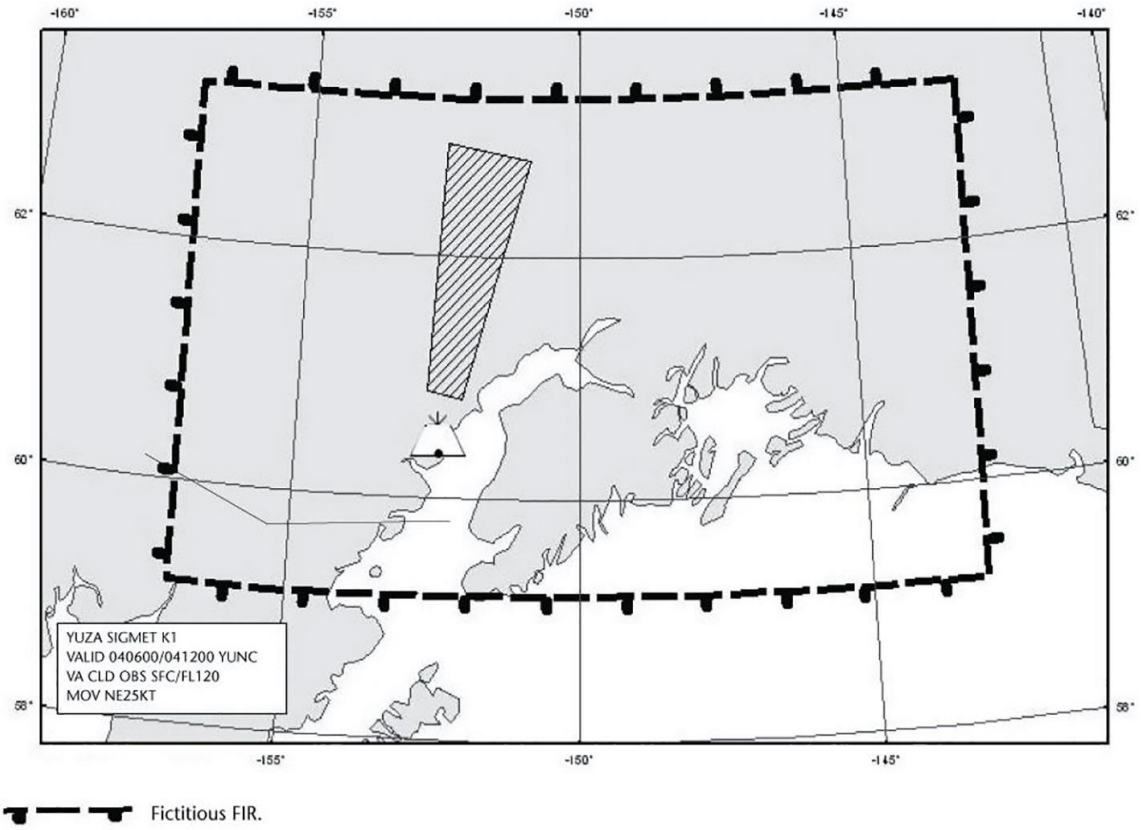
SIGMET, when issued in graphical format, should be as specified below:

(a) **SIGMET FOR TROPICAL CYCLONE — MODEL STC**

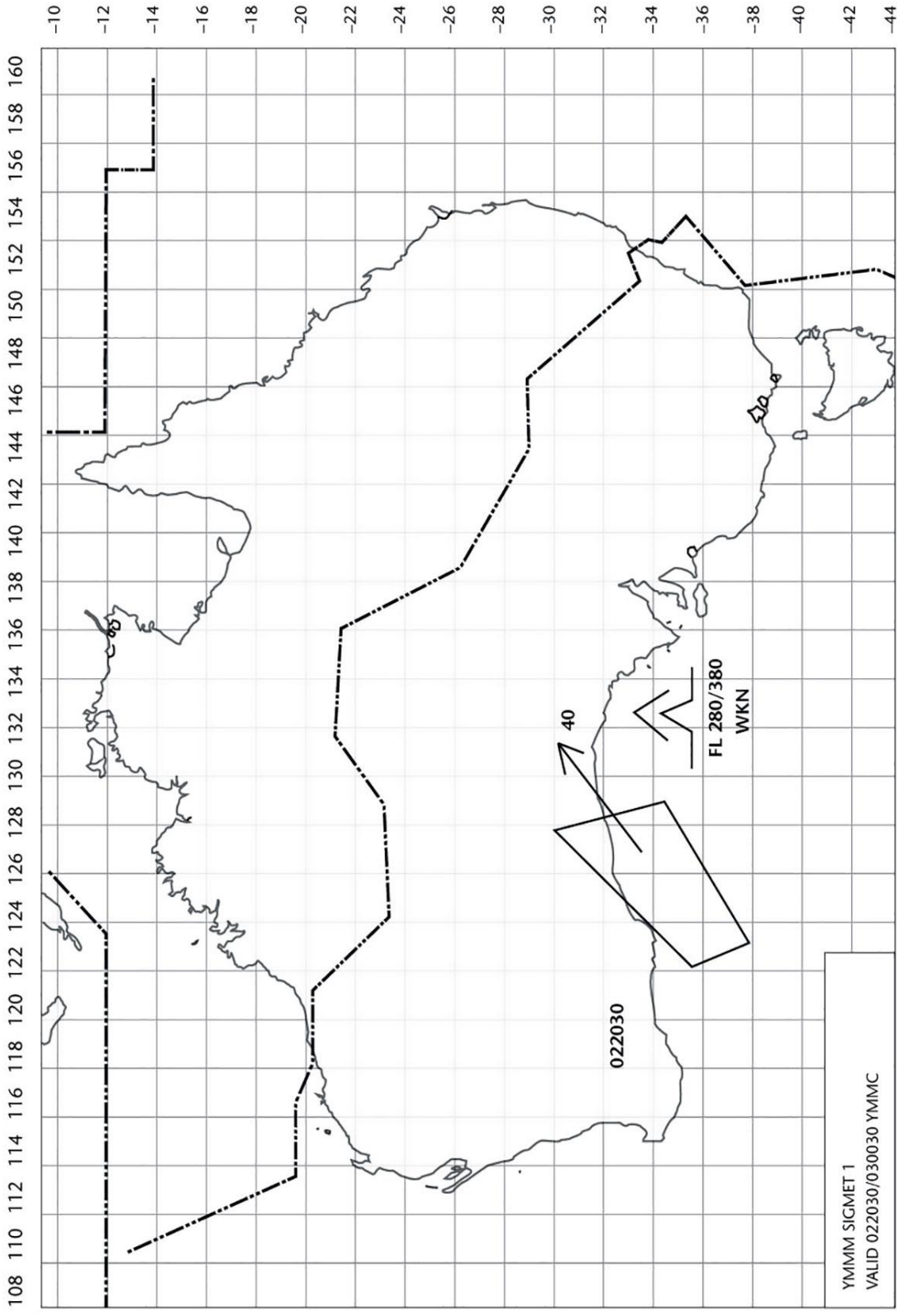


Note: Fictitious FIR.

(b) **SIGMET FOR VOLCANIC ASH — MODEL SVA**



(c) **SIGMET FOR PHENOMENA OTHER THAN TROPICAL CYCLONE AND VOLCANIC ASH — MODEL SGE**



AMC2 MET.TR.250(a) SIGMET messages

ED Decision 2017/001/R

AIRSPACE

In cases where the airspace is divided into a flight information region (FIR) and an upper-flight information region (UIR), the SIGMET message should be identified by the location indicator of the ATS unit serving the FIR.

GM1 MET.TR.250(a) SIGMET messages

ED Decision 2017/001/R

FLIGHT INFORMATION REGION

The SIGMET message applies to the whole airspace within the lateral limits of the FIR, i.e. to the FIR and to the UIR. The particular areas and/or flight levels affected by the meteorological phenomena causing the issuance of the SIGMET message are given in the text of the message.

GM2 MET.TR.250(a) SIGMET messages

ED Decision 2017/001/R

EXAMPLE OF SIGMET MESSAGES, AND THE CORRESPONDING CANCELLATIONS

SIGMET	**Cancellation of SIGMET**
YUDD SIGMET 2 VALID 101200/101600 YUSO – YUDD SHANLON FIR/UIR OBSC TS FCST S OF N54 AND E OF W012 TOP FL390 MOV E WKN FCST 1600Z S OF N54 AND E OF W010	YUDD SIGMET 3 VALID 101345/101600 YUSO – YUDD SHANLON FIR/UIR CNL SIGMET 2 101200/101600

GM3 MET.TR.250(a) SIGMET messages

ED Decision 2017/001/R

EXAMPLE OF SIGMET MESSAGE FOR TROPICAL CYCLONE

YUCC SIGMET 3 VALID 251600/252200 YUDO —

YUCC AMSWELL FIR TC GLORIA OBS AT 1600Z N2706 W07306 CB TOP FL500 WI 150NM OF CENTRE MOV NW 10KT NC FCST 2200Z TC CENTRE N2740 W07345

Meaning:

The third SIGMET message issued for the AMSWELL* flight information region (identified by YUCC Amswell area control centre) by the Donlon/International* meteorological watch office (YUDO) since 0001 UTC; the message is valid from 1600 UTC to 2200 UTC on the 25th of the month; tropical cyclone Gloria was observed at 1600 UTC at 27 degrees 6 minutes north and 73 degrees 6 minutes west with cumulonimbus top at flight level 500 within 150 nautical miles of the centre; the tropical cyclone is expected to move northwestwards at 10 knots and not to undergo any changes in intensity; the forecast position of the centre of the tropical cyclone at 2200 UTC is expected to be at 27 degrees 40 minutes north and 73 degrees 45 minutes west.

** Fictitious locations*

GM4 MET.TR.250(a) SIGMET messages

ED Decision 2017/001/R

EXAMPLE OF SIGMET MESSAGE FOR VOLCANIC ASH

YUDD SIGMET 2 VALID 211100/211700 YUSO –

YUDD SHANLON FIR/UIR VA ERUPTION MT ASHVAL PSN S1500 E07348 VA CLD OBS AT 1100Z

APRX 220KM BY 35KM S1500 E07348 — S1530 E07642 FL310/450 MOV SE 35KT FCST 1700Z VA CLD

APRX S1506 E07500 — S1518 E08112 — S1712 E08330 — S1824 E07836

Meaning:

The second SIGMET message issued for the SHANLON* flight information region (identified by YUDD Shanlon area control centre/upper flight information region) by the Shanlon/International* meteorological watch office (YUSO) since 0001 UTC; the message is valid from 1100 UTC to 1700 UTC on the 21st of the month; volcanic ash eruption of Mount Ashval* located at 15 degrees south and 73 degrees 48 minutes east; volcanic ash cloud observed at 1100 UTC in an approximate area of 220 km by 35 km between 15 degrees south and 73 degrees 48 minutes east, and 15 degrees 30 minutes south and 76 degrees 42 minutes east; between flight levels 310 and 450, the volcanic ash cloud is expected to move south-eastwards at 35 knots; at 1700 UTC the volcanic ash cloud is forecast to be located approximately in an area bounded by the following points: 15 degrees 6 minutes south and 75 degrees east, 15 degrees 18 minutes south and 81 degrees 12 minutes east, 17 degrees 12 minutes south and 83 degrees 30 minutes east, and 18 degrees 24 minutes south and 78 degrees 36 minutes east.

** Fictitious locations*

GM5 MET.TR.250(a) SIGMET messages

ED Decision 2017/001/R

EXAMPLE OF SIGMET MESSAGE FOR RADIOACTIVE CLOUD

YUCC SIGMET 2 VALID 201200/201600 YUDO —

YUCC AMSWELL FIR RDOACT CLD OBS AT 1155Z WI S5000 W14000 — S5000 W13800 — S5200 W13800 — S5200 W14000 — S5000 W14000 SFC/FL100 STNR WKN

Meaning:

The second SIGMET message issued for the AMSWELL* flight information region (identified by YUCC Amswell area control centre) by the Donlon/International* meteorological watch office (YUDO) since 0001 UTC; the message is valid from 1200 UTC to 1600 UTC on the 20th of the month; radioactive cloud was observed at 1155 UTC within an area bounded by 50 degrees 0 minutes south and 140 degrees 0 minutes west to 50 degrees 0 minutes south and 138 degrees 0 minutes west to 52 degrees 0 minutes south and138 degrees 0 minutes west to 52 degrees 0 minutes south and 140 degrees 0 minutes west to 50 degrees 0 minutes south and 140 degrees 0 minutes west and between the surface and flight level 100; the radioactive cloud is expected to remain stationary and to weaken in intensity.

** Fictitious locations*

GM6 MET.TR.250(a) SIGMET messages

ED Decision 2017/001/R

EXAMPLE OF SIGMET MESSAGE FOR SEVERE TURBULENCE

YUCC SIGMET 5 VALID 221215/221600 YUDO —

YUCC AMSWELL FIR SEV TURB OBS AT 1210Z N2020 W07005 FL250 MOV E 20KT WKN FCST 1600Z S OF N2020 E OF W06950

Meaning:

The fifth SIGMET message issued for the AMSWELL* flight information region (identified by YUCC Amswell area control centre) by the Donlon/International* meteorological watch office (YUDO) since 0001 UTC; the message is valid from 1215 UTC to 1600 UTC on the 22nd of the month; severe turbulence was observed at 1210 UTC 20 degrees 20 minutes north and 70 degrees 5 minutes west at flight level 250; the turbulence is expected to move eastwards at 20 knots and to weaken in intensity; forecast position at 1600 UTC south of 20 degrees 20 minutes north and east of 69 degrees 50 minutes west.

** Fictitious locations*

AMC1 MET.TR.250(c) SIGMET messages

ED Decision 2017/001/R

SEQUENCE NUMBER

The letters to be used as the first character for the sequence number to indicate the specified en-route weather phenomena which may affect the safety of aircraft operations should be:

SIGMET Type	Specified en-route phenomena	Letter to be used in sequence number for specified en-route phenomena
WC	Tropical cyclone	C
	For WC exchange test purposes	X
WV	Volcanic ash	A
	For WV exchange test purposes	Y
WS	Thunderstorm	T
	Turbulence	U
	Icing	I
	Freezing rain	F
	Mountain wave	M
	Dust storm	D
	Sandstorm	S
	Radioactive cloud	R
	For WS exchange test purposes	Z

AMC2 MET.TR.250(c) SIGMET messages

ED Decision 2017/001/R

SEQUENCE NUMBER

The three-character number to be used in the sequence number should correspond to the number of SIGMET messages, dependent on the phenomena as indicated by the first character, issued for the flight information region since 0001 UTC on the day concerned.

AMC1 MET.TR.250(d) SIGMET messages

ED Decision 2017/001/R

CRITERIA RELATED TO PHENOMENA

Sandstorm/dust storm should be considered:

(a) heavy whenever the visibility is below 200 m and the sky is obscured; and

(b) moderate whenever the visibility is:

(1) below 20 m and the sky is not obscured; or

(2) between 200 and 600 m.

GM1 MET.TR.250(d) SIGMET messages

ED Decision 2017/001/R

CRITERIA RELATED TO PHENOMENA

(a) An area of thunderstorms and cumulonimbus clouds is considered:

(1) obscured (OBSC) if it is obscured by haze or smoke or cannot be readily seen due to darkness;

(2) embedded (EMBD) if it is embedded within cloud layers and cannot be readily recognised;

(3) isolated (ISOL) if it consists of individual features which affect, or are forecast to affect, an area with a maximum spatial coverage less than 50 % of the area concerned (at a fixed time or during the period of validity); and

(4) occasional (OCNL) if it consists of well-separated features which affect, or are forecast to affect, an area with a maximum spatial coverage between 50 and 75 % of the area concerned (at a fixed time or during the period of validity).

(b) An area of thunderstorms is considered frequent (FRQ) if within that area there is little or no separation between adjacent thunderstorms with a maximum spatial coverage greater than 75 % of the area affected, or forecast to be affected, by the phenomenon (at a fixed time or during the period of validity).

(c) Squall line (SQL) indicates a thunderstorm along a line with little or no space between individual clouds.

(d) Hail (GR) is used as a further description of the thunderstorm, as necessary.

(e) Severe and moderate turbulence (TURB) refers only to: low-level turbulence associated with strong surface winds; rotor streaming; or turbulence whether in cloud or not (CAT). Turbulence is not used in connection with convective clouds.

(f) Turbulence is considered:

(1) severe whenever the peak value of the cube root of EDR exceeds 0.7; and

(2) moderate whenever the peak value of the cube root of EDR is above 0.4 and below or equal to 0.7.

(g) Severe and moderate icing (ICE) refers to icing in other than convective clouds. Freezing rain (FZRA) should refer to severe icing conditions caused by freezing rain.

(h) A mountain wave (MTW) is considered:

(1) severe whenever an accompanying downdraft of 600 ft/min (3.0 m/s) or more and/or severe turbulence is observed or forecast; and

(2) moderate whenever an accompanying downdraft of 350–600 ft/min (1.75–3.0 m/s) and/or moderate turbulence is observed or forecast.

AMC1 MET.TR.250(f) SIGMET messages

ED Decision 2017/001/R

FORM

SIGMET messages should be disseminated in a digital form, in addition to the abbreviated plain language.

GM1 MET.TR.250(f)(1) SIGMET messages

ED Decision 2017/001/R

FORM

Guidance on the information exchange model, GML, and the metadata profile is provided in the Manual on the Digital Exchange of Aeronautical Meteorological Information (ICAO Doc 10003).

MET.TR.255 AIRMET messages

Regulation (EU) 2017/373

(a) The content and order of elements in an AIRMET message shall be in accordance with the template shown in Appendix 5.

(b) The sequence number referred to in the template in Appendix 5 shall correspond to the number of AIRMET messages issued for the flight information region since 00.01 UTC on the day concerned.

(c) Only one of the phenomena in Appendix 5 shall be included in an AIRMET message, using the appropriate abbreviations and the following threshold values, when the phenomena is below flight level 100, or below flight level 150 in mountainous areas, or higher, where necessary:

(1) wind speed above 30 kt (15 m/s);

(2) widespread areas affected by reduction of visibility to less than 5 000 m, including the weather phenomenon causing the reduction of visibility;

(3) widespread areas of broken or overcast cloud with height of base less than 1 000 ft (300 m) above ground level.

(d) AIRMET messages concerning thunderstorms or cumulonimbus clouds shall not include references to associated turbulence and icing.

GM1 MET.TR.255(a) AIRMET messages

ED Decision 2017/001/R

EXAMPLE OF AIRMET MESSAGE FOR MODERATE MOUNTAIN WAVE

YUCC AIRMET 2 VALID 221215/221600 YUDO —

YUCC AMSWELL FIR MOD MTW OBS AT 1205Z N48 E010 FL080 STNR NC

Meaning:

The second AIRMET message issued for the AMSWELL* flight information region (identified by YUCC Amswell area control centre) by the Donlon/International* meteorological watch office (YUDO) since 0001 UTC; the message is valid from 1215 UTC to 1600 UTC on the 22nd of the month; moderate mountain wave was observed at 1205 UTC at 48 degrees north and 10 degrees east at flight level 080; the mountain wave is expected to remain stationary and not to undergo any changes in intensity.

** Fictitious locations*

GM2 MET.TR.255(a) AIRMET messages

ED Decision 2017/001/R

EXAMPLE OF AIRMET MESSAGES, AND THE CORRESPONDING CANCELLATIONS

AIRMET	**Cancellation of AIRMET**
YUDD AIRMET 1 VALID 151520/151800 YUSO – YUDD SHANLON FIR ISOL TS OBS N OF S50 TOP ABV FL100 STNR WKN	YUDD AIRMET 2 VALID 151650/151800 YUSO – YUDD SHANLON FIR CNL AIRMET 1 151520/151800

GM1 MET.TR.255(b) AIRMET messages

ED Decision 2017/001/R

FIR

The flight information region may be divided in sub-areas.

GM1 MET.TR.255(c) AIRMET messages

ED Decision 2017/001/R

CRITERIA RELATED TO PHENOMENA

In reference to the criteria related to phenomena, please refer to GM1 MET.TR.250(d).

AMC1 MET.TR.255(d) AIRMET messages

ED Decision 2017/001/R

CRITERIA RELATED TO PHENOMENA

In reference to sandstorm/dust storm, please refer to AMC1 MET.TR.250(d).

MET.TR.260 Area forecasts for low-level flights

Regulation (EU) 2017/373

(a) When chart form is used for area forecasts for low-level flights, the forecast of upper wind and upper-air temperature shall be issued for points separated by no more than 300 NM and for, as a minimum, the following altitudes: 2 000, 5 000 and 10 000 ft (600, 1 500 and 3 000 m) and 15 000 ft (4 500 m) in mountainous areas. The issuance of forecasts of upper wind and upper-air temperature at an altitude of 2 000 ft (600 m) may be subject to local orographic considerations as determined by the competent authority.

(b) When chart form is used for area forecasts for low-level flights, the forecast of SIGWX phenomena shall be issued as low-level SIGWX forecast for flight levels up to 100, or up to flight level 150 in mountainous areas, or higher, where necessary. Low-level SIGWX forecasts shall include:

(1) the following phenomena warranting the issuance of a SIGMET: icing, turbulence, cumulonimbus clouds that are obscured, frequent, embedded or occurring at a squall line, sandstorms/dust storms and volcanic eruptions or a release of radioactive materials into the atmosphere, and which are expected to affect low-level flights;

(2) the following elements in area forecasts for low-level flights: surface wind, surface visibility, significant weather phenomena, mountain obscuration, cloud, icing, turbulence, mountain wave and height of zero-degree isotherm.

(c) When the competent authority has determined that the density of traffic operating below flight level 100 warrants the issuance of an AIRMET message, the area forecasts shall be issued to cover the layer between the ground and flight level 100, or up to flight level 150 in mountainous areas, or higher, where necessary, and shall contain information on en-route weather phenomena hazardous to low-level flights, in support of the issuance of the AIRMET message and the additional information required for low-level flights.

AMC1 MET.TR.260 Area forecasts for low-level flights

ED Decision 2017/001/R

AMENDMENT OF LOW-LEVEL FORECASTS

(a) In case the AIRMET/low-level forecast concept is not fully implemented, the criteria for amendments should as a minimum include the weather phenomena hazardous to low-level flights, which constitute the criteria for the issuance of AIRMET.

(b) When low-level forecast is issued as an SIGWX chart or as a wind and temperature (W+T) chart, it should, as appropriate, include the cloud/visibility information in the form of visibility/cloud base category which should be provided for well-defined sub-areas and/or route segments. For each sub-area and/or route segment, the reference height to which the cloud base information refers should be specified.

(c) The graphical part of an SIGWX chart should depict the weather situation at the beginning of the validity period. Significant changes of initial weather parameters should be depicted together with time intervals determining the duration of expected changes.

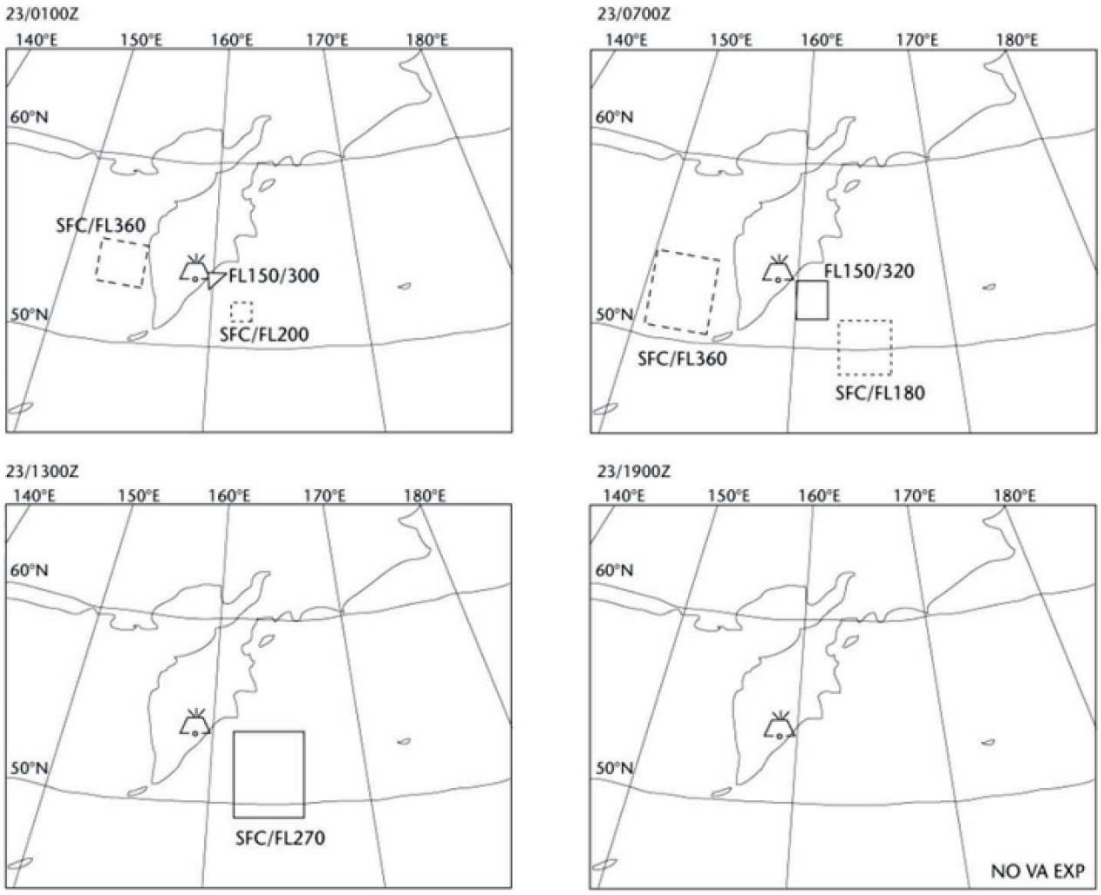
CHAPTER 4 — TECHNICAL REQUIREMENTS FOR VOLCANIC ASH ADVISORY CENTRES (VAAC)

MET.TR.265 Volcanic ash advisory centre responsibilities

Regulation (EU) 2017/373

(a) The advisory information on volcanic ash shall be issued in abbreviated plain language and in accordance with the template shown in Appendix 6. When no abbreviations are available, English plain language text, to be kept to a minimum, shall be used.

(b) The volcanic ash advisory information, when prepared in graphical format, shall be as specified below



VOLCANIC ASH ADVISORY
DTG: 20080923/0130Z
VAAC: TOKYO
VOLCANO: KARYMSKY 1000-13
AREA: RUSSIAN FEDERATION
SUMMIT ELEV: 1536M
ADVISORY NR: 2008/4
INFO SOURCE: MTSAT-1R, KVERT KEMSD
AVIATION COLOUR CODE: RED
ERUPTION DETAILS: ERUPTED AT 20080923/0000Z FL300 REPORTED
RMK: LATEST REP FM KVERT (0120Z) INDICATES ERUPTION HAS CEASED
TWO DISPERSING VA CLD ARE EVIDENT ON SATELLITE IMAGERY
NXT ADVISORY: 20080923/0730Z

and shall be issued using:

(1) the portable network graphics (PNG) format; or

(2) the BUFR code form, when exchanged in binary format.

GM1 MET.TR.265(a) Volcanic ash advisory centres (VAACs) responsibilities

ED Decision 2017/001/R

EXAMPLE OF ADVISORY MESSAGE FOR VOLCANIC ASH

FVFE01 RJTD 230130 VA ADVISORY	
DTG:	20080923/0130Z
VAAC:	TOKYO
VOLCANO:	KARYMSKY 1000-13
PSN:	N5403 E15927
AREA:	RUSSIA
SUMMIT ELEV:	1536M
ADVISORY NR:	2008/4
INFO SOURCE:	MTSAT-1R KVERT KEMSD
AVIATION COLOUR CODE:	RED
ERUPTION DETAILS:	ERUPTION AT 20080923/0000Z FL300 REPORTED
OBS VA DTG:	23/0100Z
OBS VA CLD:	FL250/300 N5400 E15930 — N5400 E16100 — N5300 E15945 MOV SE 20KT SFC/FL200 N5130 E16130 — N5130 E16230 — N5230 E16230 — N5230 E16130 MOV SE 15KT
FCST VA CLD +6 HR:	23/0700Z FL250/350 N5130 E16030 — N5130 E16230 — N5330 E16230 — N5330 E16030 SFC/FL180 N4830 E16330 — N4830 E16630 — N5130 E16630 — N5130 E16330
FCST VA CLD +12 HR:	23/1300Z SFC/FL270 N4830 E16130 — N4830 E16600 — N5300 E16600 — N5300 E16130
FCST VA CLD +18 HR:	23/1900Z NO VA EXP
RMK:	LATEST REP FM KVERT (0120Z) INDICATES ERUPTION HAS CEASED. TWO DISPERSING VA CLD ARE EVIDENT ON SATELLITE IMAGERY
NXT ADVISORY:	20080923/0730Z

GM1 MET.TR.265(b)(2) Volcanic ash advisory centres (VAACs) responsibilities

ED Decision 2017/001/R

BUFR CODE

The BUFR code form is contained in the WMO Publication No 306, Manual on Codes, Volume I.2, Part B — Binary Codes.

CHAPTER 5 — TECHNICAL REQUIREMENTS FOR TROPICAL CYCLONE ADVISORY CENTRES (TCAC)

MET.TR.270 Tropical cyclone advisory centre responsibilities

Regulation (EU) 2017/373

(a) The advisory information on tropical cyclones shall be issued for tropical cyclones when the maximum of the 10-minute mean surface wind speed is expected to reach or exceed 34 kt during the period covered by the advisory.

(b) The advisory information on tropical cyclones shall be in accordance with Appendix 7.

AMC1 MET.TR.270(b) Tropical cyclone advisory centres (TCACs) responsibilities

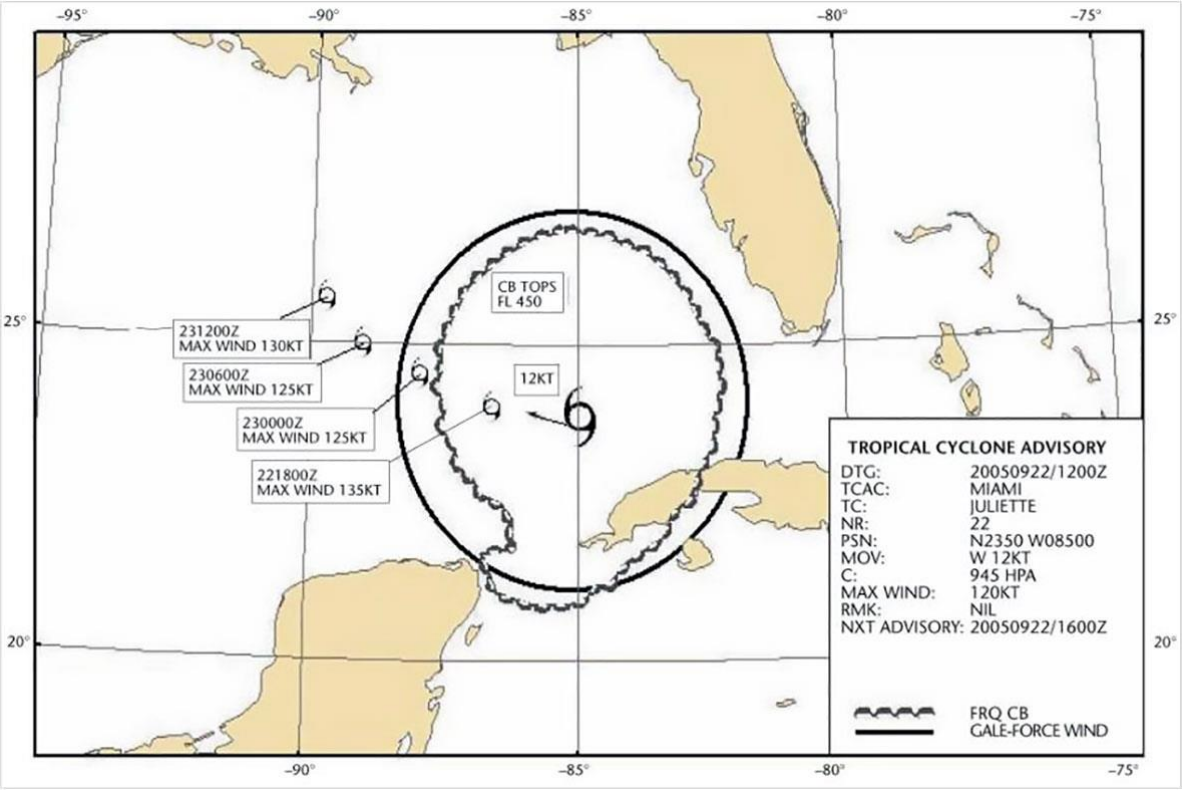
ED Decision 2017/001/R

FORMAT OF ADVISORY INFORMATION ON TROPICAL CYCLONES

The tropical cyclone advisory information listed in Table 8 of Appendix 1, when prepared in graphical format, should be as specified below and should be issued using:

(a) the portable network graphics (PNG) format; or

(b) the BUFR code form, when exchanged in binary format.



GM1 MET.TR.270(b) Tropical cyclone advisory centres (TCACs) responsibilities

ED Decision 2017/001/R

CODE FOR ADVISORY INFORMATION ON TROPICAL CYCLONES

The BUFR code form is contained in the WMO Publication No 306, Manual on Codes, Volume I.2, Part B — Binary Codes.

GM2 MET.TR.270(b) Tropical cyclone advisory centres (TCACs) responsibilities

ED Decision 2017/001/R

EXAMPLE FOR ADVISORY MESSAGE FOR TROPICAL CYCLONES

TC ADVISORY	
DTG:	20040925/1600Z
TCAC:	YUFO
TC:	GLORIA
NR:	01
PSN:	N2706 W07306
MOV:	NW 12KT
C:	965HPA
MAX WIND:	73KT
FCST PSN +6 HR:	25/2200Z N2748 W07350
FCST MAX WIND +6 HR:	73KT
FCST PSN +12 HR:	26/0400Z N2830 W07430
FCST MAX WIND +12 HR:	73KT
FCST PSN +18 HR:	26/1000Z N2852 W07500
FCST MAX WIND +18 HR:	70KT
FCST PSN +24 HR:	26/1600Z N2912 W07530
FCST MAX WIND +24 HR:	60KT
RMK:	NIL
NXT MSG:	20040925/2000Z

CHAPTER 6 — TECHNICAL REQUIREMENTS FOR WORLD AREA FORECAST CENTRES (WAFCs)

MET.TR.275 World area forecast centre responsibilities

Regulation (EU) 2017/373

(a) WAFCs shall use processed meteorological data in the form of grid point values expressed in binary form (GRIB code form) for the supply of gridded global forecasts and BUFR code form for the supply of forecast of significant weather phenomena.

(b) For global gridded forecasts, WAFCs shall:

(1) prepare forecasts of:

(i) upper wind;

(ii) upper-air temperature;

(iii) humidity;

(iv) direction, speed and flight level of maximum wind;

(v) flight level and temperature of tropopause;

(vi) areas of cumulonimbus clouds;

(vii) icing;

(viii) clear-air and in-cloud turbulence;

(ix) geopotential altitude of flight levels;

four times a day and be valid for fixed valid times at 6, 9, 12, 15, 18, 21, 24, 27, 30, 33 and 36 hours after the time (00.00, 06.00, 12.00 and 18.00 UTC) of the synoptic data on which the forecasts were based;

(2) issue forecasts in the order referred to in point (1) and complete their dissemination as soon as technically feasible, but not later than 6 hours after standard time of observation;

(3) provide grid point forecasts in a regular grid with a horizontal resolution of 1,25° of latitude and longitude and comprising:

(i) wind data for flight levels 50 (850 hPa), 100 (700 hPa), 140 (600 hPa), 180 (500 hPa), 240 (400 hPa), 270 (350 hPa), 300 (300 hPa), 320 (275 hPa), 340 (250 hPa), 360 (225 hPa), 390 (200 hPa), 410 (175 hPa), 450 (150 hPa) and 530 (100 hPa);

(ii) temperature data for flight levels 50 (850 hPa), 100 (700 hPa), 140 (600 hPa), 180 (500 hPa), 240 (400 hPa), 270 (350 hPa), 300 (300 hPa), 320 (275 hPa), 340 (250 hPa), 360 (225 hPa), 390 (200 hPa), 410 (175 hPa), 450 (150 hPa) and 530 (100 hPa);

(iii) humidity data for flight levels 50 (850 hPa), 100 (700 hPa), 140 (600 hPa) and 180 (500 hPa);

(iv) horizontal extent and flight levels of base and top of cumulonimbus clouds;

(v) icing for layers centred at flight levels 60 (800 hPa), 100 (700 hPa), 140 (600 hPa), 180 (500 hPa), 240 (400 hPa) and 300 (300 hPa);

(vi) clear-air turbulence for layers centred at flight levels 240 (400 hPa), 270 (350 hPa), 300 (300 hPa), 340 (250 hPa), 390 (200 hPa) and 450 (150 hPa);

(vii) in-cloud turbulence for layers centred at flight levels 100 (700 hPa), 140 (600 hPa), 180 (500 hPa), 240 (400 hPa) and 300 (300 hPa);

(viii) geopotential altitude data for flight levels 50 (850 hPa), 100 (700 hPa), 140 (600 hPa), 180 (500 hPa), 240 (400 hPa), 270 (350 hPa), 300 (300 hPa), 320 (275 hPa), 340 (250 hPa), 360 (225 hPa), 390 (200 hPa), 410 (175 hPa), 450 (150 hPa) and 530 (100 hPa).

(c) For global forecasts of en-route significant weather phenomena, WAFCs shall:

(1) prepare SIGWX forecasts four times a day and shall be valid for fixed valid times at 24 hours after the time (00.00, 06.00, 12.00 and 18.00 UTC) of the synoptic data on which the forecasts were based. The dissemination of each forecast shall be completed as soon as technically feasible, but not later than 9 hours after standard time of observation;

(2) issue SIGWX forecasts as high-level SIGWX forecasts for flight levels between 250 and 630;

(3) include in SIGWX forecasts the following items:

(i) tropical cyclone provided that the maximum of the 10-minute mean surface wind speed is expected to reach or exceed 34 kt (17 m/s);

(ii) severe squall lines;

(iii) moderate or severe turbulence (in cloud or clear air);

(iv) moderate or severe icing;

(v) widespread sandstorm/dust storm;

(vi) cumulonimbus clouds associated with thunderstorms and with points (i) to (v);

(vii) non-convective cloud areas associated with in-cloud moderate or severe turbulence and/or moderate or severe icing;

(viii) flight level of tropopause;

(ix) jet streams;

(x) information on the location of volcanic eruptions that are producing ash clouds of significance to aircraft operations, comprising: volcanic eruption symbol at the location of the volcano and, in a separate text box on the chart, the volcanic eruption symbol, the name of the volcano, if known, and the latitude/longitude of the eruption. In addition, the legend of SIGWX charts should indicate 'CHECK SIGMET, ADVISORIES FOR TC AND VA, AND ASHTAM AND NOTAM FOR VA';

(xi) information on the location of a release of radioactive materials into the atmosphere of significance to aircraft operations, comprising: the radioactive materials in the atmosphere symbol at the location of the release and, in a separate box on the chart, the radioactive materials in the atmosphere symbol, latitude/longitude of the site of the release and, if known, the name of the site of the radioactive source. In addition, the legend of SIGWX charts on which a release of radiation is indicated should contain 'CHECK SIGMET AND NOTAM FOR RDOACT CLD'.

(4) The following criteria shall be applied for SIGWX forecasts:

(i) points (i) to (vi) of point (3) shall only be included if expected to occur between the lower and upper levels of the SIGWX forecast;

(ii) the abbreviation 'CB' shall only be included when it refers to the occurrence or expected occurrence of cumulonimbus clouds:

(A) affecting an area with a maximum spatial coverage of 50 % or more of the area concerned;

(B) along a line with little or no space between individual clouds; or

(C) embedded in cloud layers or concealed by haze;

(iii) the inclusion of 'CB' shall be understood to include all weather phenomena normally associated with cumulonimbus clouds, i.e. thunderstorm, moderate or severe icing, moderate or severe turbulence, and hail;

(iv) where a volcanic eruption or a release of radioactive materials into the atmosphere warrants the inclusion of the volcanic activity symbol or the radioactivity symbol in SIGWX forecasts, the symbols shall be included on SIGWX forecasts irrespective of the height to which the ash column or radioactive material is reported or expected to reach;

(v) in the case of coincident or the partial overlapping of points (i), (x) and (xi) of point (3), the highest priority shall be given to point (x), followed by points (xi) and (i). The point with the highest priority shall be placed at the location of the event, and an arrow shall be used to link the location of the other point(s) to its (their) associated symbol(s) or text box(es).

(d) Medium-level SIGWX forecasts for flight levels between 100 and 250 for limited geographical areas shall be issued.

AMC1 MET.TR.275(a) World area forecast centres (WAFCs) responsibilities

ED Decision 2017/001/R

GRIDDED GLOBAL FORECASTS

The telecommunications facilities used for the supply of world area forecast system products should:

(a) be the aeronautical fixed service or the public Internet;

(b) be continuous; and

(c) not have interruptions exceeding 10 minutes during any period of 6 hours.

GM1 MET.TR.275(a) World area forecast centres (WAFCs) responsibilities

ED Decision 2017/001/R

GRIB CODE

The GRIB code form is contained in the WMO Publication No 306, Manual on Codes, Volume I.2, Part B — Binary Codes.

GM2 MET.TR.275(a) World area forecast centres (WAFCs) responsibilities

ED Decision 2017/001/R

BUFR CODE

The BUFR code form is contained in the WMO Publication No 306, Manual on Codes, Volume I.2, Part B — Binary Codes.

GM1 MET.TR.275(b)(3) World area forecast centres (WAFCs) responsibilities

ED Decision 2017/001/R

GRID POINT FORECASTS

(a) Layers centred at a flight level referred to in MET.TR.275(b)(3)(v) and (vii) have a depth of 100 hPa.

(b) Layers centred at a flight level referred to in MET.TR.275(b)(3)(vi) have a depth of 50 hPa.

AMC1 MET.TR.275(d) World area forecast centres (WAFCs) responsibilities

ED Decision 2017/001/R

MEDIUM-LEVEL SIGWX FORECASTS

The medium-level SIGWX forecasts provided for flight levels between 100 and 250 for limited geographical areas should cover the areas as shown in in Table 2 of Appendix 1.

APPENDICES TO ANNEX V

Appendix 1

Regulation (EU) 2017/373

Template for METAR

Key:

M = inclusion mandatory, part of every message;

C = inclusion conditional, dependent on meteorological conditions or method of observation;

O = inclusion optional.

Note 1: The ranges and resolutions for the numerical elements included in METAR are shown below this template.

Note 2: The explanations for the abbreviations can be found in Procedures for Air Navigation Services — ICAO Abbreviations and Codes (PANS-ABC, Doc 8400).

Element	Detailed content	Template(s)		Examples
Identification of the type of report (M)	Type of report (M)	METAR, METAR COR,		METAR METAR COR
Location indicator (M)	ICAO location indicator (M)	Nnnn		YUDO
Time of the observation (M)	Day and actual time of the observation in UTC (M)	nnnnnnZ		221630Z
Identification of an automated or missing report (C)	Automated or missing report identifier (C)	AUTO or NIL		AUTO NIL
END OF METAR IF THE REPORT IS MISSING.				
Surface wind (M)	Wind direction (M)	Nnn	VRB	24004MPS (24008KT) VRB01MPS (VRB02KT) 19006MPS (19012KT) 00000MPS (00000KT) 140P149MPS (140P99KT)
	Wind speed (M)	[P]nn[n]		
	Significant speed variations (C)	G[P]nn[n]		12003G09MPS (12006G18KT) 24008G14MPS (24016G28KT)
	Units of measurement (M)	MPS (or KT)		
	Significant directional variations (C)	nnnVnnn	—	02005MPS 350V070 (02010KT 350V070)

Element	Detailed content	Template(s)				Examples
Visibility (M)	Prevailing or minimum visibility (M)	Nnnn			C A V O K	0350 CAVOK 7000 9999 0800
	Minimum visibility and direction of the minimum visibility (C)	nnnn[N] or nnnn[NE] or nnnn[E] or nnnn[SE] or nnnn[S] or nnnn[SW] or nnnn[W] or nnnn[NW]				2000 1200NW 6000 2800E 6000 2800
Runway visual range (C)[1]	Name of the element (M)	R				R32/0400 R12R/1700 R10/M0050 R14L/P2000
	Runway (M)	nn[L]/or nn[C]/or nn[R]/				
	Runway visual range (M)	[P or M]nnnn				R16L/0650 R16C/0500 R16R/0450 R17L/0450
	Runway visual range past tendency (C)	U, D or N				R12/1100U R26/0550N R20/0800D R12/0700
Present weather (C)	Intensity or proximity of present weather (C)	– or +	—	VC		
	Characteristics and type of present weather (M)	DZ or RA or SN or SG or PL or DS or SS or FZDZ or FZRA or FZUP or FC[2] or SHGR or SHGS or SHRA or SHSN or SHUP or TSGR or TSGS or TSRA or TSSN or TSUP or UP	FG or BR or SA or DU or HZ or FU or VA or SQ or PO or TS or BCFG or BLDU or BLSA or BLSN or DRDU or DRSA or DRSN or FZFG or MIFG or PRFG or //	FG or PO or FC or DS or SS or TS or SH or BLSN or BLSA or BLDU or VA		RA HZ VCFG +TSRA FG VCSH +DZ VA VCTS –SN MIFG VCBLSA +TSRASN –SNRA DZ FG +SHSN BLSN UP FZUP TSUP FZUP //

[1] To be included if visibility or runway visual range < 1 500 m; for up to a maximum of four runways.

[2] Heavy used to indicate tornado or waterspout; moderate (no qualifier) to indicate funnel cloud not reaching the ground.

Element	Detailed content		Template(s)				Examples
Cloud (M)	Cloud amount and height of cloud base or vertical visibility (M)		FEWnnn or SCTnnn or BKNnnn or OVCnnn or FEW/// or SCT/// or BKN/// or OVC/// or ///nnn or //////	VVnnn or VV///	NSC or NCD		FEW015 VV005 OVC030 VV/// NSC SCT010 OVC020 BKN/// ///015
	Cloud type (C)		CB or TCU or ///	—			BKN009TCU NCD SCT008 BKN025CB BKN025/// //////CB
Air and dew-point temperature (M)	Air and dew-point temperature (M)		[M]nn/[M]nn				17/10 02/M08 M01/M10
Pressure values (M)	Name of the element (M)		Q				Q0995 Q1009 Q1022 Q0987
	QNH (M)		Nnnn				
Supplementary information (C)	Recent weather (C)		REFZDZ or REFZRA or REDZ or RE[SH]RA or RERASN or RE[SH]SN or RESG or RESHGR or RESHGS or REBLSN or RESS or REDS or RETSRA or RETSSN or RETSGR or RETSGS or RETS or REFC or REVA or REPL or REUP or REFZUP or RETSUP or RESHUP				REFZRA RETSRA
	Wind shear (C)		WS Rnn[L] or WS Rnn[C] or WS Rnn[R] or WS ALL RWY				WS R03 WS ALL RWY WS R18C
	Sea–surface temperature and state of the sea or significant wave height (C)		W[M]nn/Sn or W[M]nn/Hn[n][n]				W15/S2 W12/H75
	State of the runway (C)	Runway designator (M)	R nn[L]/ or Rnn[C]/ or Rnn[R]/		R/SNOCLO		R99/421594 R/SNOCLO R14L/CLRD//
		Runway deposits (M)	n or /	CLRD//			
		Extent of runway contamination (M)	n or /				
		Depth of deposit (M)	nn or //				
		Friction coefficient or braking action (M)	nn or //				

Element	Detailed content	Template(s)				Examples
Trend forecast (O)	Change indicator (M)	NOSIG	BECMG or TEMPO			NOSIG BECMG FEW020 TEMPO 25018G25MPS (TEMPO 25036G50KT) BECMG FM1030 TL1130 CAVOK BECMG TL1700 0800 FG BECMG AT1800 9000 NSW BECMG FM1900 0500 +SNRA BECMG FM1100 SN TEMPO FM1130 BLSN TEMPO FM0330 TL0430 FZRA TEMPO TL1200 0600 BECMG AT1200 8000 NSW NSC BECMG AT1130 OVC010 TEMPO TL1530 +SHRA BKN012CB
	Period of change (C)		FMnnnn and/or TLnnnn or ATnnnn			
	Wind (C)		nnn[P]nn[n][G[P]nn[n]]MPS (or nnn[P]nn[G[P]nn]KT)			
	Prevailing visibility (C)		nnnn		CAVOK	
	Weather phenomenon: intensity (C)		– or +	—	NSW	
	Weather phenomenon: characteristics and type (C)		DZ or RA or SN or SG or PL or DS or SS or FZDZ or FZRA or SHGR or SHGS or SHRA or SHSN or TSGR or TSGS or TSRA or TSSN	FG or BR or SA or DU or HZ or FU or VA or SQ or PO or FC or TS or BCFG or BLDU or BLSA or BLSN or DRDU or DRSA or DRSN or FZFG or MIFG or PRFG		
	Cloud amount and height of cloud base or vertical visibility (C)		FEWnnn or SCTnnn or BKNnnn or OVCnnn	VVnnn or VV///	NSC	
	Cloud type (C)		CB or TCU	—		

Ranges and resolutions for the numerical elements included in METAR				
	Element		Range	Resolution
Runway:	(no units)		01–36	1
Wind direction:		°true	000–360	10
Wind speed:		MPS KT	00–99 00–199	1 1
Visibility:		M M M M	0000–0750 0800–4 900 5 000–9 000 10 000–	50 100 1000 0 (fixed value: 9 999)
Runway visual range:		M M M	0000–0375 0400–0750 0800–2 000	25 50 100
Vertical visibility:	30's M (100's FT)		000–020	1
Clouds: height of cloud base:	30's M (100's FT)		000–100	1
Air temperature; Dew-point temperature:		°C	– 80 - +60	1
QNH:		hPa	0850–1 100	1
Sea–surface temperature:		°C	– 10 - +40	1
State of the sea:		(no units)	0–9	1
Significant wave height		M	0–999	0,1
State of the runway	Runway designator:	(no units)	01–36; 88; 99	1
	Runway deposits:	(no units)	0–9	1
	Extent of runway contamination:	(no units)	1; 2; 5; 9	—
	Depth of deposit:	(no units)	00–90; 92–99	1
	Friction coefficient/ braking action:	(no units)	00–95; 99	1

*There is no aeronautical requirement to report surface wind speeds of 100 kt (50 m/s) or more; however, provision has been made for reporting wind speeds up to 199 kt (99 m/s) for non-aeronautical purposes, as necessary.

Regulation (EU) 2017/373

Fixed areas of coverage of WAFS forecasts in chart form

Mercator projection

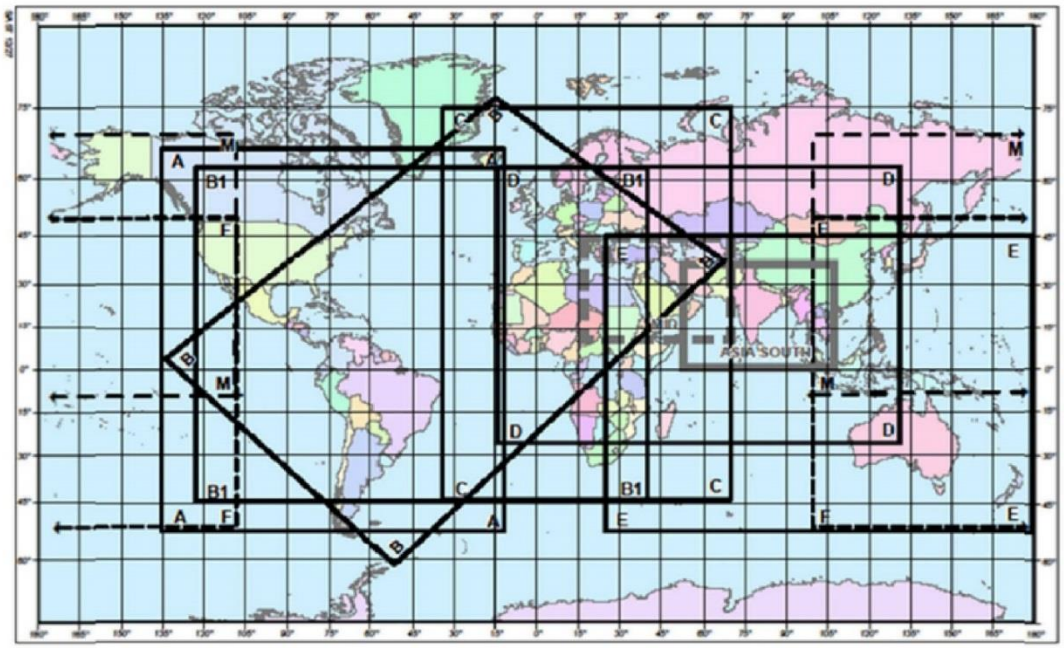


CHART	LATITUDE	LONGITUDE	CHART	LATITUDE	LONGITUDE
A	N6700	W13724	D	N6300	W01500
A	N6700	W01236	D	N6300	E13200
A	S5400	W01236	D	S2700	E13200
A	S5400	W13724	D	S2700	W01500
ASIA	N3600	E05300	E	N4455	E02446
ASIA	N3600	E10800	E	N4455	E18000
ASIA	0000	E10800	E	S5355	E18000
ASIA	0000	E05300	E	S5355	E02446
B	N0304	W13557	F	N5000	E10000
B	N7644	W01545	F	N5000	W11000
B	N3707	E06732	F	S5242	W11000
B	S6217	W05240	F	S5242	E10000
B1	N6242	W12500	M	N7000	E10000
B1	N6242	E04000	M	N7000	W11000
B1	S4530	E04000	M	S1000	W11000
B1	S4530	W12500	M	S1000	E10000
C	N7500	W03500	MID	N4400	E01700
C	N7500	E07000	MID	N4400	E07000
C	S4500	E07000	MID	N1000	E07000
C	S4500	W03500	MID	N1000	E01700

Polar stereographic projection (northern hemisphere)

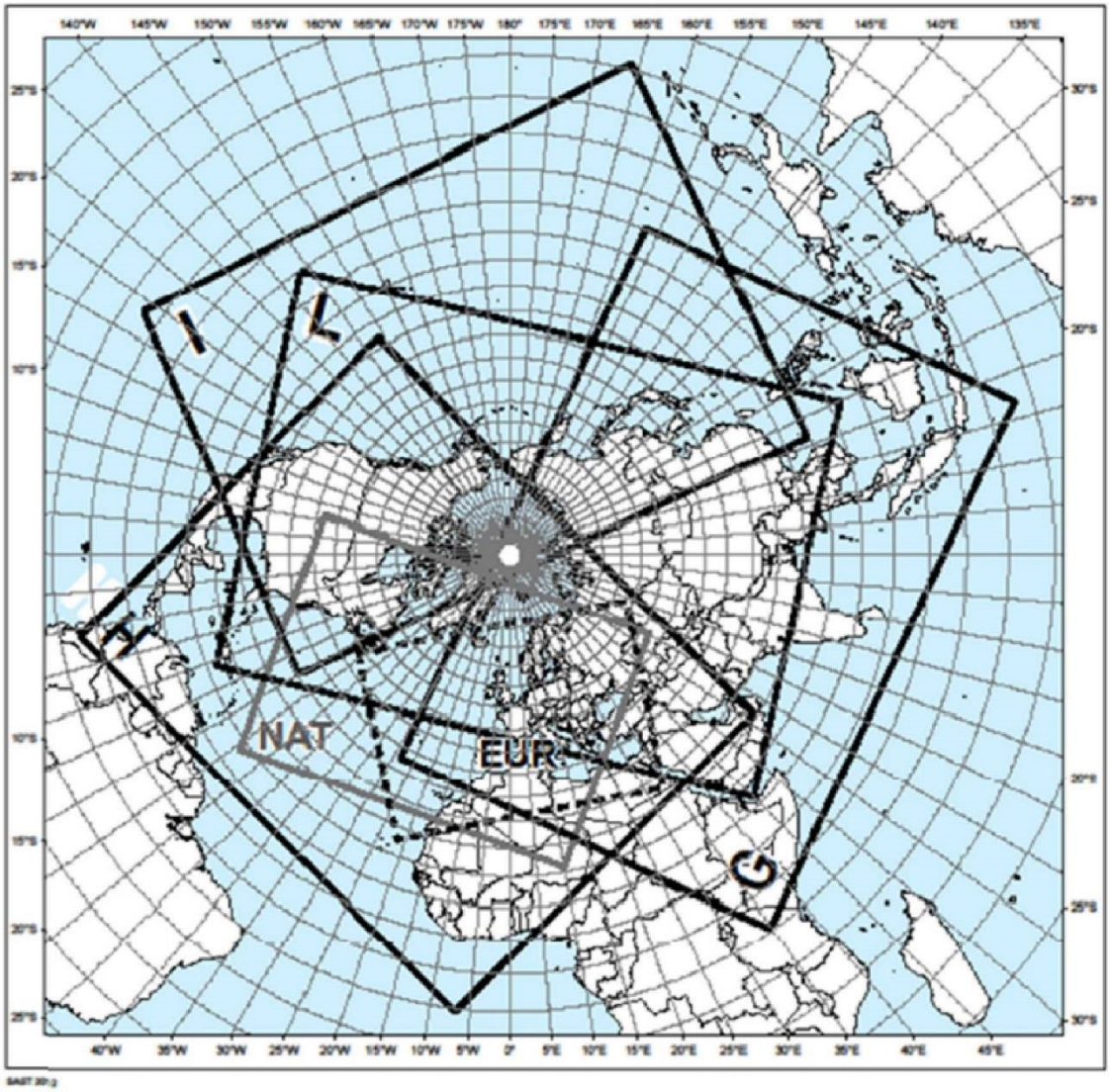


CHART	LATITUDE	LONGITUDE	CHART	LATITUDE	LONGITUDE
EUR	N4633	W05634	I	N1912	E11130
EUR	N5842	E06824	I	N3330	W06012
EUR	N2621	E03325	I	N0126	W12327
EUR	N2123	W02136	I	S0647	E16601
G	N3552	W02822	L	N1205	E11449
G	N1341	E15711	L	N1518	E04500
G	S0916	E10651	L	N2020	W06900
G	S0048	E03447	L	N1413	W14338
H	N3127	W14836	NAT	N4439	W10143
H	N2411	E05645	NAT	N5042	E06017
H	N0127	W00651	NAT	N1938	E00957
H	N0133	W07902	NAT	N1711	W05406

Polar stereographic projection (southern hemisphere)

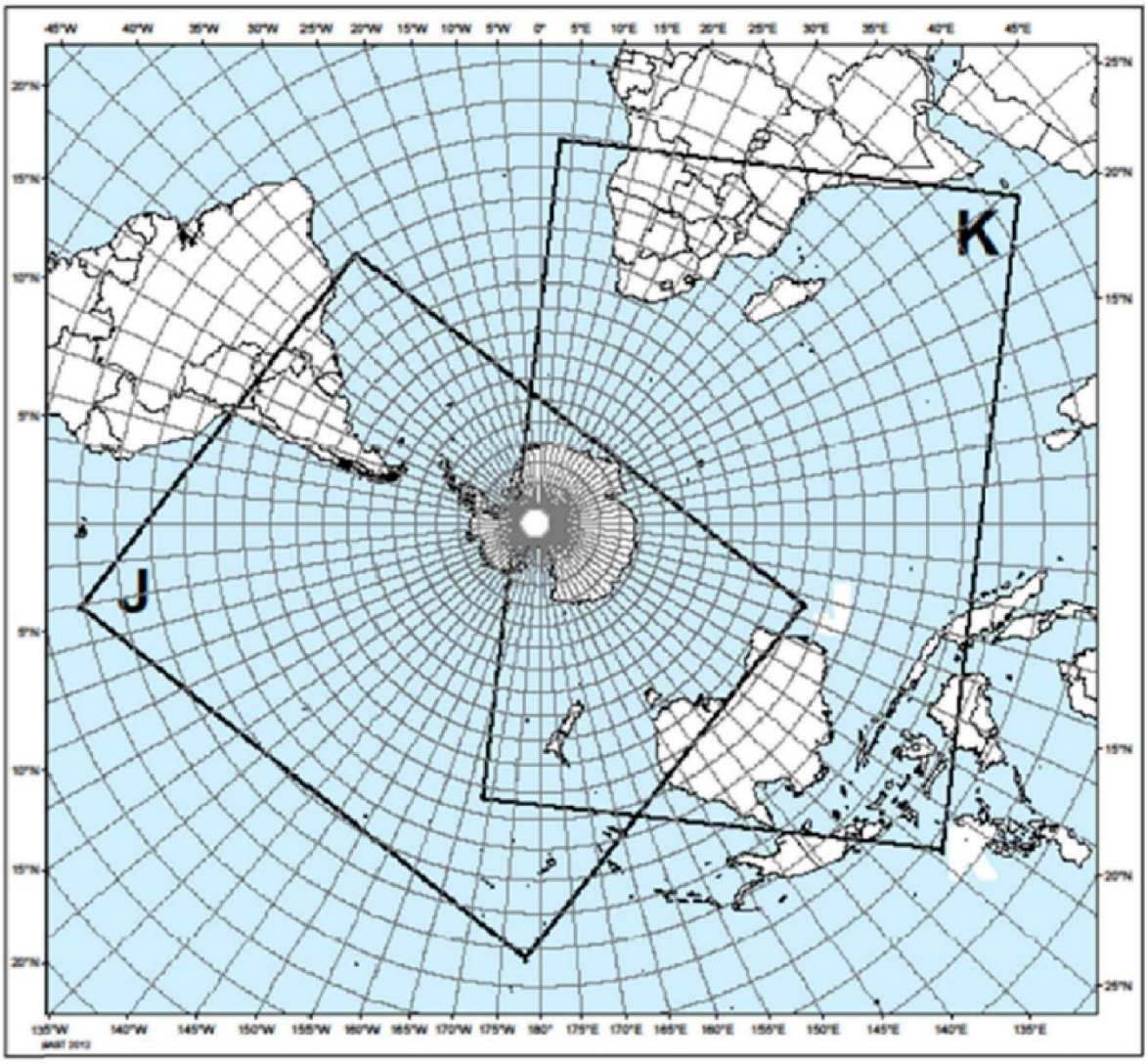


CHART	LATITUDE	LONGITUDE
J	S0318	W17812
J	N0037	W10032
J	S2000	W03400
J	S2806	E10717
K	N1255	E05549
K	N0642	E12905
K	S2744	W16841
K	S1105	E00317

Template for TAF

Key:

M = inclusion mandatory, part of every message;

C = inclusion conditional, dependent on meteorological conditions or method of observation;

O = inclusion optional.

Note 1: The ranges and resolutions for the numerical elements included in TAF are shown below this template.

Note 2: The explanations for the abbreviations can be found in Procedures for Air Navigation Services — ICAO Abbreviations and Codes (PANS-ABC, Doc 8400).

Element	Detailed content	Template(s)	Examples
Identification of the type of forecast (M)	Type of forecast (M)	TAF or TAF AMD or TAF COR	TAF TAF AMD
Location indicator (M)	ICAO location indicator (M)	Nnnn	YUDO
Time of issue of forecast (M)	Day and time of issue of the forecast in UTC (M)	nnnnnnZ	160000Z
Identification of a missing forecast (C)	Missing forecast identifier (C)	NIL	NIL
END OF TAF IF THE FORECAST IS MISSING.			
Days and period of validity of forecast (M)	Days and period of validity of the forecast in UTC (M)	nnnn/nnnn	1606/1624 0812/0918
Identification of a cancelled forecast (C)	Cancelled forecast identifier (C)	CNL	CNL
END OF TAF IF THE FORECAST IS CANCELLED.			
Surface wind (M)	Wind direction (M)	nnn or VRB	24004MPS; VRB01MPS (24008KT); (VRB02KT) 19005MPS (19010KT)
	Wind speed (M)	[P]nn[n]	00000MPS (00000KT) 140P49MPS (140P99KT)
	Significant speed variations (C)	G[P]nn[n]	12003G09MPS (12006G18KT) 24008G14MPS (24016G28KT)
	Units of measurement (M)	MPS (or KT)	

Element	Detailed content	Template(s)				Examples
Visibility (M)	Prevailing visibility (M)	Nnnn			CAVOK	0350 CAVOK 7000 9000 9999
Weather (C)	Intensity of weather phenomena (C)[1]	– or +		—		
	Characteristics and type of weather phenomena (C)	DZ or RA or SN or SG or PL or DS or SS or FZDZ or FZRA or SHGR or SHGS or SHRA or SHSN or TSGR or TSGS or TSRA or TSSN		FG or BR or SA or DU or HZ or FU or VA or SQ or PO or FC or TS or BCFG or BLDU or BLSA or BLSN or DRDU or DRSA or DRSN or FZFG or MIFG or PRFG		RA HZ +TSRA FG –FZDZ PRFG +TSRASN SNRA FG
Cloud (M)[2]	Cloud amount and height of base or vertical visibility (M)	FEWnnn or SCTnnn or BKNnnn or OVCnnn	VVnnn or VV///	NSC		FEW010 VV005 OVC020 VV/// NSC SCT005 BKN012
	Cloud type (C)	CB or TCU	—			SCT008 BKN025CB
Temperature (O)[3]	Name of the element (M)	TX				TX25/1013Z TN09/1005Z TX05/2112Z TNM02/2103Z
	Maximum temperature (M)	[M]nn/				
	Day and time of occurrence of the maximum temperature (M)	nnnnZ				
	Name of the element (M)	TN				
	Minimum temperature (M)	[M]nn/				
	Day and time of occurrence of the minimum temperature (M)	nnnnZ				

[1] To be included whenever applicable. No qualifier for moderate intensity.

[2] Up to four cloud layers.

[3] Consisting of up to a maximum of four temperatures (two maximum temperatures and two minimum temperatures).

Element	Detailed content	Template(s)				Examples
Expected significant changes to one or more of the above elements during the period of validity (C)	Change or probability indicator (M)	PROB30 [TEMPO] or PROB40 [TEMPO] or BECMG or TEMPO or FM				
	Period of occurrence or change (M)	nnnn/nnnn or nnnnnn				
	Wind (C)	nnn[P]nn[n][G[P]nn[n]]MPS or VRBnnMPS (or nnn[P]nn[G[P]nn]KT or VRBnnKT)				TEMPO 0815/0818 25017G25MPS (TEMPO 0815/0818 25034G50KT) TEMPO 2212/2214 17006G13MPS 1000 TSRA SCT010CB BKN020 (TEMPO 2212/2214 17012G26KT 1000 TSRA SCT010CB BKN020)
	Prevailing visibility (C)	Nnnn			CAVOK	BECMG 3010/3011 00000MPS 2400 OVC010 (BECMG 3010/3011 00000KT 2400 OVC010) PROB30 1412/1414 0800 FG
	Weather phenomenon: intensity (C)	– or +	—	NSW		BECMG 1412/1414 RA TEMPO 2503/2504 FZRA TEMPO 0612/0615 BLSN PROB40 TEMPO 2923/3001 0500 FG

Element	Detailed content	Template(s)				Examples
	Weather phenomenon: characteristics and type (C)	DZ or RA or SN or SG or PL or DS or SS or FZDZ or FZRA or SHGR or SHGS or SHRA or SHSN or TSGR or TSGS or TSRA or TSSN	FG or BR or SA or DU or HZ or FU or VA or SQ or PO or FC or TS or BCFG or BLDU or BLSA or BLSN or DRDU or DRSA or DRSN or FZFG or MIFG or PRFG			
	Cloud amount and height of base or vertical visibility (C)	FEWnnn or SCTnnn or BKNnnn or OVCnnn	VVnnn or VV///	NSC		FM051230 15015KMH 9999 BKN020 (FM051230 15008KT 9999 BKN020) BECMG 1618/1620 8000 NSW NSC
	Cloud type (C)	CB or TCU	—			BECMG 2306/2308 SCT015CB BKN020

Ranges and resolutions for the numerical elements included in TAF

Elements		Range	Resolution
Wind direction:	°true	000–360	10
Wind speed:	MPS KT*	00–99* 0-199	1 1
Visibility:	M	0000–0750	50
	M M M	0800–4900 5000–9000 10000 -	100 1000 0 (fixed value: 9999)
Vertical visibility:	30's M (100's FT)	000–020	1
Cloud: height of cloud base:	30's M (100's FT)	000–100	1
Air temperature (maximum and minimum):	°C	– 80 - + 60	1

(*) There is no aeronautical requirement to report surface wind speeds of 100 kt (50 m/s) or more; however, provision has been made for reporting wind speeds up to 199 kt (99 m/s) for non-aeronautical purposes, as necessary.

Template for wind shear warnings

Key:

M = inclusion mandatory, part of every message;

C = inclusion conditional, whenever applicable.

Note 1: The ranges and resolutions for the numerical elements included in wind shear warnings are shown in Appendix 8.

Note 2: The explanations for the abbreviations can be found in Procedures for Air Navigation Services — ICAO Abbreviations and Codes (PANS-ABC, Doc 8400).

Element	Detailed content	Template(s)	Example
Location indicator of the aerodrome (M)	Location indicator of the aerodrome	nnnn	YUCC
Identification of the type of message (M)	Type of message and sequence number	WS WRNG [n]n	WS WRNG 1
Time of origin and validity period (M)	Day and time of issue and, where applicable, validity period in UTC	nnnnnn [VALID TL nnnnnn] or [VALID nnnnnn/nnnnnn]	211230 VALID TL 211330 221200 VALID 221215/221315
IF THE WIND SHEAR WARNING IS TO BE CANCELLED, SEE DETAILS AT THE END OF THE TEMPLATE.			
Phenomenon (M)	Identification of the phenomenon and its location	[MOD] or [SEV] WS IN APCH or [MOD] or [SEV] WS [APCH] RWYnnn or [MOD] or [SEV] WS IN CLIMB-OUT or [MOD] or [SEV] WS CLIMB-OUT RWYnnn or MBST IN APCH or MBST [APCH] RWYnnn or MBST IN CLIMB-OUT or MBST CLIMB-OUT RWYnnn	WS APCH RWY12 MOD WS RWY34 WS IN CLIMB-OUT MBST APCH RWY26 MBST IN CLIMB-OUT
Observed, reported or forecast phenomenon (M)	Identification whether the phenomenon is observed or reported and expected to continue or forecast	REP AT nnnn nnnnnnnn or OBS [AT nnnn] or FCST	REP AT 1510 B747 OBS AT 1205 FCST
Details of the phenomenon (C)	Description of phenomenon causing the issuance of the wind shear warning	SFC WIND: nnn/nnMPS (or nnn/nnKT) nnnM (nnnFT)-WIND: nnn/nnMPS (or nnn/nnKT) or nnKMH (or nnKT) LOSS nnKM (or nnNM) FNA RWYnn or nnKMH (or nnKT) GAIN nnKM (or nnNM) FNA RWYnn	SFC WIND: 320/5MPS 60M-WIND: 360/13MPS (SFC WIND: 320/10KT 200FT-WIND: 360/26KT) 60KMH LOSS 4KM FNA RWY13 (30KT LOSS 2NM FNA RWY13)
OR			
Cancellation of wind shear warning	Cancellation of wind shear warning referring to its identification	CNL WS WRNG [n]n nnnnnn/nnnnnn	CNL WS WRNG 1 211230/211330

Template for SIGMET and AIRMET messages and special air-reports (uplink)

Key:

M = inclusion mandatory, part of every message;

C = inclusion conditional, whenever applicable; and

= = a double line indicates that the text following it should be placed on the subsequent line.

Note: The ranges and resolutions for the numerical elements included in SIGMET/AIRMET messages and in special air-reports are shown in Appendix 8.

Elements	Detailed content	Template(s)			Examples
		SIGMET	AIRMET	SPECIAL AIR-REPORT	
Location indicator of FIR/CTA (M)	ICAO location indicator of the ATS unit serving the FIR or CTA to which the SIGMET/AIRMET refers (M)	Nnnn		—	YUCC YUDD
Identification (M)	Message identification and sequence number (M)	SIGMET nnn	AIRMET [nn]n	ARS	SIGMET 5 SIGMET A3 AIRMET 2 ARS
Validity period (M)	Day-time groups indicating the period of validity in UTC (M)	VALID nnnnnn/nnnnnn		—	VALID 221215/221600 VALID 101520/101800 VALID 251600/252200
Location indicator of MWO (M)	Location indicator of MWO originating the message with a separating hyphen (M)	nnnn–			YUDO– YUSO–
Name of the FIR/CTA or aircraft identification (M)	Location indicator and name of the FIR/CTA for which the SIGMET/AIRMET is issued or aircraft radiotelephony call sign (M)	nnnn nnnnnnnnnn FIR[/UIR] or nnnn nnnnnnnnnn CTA	nnnn nnnnnnnnnn FIR[/n]	nnnnnn	YUCC AMSWELL FIR YUDD SHANLON FIR/UIR YUCC AMSWELL FIR/2 YUDD SHANLON FIR VA812
IF THE SIGMET IS TO BE CANCELLED, SEE DETAILS AT THE END OF THE TEMPLATE.					

Elements	Detailed content	Template(s)			Examples
		SIGMET	AIRMET	SPECIAL AIR-REPORT	
Phenomenon (M)	Description of the phenomenon causing the issuance of SIGMET/AIRMET (C)	OBSC TS[GR] EMBD TS[GR] FRQ TS[GR] SQL TS[GR] TC nnnnnnnnnn or NN SEV TURB SEV ICE SEV ICE (FZRA) SEV MTW HVY DS HVY SS [VA ERUPTION] [MT] [nnnnnnnnnn] [PSN Nnn[nn] or Snn[nn] Ennn[nn] or Wnnn[nn]] VA CLD RDOACT CLD	SFC WSPD nn[n]MPS (or SFC WSPD nn[n]KT) SFC VIS nnnnM (nn) ISOL TS[GR] OCNL TS[GR] MT OBSC BKN CLD nnn/[ABV]nnnnM (or BKN CLD nnn/[ABV]nnnnFT) OVC CLD nnn/[ABV]nnnnM (or OVC CLD nnn/[ABV]nnnnFT) ISOL CB OCNL CB FRQ CB ISOL TCU OCNL TCU FRQ TCU MOD TURB MOD ICE MOD MTW	TS TSGR SEV TURB SEV ICE SEV MTW HVY SS VA CLD [FL nnn/nnn] VA [MT nnnnnnnnnn] MOD TURB MOD ICE	SEV TURB FRQ TS OBSC TSGR EMBD TSGR TC GLORIA TC NN VA ERUPTION MT ASHVAL PSN S15 E073 VA CLD MOD TURB MOD MTW ISOL CB BKN CLD 120/900M (BKN CLD 400/3000FT) OVC CLD 270/ABV30000M (OVC CLD 900/ABV100000FT) SEV ICE RDOACT CLD
Observed or forecast phenomenon (M)	Indication whether the information is observed and expected to continue, or forecast (M)	OBS [AT nnnnZ] FCST [AT nnnnZ]		OBS AT nnnnZ	OBS AT 1210Z OBS FCST AT 1815Z
Location (C)	Location (referring to latitude and longitude (in degrees and minutes))	Nnn[nn] Wnnn[nn] or Nnn[nn] Ennn[nn] or Snn[nn] Wnnn[nn] or Snn[nn] Ennn[nn] or N OF Nnn[nn] or S OF Nnn[nn] or N OF Snn[nn] or S OF Snn[nn] or [AND] W OF Wnnn[nn] or E OF Wnnn[nn] or W OF Ennn[nn] or E OF Ennn[nn]		NnnnnWnnnnn or NnnnnEnnnnn or SnnnnWnnnnn or SnnnnEnnnnn	S OF N54 N OF N50 N2020 W07005 N2706 W07306 N48 E010 N OF N1515 AND W OF E13530 W OF E1554 N OF LINE S2520 W11510 —

Elements	Detailed content	Template(s)			Examples
		SIGMET	AIRMET	SPECIAL AIR-REPORT	
		or [N OF, NE OF, E OF, SE OF, S OF, SW OF, W OF, NW OF] [LINE] Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] — Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] or WI Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] — Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] — Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] — [Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] — Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]] or ENTIRE FIR[1] or ENTIRE CTA[1]			S2520 W12010 WI N6030 E02550 — N6055 E02500 — N6050 E02630 ENTIRE FIR ENTIRE CTA
Level (C)	Flight level or altitude and extent (C)[2]	[SFC/]FLnnn or [SFC/]nnnnM (or [SFC/]nnnnFT) or FLnnn/nnn or TOP FLnnn or [TOP] ABV FLnnn or[3] CB TOP [ABV] FLnnn WI nnnKM OF CENTRE (or CB TOP [ABV] FLnnn WI nnnNM OF CENTRE) or CB TOP [BLW] FLnnn WI nnnKM OF CENTRE (or CB TOP [BLW] FLnnn WI nnnNM OF CENTRE) or[1] FLnnn/nnn [APRX nnnKM BY nnnKM] [nnKM WID LINE BTN (nnNM WID LINE BTN)] [Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] [— Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]] [— Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]]] (or FLnnn/nnn [APRX nnnNM BY nnnNM] [Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] [— Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]] [— Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]]])		FLnnn or nnnnM (or nnnnFT)	FL180 FL050/080 TOP FL390 SFC/FL070 TOP ABV FL100 FL310/450 CB TOP FL500 WI 270KM OF CENTRE (CB TOP FL500 WI 150NM OF CENTRE) FL310/350 APRX 220KM BY 35KM FL390

[1] Only for SIGMET messages for volcanic ash.

[2] Only for SIGMET messages for volcanic ash cloud and tropical cyclones.

[3] Only for SIGMET messages for tropical cyclones.

Elements	Detailed content	Template(s)			Examples
		SIGMET	AIRMET	SPECIAL AIR-REPORT	
Movement or expected movement (C)	Movement or expected movement (direction and speed) with reference to one of the sixteen points of compass, or stationary (C)	MOV N [nnKMH] or MOV NNE [nnKMH] or MOV NE [nnKMH] or MOV ENE [nnKMH] or MOV E [nnKMH] or MOV ESE [nnKMH] or MOV SE [nnKMH] or MOV SSE [nnKMH] or MOV S [nnKMH] or MOV SSW [nnKMH] or MOV SW [nnKMH] or MOV WSW [nnKMH] or MOV W [nnKMH] or MOV WNW [nnKMH] or MOV NW [nnKMH] or MOV NNW [nnKMH] (or MOV N [nnKT] or MOV NNE [nnKT] or MOV NE [nnKT] or MOV ENE [nnKT] or MOV E [nnKT] or MOV ESE [nnKT] or MOV SE [nnKT] or MOV SSE [nnKT] or MOV S [nnKT] or MOV SSW [nnKT] or MOV SW [nnKT] or MOV WSW [nnKT] or MOV W [nnKT] or MOV WNW [nnKT] or MOV NW [nnKT] or MOV NNW [nnKT]) or STNR		—	MOV E 40KMH (MOV E 20KT) MOV SE STNR
Changes in intensity (C)	Expected changes in intensity (C)	INTSF or WKN or NC		—	WKN
Forecast position (C)	Forecast position of volcanic ash cloud or the centre of the TC or other hazardous phenomena[1] at the end of the validity period of the SIGMET message (C)	FCST nnnnZ TC CENTRE Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] or FCST nnnnZ VA CLD APRX [nnKM WID LINE BTN (nnNM WID LINE BTN)] Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] — Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] [— Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]] [— Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]] [AND] or[2] FCST nnnnZ ENTIRE FIR[3]	—	—	FCST 2200Z TC CENTRE N2740 W07345 FCST 1700Z VA CLD APRX S15 E075 — S15 E081 — S17 E083 — S18 E079 — S15 E075 FCST 0500Z ENTIRE FIR FCST 0500Z ENTIRE CTA FCST 0500Z NO VA EXP

[1] To be used for hazardous phenomena other than volcanic ash cloud and tropical cyclones.

[2] To be used for two volcanic ash clouds or two centres of tropical cyclones simultaneously affecting the FIR concerned.

[3] Only for SIGMET messages for volcanic ash.

Elements	Detailed content	Template(s)			Examples
		SIGMET	AIRMET	SPECIAL AIR-REPORT	
		or FCST nnnnZ ENTIRE CTA[3] or FCST nnnnZ NO VA EXP or[1] [FCST nnnnZ Nnn[nn] Wnnn[nn] or Nnn[nn] Ennn[nn] or Snn[nn] Wnnn[nn] or Snn[nn] Ennn[nn] or N OF Nnn[nn] or S OF Nnn[nn] or N OF Snn[nn] or S OF Snn[nn] [AND] W OF Wnnn[nn] or E OF Wnnn[nn] or W OF Ennn[nn] or E OF Ennn[nn] or [N OF, NE OF, E OF, SE OF, S OF, SW OF, W OF, NW OF] [LINE] Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] — Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] or WI[2] Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] — Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] — Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] — Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]]			
OR					

[1] To be used for hazardous phenomena other than volcanic ash cloud and tropical cyclones.

[2] The number of coordinates should be kept to a minimum and should not normally exceed seven.

Elements	Detailed content	Template(s)			Examples
		SIGMET	AIRMET	SPECIAL AIR-REPORT	
Cancellation of SIGMET/AIRMET (C)	Cancellation of SIGMET/AIRMET referring to its identification	CNL SIGMET [nn]n nnnnnn/nnnnnn or CNL SIGMET [nn]n nnnnnn/nnnnnn [VA MOV TO nnnn FIR][1]	CNL AIRMET [nn]n nnnnnn/nnnnn n	—	CNL SIGMET 2 101200/101600 CNL SIGMET 3 251030/251430 VA MOV TO YUDO FIR CNL AIRMET 151520/151800

[1] Only for SIGMET messages for volcanic ash.

Template for advisory message for volcanic ash

Key:

M = inclusion mandatory, part of every message;

O = inclusion optional;

= = a double line indicates that the text following it should be placed on the subsequent line.

Note 1: The ranges and resolutions for the numerical elements included in advisory messages for volcanic ash are shown in Appendix 8.

Note 2: The explanations for the abbreviations can be found in Procedures for Air Navigation Services — ICAO Abbreviations and Codes (PANS-ABC, Doc 8400).

Note 3: Inclusion of a 'colon' after each element heading is mandatory.

Note 4: The numbers 1 to 18 are included only for clarity and they are not part of the advisory message, as shown in the example.

Element		Detailed content	Template(s)		Examples	
1	Identification of the type of message (M)	Type of message	VA ADVISORY		VA ADVISORY	
2	Time of origin (M)	Year, month, day, time in UTC	DTG:	nnnnnnnn/nnnnZ	DTG:	20080923/0130Z
3	Name of VAAC (M)	Name of VAAC	VAAC:	nnnnnnnnnnn	VAAC:	TOKYO
4	Name of volcano (M)	Name and IAVCEI number of volcano	VOLCANO:	nnnnnnnnnnnnnnnnn nnnnn [nnnnnn] or UNKNOWN or UNNAMED	VOLCANO: VOLCANO:	KARYMSKY 1000-13 UNNAMED
5	Location of volcano (M)	Location of volcano in degrees and minutes	PSN:	Nnnnn or Snnnn Wnnnnn or Ennnnn or UNKNOWN	PSN: PSN:	N5403 E15927 UNKNOWN
6	State or region (M)	State, or region if ash is not reported over a State	AREA:	nnnnnnnnnnnnnnn	AREA:	RUSSIA
7	Summit elevation (M)	Summit elevation in m (or ft)	SUMMIT ELEV:	nnnnM (or nnnnnFT)	SUMMIT ELEV:	1536M
8	Advisory number (M)	Advisory number: year in full and message number (separate sequence for each volcano)	ADVISORY NR:	nnnn/nnnn	ADVISORY NR:	2008/4
9	Information source (M)	Information source using free text	INFO SOURCE:	Free text up to 32 characters	INFO SOURCE:	MTSAT-1R KVERT KEMSD
10	Colour code (O)	Aviation colour code	AVIATION COLOUR CODE:	RED or ORANGE or YELLOW or GREEN or UNKNOWN or NOT GIVEN or NIL	AVIATION COLOUR CODE:	RED

Element		Detailed content	Template(s)		Examples	
11	Eruption details (M)	Eruption details (including date/time of eruption(s))	ERUPTION DETAILS:	Free text up to 64 characters or UNKNOWN	ERUPTION DETAILS:	ERUPTION AT 20080923/0000Z FL300 REPORTED
12	Time of observation (or estimation) of ash (M)	Day and time (in UTC) of observation (or estimation) of volcanic ash	OBS (or EST) VA DTG:	nn/nnnnZ	OBS VA DTG:	23/0100Z
13	Observed or estimated ash cloud (M)	Horizontal (in degrees and minutes) and vertical extent at the time of observation of the observed or estimated ash cloud or, if the base is unknown, the top of the observed or estimated ash cloud; Movement of the observed or estimated ash cloud	OBS VA CLD or EST VA CLD:	TOP FLnnn or SFC/FLnnn or FLnnn/nnn [nnKM WID LINE BTN (nnNM WID LINE BTN)] Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] — Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn][— Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] — Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] — Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]] MOV N nnKMH (or KT) or MOV NE nnKMH (or KT) or MOV E nnKMH (or KT) or MOV SE nnKMH (or KT) or MOV S nnKMH (or KT) or MOV SW nnKMH (or KT) or MOV W nnKMH (or KT) or MOV NW nnKMH (or KT) or VA NOT IDENTIFIABLE FM SATELLITE DATA WIND FLnnn/nnn nnn/nn[n]MPS (or KT)[1] or WIND FLnnn/nnn VRBnnMPS (or KT) or WIND SFC/FLnnn nnn/nn[n]MPS (or KT) or WIND SFC/FLnnn VRBnnMPS (or KT)	OBS VA CLD:	FL250/300 N5400 E15930 — N5400 E16100 — N5300 E15945 MOV SE 20KT SFC/FL200 N5130 E16130 — N5130 E16230 — N5230 E16230 — N5230 E16130 MOV SE 15KT TOP FL240 MOV W 40KMH VA NOT IDENTIFIABLE FM SATELLITE DATA WIND FL050/070 180/12MPS

[1] If ash reported (e.g. AIREP) but not identifiable from satellite data.

Element		Detailed content	Template(s)		Examples	
14	Forecast height and position of the ash clouds (+ 6 HR) (M)	Day and time (in UTC) (6 hours from the 'Time of observation (or estimation) of ash' given in Item 12); Forecast height and position (in degrees and minutes) for each cloud mass for that fixed valid time	FCST VA CLD + 6 HR:	nn/nnnnZ SFC or FLnnn/[FL]nnn [nnKM WID LINE BTN (nnNM WID LINE BTN)] Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] — Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn][— Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] — Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] — Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]][1] or NO VA EXP or NOT AVBL or NOT PROVIDED	FCST VA CLD + 6 HR:	23/0700Z FL250/350 N5130 E16030 — N5130 E16230 — N5330 E16230 — N5330 E16030 SFC/FL180 N4830 E16330 — N4830 E16630 — N5130 E16630 — N5130 E16330 NO VA EXP NOT AVBL NOT PROVIDED
15	Forecast height and position of the ash clouds (+ 12 HR) (M)	Day and time (in UTC) (12 hours from the 'Time of observation (or estimation) of ash' given in Item 12); Forecast height and position (in degrees and minutes) for each cloud mass for that fixed valid time	FCST VA CLD + 12 HR:	nn/nnnnZ SFC or FLnnn/[FL]nnn [nnKM WID LINE BTN (nnNM WID LINE BTN)] Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] — Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn][— Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] — Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] — Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]] or NO VA EXP or NOT AVBL or NOT PROVIDED	FCST VA CLD + 12 HR:	23/1300Z SFC/FL270 N4830 E16130 — N4830 E16600 — N5300 E16600 — N5300 E16130 NO VA EXP NOT AVBL NOT PROVIDED

[1] Up to four selected layers.

Element		Detailed content	Template(s)		Examples	
16	Forecast height and position of the ash clouds (+ 18 HR) (M)	Day and time (in UTC) (18 hours from the 'Time of observation (or estimation) of ash' given in Item 12); Forecast height and position (in degrees and minutes) for each cloud mass for that fixed valid time	FCST VA CLD + 18 HR:	nn/nnnnZ SFC or FLnnn/[FL]nnn [nnKM WID LINE BTN (nnNM WID LINE BTN)] Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] — Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn][— Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] — Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn] — Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]] or NO VA EXP or NOT AVBL or NOT PROVIDED	FCST VA CLD + 18 HR:	23/1900Z NO VA EXP NOT AVBL NOT PROVIDED
17	Remarks (M)	Remarks, as necessary	RMK:	Free text up to 256 characters or NIL	RMK:	LATEST REP FM KVERT (0120Z) INDICATES ERUPTION HAS CEASED. TWO DISPERSING VA CLD ARE EVIDENT ON SATELLITE IMAGERY NIL
18	Next advisory (M)	Year, month, day and time in UTC	NXT ADVISORY:	nnnnnnnn/nnnnZ or NO LATER THAN nnnnnnnn/nnnnZ or NO FURTHER ADVISORIES or WILL BE ISSUED BY nnnnnnnn/nnnnZ	NXT ADVISORY:	20080923/0730Z NO LATER THAN nnnnnnnn/nnnnZ NO FURTHER ADVISORIES WILL BE ISSUED BY nnnnnnnn/nnnnZ

Template for advisory message for tropical cyclones

Key:

= = a double line indicates that the text following it should be placed on the subsequent line.

Note 1: The ranges and resolutions for the numerical elements included in advisory messages for tropical cyclones are shown in Appendix 8.

Note 2: The explanations for the abbreviations can be found in Procedures for Air Navigation Services — ICAO Abbreviations and Codes (PANS-ABC, Doc 8400).

Note 3: All the elements are mandatory.

Note 4: Inclusion of a 'colon' after each element heading is mandatory.

Note 5: The numbers 1 to 19 are included only for clarity and they are not part of the advisory message, as shown in the example.

Element		Detailed content	Template(s)		Examples	
1	Identification of the type of message	Type of message	TC ADVISORY		TC ADVISORY	
2	Time of origin	Year, month, day and time in UTC of issue	DTG:	nnnnnnnn/nnnnZ	DTG:	20040925/1600Z
3	Name of TCAC	Name of TCAC (location indicator or full name)	TCAC:	nnnn or nnnnnnnnnn	TCAC: TCAC:	YUFO MIAMI
4	Name of tropical cyclone	Name of tropical cyclone or'NN' for unnamed tropical cyclone	TC:	nnnnnnnnnnnn or NN	TC:	GLORIA
5	Advisory number	Advisory number (starting with '01' for each cyclone)	NR:	nn	NR:	01
6	Position of the centre	Position of the centre of the tropical cyclone (in degrees and minutes)	PSN:	Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]	PSN:	N2706 W07306
7	Direction and speed of movement	Direction and speed of movement given in sixteen compass points and km/h (or kt), respectively, or moving slowly (< 6 km/h (3 kt)) or stationary (< 2 km/h (1 kt))	MOV:	N nnKMH (or KT) or NNE nnKMH (or KT) or NE nnKMH (or KT) or ENE nnKMH (or KT) or E nnKMH (or KT) or ESE nnKMH (or KT) or SE nnKMH (or KT) or SSE nnKMH (or KT) or S nnKMH (or KT) or SSW nnKMH (or KT) or SW nnKMH (or KT) or WSW nnKMH (or KT)	MOV:	NW 20KMH

Element		Detailed content	Template(s)		Examples	
				or W nnKMH (or KT) or WNW nnKMH (or KT) or NW nnKMH (or KT) or NNW nnKMH (or KT) or SLW or STNR		
8	Central pressure	Central pressure (in hPa)	C:	nnnHPA	C:	965HPA
9	Maximum surface wind	Maximum surface wind near the centre (mean over 10 minutes, in m/s (or kt))	MAX WIND:	nn[n]MPS (or nn[n]KT)	MAX WIND:	22MPS
10	Forecast of centre position (+ 6 HR)	Day and time (in UTC) (6 hours from the 'DTG' given in Item 2); Forecast position (in degrees and minutes) of the centre of the tropical cyclone	FCST PSN + 6 HR:	nn/nnnnZ Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]	FCST PSN + 6 HR:	25/2200Z N2748 W07350
11	Forecast of maximum surface wind (+ 6 HR)	Forecast of maximum surface wind (6 hours after the 'DTG' given in Item 2)	FCST MAX WIND + 6 HR:	nn[n]MPS (or nn[n]KT)	FCST MAX WIND + 6 HR:	22MPS
12	Forecast of centre position (+ 12 HR)	Day and time (in UTC) (12 hours from the 'DTG' given in Item 2); Forecast position (in degrees and minutes) of the centre of the tropical cyclone	FCST PSN + 12 HR:	nn/nnnnZ Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]	FCST PSN + 12 HR:	26/0400Z N2830 W07430
13	Forecast of maximum surface wind (+ 12 HR)	Forecast of maximum surface wind (12 hours after the 'DTG' given in Item 2)	FCST MAX WIND + 12 HR:	nn[n]MPS (or nn[n]KT)	FCST MAX WIND + 12 HR:	22MPS
14	Forecast of centre position (+ 18 HR)	Day and time (in UTC) (18 hours from the 'DTG' given in Item 2); Forecast position (in degrees and minutes) of the centre of the tropical cyclone	FCST PSN + 18 HR:	nn/nnnnZ Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]	FCST PSN + 18 HR:	26/1000Z N2852 W07500

Element		Detailed content	Template(s)		Examples	
15	Forecast of maximum surface wind (+ 18 HR)	Forecast of maximum surface wind (18 hours after the 'DTG' given in Item 2)	FCST MAX WIND + 18 HR:	nn[n]MPS (or nn[n]KT)	FCST MAX WIND + 18 HR:	21MPS
16	Forecast of centre position (+ 24 HR)	Day and time (in UTC) (24 hours from the 'DTG' given in Item 2); Forecast position (in degrees and minutes) of the centre of the tropical cyclone	FCST PSN + 24 HR:	nn/nnnnZ Nnn[nn] or Snn[nn] Wnnn[nn] or Ennn[nn]	FCST PSN + 24 HR:	26/1600Z N2912 W07530
17	Forecast of maximum surface wind (+ 24 HR)	Forecast of maximum surface wind (24 hours after the 'DTG' given in Item 2)	FCST MAX WIND + 24 HR:	nn[n]MPS (or nn[n]KT)	FCST MAX WIND + 24 HR:	20MPS
18	Remarks	Remarks, as necessary	RMK:	Free text up to 256 characters or NIL	RMK:	NIL
19	Expected time of issuance of next advisory	Expected year, month, day and time (in UTC) of issuance of next advisory	NXT MSG:	[BFR] nnnnnnnn/nnnnZ or NO MSG EXP	NXT MSG:	20040925/2000Z

Ranges and resolutions for the numerical elements included in volcanic ash and tropical cyclone advisory messages, SIGMET/AIRMET messages and aerodrome and wind shear warnings			
Elements		**Range**	**Resolution**
Summit elevation:	M FT	000–8100 000–27000	1 1
Advisory number:	for VA (index)[1] for TC (index)[1]	000–2000 00–99	1 1
Maximum surface wind:	MPS KT	00–99 00–199	1 1
Central pressure:	hPa	850–1050	1
Surface wind speed:	MPS KT	15–49 30–99	1 1
Surface visibility:	M M	0000–0750 0800–5000	50 100
Cloud: height of base:	M FT	000–300 000–1000	30 100
Cloud: height of top:	M M FT FT	000–2970 3000–20000 000–9900 10000–60000	30 300 100 1000
Latitudes:	° (degrees) (minutes)	00–90 00–60	1 1
Longitudes:	° (degrees) (minutes)	000–180 00–60	1 1
Flight levels:		000–650	10
Movement:	KMH KT	0–300 0–150	10 5

[1] Non-dimensional

ANNEX VI — PART-AIS

SPECIFIC REQUIREMENTS FOR PROVIDERS OF AERONAUTICAL INFORMATION SERVICES

SUBPART A — ADDITIONAL ORGANISATION REQUIREMENTS FOR PROVIDERS OF AERONAUTICAL INFORMATION SERVICES (AIS.OR)

SECTION 1 — GENERAL REQUIREMENTS

AIS.OR.100 Technical and operational competence and capability

Regulation (EU) 2017/373

(a) An aeronautical information services provider shall ensure that information and data are available for operations in a form suitable for:

(1) flight operating personnel, including flight crew;

(2) flight planning, flight management systems and flight simulators;

(3) air traffic services providers which are responsible for flight information services, aerodrome flight information services and the provision of pre-flight information.

(b) Aeronautical information services providers shall ensure the integrity of data and confirm the level of accuracy of the information distributed for operations, including the source of such information, before such information is distributed.

SUBPART B — TECHNICAL REQUIREMENTS FOR PROVIDERS OF AERONAUTICAL INFORMATION SERVICES (AIS.TR)

SECTION 1 — GENERAL REQUIREMENTS

AIS.TR.100 Working methods and operating procedures for the provision of aeronautical information services

Regulation (EU) 2017/373

An aeronautical information services provider shall be able to demonstrate that their working methods and operating procedures are compliant with the standards in the following Annexes to the Chicago Convention as far as they are relevant to the provision of aeronautical information services in the airspace concerned:

(a) Annex 4 on aeronautical charts in its 11th edition of July 2009, including all amendments up to and including No 58;

(b) without prejudice to Commission Regulation (EU) No 73/2010[1], Annex 15 on aeronautical information services in its 14th edition of July 2013, including all amendments up to and including No 38.

[1] Commission Regulation (EU) No 73/2010 of 26 January 2010 laying down requirements on the quality of aeronautical data and aeronautical information for the single European sky (OJ L 23, 27.1.2010, p. 6).

ACCEPTABLE MEANS OF COMPLIANCE (AMC) AND GUIDANCE MATERIAL (GM) TO PART-AIS SPECIFIC REQUIREMENTS FOR PROVIDERS OF AERONAUTICAL INFORMATION SERVICES

Reserved

ANNEX VII — PART-DAT

SPECIFIC REQUIREMENTS FOR PROVIDERS OF DATA SERVICES

SUBPART A — ADDITIONAL ORGANISATION REQUIREMENTS FOR PROVIDERS OF DATA SERVICES (DAT.OR)

SECTION 1 — GENERAL REQUIREMENTS

DAT.OR.100 Aeronautical data and information

Regulation (EU) 2017/373

(a) The DAT provider shall receive, assemble, translate, select, format, distribute and/or integrate aeronautical data and information that is released by an authoritative source for use in aeronautical databases on certified aircraft application/equipment.

In specific cases, if aeronautical data is not provided in the aeronautical information publication (AIP) or by an authoritative source or does not meet the applicable data quality requirements (DQRs), that aeronautical data may be originated by the DAT provider itself and/or by other DAT providers. In this context, that aeronautical data shall be validated by the DAT provider originating it.

(b) When so requested by its customers, the DAT provider may process tailored data provided by the aircraft operator or originating from other DAT providers for use by that aircraft operator. The responsibility for this data and its subsequent update shall remain with the aircraft operator.

AMC1 DAT.OR.100 Aeronautical data and information

ED Decision 2017/001/R

GENERAL

(a) Aeronautical data and information in this context should consist of:

(1) Integrated Aeronautical Information Package (IAIP); and/or

(2) obstacle data; and/or

(3) terrain data; and/or

(4) Aerodrome Mapping Data (AMD); and/or

(5) other data and information that is validated by the DAT provider for the purpose of provision of its services.

(b) Aeronautical databases should be databases, used on certified aircraft application/equipment, that support the flight operation where incorrect data leads to failures having at least minor or higher failure effect.

(c) The scope should not include databases that are approved as part of the type design of the aircraft or engine (e.g. engine power settings (take-off, climb, maximum continuous thrust (MCT), cruise) and aircraft performance data (e.g. take-off distance, V speeds)).

GM1 DAT.OR.100 Aeronautical data and information

ED Decision 2017/001/R

GENERAL

(a) In the context of this Regulation, aeronautical databases should include databases, used on certified aircraft applications, that support the flight operation of aircraft for the purpose of primary communication, navigation and surveillance (CNS) or supplementing CNS.

(1) Database used in primary CNS applications (e.g. flight management system (FMS)).

(2) Database used in supplementary CNS applications including but not limited to systems generating alerts and used for awareness having the following databases:

(i) database for synthetic vision systems;

(ii) terrain database (TAWS);

(iii) obstacle database (TAWS);

(iv) aerodrome mapping database (AMDB);

(v) brake assistance to vacate; and

(vi) surface indication and alert system.

(b) Databases for which the DAT provider is not required to be certified in accordance with this Regulation include but are not limited to:

(1) databases provided and/or used by the operator of the aircraft that are monitored under the operator's responsibility and not loaded into certified aircraft applications (e.g. airport moving map used in electronic flight bags (EFBs), take-off and landing performance used in EFBs);

(2) databases not having any safety affect (e.g. used for passenger in-flight entertainment (IFE) systems outside the flight deck, etc.); and

(3) databases for systems applications/equipment installed on aircraft certified for visual flight rules (VFR) operation only, except those used for primary navigation to meet the airspace usage requirements.

AMC1 DAT.OR.100(a) Aeronautical data and information

ED Decision 2017/001/R

DATA SOURCE

The DAT provider should use data coming from authoritative sources. If such data is not formally made available by an authoritative source or does not meet the applicable data quality requirements, but is required by end users, the DAT provider may use data from other (non-authoritative) sources, provided these have been verified and validated by the DAT provider itself and/or other DAT providers to conform with the relevant standards and data quality requirements.

If a non-authoritative source is used for the data release, the DAT provider should issue a statement at its discretion.

GM1 to AMC1 DAT.OR.100(a) Aeronautical data and information

ED Decision 2017/001/R

NON-AUTHORITATIVE SOURCE

(a) A non-authoritative source may be an organisation other than those defined in point 32 of Annex I, but providing and/or publishing data derived from data gathering or measuring performed (e.g. by aircraft operators, air crew, DAT providers, or other similar operational organisations, or a combination thereof), transformation of various sources to provide aeronautical data which conform with relevant standards and data quality requirements as specified by the airspace end users.

(b) When validating data from a non-authoritative source, the DAT provider should proceed by using either additional information sources to validate this data (like satellite imagery, data or manuals from other providers, users, military, etc.), or data which has been tested and confirmed through operations.

GM2 to AMC1 DAT.OR.100(a) Aeronautical data and information

ED Decision 2017/001/R

DATA SOURCE

The first known DAT provider that uses data coming from other (non-authoritative) sources in the aeronautical data chain, accepts the responsibility of the data originator (i.e. ensuring that the data meets the data quality requirements).

GM3 to AMC1 DAT.OR.100(a) Aeronautical data and information

ED Decision 2017/001/R

END USER

In the context of this Regulation, the end users should be considered the 'airspace users' as defined in Article 2(8) of Regulation (EC) No 549/2004.

GM1 DAT.OR.100(a) Aeronautical data and information

ED Decision 2017/001/R

VALIDATION OF AERONAUTICAL DATA

The processes of validating the aeronautical data by DAT provider should meet the standards specified in EUROCAE ED-76A/RTCA DO-200B 'Standards for Processing Aeronautical Data', dated June 2015, especially Section 2.4.1 (6) and Appendix C, in particular points C.2.1 and C.2.2. EUROCAE ED-76/RTCA DO-200A may be also used for the demonstration of compliance.

GM1 DAT.OR.100(b) Aeronautical data and information

ED Decision 2017/001/R

GENERAL

(a) The full responsibility for the origination and provision of tailored data and its subsequent updates, as required, should lie with the aircraft operator.

(b) The origination and provision of tailored data by an aircraft operator or on the aircraft operator's behalf for the purpose of air operation is not part of the DAT provider's scope of activities and this Regulation does not cover its oversight.

(c) The use of tailored data is related and limited to the operational purposes of the aircraft operator that requested the insertion of the tailored data.

DAT.OR.105 Technical and operational competence and capability

Regulation (EU) 2017/373

(a) In addition to ATM/ANS.OR.B.001, the DAT provider shall:

(1) perform the reception, assembly, translation, selection, formatting, distribution and/or integration of aeronautical data and information that is released by aeronautical data source provider(s) into aeronautical databases for certified aircraft application/equipment under the applicable requirements. The type 2 DAT provider shall ensure that the DQRs are compatible with the intended use of the certified aircraft application/equipment through an appropriate arrangement with the specific equipment design approval holder or an applicant for an approval of that specific design;

(2) issue a statement of conformity that the aeronautical databases it has produced are produced in accordance with this Regulation and the applicable industry standards;

(3) provide assistance to the equipment design approval holder in dealing with any continuing airworthiness actions that are related to the aeronautical databases that have been produced.

(b) For release of databases, the accountable manager shall nominate attesting staff identified in point DAT.TR.100(b) and allocate their responsibilities in an independent manner to attest through the statement of conformity that data meets the DQRs and processes are followed. The ultimate responsibility for the databases release statements signed by the attesting staff shall remain with the accountable manager of the DAT provider.

GM1 DAT.OR.105(a)(1) Technical and operational competence and capability

ED Decision 2017/001/R

AERONAUTICAL DATA SOURCE PROVIDER

Aeronautical data source providers should be considered at least, but are not limited to:

(a) organisations providing authoritative data for the purpose of air navigation (e.g. AIS providers);

(b) the DAT provider itself or another DAT provider;

(c) the aircraft operator(s) for tailored data; and

(d) the aerodrome operator(s), in case the information is not provided in the AIPs.

GM2 DAT.OR.105(a)(1) Technical and operational competence and capability

ED Decision 2017/001/R

DQR COMPATIBILITY

The Type 2 DAT provider should ensure through an appropriate arrangement that the equipment design approval holder or an applicant for an approval of that specific design is responsible for demonstrating (e.g. using system verification tests, sampling checks, etc.) that the DQRs are consistent with the intended function of the equipment.

AMC1 DAT.OR.105(a)(2) Technical and operational competence and capability

ED Decision 2017/001/R

STATEMENT OF CONFORMITY FOR AERONAUTICAL DATABASES

Logo of the DAT provider	**Statement of conformity for aeronautical databases**	
1. DAT provider certificate number:	No …..	
2. Type 1/Type 2* DAT provider: ** delete as appropriate*	Name	
3. Address:	Address	
4. Database identification:	Identification	
5. Database use:	Applications/standards	
6. Deviations:	Deviations	
7. New database release:	8. Additional database release (correction):	
9. Declaration of conformity: [XXX] databases released and distributed are produced in compliance with Regulation (EU) 2017/373		
10. Attesting staff:		
Date:	Name: Name	Signature: Signature
AIRAC cycle/ validity period:		

Information to be entered into the statement of conformity for DAT form:

Field 4: List all the identifications of the databases covered under this release, or make reference to the document listing all the identifications of the released databases.

Field 5:

In case of Type 1 DAT provider, list the standard data formats.

In case of Type 2 DAT provider, list the equipment models and part numbers where compatibility has been demonstrated, or make reference to the document containing equipment models and part numbers where compatibility has been demonstrated.

Field 6: List the deviations or make reference to where the deviation information can be found (e.g. a weblink).

Field 10:Signature of an authorised representative of the applicant.

AMC2 DAT.OR.105(a)(2) Technical and operational competence and capability

ED Decision 2017/001/R

PRODUCING AND UPDATING AERONAUTICAL DATABASES

The processes of producing and updating aeronautical databases should meet the standards specified in EUROCAE ED-76A/RTCA DO-200B 'Standards for Processing Aeronautical Data', dated June 2015. EUROCAE ED-76/RTCA DO-200A may be also used for the demonstration of compliance.

GM1 DAT.OR.105(b) Technical and operational competence and capability

ED Decision 2017/001/R

INDEPENDENCE

A DAT provider should ensure that the attesting staff and the person involved in the database release is not a single person (i.e. the four-eye principle).

DAT.OR.110 Management system

Regulation (EU) 2017/373

In addition to point ATM/ANS.OR.B.005, the DAT provider, as applicable for the type of DAT provision, shall establish and maintain a management system that includes control procedures for:

(a) document issue, approval or change;

(b) DQRs change;

(c) verification that incoming data has been produced in accordance with the applicable standards;

(d) timely update of the data used;

(e) identification and traceability;

(f) processes for reception, assembly, translation, selection, formatting, distribution and/or integration of data into a generic database or database compatible with the specific aircraft application/equipment;

(g) data verification and validation techniques;

(h) identification of tools, including configuration management and tools qualification, as necessary;

(i) handling of errors/deficiencies;

(j) coordination with the aeronautical data source provider(s) and/or DAT provider(s), and with the equipment design approval holder or an applicant for an approval of that specific design when providing type 2 DAT services;

(k) issue of statement of conformity;

(l) controlled distribution of databases to users.

AMC1 DAT.OR.110 Management system

ED Decision 2017/001/R

ISO 9001/EN 9100 CERTIFICATE(S) FOR TYPE 1 DAT PROVIDERS

In reference to ISO 9001/EN 9100 certificates issued by appropriate accredited organisations, please refer to AMC1 ATM/ANS.OR.B.005(a) 'Management system' ISO 9001/EN 9100 CERTIFICATE(S) FOR TYPE 1 DAT PROVIDERS.

AMC2 DAT.OR.110 Management system

ED Decision 2017/001/R

EN 9100 CERTIFICATE FOR TYPE 2 DAT PROVIDERS

In reference to EN 9100 certificate issued by appropriate accredited organisations, please refer to AMC1 ATM/ANS.OR.B.005(a) 'Management system' EN 9100 CERTIFICATE FOR TYPE 2 DAT PROVIDERS.

AMC1 DAT.OR.110(h) Management system

ED Decision 2017/001/R

TOOLS QUALIFICATION

Tools qualification should meet the standards specified in EUROCAE ED-76A/RTCA DO-200B 'Standards for Processing Aeronautical Data', dated June 2015. EUROCAE ED-76/RTCA DO-200A may be also used for the demonstration of compliance.

DAT.OR.115 Record-keeping

Regulation (EU) 2017/373

In addition to ATM/ANS.OR.B.030, the DAT provider shall include in its record-keeping system the elements indicated in DAT.OR.110.

SECTION 2 — SPECIFIC REQUIREMENTS

DAT.OR.200 Reporting requirements

Regulation (EU) 2017/373

(a) The DAT provider shall:

(1) report to the customer and, where applicable, the equipment design approval holder all the cases where aeronautical databases have been released by the DAT provider and have been subsequently identified to have deficiencies and/or errors, thus not meeting the applicable data requirements.;

(2) report to the competent authority the deficiencies and/or errors identified according to point (1), which could lead to an unsafe condition. Such reports shall be made in a form and manner acceptable to the competent authority;

(3) where the certified DAT provider is acting as a supplier to another DAT provider, report also to that other organisation all the cases where it has released aeronautical databases to that organisation and have been subsequently identified to have errors;

(4) report to the aeronautical data source provider instances of erroneous, inconsistent or missing data in the aeronautical source.

(b) The DAT provider shall establish and maintain an internal reporting system in the interest of safety to enable the collection and assessment of reports in order to identify adverse trends or to address deficiencies, and to extract reportable events and actions.

This internal reporting system may be integrated into the management system as required in point ATM/ANS.OR.B.005.

GM1 DAT.OR.200 Reporting requirements

ED Decision 2017/001/R

GENERAL

The DAT provider should notify the competent authority of the following by using the occurrence reporting form:

(a) errors/deficiencies affecting safe operations in an airspace segment/block;

(b) errors/deficiencies with negative impact on safety stemming from a source in a Member State or a functional airspace block (FAB); and

(c) errors/deficiencies with negative impact on safety stemming from erroneous processing of the data or information within the intended aircraft application/equipment.

GM1 DAT.OR.200(b) Reporting requirements

ED Decision 2017/001/R

UNSAFE CONDITION

'Unsafe condition' may be considered as a situation where due to a data error there will be, but is not limited to:

- aircraft deviation from the published procedure;
- erroneous warning (red colour) in the cockpit (e.g. PULL UP, TERRAIN, RWY TOO SHORT);
- pilot workload increase due to presentation of misleading or conflicting data in the primary flight display; and
- malfunction or defect of an indication system at a critical phase of the flight, etc.

SUBPART B — TECHNICAL REQUIREMENTS FOR PROVIDERS OF DATA SERVICES (DAT.TR)

SECTION 1 — GENERAL REQUIREMENTS

DAT.TR.100 Working methods and operating procedures

Regulation (EU) 2017/373

The DAT provider shall:

(a) with regard to all the necessary aeronautical data:

(1) establish DQRs that are agreed upon with the other DAT provider and in the case of a type 2 DAT provider, with the equipment design approval holder or an applicant for an approval of that specific design, to determine the compatibility of these DQRs with the intended use;

(2) use data from an authoritative source(s) and, if required, other aeronautical data verified and validated by the DAT provider itself and/or by other DAT provider(s);

(3) establish a procedure to ensure that the data is correctly processed;

(4) establish and implement processes to ensure that the tailored data provided or requested by an aircraft operator or other DAT provider shall only be distributed to the requester itself; and

(b) with regard to attesting staff that sign the statements of conformity issued under DAT.OR.105(b) ensure that:

(1) the knowledge, background (including other functions in the organisation), and experience of the attesting staff are appropriate to their allocated responsibilities;

(2) it maintains records of all attesting staff which include details of the scope of their authorisation;

(3) attesting staff are provided with evidence of the scope of their authorisation.

AMC1 DAT.TR.100(a)(1) Working methods and operating procedures

ED Decision 2017/001/R

COMPATIBILITY WITH CERTIFIED AIRCRAFT APPLICATION/EQUIPMENT — TYPE 2 DAT PROVIDER

A Type 2 DAT provider should perform tests to ensure that the database works as intended with the application by performing sampling checks on individual data sets (e.g. in a simulation/test bench environment).

AMC1 DAT.TR.100(a)(2) Working methods and operating procedures

ED Decision 2017/001/R

DATA SOURCE

In reference to the 'data source', please refer to AMC1 DAT.OR.100(a) 'Aeronautical data and information'.

GM1 DAT.TR.100(a)(2) Working methods and operating procedures

ED Decision 2017/001/R

DATA EXCHANGE

To support data integrity, the DAT provider may use digital data sets as a preferred means of data exchange.

AMC1 DAT.TR.100(a)(3) Working methods and operating procedures

ED Decision 2017/001/R

DATA PROCESSING

The DAT provider should keep the records for a period of at least 3 years after the end of the validity period of the database unless otherwise specified by other applicable requirements.

GM1 DAT.TR.100(b) Working methods and operating procedures

ED Decision 2017/001/R

SIGNATURE

The attesting staff, authorised by the DAT provider, may sign the statements issued in accordance with DAT.OR.105(b) manually or in a digital manner (e.g. digital signature).

AMC1 DAT.TR.100(b)(1) Working methods and operating procedures

ED Decision 2017/001/R

ATTESTING STAFF

(a) To qualify as attesting staff, appropriate knowledge, background, experience and specific training or assessment established by the DAT provider should be required.

(b) Training should be provided to develop a satisfactory level of knowledge of organisational procedures, processes and products, aviation law, and associated IRs, AMC and GM, relevant to the particular role.

(c) In addition to the general training policy, the DAT provider should define its own standards for training, including qualification standards, for personnel to be identified as attesting staff.

(d) The training should be updated in response to experience gained and technological advancements.

AMC1 DAT.TR.100(b)(2) Working methods and operating procedures

ED Decision 2017/001/R

RECORDS OF ATTESTING STAFF

(a) The following is the minimum information that should be recorded by the DAT provider in respect of each attesting staff member:

(1) name;

(2) general training and standard attained;

(3) specific training and standard attained;

(4) continuation training, if appropriate;

(5) background experience;

(6) scope of the authorisation; and

(7) date of first issue of the authorisation.

(b) The record should be kept in an appropriate format and should be controlled through an internal procedure of the organisation. This procedure could be part of the management system.

(c) The DAT provider should ensure that the number of persons authorised to access the system of personnel data record-keeping is limited and an appropriate access control mechanism is in place.

(d) The attesting staff member should be given access, upon request, to his or her own records.

(e) The DAT provider should keep the record for at least two years after the attesting staff member has ceased employment with the organisation or the withdrawal of the authorisation, whichever occurs first.

GM1 DAT.TR.100(b)(2) Working methods and operating procedures

ED Decision 2017/001/R

RECORDS OF ATTESTING STAFF

Records of the attesting staff may be stored electronically.

AMC1 DAT.TR.100(b)(3) Working methods and operating procedures

ED Decision 2017/001/R

EVIDENCE OF THE SCOPE OF THE ATTESTING STAFF AUTHORISATION

(a) The authorisation document should clearly indicate the scope of the authorisation to allow attesting staff and any other authorised persons to verify the privileges.

(b) Attesting staff should make the authorisation document available to the competent authority upon request.

DAT.TR.105 Required interfaces

Regulation (EU) 2017/373

The DAT provider shall ensure the necessary formal interfaces with:

(a) aeronautical data source(s) and/or other DAT providers;

(b) the equipment design approval holder for type 2 DAT provision, or an applicant for an approval of that specific design;

(c) aircraft operators, as applicable.

AMC1 DAT.TR.105(a) Required interfaces

ED Decision 2017/001/R

INTERFACES WITH THE AERONAUTICAL DATA SOURCE AND/OR OTHER DAT PROVIDERS

(a) The DAT provider should demonstrate that formal interfaces with aeronautical data sources or other DAT providers are implemented. Procedures should be established to communicate instances of erroneous, inconsistent or missing data to such providers and monitor that timely and effective responses are received.

(b) Where resolution and correction cannot be obtained for data that has been called into question, the DAT provider's procedures for dealing with this situation should ensure that the DAT provider communicates the alteration or removal of data which the aeronautical data source and/or other DAT provider has not concurred with or resolved. The DAT provider's procedures should confirm that effective controls are in place to ensure that an unsafe product is not released and that such concerns are communicated to customers in accordance with the requirements laid down in DAT.OR.200.

AMC1 DAT.TR.105(b) Required interfaces

ED Decision 2017/001/R

INTERFACES WITH THE AIRCRAFT EQUIPMENT DESIGN APPROVAL HOLDER FOR TYPE 2 DAT PROVISION

The DAT provider should demonstrate that formal interfaces exist with the equipment design approval holder. In particular, the DAT provider's procedures should stipulate that the equipment design approval holder communicates and responds to issues and constraints concerning compatibility/eligibility for installation between their equipment and the databases of the DAT provider.

AMC1 DAT.TR.105(c) Required interfaces

ED Decision 2017/001/R

INTERFACES WITH AIRCRAFT OPERATORS — TYPE 2 DAT PROVIDERS

The Type 2 DAT provider should demonstrate that a formal interface with aircraft operators is in place to confirm that operators' requests are clearly defined and subject to review.

ANNEX VIII — PART-CNS

SPECIFIC REQUIREMENTS FOR PROVIDERS OF COMMUNICATION, NAVIGATION, OR SURVEILLANCE SERVICES

SUBPART A — ADDITIONAL ORGANISATION REQUIREMENTS FOR PROVIDERS OF COMMUNICATION, NAVIGATION, OR SURVEILLANCE SERVICES (CNS.OR)

SECTION 1 — GENERAL REQUIREMENTS

CNS.OR.100 Technical and operational competence and capability

Regulation (EU) 2017/373

(a) A communication, navigation or surveillance services provider shall ensure the availability, continuity, accuracy and integrity of their services.

(b) A communication, navigation or surveillance services provider shall confirm the quality level of the services they are providing, and shall demonstrate that their equipment is regularly maintained and, where required, calibrated.

SUBPART B — TECHNICAL REQUIREMENTS FOR PROVIDERS OF COMMUNICATION, NAVIGATION OR SURVEILLANCE SERVICES (CNS.TR)

SECTION 1 — GENERAL REQUIREMENTS

CNS.TR.100 Working methods and operating procedures for providers of communication, navigation or surveillance services

Regulation (EU) 2017/373

A communication, navigation or surveillance services provider shall be able to demonstrate that its working methods and operating procedures are compliant with the standards of Annex 10 to the Chicago Convention on aeronautical telecommunications in the following versions as far as they are relevant to the provision of communication, navigation or surveillance services in the airspace concerned:

(a) Volume I on radio navigation aids in its 6th edition of July 2006, including all amendments up to and including No 89;

(b) Volume II on communication procedures, including those with PANS status in its 6th edition of October 2001, including all amendments up to and including No 89;

(c) Volume III on communications systems in its 2nd edition of July 2007, including all amendments up to and including No 89;

(d) Volume IV on surveillance radar and collision avoidance systems in its 4th edition of July 2007, including all amendments up to and including No 89;

(e) Volume V on aeronautical radio frequency spectrum utilisation in its 3rd edition of July 2013, including all amendments up to and including No 89.

ACCEPTABLE MEANS OF COMPLIANCE (AMC) AND GUIDANCE MATERIAL (GM) TO PART-CNS SPECIFIC REQUIREMENTS FOR PROVIDERS OF COMMUNICATION, NAVIGATION, OR SURVEILLANCE SERVICES

Reserved

ANNEX IX — PART-ATFM

SPECIFIC REQUIREMENTS FOR PROVIDERS OF AIR TRAFFIC FLOW MANAGEMENT

TECHNICAL REQUIREMENTS FOR PROVIDERS OF AIR TRAFFIC FLOW MANAGEMENT (ATFM.TR)

SECTION 1 — GENERAL REQUIREMENTS

ATFM.TR.100 Working methods and operating procedures for providers of air traffic flow management

Regulation (EU) 2017/373

An air traffic flow management provider shall be able to demonstrate that its working methods and operating procedures are compliant with Commission Regulations (EU) No 255/2010[1] and (EU) No 677/2011.

[1] Commission Regulation (EU) No 255/2010 of 25 March 2010 laying down common rules on air traffic flow management (OJ L 80, 26.3.2010, p. 10).

ACCEPTABLE MEANS OF COMPLIANCE (AMC) AND GUIDANCE MATERIAL (GM) TO PART-ATFM

Reserved

ANNEX X — PART-ASM

SPECIFIC REQUIREMENTS FOR PROVIDERS OF AIRSPACE MANAGEMENT

TECHNICAL REQUIREMENTS FOR PROVIDERS OF AIRSPACE MANAGEMENT (ASM.TR)

SECTION 1 — GENERAL REQUIREMENTS

ASM.TR.100 Working methods and operating procedures for providers of airspace management

Regulation (EU) 2017/373

An airspace management provider shall be able to demonstrate that its working methods and operating procedures are compliant with Commission Regulations (EC) No 2150/2005[1] and (EU) No 677/2011.

[1] Commission Regulation (EC) No 2150/2005 of 23 December 2005 laying down common rules for the flexible use of airspace (OJ L 342, 24.12.2005, p. 20).

ACCEPTABLE MEANS OF COMPLIANCE (AMC) AND GUIDANCE MATERIAL (GM) TO PART-ASM SPECIFIC REQUIREMENTS FOR PROVIDERS OF AIRSPACE MANAGEMENT

Reserved

ANNEX XI — PART-ASD

SPECIFIC REQUIREMENTS FOR PROVIDERS OF PROCEDURE DESIGN

ACCEPTABLE MEANS OF COMPLIANCE (AMC) AND GUIDANCE MATERIAL (GM) TO PART-ASD SPECIFIC REQUIREMENTS FOR PROVIDERS OF FLIGHT PROCEDURE DESIGN

Reserved

ANNEX XII — PART-NM

SPECIFIC REQUIREMENTS FOR THE NETWORK MANAGER

TECHNICAL REQUIREMENTS FOR THE NETWORK MANAGER (NM.TR)

SECTION 1 — GENERAL REQUIREMENTS

NM.TR.100 Working methods and operating procedures for the Network Manager

Regulation (EU) 2017/373

The Network Manager shall be able to demonstrate that its working methods and operating procedures are compliant with other Union legislation and in particular with Regulation (EU) No 255/2010 and (EU) No 677/2011.

ACCEPTABLE MEANS OF COMPLIANCE (AMC) AND GUIDANCE MATERIAL (GM) TO PART-NM SPECIFIC REQUIREMENTS FOR THE NETWORK MANAGER

Reserved

ANNEX XIII — PART-PERS

REQUIREMENTS FOR SERVICE PROVIDERS CONCERNING PERSONNEL TRAINING AND COMPETENCE ASSESSMENT

SUBPART A —AIR TRAFFIC SAFETY ELECTRONIC PERSONNEL

SECTION 1 — GENERAL REQUIREMENTS

ATSEP.OR.100 Scope

Regulation (EU) 2017/373

(a) This Subpart establishes the requirements to be met by the service provider with respect to the training and the competence assessment of air traffic safety electronics personnel (ATSEP).

(b) For the service providers applying for a limited certificate in accordance with points (a) and (b) of point ATM/ANS.OR.A.010 and/or declaring its activities in accordance with point ATM/ANS.OR.A.015, the minimum requirements to be met with respect to the training and the competence assessment of ATSEP may be determined by the competent authority. Those minimum requirements shall be based on qualification, experience and recent experience, to maintain specific equipment or types of equipment and ensuring equivalent level of safety.

GM1 ATSEP.OR.100 Scope

ED Decision 2017/001/R

GENERAL

Whilst it is acknowledged that 'power supply' and 'air conditioning' systems and equipment that can be critical elements of the aviation safety chain and that personnel should, therefore, be appropriately trained in those areas, it is not considered that this training should fall within the scope of the ATSEP training provisions. In general, ATSEP do not work on these systems, but rather control and manage the release of power and air conditioning systems, to and from operational service. In this situation, the person does not have, and is not expected to have, extensive knowledge of the aviation environment to provide the required service. Consequently, the vast majority of the Initial Training objectives would not be applicable to a power engineer.

ATSEP.OR.105 Training and competence assessment programme

Regulation (EU) 2017/343

In accordance with point ATM/ANS.OR.B.005(a)(6), the service provider employing ATSEP shall establish a training and competence assessment programme to cover the duties and responsibilities to be performed by ATSEP.

When ATSEP are employed by a contracted organisation, the service provider shall ensure that those ATSEP have received the applicable training and competences foreseen in this Subpart.

GM1 ATSEP.OR.105 Training and competence assessment programme

ED Decision 2017/001/R

GENERAL

The training and competence assessment programme should include:

(a) the training policy;

(b) the description of all training activities and the interrelations between different training activities;

(c) the description of the function/role of the phase/course supervisor, instructors and assessors;

(d) the description of the qualifications of instructional and competence assessment personnel;

(e) the target group of learners;

(f) the description of the minimum qualification of learners or required entry levels ('learner' is the generic term for a person performing a learning activity without any reference to his or her status (ab initio/student/trainee));

(g) the description of knowledge outcome and performance objectives;

(h) the record of supervisory, instructional and competence assessment personnel participating in a course;

(i) the training environment (e.g. infrastructure, equipment, etc.);

(j) the training methodology (e.g. classroom instruction, self-study, computer-based training (CBT), on-the-job training (OJT), etc.);

(k) the training material;

(l) the training schedule;

(m) the competence assessment method (e.g. pre-course, on-training evaluation, post-course, etc.);

(n) the record of individual learners training and competence assessment; and

(o) the feedback mechanisms.

GM2 ATSEP.OR.105 Training and competence assessment programme

ED Decision 2017/001/R

CHANGE OF ORGANISATION

When already qualified and experienced ATSEP move from one service provider to another, the receiving service provider may conduct an analysis and/or competence assessment of their previous training. Any identified training shortcomings, relative to their new duties assignments should be addressed through additional training.

ATSEP.OR.110 Record-keeping

Regulation (EU) 2017/373

In addition to point ATM/ANS.OR.B.030, the service provider employing ATSEP shall maintain records of all the training completed by ATSEP, as well as the competence assessment of ATSEP and make such records available:

(a) on request, to the ATSEP concerned;

(b) on request, and with the agreement of the ATSEP, to the new employer when the ATSEP is employed by a new entity.

ATSEP.OR.115 Language proficiency

Regulation (EU) 2017/373

The service provider shall ensure that ATSEP are proficient in the language(s) required to perform their duties.

AMC1 ATSEP.OR.115 Language proficiency

ED Decision 2017/001/R

LANGUAGE LEVEL

Service providers should determine the level of language proficiency based on the particular ATSEP duties, the safety criticality of the system ATSEP will need to work on, and taking into account the language requirements related to operating instructions, manuals, and the need to communicate across operational boundaries that require a common language.

SECTION 2 — TRAINING REQUIREMENTS

ATSEP.OR.200 Training requirements — General

Regulation (EU) 2017/373

A service provider shall ensure that ATSEP:

(a) have successfully completed:

(1) the basic training as set out in point ATSEP.OR.205;

(2) the qualification training as set out in point ATSEP.OR.210;

(3) the system/equipment rating training as set out in point ATSEP.OR.215;

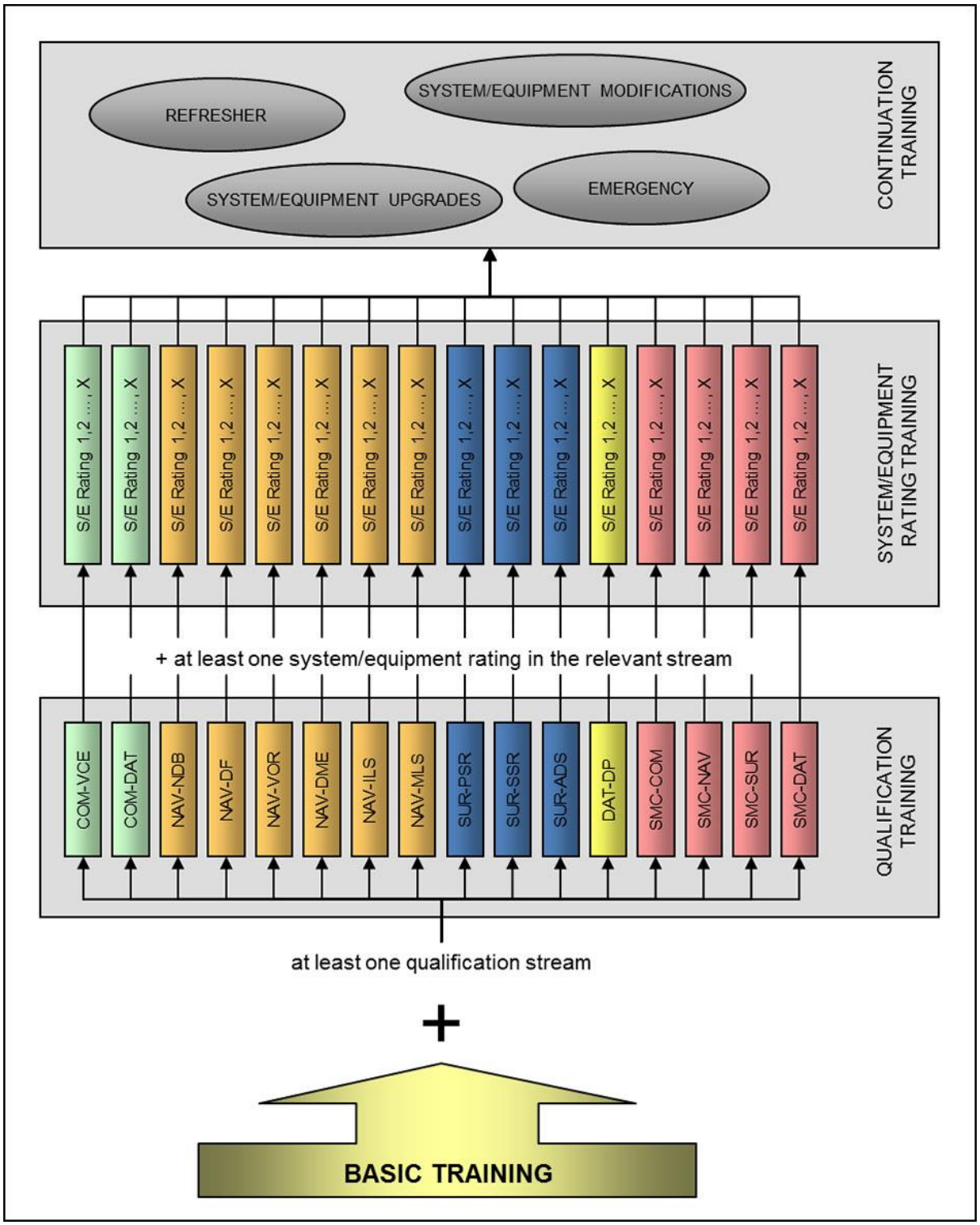
(b) have completed continuation training in accordance with point ATSEP.OR.220.

GM1 ATSEP.OR.200 Training requirements — General

ED Decision 2017/001/R

ATSEP TRAINING PHASES

The following diagram illustrates the phases of ATSEP training:



GM2 ATSEP.OR.200 Training requirements — General

ED Decision 2017/001/R

STRUCTURE SYLLABI

Guidance material on how to read the tables in the appendices contained in this Subpart A of ANNEX XIII is provided in Appendix 5a.

GM1 ATSEP.OR.200(a) Training requirements — General

ED Decision 2017/001/R

BASIC TRAINING

For the purpose of this section, 'basic training' is understood as being training designed to impart fundamental knowledge of the service provider's operational environment.

QUALIFICATION TRAINING

For the purpose of this section, 'qualification training' is understood as being training designed to impart knowledge and skills appropriate to the qualification stream to be pursued in the service provider's operational environment.

SYSTEM/EQUIPMENT RATING TRAINING

For the purpose of this section, 'system/equipment rating training' is understood as being training designed to impart system/equipment-related knowledge and skills leading towards operational competence.

CONTINUATION TRAINING

For the purpose of this section, 'continuation training' is understood as being training designed to maintain and/or augment existing knowledge and skills related to the ATSEP assigned responsibilities and duties.

ATSEP.OR.205 Basic training

Regulation (EU) 2017/373

(a) The basic training of ATSEPs shall comprise:

(1) the subjects, topics, and sub-topics contained in Appendix 1 (Basic training — Shared);

(2) where relevant to service provider's activities, the subjects contained in Appendix 2 (Basic training — Streams).

(b) A service provider may determine the most suitable educational requirements for its candidate ATSEP and, consequently, adapt the number and/or level of subjects, topics or sub-topics referred to in point (a) where relevant.

GM1 ATSEP.OR.205 Basic training

ED Decision 2017/001/R

MINIMUM TRAINING

The basic training contained within the requirement is the minimum training that needs to be followed by all who aim at becoming ATSEP. However, service providers may decide to add additional subjects or topics that may be specific to their national or local environment.

COMPOSITION OF COURSES

Basic training may be provided as a stand-alone course or as part of a larger initial training course (i.e. basic plus qualification training).

AMC1 ATSEP.OR.205(a) Basic training

ED Decision 2017/001/R

GENERAL

The subjects, topics, and sub-topics should be tailored to:

(a) the responsibility of the ATSEP regarding the service provider's activities; and

(b) prior experience and education of the candidate ATSEP.

AMC1 ATSEP.OR.205(a)(1) Basic training

ED Decision 2017/001/R

SHARED

The objectives contained in Appendix 1a to this AMC should be included in the basic training course.

AMC1 ATSEP.OR.205(a)(2) Basic training

ED Decision 2017/001/R

STREAMS

The topics, sub-topics and objectives contained in Appendix 2a to this AMC should be included in the basic training course.

GM1 ATSEP.OR.205(b) Basic training

ED Decision 2017/001/R

ENTRY LEVEL

In some instances, only a limited number of training objectives will need to be taught to learners ATSEP. This is usually the case when the entry level of learners includes some form of previous qualification (e.g. engineering degree or diploma). In this case, the length of training and the number of objectives may be less than that of a course directed to learners who have little or no engineering or technical qualifications. If no engineering or technical qualifications are required prior to starting the basic training, then it may be necessary to include additional objectives in the training that will prepare learners to deal with the basic training.

ATSEP.OR.210 Qualification training

Regulation (EU) 2017/373

The qualification training of ATSEPs shall comprise:

(a) the subjects, topics, and sub-topics contained in Appendix 3 (Qualification training — Shared);

(b) where relevant to its activities, at least one of the qualification streams, contained in Appendix 4 (Qualification training — Streams).

AMC1 ATSEP.OR.210 Qualification training

ED Decision 2017/001/R

GENERAL

The subjects, topics, and sub-topics should be tailored to:

(a) the responsibility of the ATSEP regarding the service provider's activities; and

(b) prior experience and education of the candidate ATSEP.

AMC2 ATSEP.OR.210 Qualification training

ED Decision 2017/001/R

SHARED

The objectives contained in Appendix 3a to this AMC should be included in the qualification training course.

GM1 ATSEP.OR.210 Qualification training

ED Decision 2017/001/R

MINIMUM TRAINING

The qualification training contained within the requirement is the minimum training that needs to be followed by all who aim at becoming ATSEP. However, service providers may decide to add additional subjects or topics that may be specific to their national or local environment.

COMPOSITION OF COURSES

Qualification training may be provided as (a) stand-alone course(s) or as part of a larger course.

GM2 ATSEP.OR.210 Qualification training

ED Decision 2017/001/R

FLEXIBILITY

Service providers may choose to add content to a qualification stream to tailor the training to meet the needs of the individual organisation.

AMC1 ATSEP.OR.210(a) Qualification training

ED Decision 2017/001/R

STREAMS

The objectives contained in Appendix 4a to this AMC should be included in the qualification training course.

GM1 ATSEP.OR.210(b) Qualification training

ED Decision 2017/001/R

STREAMS

For the purpose of this section, 'streams' is understood as being a cluster of training objectives that support a particular area of work.

GM2 ATSEP.OR.210(b) Qualification training

ED Decision 2017/001/R

SYSTEM MONITORING AND CONTROL (SMC)

(a) There are two recognised routes to achieve SMC competence. Organisations may choose which route is most appropriate for their environment.

(b) Both SMC competence routes may be used by individuals and/or service providers at different times during their careers.

(c) In some organisations, SMC of operational system and equipment tasks are performed after the initial competence in a stream or collection of streams that make up a domain (e.g. the Communication domain comprises the COMMUNICATION-VOICE and COMMUNICATION-DATA streams) has been achieved and appropriate SMC development training has been completed. This route is considered to be the development route to SMC competence. The objectives contained within the four qualification training SMC stream(s) may be completed as part of this development training.

(d) The alternative option, used by some organisations, is to provide training for SMC duties directly after basic training. This is based on an arrangement where SMC operators perform level A tasks. If level B tasks are required, these are performed under supervision or are delegated to appropriately qualified personnel. This route is considered to be the direct route to SMC competence, and the four qualification training streams relating to SMC apply, such as, for instance, SMC Communication, SMC Navigation, SMC Surveillance and/or SMC Data. To start S/E rating training on level A tasks for the monitored and/or controlled S/E, no additional qualification training stream (e.g. QUAL NAV-VOR) is required because the relevant information is contained in the related SMC qualification training stream(s) already.

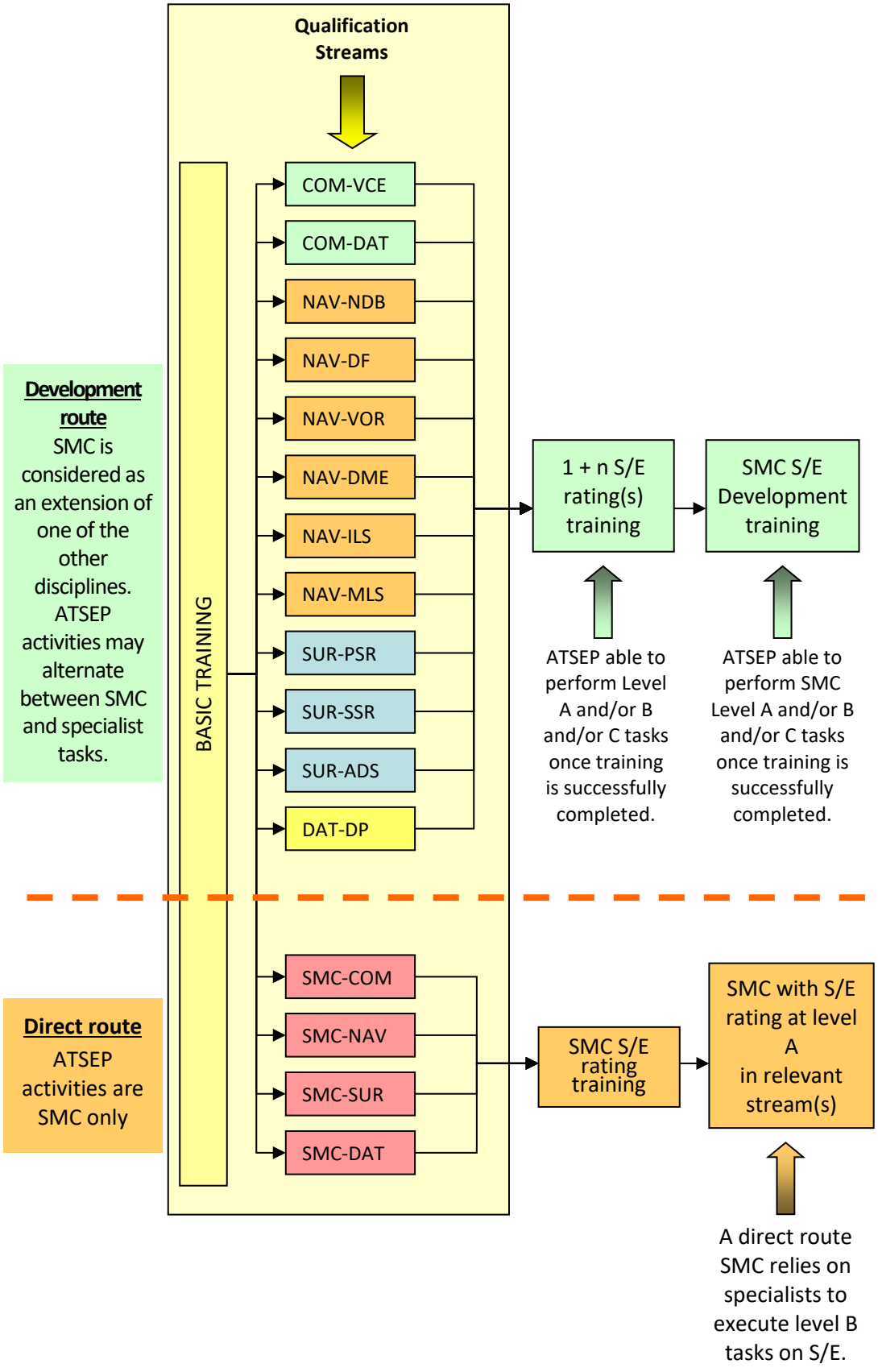
(e) Level tasks represent the categorisation by complexity, knowledge, skills and operational impact. Three categories will usually suffice, but could be further subdivided for highly complex or diverse systems:

(1) Level A tasks: Level A maintenance tasks are primarily associated with immediate service restoration or reconfiguration (‘front-panel level’). They are appropriate for personnel that have been trained to understand the elements of an equipment or system(s), their interrelationships and functional purpose, but do not require in-depth knowledge of these elements.

(2) Level B tasks: Level B maintenance tasks involve in-depth fault analysis at the system/equipment level (‘functional level’). They are usually carried out by personnel that have been trained for the more complicated maintenance tasks on the equipment/system.

(3) Level C tasks: Level C maintenance tasks involve the detailed diagnosis of a software problem, of a faulty Line Replacement Unit (LRU), Printed Circuit Board (PCB) or module (‘component level’). They usually require the use of automated test equipment at a suitable location and are usually carried out by personnel that have been trained in detailed fault diagnosis and repair techniques. If a Level C task is carried out in an offline environment (e.g. a workshop), it is not mandatory that the personnel carrying out this task is trained as ATSEP. However, an organisation may choose to train that personnel as ATSEP.

(f) The diagram below illustrates the SMC competence routes.


Qualification Streams
BASIC TRAINING
COM-VCE
COM-DAT
NAV-NDB
NAV-DF
NAV-VOR
NAV-DME
NAV-ILS
NAV-MLS
SUR-PSR
SUR-SSR
SUR-ADS
DAT-DP
SMC-COM
SMC-NAV
SMC-SUR
SMC-DAT
Development route
SMC is considered as an extension of one of the other disciplines. ATSEP activities may alternate between SMC and specialist tasks.
Direct route
ATSEP activities are SMC only
1 + n S/E rating(s) training
SMC S/E Development training
ATSEP able to perform Level A and/or B and/or C tasks once training is successfully completed.
ATSEP able to perform SMC Level A and/or B and/or C tasks once training is successfully completed.
SMC S/E rating training
SMC with S/E rating at level A in relevant stream(s)
A direct route SMC relies on specialists to execute level B tasks on S/E.

ATSEP.OR.215 System and equipment rating training

Regulation (EU) 2017/373

(a) The system and equipment rating training of ATSEPs shall be applicable to the duties to be performed and include one or several of the following:

(1) theoretical courses;

(2) practical courses;

(3) on-the-job training.

(b) The system and equipment rating training shall ensure that candidate ATSEP acquire knowledge and skills pertaining to:

(1) the functionality of the system and equipment;

(2) the actual and potential impact of ATSEP actions on the system and equipment;

(3) the impact of the system and equipment on the operational environment.

GM1 ATSEP.OR.215 System and equipment rating training

ED Decision 2017/001/R

SYSTEM AND EQUIPMENT RATING

A system and equipment rating is the authorisation which allows the ATSEP to perform operational tasks on specific system/equipment and may, optionally, include an association with operational site/s, location/s and/or maintenance task levels. The award of this rating follows the successful assessment of operational competence.

The term 'rating' in the definition of 'system/equipment rating training' should not be associated with the definition of 'rating' in Regulation (EC) No 216/2008.

ATSEP.OR.220 Continuation training

Regulation (EU) 2017/373

The continuation training of ATSEPs shall comprise refresher, equipment/systems upgrades and modifications, and/or emergency training.

AMC1 ATSEP.OR.220 Continuation training

ED Decision 2017/001/R

GENERAL

The frequency and duration of continuation training should be determined by taking into account the ATSEP task exposure (recency) as well as the complexity of the operation and of the maintenance of systems.

GM1 ATSEP.OR.220 Continuation training

ED Decision 2017/001/R

REFRESHER TRAINING

(a) For the purpose of this section, 'refresher training' is understood as being training designed to review, reinforce or upgrade existing knowledge and skills (including team skills).

(b) Refresher training may periodically include training to refresh and augment ATSEP team skills. Team skills include but are not limited to communication, negotiation, decision-making, conflict resolution and listening skills.

EMERGENCY TRAINING

(c) 'Emergency training' is understood as being training designed to broaden knowledge, skills, and behaviour in case of emergency, unusual or degraded situation. Most of the training will be site-specific or may make use of incident or accident analysis.

(d) The term 'emergency' is considered as a serious, unexpected and/or potentially dangerous situation requiring immediate action(s), e.g. complete loss of any of the following:

- radar display picture;
- Electronic Flight Progress Strip system;
- main, standby and emergency communications on multiple frequencies due to external interference blocking the radiotelephony channels.

(e) The term 'unusual situation' is considered as a set of circumstances which are neither habitually nor commonly experienced and for which an ATSEP has not developed a practised response.

(f) The term 'degraded situation' is considered as a situation that is the result of a technical system failure or malfunction or a set of circumstances arising from human error or violation of rules affecting the quality of the service provided (i.e. the service continues to be available, even though in a reduced or limited way). For instance, external main supply's failure to a Category III ILS localiser field site cabin or a normally dual channel DME having a fault on one channel.

SECTION 3 — COMPETENCE ASSESSMENT REQUIREMENTS

ATSEP.OR.300 Competence assessment — General

Regulation (EU) 2017/373

A service provider shall ensure that ATSEP:

(a) have been assessed as competent before performing their duties;

(b) are subject to ongoing competence assessment in accordance with point ATSEP.OR.305.

GM1 ATSEP.OR.300(a) Competence assessment — General

ED Decision 2017/001/R

MEANING

'Competence' is understood as a situation where ATSEP possess the required level of knowledge, technical and behavioural skills and experience, and language proficiency when required, in order to be authorised to perform duties on the system and equipment they are competent to work on.

ATSEP.OR.305 Assessment of initial and ongoing competence

Regulation (EU) 2017/373

A service provider employing ATSEP shall:

(a) establish, implement and document processes for:

(1) assessing the initial and ongoing competence of ATSEP;

(2) addressing a failure or degradation of ATSEP competence, including an appeal process;

(3) ensuring the supervision of personnel who have not been assessed as competent;

(b) define the following criteria against which initial and ongoing competence shall be assessed:

(1) technical skills;

(2) behavioural skills;

(3) knowledge.

GM1 ATSEP.OR.305(a)(1) Assessment of initial and ongoing competence

ED Decision 2017/001/R

INITIAL COMPETENCE ASSESSMENT

If the competence assessment is done by the same person training the ATSEP learner during the S/E training phase, the service provider should have in place a process to reduce biases.

GM1 ATSEP.OR.305(a)(3) Assessment of initial and ongoing competence

ED Decision 2017/001/R

SUPERVISION OF NON-COMPETENT PERSONNEL

Supervision of personnel for lack of competence may be necessary due to a number of circumstances including but not restricted to:

(a) the ATSEP still being trained;

(b) the ATSEP undergoing remedial training due to loss of competence; and

(c) the ATSEP having lost competence due to extended absence from tasks that require competence.

GM1 ATSEP.OR.305(b)(2) Assessment of initial and ongoing competence

ED Decision 2017/001/R

BEHAVIOURAL SKILLS

Behavioural skills are non-technical skills and attitudes that ATSEP need to perform effectively. Examples of potential behavioural skills criteria related to initial and ongoing competence are:

(a) cooperation within a team;

(b) attitudes towards safety and security;

(c) flexibility;

(d) analytical thinking; and

(e) ability to communicate effectively.

SECTION 4 — INSTRUCTORS AND ASSESSORS REQUIREMENTS

ATSEP.OR.400 ATSEP training instructors

Regulation (EU) 2017/373

A service provider employing ATSEP shall ensure that:

(a) ATSEP training instructors are suitably experienced in the field where instruction is to be given;

(b) on-the-job training instructors have successfully completed an on-the-job-training course and have the skills to intervene in instances where safety may be compromised during the training.

AMC1 ATSEP.OR.400 ATSEP training instructors

ED Decision 2017/001/R

EXPERIENCE

To be considered suitably experienced, technical skills assessors should:

(a) have clear understanding of the service provider's assessment process and procedures applicable;

(b) have clear understanding of the performance required of the ATSEP during the assessment and/or on-going assessment;

(c) have the ability to evaluate, in an objective and independent manner, whether the ATSEP has achieved or is maintaining the level of performance required;

(d) have the ability to assess and, if required, act when intervention is necessary to ensure that safety is not compromised;

(e) have the ability to analyse and accurately describe and/or record strengths and weaknesses of an ATSEP performance; and

(f) use appropriate interpersonal and communication skills to brief and debrief an ATSEP, if required.

ATSEP.OR.405 Technical skills assessors

Regulation (EU) 2017/373

A service provider employing ATSEP shall ensure that technical skills assessors have successfully completed an assessor course and are suitably experienced to assess the criteria defined in point ATSEP.OR.305(b).

GM1 ATSEP.OR.405 Technical skills assessors

ED Decision 2017/001/R

GENERAL

The technical skills assessor is the person who is considered suitable to determine whether an ATSEP is technically competent to operate, maintain, release from and return into operations systems that are necessary for the provision of services. This assessment may be in any context where assessment of technical skills is required, e.g. assessment of first competence, ongoing competence.

GM2 ATSEP.OR.405 Technical skills assessors

ED Decision 2017/001/R

ASSESSMENT RESPONSIBILITIES

(a) Where a technical skills assessor works regularly with an ATSEP, he or she is required to assess the ATSEP. Continuous assessment may be appropriate, i.e. assessment may be achieved by the technical assessor observing the standard of an ATSEP's work on a continuous basis as he or she works with the ATSEP during normal operational duties.

(b) If the appointed technical assessor also acts as line manager to the individual ATSEP, the service provider should have in place a process to reduce biases. Responsibility for determining competence lies with the person having the safety accountability for the ATSEP function.

APPENDICES TO ANNEX XIII

Appendix 1 — Basic training — Shared

Regulation (EU) 2017/373

Subject 1: INDUCTION

TOPIC 1 BASIND — Induction

Sub-topic 1.1 — Training and Assessment Overview

Sub-topic 1.2 — National Organisation

Sub-topic 1.3 — Workplace

Sub-topic 1.4 — ATSEP role

Sub-topic 1.5 — European/Worldwide Dimension

Sub-topic 1.6 — International Standards and Recommended Practices

Sub-topic 1.7 — Data Security

Sub-topic 1.8 — Quality Management

Sub-topic 1.9 — Safety Management System

Sub-topic 1.10 — Health and Safety

Subject 2: AIR TRAFFIC FAMILIARISATION

TOPIC 1 BASATF — Air Traffic Familiarisation

Sub-topic 1.1 — Air Traffic Management

Sub-topic 1.2 — Air Traffic Control

Sub-topic 1.3 — Ground-based Safety Nets

Sub-topic 1.4 — Air Traffic Control Tools and Monitoring Aids

Sub-topic 1.5 — Familiarisation

Appendix 1a — Basic training — Shared

ED Decision 2017/001/R

The subjects, topics and sub-topics are repeated in this AMC for the convenience of the reader and do not form a part of it.

SUBJECT 1: INDUCTION

TOPIC 1: INDUCTION

SUB-TOPIC 1.1: Training and assessment overview

1.1.1	Describe the training scheme and progression towards ATSEP competence	2	Initial (basic and qualification), S/E rating and continuation training. Course aims, objectives, and topics.
1.1.2	State the assessment requirements, procedures, and methods	1	—

SUB-TOPIC 1.2: National organisation

1.2.1	Describe the organisational structure, purpose and functions of the service provider(s) and regulatory structures	2	e.g. headquarters, control centres, training facilities, airports, outstations, civil/military interfaces, regulatory interfaces.
1.2.2	Describe the structure and functions of the major departments within the service provider	2	e.g. organisational handbook (plans, concepts and structure, finance model).
1.2.3	State appropriate accountabilities and responsibilities of the service provider(s) and competent authority	1	—

SUB-TOPIC 1.3: Workplace

1.3.1	State the role of trade unions and professional organisations	1	e.g. international, European, national, local level
1.3.2	Consider security of site facilities and personnel against unlawful interference	2	Environmental, physical and information security measures, employee vetting, and reference checks.
1.3.3	Describe actions when suspecting a security breach	2	e.g. inform police, security agencies and managers. Security manual and/or contingency plan.

SUB-TOPIC 1.4: ATSEP role

1.4.1	Describe the key responsibilities of an ATSEP	2	Initial (basic and qualification), S/E rating and continuation training. Course aims, objectives, and topics.

SUB-TOPIC 1.5: European/worldwide dimension

1.5.1	Explain the relationship between States and its relevance to ATM operations	2	e.g. harmonisation, flow management, bilateral agreement, sharing of ATM relevant data, major studies, research programmes, and policy documents.
1.5.2	Define the regulatory framework of international and national ATM	1	e.g. ICAO, European and national concepts, responsibilities.
1.5.3	State the purpose of a range of international bodies	1	ICAO, EU, EASA e.g. ECAC, EUROCONTROL, FAA RTCA, EUROCAE

SUB-TOPIC 1.6: International Standards and Recommended Practices

1.6.1	Explain how the regulatory environment of ICAO notifies and implements legislation	2	Annexes, SARPs
1.6.2	State which major/key ATM engineering ‘standards’ and ‘practices’ are applicable	1	e.g. ICAO Annex 10, ICAO Doc 8071, ICAO Doc 9426-3, available EUROCONTROL standards, guidance material on reliability, maintainability and availability.

SUB-TOPIC 1.7: Data security

1.7.1	Explain the importance of ATM security	2	
1.7.2	Describe the security of operational data	2	Secure, restricted access by authorised personnel.
1.7.3	Explain security policies and practices for information and data	2	Backup, storing, hacking, confidentiality, copyright.
1.7.4	Describe the possible external interventions which may interrupt or corrupt ATM services	2	Introduction of software viruses, illegal broadcasts, jamming, spoofing.

SUB-TOPIC 1.8: Quality management

1.8.1	Explain the need for quality management	2	e.g. ISO, EFQM
1.8.2	Explain the need for configuration management	2	Importance for safe operations e.g. S/E build state, software adaption/version

SUB-TOPIC 1.9: Safety Management System

1.9.1	Explain why there is a need for high-level safety requirements for ATM/ANS activities	2	Safety policy and rules, system safety cases, system safety requirements.

SUB-TOPIC 1.10: Health and safety

1.10.1	Explain personal safety responsibilities in the work environment	2	Safety statement, first aid, rules about climbing
1.10.2	Explain potential hazards to health and safety generated by equipment, or contained within the work environment	2	e.g. health consequences of electric shock and static discharges, precautions with chemical products (batteries), mechanical hazards (rotating machinery/antennas), toxic materials (beryllium), biological hazards, faulty earthing
1.10.3	Describe fire safety and first-aid regulations and practices	2	Requirements and rules e.g. standards
1.10.4	State any applicable legal requirements and safety rules	1	National, international regulations e.g. for working on power supply and/or air conditioning
1.10.5	Describe the main features and uses of the different types of fire detectors and extinguishers	2	e.g. VESDA, Type A, B, C, D extinguishers

SUBJECT 2: AIR TRAFFIC FAMILIARISATION

TOPIC 1: AIR TRAFFIC FAMILIARISATION

SUB-TOPIC 1.1: Air Traffic Management

1.1.1	Define Air Traffic Management	1	ICAO, EU regulations
1.1.2	Describe operational ATM functions	2	ATFCM, ATS, ASM
1.1.3	Describe ATM concepts and associated terminology	2	e.g. concepts: FUA, free flight, gate-to-gate, performance-based ATM operations (PBN, RCP), operational concepts (ICAO, EUROCONTROL, SESAR).
1.1.4	Explain the operational importance of technical services required for ATM	2	e.g. Regulation (EC) No 552/2004

1.1.5	State future developments in systems and/or ATM/ANS practices which may impact on services provided	1	e.g. data link, satellite-based navigation, gate-to-gate (CDM), ATC tools, continuous approach, 4D trajectory, business trajectory, SWIM, NOP, SESAR (UDPP, modes of separation), ASAS.
1.1.6	List the standard units of measurement used in aviation	1	Speed, distance, vertical distance, time, direction, pressure, temperature.

SUB-TOPIC 1.2: Air Traffic Control

1.2.1	Define airspace organisation	1	ICAO Annex 11, Regulation (EU) No 923/2012 e.g. FIR, UTA, TMA, CTR, ATS routes
1.2.2	Describe commonly used airspace terminologies and concepts	2	e.g. sectorisation, identification of ATS routes, restricted airspace, significant points.
1.2.3	State the general organisation of aerodromes	1	e.g. obstacle limitation surfaces, different departure and arrival trajectories, approach and landing categories, operational status of radio navigation aids.
1.2.4	State the purpose of ATC	1	ICAO Doc 4444
1.2.5	State the organisation of ATC services	1	ICAO Doc 4444

SUB-TOPIC 1.3: Ground-based Safety nets

1.3.1	Describe the purpose of ground-based safety nets	2	e.g. STCA, MSAW, APW, runway incursion alerts

SUB-TOPIC 1.4: Air Traffic Control tools and monitoring aids

1.4.1	Explain the main characteristics and use of ATC support and monitoring tools	2	e.g. MTCD, sequencing and metering tools (AMAN, DMAN), A-SMGCS, CLAM, RAM, CORA

SUB-TOPIC 1.5: Familiarisation

1.5.1	Take account of ATC tasks	2	e.g. simulation, role play, PC, Part Task Trainer, observations in the operational environment
1.5.2	Explain the need for good communication, coordination and cooperation between operational staff	1	e.g. handovers, MIL/CIV, planner/tactical, SV Tech (SMC) and SV ATCO, site visit(s) to ATC units
1.5.3	Consider the purpose, function and role of various operational stations in respect of ATM-related operations	2	Site visit(s) to ATC units e.g. meteorological services providers, remote sites, airport operations
1.5.4	Define the phases of flight	1	Take-off, climb, cruise, descent and initial approach, final approach and landing
1.5.5	Recognise the cockpit environment and associated equipment, in relation to ATC	1	Relevant pilot HMI e.g. familiarisation flight or cockpit simulator training (where practicable), antenna
1.5.6	Define airborne collision avoidance systems	1	ACAS, EGPWS e.g. TCAS

Appendix 2 — Basic training — Streams

Regulation (EU) 2017/373

Subject 3: AERONAUTICAL INFORMATION SERVICES

Subject 4: METEOROLOGY

Subject 5: COMMUNICATION

Subject 6: NAVIGATION

Subject 7: SURVEILLANCE

Subject 8: DATA PROCESSING

Subject 9: SYSTEM MONITORING & SYSTEM CONTROL

Subject 10: MAINTENANCE PROCEDURES

Appendix 2a — Basic training — Streams

ED Decision 2017/001/R

The Subjects are repeated in this Appendix for the convenience of the reader and do not form a part of it.

SUBJECT 3: AERONAUTICAL INFORMATION SERVICES (AIS)

TOPIC 1: AERONAUTICAL INFORMATION SERVICES

SUB-TOPIC 1.1: Aeronautical Information Services

1.1.1	State the organisation of the AIS	1	—
1.1.2	Define the AIP	1	e.g. contents of AIP, AIC and types of publication: AIRAC, non-AIRAC, data collection and preparation, data format, distribution channels, supporting systems and tools
1.1.3	Define the aeronautical charting service	1	Types of aeronautical charts, operational use of charts, supporting systems and tools
1.1.4	Define the NOTAM services	1	—
1.1.5	Define the ATS Reporting Office	1	e.g. purpose of flight plans and other ATS messages, types of flight plans (FPL and RPL), contents of flight plans and other ATS messages, distribution of flight plans and other ATS messages, supporting systems and tools
1.1.6	Define the European AIS Database	1	e.g. central single source, validation, redundancy, EAD structure
1.1.7	Define procedures for providing Communications, Navigation and Surveillance (CNS) data	1	Information of a permanent nature, information of a temporary nature, status report of NAVAIDs

SUBJECT 4: METEOROLOGY

TOPIC 1: METEOROLOGY

SUB-TOPIC 1.1: Introduction to meteorology

1.1.1	State the relevance of meteorology in aviation	1	Influence on the operation of aircraft, flying conditions, aerodrome conditions

1.1.2	State the weather prediction and measurement systems available	1	—

SUB-TOPIC 1.2: Impact on aircraft and ATS operation

1.2.1	State the meteorological conditions and their impact on aircraft operations	1	e.g. atmospheric circulation, wind, visibility, temperature/humidity, clouds, precipitation
1.2.2	State the meteorological conditions hazardous to aircraft operations	1	e.g.; turbulence, thunderstorms, icing, microbursts, squall, macro bursts, wind shear, standing water on runways (aquaplaning)
1.2.3	Explain the impact of meteorological conditions and hazards on ATS operations	2	e.g. effects on equipment performance (e.g. temperature inversion, rain density), increased vertical and horizontal separation, low visibility procedures, anticipation of flights not adhering to tracks, diversions, missed approaches
1.2.4	Explain the effects of weather on propagation	2	e.g. anaprop, rain noise, sunspots

SUB-TOPIC 1.3: Meteorological parameters and information

1.3.1	List the main meteorological parameters	1	Wind, visibility, temperature, pressure, humidity
1.3.2	List the most common weather messages and broadcasts used in aviation	1	e.g. ICAO Annex 3 Meteorology messages: TAF, METAR, SNOWTAM Broadcasts: ATIS/flight meteorology broadcast (VOLMET)

SUB-TOPIC 1.4: Meteorological systems

1.4.1	Explain the basic principles of the main meteorological systems in use	2	e.g. weather display and information systems, wind speed (anemometer), wind direction (weather vane), visibility (types of IRVR, forward scatter), temperature probes, pressure (aneroid barometers), humidity, cloud base (laser ceilometers)

SUBJECT 5: COMMUNICATION

TOPIC 1: GENERAL INTRODUCTION

SUB-TOPIC 1.1: Introduction to communications

1.1.1	State the structure of the communication domain	1	Voice communication, data communication
1.1.2	State major substructures of the communication domain	1	Air-ground, ground-ground, air-air communications
1.1.3	State ATS requirements for safe communications	1	Safety, reliability, availability, coverage, QoS, latency
1.1.4	State the aeronautical communication services	1	Mobile, fixed

TOPIC 2: VOICE COMMUNICATION

SUB-TOPIC 2.1: Introduction to voice communications

2.1.1	Describe system architecture	2	—
2.1.2	Explain the purpose, principles and role of voice communication systems in ATS	2	e.g. audio bandwidth, dynamic range, fidelity, routing, switching, lineside/deskside, coverage, communication chain between controller and pilot
2.1.3	Describe the way in which voice communication systems function	2	Analogue/digital comparisons, distortion, harmonics
2.1.4	State methods used to route and switch voice communications	1	e.g. multichannels, multi-users, party lines, VHF/UHF linkage, HF, SELCAL
2.1.5	State how systems interface to produce an integrated service to ATS	1	—
2.1.6	State radio spectrum and frequency allocation constraints and procedures	1	Spectrum, interference sources, commercial allocations, world radio conference, ITU, common aviation position, efficient utilisation of frequency bands, channel spacing
2.1.7	State voice recording systems in use	1	e.g. digital recording equipment, analogue recording
2.1.8	State ICAO and local legal requirements regarding recording and retention of voice communications	1	Regulatory requirements, incident recording and playback, recording equipment
2.1.9	State the purpose of ATIS and VOLMET	1	—

SUB-TOPIC 2.2: Air-ground communication

2.2.1	State the functions and basic operation of routing and switching equipment in use in the ATS environment	1	Voice switching
2.2.2	Describe the purpose and operation of the elements of a communication chain in use in the ATS environment	2	Functionality, emergency systems, transmission/reception, CWP, on-board equipment e.g. channel spacing, antenna switching, CLIMAX, voting systems
2.2.3	State ways of achieving quality of service	1	e.g. importance of coverage and redundancy of equipment, overlapping coverage, backup system, functional redundancy vs element redundancy
2.2.4	Recognise the elements of the CWP that are used for air-ground communication	1	Frequency selection, emergency, station selection, coupling, microphone, headset, loudspeaker, footswitch, PTT
2.2.5	List future developments and techniques which may have an impact on ATS voice communications	1	e.g. CPDLC, VDL Modes 2

SUB-TOPIC 2.3: Ground-ground communication

2.3.1	State the functions and the basic operations of routing and switching equipment in use in ATS environment	1	General architecture
2.3.2	Describe how ground-ground systems interface to provide an integrated service to ATS environment	2	International/national links, ACC interoperability, voice and data integration
2.3.3	Describe the purpose and operation of the elements of a system	2	Functionality, emergency systems, PTT interfaces e.g. MFC and ATS-Qsig, switching, local PABX equipment
2.3.4	Recognise the elements of the CWP used for ground-ground communication	1	Selection, emergency, loudspeaker, headset, microphone
2.3.5	List developments in ground-ground technologies which may impact on ATS voice communication	1	e.g. protocols (TCP/IP, voice-over IP) future development

TOPIC 3: DATA COMMUNICATIONS

SUB-TOPIC 3.1: Introduction to data communications

3.1.1	Explain the purpose, principles and role of data communication systems in ATS	2	e.g. terminology, principles and theory of networks, layering (e.g.: OSI or TCP/IP), data links, LAN, WAN
3.1.2	Define the concept of data transmission	1	e.g. packet switching, protocols, multiplexing, demultiplexing, error detection and correction, routing, switching, hops, cost, bandwidth/speed
3.1.3	Describe the function of various elements of the data systems in use in ATS environment	2	Switch, router, gateways, end systems, redundancy
3.1.4	Define protocols in current use	1	e.g. TCP/IP, X.25, frame relay, asynchronous transfer mode

SUB-TOPIC 3.2: Networks

3.2.1	State ATS requirements for safe data communications	1	Reliability, availability
3.2.2	Describe the different types of networks	2	LAN, WAN, ATN, national network for ATM e.g. satellite-dedicated networks, AFTN
3.2.3	State the functions of a network management system	1	Priorities, rights e.g. SNMP

SUB-TOPIC 3.3: Aviation specific networks, applications and ATM/ANS providers

3.3.1	Name a range of air-ground aviation-related network concepts	12	ATN e.g. Subnetworks: ATN air-ground subnetwork, AMSS, VDL, HFDL Protocols: ACARS Communication service providers: ARINC, SITA, States, LINK16
3.3.2	Name a range of ground-ground aviation-related network concepts	12	ATN, PENS Optional content e.g. Physical networks: PENS, AFTN/CIDIN, RAPNET

			Communication protocols: IP, X.25, ASTERIX, FMTP Communication service providers: SITA, ARINC, national carriers, ANSPs Applications: AMHS, AIDC, OLDI

SUBJECT 6: NAVIGATION

TOPIC 1: INTRODUCTION

SUB-TOPIC 1.1: Purpose and use of navigation

1.1.1	Explain the need for navigation in aviation	2	Positioning, guidance, planning
1.1.2	Characterise navigation methods	2	e.g. historical overview, visual, celestial, electronic (on-board, radio, space-based and relative)

TOPIC 2: THE EARTH

SUB-TOPIC 2.1: Form of the Earth

2.1.1	Name the shape of the Earth	1	Oblate spheroid e.g. earth's parameters
2.1.2	Explain the Earth's properties and their effects	2	East, West, North and South, polar axis, direction of rotation
2.1.3	State the accepted conventions for describing 2D position on a globe	1	Meridians, parallels of latitude, equatorial plane

SUB-TOPIC 2.2: Coordinate systems, direction and distance

2.2.1	State the general principles of reference systems	1	Geoid, reference ellipsoids, WGS 84 Latitude and longitude, undulation
2.2.2	Explain why a global reference system is required for aviation	2	_

SUB-TOPIC 2.3: Earth's magnetism

2.3.1	State the general principles of Earth's magnetism	1	True North, magnetic North — e.g. variation, declination, deviation, inclination

TOPIC 3: NAVIGATIONAL SYSTEM PERFORMANCE

SUB-TOPIC 3.1: Factors affecting electronic navigation performance

3.1.1	State how radio waves propagate	1	Ground, sky, direct
3.1.2	State why the siting of a terrestrial navigation aid is important	1	Multipath, blanking

SUB-TOPIC 3.2: Performance of navigation systems

3.2.1	State the performance of navigation systems	1	Coverage, accuracy, integrity, continuity of service, availability

3.2.2	Explain the need for redundancy in navigation systems	2	Ensuring continuity of service, maintainability, reliability

SUB-TOPIC 3.3: Means of navigation

3.3.1	State the different means of navigation	1	Sole, primary, supplementary

TOPIC 4: NAVIGATION SYSTEMS

SUB-TOPIC 4.1: Terrestrial navigation aids

4.1.1	Explain the basic working principles of electronic positioning	2	Distance measurements (time and phase), angular measurements
4.1.2	Describe ground-based navigation systems	2	NDB, VOR, DME, ILS, DF, MLS e.g. Loran C, MLS, TACAN, marker beacons
4.1.3	Recognise how the navigation information is displayed on the relevant pilot HMI	1	_
4.1.4	Explain the operational use of ground-based navigation systems in the different phases of flight	2	NDB, VOR, DME, ILS, DF, MLS
4.1.5	Recognise the frequency bands used by the ground-based navigation systems	1	_
4.1.6	State the need for calibration	1	Flight calibration, ground-based calibration and/or maintenance

SUB-TOPIC 4.2: On-board navigation systems

4.2.1	State the use of on-board navigation systems	1	e.g. barometric altimetry, radio altimetry, INS/IRS, compass

SUB-TOPIC 4.3: Space-based navigation systems

4.3.1	Explain the basic working principles of satellite positioning	2	GPS e.g. Galileo
4.3.2	Recognise the basic architecture of a core satellite positioning system	1	GPS e.g. Galileo
4.3.3	Recognise the frequency bands used by the space-based navigational systems	1	—
4.3.4	State the benefits of satellite-based navigation	1	Global coverage, accuracy, time dissemination e.g. redundancy, interoperability, single set of avionics
4.3.5	State the current limitations of space-based navigation systems	1	e.g. single frequency, weak signal, ionospheric delay, institutional, military, multipath
4.3.6	State the basic working principles of satellite augmentation	1	e.g. ABAS (RAIM, AAIM), SBAS (WAAS, EGNOS), GBAS (GRAS, S-CAT 1)
4.3.7	State the current implementations of satellite-based navigation systems	1	GPS, GLONASS, GALILEO and augmentations e.g. ABAS, GBAS, SBAS

TOPIC 5: PERFORMANCE-BASED NAVIGATION

SUB-TOPIC 5.1: PBN

5.1.1	Describe the basic principle of area navigation	2	ICAO RNAV definition and PBN concept Conventional and area navigation e.g. navigation computer and FMS functionality
5.1.2	List the navigation applications in use in Europe	1	B-RNAV-5, P-RNAV-1, RNP approaches

SUB-TOPIC 5.2: Future developments

5.2.1	State future navigation developments	21	e.g. 4D-RNAV, free routes, rationalisation plans, advanced RNP1

SUBJECT 7: SURVEILLANCE

TOPIC 1: INTRODUCTION TO SURVEILLANCE

SUB-TOPIC 1.1: Introduction to surveillance

1.1.1	Define surveillance in the context of ATM	1	What (positioning/identification) and why (maintain separation)
1.1.2	Define the various surveillance domains	1	Air-air, ground-air, ground-ground
1.1.3	List the surveillance techniques	1	Non-cooperative, cooperative, dependent, independent techniques
1.1.4	Define the current and emerging surveillance systems in use in ATM	1	Radar technology, ADS technology, multilateration, TIS
1.1.5	Explain the role and the current use of surveillance equipment by ATM	2	Separation, vectoring, data acquisition Detection and ranging, safety nets e.g. weather mapping
1.1.6	State ICAO and any local legal requirements	1	e.g. ICAO Annex 10 Vol. IV
1.1.7	List the main users of surveillance data	1	HMI, safety nets, FDPS, air defence systems, flow management

SUB-TOPIC 1.2: Avionics

1.2.1	State the avionics used for the surveillance in ATM and their interdependencies	1	Transponder, GNSS, data link equipment, ACAS, ATC control panel e.g. FMS
1.2.2	Define the role of TCAS as a safety net	1	e.g. FMS_

SUB-TOPIC 1.3: Primary radar

1.3.1	Describe the need for and the use of primary radar in ATC	2	Non-cooperative detection, improvement of detection and tracking e.g. types of PSR (en-route, terminal, SMR, weather)
1.3.2	Explain the principles of operation, basic elements and overall architecture of a primary radar	2	Detection, range measurement, azimuth indication Doppler shift Antenna system, TX/RX, signal processing, plot extraction, local tracking, data transmission e.g. use of the parameters of the radar equation

1.3.3	State the limitations of primary radar	1	Line of sight, environmental, clutter, no identification of the target, no height information (in case of 2D radar)

SUB-TOPIC 1.4 Secondary radars

1.4.1	Describe needs for and the use of secondary radars in ATC	2	Cooperative detection, ICAO-defined standard, IFF, military and civil modes (include Mode S) and related code protocols, code limitations e.g. identification, SPI, flight level, BDS, specific and emergency codes
1.4.2	Explain the principles of operation, basic elements and overall architecture of a secondary radar	2	SSR, MSSR, Mode S antenna, TX/RX, extractor, tracking processor
1.4.3	State the limitations of secondary radar	1	FRUIT, garbling, ghost reply, code shortage, cooperation by the aircraft needed

SUB-TOPIC 1.5: Surveillance data message format

1.5.1	State the need for harmonisation	1	Surveillance data sharing, interoperability
1.5.2	State the techniques used for transmission of surveillance data	1	e.g. point-to-point, network, microwave, satellite
1.5.3	State main formats in use	1	ASTERIX, etc.

SUB-TOPIC 1.6: Automatic dependent surveillance (ADS)

1.6.1	State surveillance-related FANS concepts and their impact on ATM	1	Sources of aircraft parameters (e.g. FMS outputs), communication mediums Application within oceanic and other non-radar airspace, ATC requirements
1.6.2	Explain the principles of operation, basic elements and overall architecture of ADS-C and ADS-B and the differences between them	2	Advantages/disadvantages, standards, data update rates
1.6.3	State the data link technologies proposed and the current situation of deployment	1	Extended squitter 1 090 MHz e.g. VDL 4, HFDL, UAT, AMSS

SUB-TOPIC 1.7: Weather radar

1.7.1	Define the use of weather radar in ATM	1	e.g. role in adverse weather in dense airspace, antenna, coverage, polarisation, multi-elevation scanning, frequency band

SUB-TOPIC 1.8: Integration of surveillance information

1.8.1	Describe complementary use of different sensors	2	_

SUB-TOPIC 1.9: Multilateration

1.9.1	State the use of MLAT in ATC	1	LAM and WAM
1.9.2	Explain the principles of operation, basic elements and overall architecture of MLAT	12	TDOA principle, hyperboloic positioning, accuracy, transmissions used

SUB-TOPIC 1.10: Airport surface surveillance

1.10.1	State typical ATC requirements	1	e.g. safety (aircraft and mobiles), clear runway, low visibility, collision warnings, displays, mapping, data merging, aircraft identification, ground mobiles
1.10.2	State the current technologies for airport surface surveillance	1	Radar-based and MLAT-based technologies, example layout of airport surveillance infrastructure e.g. other systems (acoustic, vibration, induction loop, video, infrared, GNSS, ADS-B)

SUB-TOPIC 1.11: Display of surveillance information

1.11.1	Recognise surveillance information on a display	1	e.g. PSR and MSSR tracks, position identification, FL, speed vector, RDP and FDP information

SUB-TOPIC 1.12: Analysis Tools

1.12.1	State analysis tools	1	e.g. SASS-C, SASS-S, RAPS

SUBJECT 8: DATA PROCESSING

TOPIC 1: DATA PROCESSING

SUB-TOPIC 1.1: Introduction to data processing

1.1.1	Describe the functions and generic architecture of the systems	2	Generic FDP and SDP overall functional block diagrams
1.1.2	Describe how the systems interface with other systems	2	Surveillance sensors, displays, CFMU, recording, international ATM networks e.g. safety nets, military interfaces
1.1.3	Define basic software functions/applications	1	FDP (IFPS, route processing, code/call sign correlation, code allocation, strip distribution, track labelling) SDP (coordinate conversion, plot and track processing, MRP, safety nets, track labelling)
1.1.4	State the legal aspects for data processing in ATM	1	Traceability and recording of data and actions, configuration control
1.1.5	State the additional data used by ATM system	1	e.g. MET, airlines
1.1.6	State current developments and future possibilities	1	e.g. Coflight, iTEC, SESAR, multisensor tracking

SUB-TOPIC 1.2: System software and hardware principles

1.2.1	Describe the current hardware configurations used in ATM	2	Redundancy and backup e.g. driver, interfaces, hardware platforms, fault tolerant systems
1.2.2	Describe the current software platforms, used in ATM	2	Operating systems

SUB-TOPIC 1.3: Surveillance data processing

1.3.1	State ATC requirements	1	QoS, mandatory data recording, dependability
1.3.2	Explain the principles of SDP	2	e.g. single, multi, plot, track
1.3.3	Describe the functions of SDP	2	Plot processing, tracking, single sensor and multisensor tracker (e.g. radar, ADS, MLAT), estimating limits and accuracy of multisensor tracker, recording e.g. ARTAS tracker
1.3.4	Describe radar data inputs/outputs	2	Tracks, plots, messages, code/call sign, time, control and monitoring, conflict alerts, FDP interface, maps, adaptation
1.3.5	Describe the surveillance data-based monitoring functions	2	Safety nets, ATC tools e.g. safety nets: STCA, MSAW, APW, runway incursion alerts ATC Tools: MTCD, AMAN, DMAN, A-SMGCS

SUB-TOPIC 1.4: Flight data processing (FDP)

1.4.1	State ATC requirements	1	QoS, unambiguous, accurate, error free, timely
1.4.2	Explain the functions of FDP	2	Flight strip production, flight plan data updates, code/call sign correlation, flight progress monitoring, coordination and transfer e.g. CIV/MIL coordination
1.4.3	Define inputs and outputs	1	Flow control (CFMU/IFPS/FMP, ETFMS), flight strips/data displays, MRT, environmental data, static data, airspace adaptation
1.4.4	Describe the basic software functions/applications	2	FDP (IFPS, route processing, code/call sign correlation, code allocation, strip distribution, track labelling)
1.4.5	Describe the FPL data update process	2	Automatic and manual update

SUB-TOPIC 1.5: Human machine interface systems

1.5.1	Describe the different display technologies	2	Raster scan, common graphic display interface, LCD, plasma, TFT, Touch Input Device
1.5.2	Recognise what information is normally displayed on the ATCO and ATSEP HMI	1	—

SUB-TOPIC 1.6: Miscellaneous information

1.6.1	State the additional data used by ATM system	1	e.g. MET, airlines

SUBJECT 9: SYSTEM MONITORING AND CONTROL

TOPIC 1: SYSTEM MONITORING AND CONTROL (SMC)

SUB-TOPIC 1.1: Overview of SMC Function

1.1.1	Describe the principles and purpose of the operational management of the technical services	2	Service requirements, interfaces, boundaries of tactical responsibility e.g. hierarchy of authority for the technical and ATC structures

1.1.2	Describe the technical system architecture of the SMC function and its subordinate systems	2	Main monitoring and control architecture e.g. Surveillance: Radar stations, communications, processing, display Communications: TX/RX, circuit management, networks, HMI, standby facilities, recording Navigation: NDB, VOR, ILS, DF DP: FDPS, data communications Facilities: Power, generators, UPS, battery, environmental (heating, cooling), fire and security
1.1.3	Describe the transfer of responsibility for a service	2	Operational and technical responsibility Configuration and monitoring access and responsibility

SUB-TOPIC 1.2: System configuration:

1.2.1	Describe the range of configurations that can be used	2	Equipment or channel switching, parameter settings
1.2.2	Describe the general techniques that are employed to make configuration changes	2	e.g. physical switching
1.2.3	State procedures required to implement a planned major system change	1	e.g. safety requirement, authorisation, coordination, implementation plan, fallback strategies, major system change, activation of new version of software in a subordinate system, transfer of a service to a new system, change of a database

SUB-TOPIC 1.3: Monitoring and control functions

1.3.1	State the monitoring functions that are available	1	e.g. BITE, status, parameters, software and hardware watchdogs
1.3.2	State the control functions that are available	1	e.g. switching, parameters, set configurations
1.3.3	Explain the importance of SMC management and coordination of maintenance activities	2	—
1.3.4	State analysis tools associated with SMC	1	e.g. possible malfunctions (SASS-C, SASS-S, RAPS, track and noise monitoring tools)

SUB-TOPIC 1.4: Coordination and reporting

1.4.1	State why coordination and reporting is required and how it is achieved	1	Facility interrupts, deconflict multiple outages, legal requirements e.g. causes: service failure, planned outage, loss of backup, software upgrade Relevant parties: external service providers, ATC, other centres Relevant information: NOTAM, logbook

SUB-TOPIC 1.5: Emergency coordination

1.5.1	Describe situations where coordination and reporting will be necessary	2	e.g. hijack, mayday, R/T fail, loss of aircraft, MIL action, fire, flood, security, terrorist threat or action, medical

1.5.2	State which parties may be involved in the coordination and reporting of emergency situations	1	e.g. ATC supervisors (local and remote), ATSEP supervisors (local and remote), management, police, MIL, medical, accident investigation branch
1.5.3	Explain the responsibilities and/or duties of SMC members during an emergency situation by using an example scenario	2	—
1.5.4	State the succession of authorities and responsibilities in the event that the nominated person or function is not available	1	Hierarchy of responsibility

SUB-TOPIC 1.6: Equipment operating

1.6.1	Define the principles and ergonomics of the HMI of the SMC central system and its subordinate systems	1	Permissions, control tokens, ergonomic conventions (e.g. green is good or safe, red is fail or unsafe)
1.6.2	State the routine tasks required and the criticality of their completion and any legal requirements	1	e.g. audio circuit voice checking, audio recording checking, archive media changing and storage, VOLMET

SUBJECT 10: MAINTENANCE PROCEDURES

TOPIC 1: MAINTENANCE PROCEDURES

SUB-TOPIC 1.1: Maintenance procedures

1.1.1	Explain handling precautions to be taken to ensure equipment protection	2	Isolation, protection devices, electrostatic sensitive devices, power supplies, heavy loads, high voltage
1.1.2	Explain the classifications of maintenance	2	e.g. preventative, corrective, service configuration
1.1.3	Explain the maintenance strategy and rules	2	Organisation and planning of maintenance, rules controlling deviation from planned maintenance, intervention tracking, return to service
1.1.4	State the scope or responsibility of an S/E rated person	1	e.g. tracing maintenance actions and objectives, liability of maintenance personnel actions, safety of service, safety of equipment

Appendix 3 — Qualification training — Shared

Regulation (EU) 2017/373

Subject 1: SAFETY

TOPIC 1 — Safety Management

Sub-topic 1.1 — Policy and Principles

Sub-topic 1.2 — Concept of Risk and Principles of Risk Assessment

Sub-topic 1.3 — Safety Assessment Process

Sub-topic 1.4 — Air Navigation System Risk Classification Scheme

Sub-topic 1.5 — Safety Regulation

Subject 2: HEALTH AND SAFETY

TOPIC 1 — Hazard Awareness and Legal Rules

Sub-topic 1.1 — Hazard Awareness

Sub-topic 1.2 — Regulations and Procedures

Sub-topic 1.3 — Handling of Hazardous Material

Subject 3: HUMAN FACTORS

TOPIC 1 — Introduction to Human Factors

Sub-topic 1.1 — Introduction

TOPIC 2 — Working Knowledge and Skills

Sub-topic 2.1 — ATSEP knowledge, skills and competence

TOPIC 3 — Psychological Factors

Sub-topic 3.1 — Cognition

TOPIC 4 — Medical

Sub-topic 4.1 — Fatigue

Sub-topic 4.2 — Fitness

Sub-topic 4.3 — Work Environment

TOPIC 5 — Organisational and Social Factors

Sub-topic 5.1 — Basic Needs of People at Work

Sub-topic 5.2 — Team Resource Management

Sub-topic 5.3 — Teamwork and Team Roles

TOPIC 6 — Communication

Sub-topic 6.1 — Written Report

Sub-topic 6.2 — Verbal and Non-verbal Communication

TOPIC 7 — Stress

Sub-topic 7.1 — Stress

Sub-topic 7.2 — Stress Management

TOPIC 8 — Human Error

Sub-topic 8.1 — Human Error

Appendix 3a — Qualification training — Shared

ED Decision 2017/001/R

The subjects, topics and sub-topics are repeated in this AMC for the convenience of the reader and do not form a part of it.

SUBJECT 1: SAFETY

TOPIC 1: SAFETY MANAGEMENT

SUB-TOPIC 1.1: Policy and principles

1.1.1	Explain the underlying need for safety management policy and principles	2	ICAO Annex 19, lessons learnt from events, evolving environment, requirements
1.1.2	State the safety management policy	1	ICAO Annex 19, priority of safety, the safety objective of ATM, roles and responsibilities
1.1.3	Explain safety management principles	2	ICAO Annex 19, safety achievement, safety assurance, safety promotion
1.1.4	Appreciate the reactive and proactive nature of safety management policy and principles	3	e.g. ICAO Annex 19 e.g. nature of events, reason model, events investigation, safety assessment
1.1.5	Explain the link between safety management principles and the life cycle of an ATM system	2	ICAO Annex 19, safety occurrences, setting of safety levels, system safety assessment, safety surveys, safety monitoring, system safety assessment documentation, lesson dissemination, safety improvement, use of safety data to assist in decommissioning or replacement of system
1.1.6	Relate the ATSEP role and responsibilities to safety management	4	Competency, occurrence reporting
1.1.7	State the role and content of a typical SMS within an ANSP	1	ICAO Annex 19
1.1.8	Explain the ‘just culture’ concept	2	Benefits, prerequisites, constraints

SUB-TOPIC 1.2: Concept of risk and principles of risk assessment

1.2.1	Describe the concept of risk	2	Types of risk, components of risk, risk contributors (people, procedure, organisations and equipment)
1.2.2	State ways of assessing risk	1	Risk comparisons, risk analysis
1.2.3	Describe the concept of risk tolerability	2	Risk assessment and mitigation, ALARP Principle e.g. Risk perception, risk management

SUB-TOPIC 1.3: Safety assessment process

1.3.1	Explain the methods for the assessment of hazards and possible failures	2	e.g. Failure and hazard brainstorm session, Fault tree analysis
1.3.2	Appreciate the importance of adopting a total system approach covering human, procedure, organisation and equipment elements	3	ATM system description (including scope definition and limitation), end-to-end integrity of safety assessment e.g. Concept of TRM
1.3.3	Describe the overall safety assessment process and its relationships with risk assessment during the total life cycle of ANS system	2	Collection and presentation of results, contingency arrangements, back-up procedures e.g. Risk-based process, FHA, (safety objectives), preliminary system safety assessment PSSA (safety requirements), system safety assessment SSA (safety monitoring and evidence)

SUB-TOPIC 1.4: Air navigation system risk classification scheme

1.4.1	Describe the ATM system risk classification scheme	2	e.g. Scenario of failure of air navigation system (incident chain), component of a risk classification scheme, severity classes, probability classes (qualitative and quantitative)

SUB-TOPIC 1.5: Safety regulation

1.5.1	Describe the role of safety regulation	2	The purpose of European (EASA, EU) regulations and international standards, objective of the national regulator
1.5.2	Explain the relationship between the safety regulation documents	2	ICAO documentation (SARPS), EASA/EU Regulations, AMCs and GM, national regulation
1.5.3	Explain how the safety regulation documents affect ATM service provision	2	ICAO documentation (SARPS), EASA/EU Regulations, AMCs and GM, national regulation
1.5.4	Explain the interface between the safety regulator and the ANSP	2	Information to be provided to regulator by ANSP and vice versa, importance of incident reporting

SUBJECT 2: HEALTH AND SAFETY

TOPIC 1: HAZARD AWARENESS AND LEGAL RULES

SUB-TOPIC 1.1: Hazard awareness

1.1.1	State potential hazards to health and safety generated by equipment used in CNS/ATM	1	e.g. COM/SUR/SMC: mechanical hazards, electrical hazards (LV, HV, EMI), chemical hazards NAV: includes RF energy DP: none

SUB-TOPIC 1.2: Regulations and procedures

1.2.1	State applicable international requirements	1	e.g. European norms, CENELEC, DIN
1.2.2	State any applicable national requirements	1	—
1.2.3	State safety procedure for the persons working on or near relevant equipment	1	e.g. COM/NAV/SUR/SMC: isolation (clothing, tools), fire extinction types, safety man presence, safety interlocks, isolating switches, security of the site, climbing procedures, earthing, direct or indirect contact with HV

SUB-TOPIC 1.3: Handling of hazardous material

1.3.1	State European and local regulations for electronic device disposal	1	Protection of environment e.g. recycling

SUBJECT 3: HUMAN FACTORS

TOPIC 1: INTRODUCTION TO HUMAN FACTORS

SUB-TOPIC 1.1: Introduction

1.1.1	Explain why human factors are particularly important in the ATM environment	2	Historical background, safety impact on ATM, incidents
1.1.2	Define human factors	1	e.g. ICAO Human Factors Training Manual
1.1.3	Explain the concept of systems and its relevance in the ATM environment	2	People, procedures, equipment
1.1.4	Explain the use of the SHELL model	2	e.g. ICAO Human Factors Training Manual, visits to OPS and technical rooms
1.1.5	State the factors which can affect personal and team performance	1	e.g. psychological, medical, physiological, social, organisational, communication, stress, human error, working knowledge and skills

TOPIC 2: WORKING KNOWLEDGE AND SKILLS

SUB-TOPIC 2.1: ATSEP knowledge, skills and competence

2.1.1	Explain the importance of maintaining and updating professional knowledge and skills	2	Assure safety
2.1.2	Explain the importance of maintaining non-technical skills and professional competence	2	e.g. communication, human relationship, knowledge of environment, human limit awareness
2.1.3	State the available means to maintain professional knowledge and skills	1	e.g. practice, personal study, briefing, seminars, courses, technical periodicals, technical books, OJT, simulation, CBT, e-learning, visits, feedback, TRM

TOPIC 3: PSYCHOLOGICAL FACTORS

SUB-TOPIC 3.1: Cognition

3.1.1	Describe major aspects of human information processing	2	Perception, attention, memory, judgement, decision-making, response execution, control of execution
3.1.2	Describe the factors which influence information processing	2	e.g. stress and strain, experience, knowledge, distraction, interpersonal relations, working environment, risk perception, attitude, workload, fatigue, confidence, job security
3.1.3	Appreciate factors which influence information processing	3	e.g. case study, simulation, role playing

TOPIC 4: MEDICAL

SUB-TOPIC 4.1: Fatigue

4.1.1	Describe the effect of fatigue on human performance	2	Physiological, cognitive and relational effects e.g. lack of concentration, irritability, frustration
4.1.2	Recognise the signs of fatigue in oneself and in others	1	e.g. making frequent mistakes, unable to concentrate, lack of normal humour, sleeping and/or eating disorders
4.1.3	Explain how to respond to indications of fatigue in an appropriate manner	2	Take time off, rest for short periods of time, seek professional help

SUB-TOPIC 4.2: Fitness

4.2.1	Describe signs of lack of personal fitness	2	—
4.2.2	Describe actions to prevent or resolve lack of personal fitness	2	Healthy lifestyle e.g. healthy diet, sleeping, physical and mental activities
4.2.3	Explain the influence of psychoactive substances on human performance	2	e.g. nervous system, medication, smoking, alcohol, habitual and occasional use of psychoactive substances

SUB-TOPIC 4.3: Work environment

4.3.1	Describe the influence of the work environment on human performance	2	Ergonomics, effects of noise, electromagnetic waves, temperature, working circumstances

TOPIC 5: ORGANISATIONAL AND SOCIAL FACTORS

SUB-TOPIC 5.1: Basic needs of people at work

5.1.1	Explain basic needs of people at work	2	e.g. balance between individual ability and workload, working time and rest periods; adequate working conditions, positive working environment
5.1.2	Characterise the factors of work satisfaction	2	e.g. money, motivation, achievement, recognition, advancement, challenge

SUB-TOPIC 5.2: Team resource management

5.2.1	State the objectives of TRM	1	Experience sharing, feedback, improved interpersonal relations, indirect increase in safety

SUB-TOPIC 5.3: Teamwork and team roles

5.3.1	Describe the differences between social human relations and professional interactions	2	—
5.3.2	Identify reasons for loss of team effectiveness and actions to prevent it and prevent repetition	3	e.g. roles poorly defined, goals poorly identified, bad planning, too many leaders or not enough, respect for others, divergence in values, misunderstandings
5.3.3	Describe the principles of teamwork	2	e.g. team membership, group dynamics, advantages/disadvantages of teamwork
5.3.4	Identify reasons for conflict	3	—
5.3.5	Describe actions to prevent human conflicts	2	—
5.3.6	Describe strategies to cope with human conflicts	2	—

TOPIC 6: COMMUNICATION

SUB-TOPIC 6.1: Written report

6.1.1	Appreciate the importance of recording information by writing effectively	3	ATSEP technical report, logs, system degradation reports, specification, system manager report
6.1.2	Use appropriate terminology to communicate effectively in writing	3	Be concise, clear; common technical terms; convey key points

SUB-TOPIC 6.2: Verbal and non-verbal communication

6.2.1	Describe the human communication process	2	—
6.2.2	Characterise the factors which affect verbal communication	2	e.g. Cognitive: lack of knowledge of the procedures, of technical terms, workload, poor receiver references Affective: being shy, feelings of not being listened to, not being part of the group, not being assertive, poor eye contact while talking, stress Physiological: stuttering, low voice level
6.2.3	Describe factors which affect non-verbal communication	2	e.g. touch, noise, interruption, body language
6.2.4	Use appropriate vocabulary to communicate effectively on technical matters	3	Technical ‘jargon’, language differences, standard words/phrases
6.2.5	Use appropriate language for professional communication with non-ATSEP	3	Term sharing, translation, being concise, simple words, selection of information and detail level according to the receiver

TOPIC 7: STRESS

SUB-TOPIC 7.1: Stress

7.1.1	Explain the process of stress	2	Causes, stress mechanism, consequences in different work situations (e.g. online intervention, maintenance, training)
7.1.2	State the symptoms of stress	1	e.g. frustration, anger, irritability, aggressive and/or irrational behaviour, helplessness

SUB-TOPIC 7.2: Stress management

7.2.1	Act to relieve or minimise stress in self and/or others	3	The effect of personality in coping with stress, benefits of active stress management
7.2.2	Appreciate how assistance is obtained in stressful situations	3	Benefits of asking, offering and accepting help in stressful situations e.g. CISM
7.2.3	Recognise the effects of shocking and stressful situations	1	For oneself and for others, abnormal situations
7.2.4	Consider the benefits of critical incident stress management	2	—

TOPIC 8: HUMAN ERROR

SUB-TOPIC 8.1: Human error

8.1.1	Describe human error	2	—
8.1.2	Explain the relationship between human error and safety	2	Mechanism, error-prone conditions, consequences e.g. reason model, feedback
8.1.3	State different types of errors using an appropriate model	1	e.g. Rasmussen model, Gagne model
8.1.4	Differentiate between errors and violations	2	—
8.1.5	Explain how to detect errors	2	e.g. individual and collective strategy, event report, procedure
8.1.6	Explain, in general terms, how errors are mitigated	2	—
8.1.7	Appreciate two significant ATM incidents/accidents involving ATSEP/engineering contributory factors	3	—

Appendix 4 — Qualification training — Streams

Regulation (EU) 2017/343

1. COMMUNICATION — VOICE

Subject 1: VOICE

TOPIC 1 — Air-Ground

Sub-topic 1.1 — Transmission/Reception

Sub-topic 1.2 — Radio Antenna Systems

Sub-topic 1.3 — Voice Switch

Sub-topic 1.4 — Controller Working Position

Sub-topic 1.5 — Radio Interfaces

TOPIC 2 — COMVCE — Ground-Ground

Sub-topic 2.1 — Interfaces

Sub-topic 2.2 — Protocols

Sub-topic 2.3 — Switch

Sub-topic 2.4 — Communication chain

Sub-topic 2.5 — Controller working position

Subject 2: TRANSMISSION PATH

TOPIC 1 — Lines

Sub-topic 1.1 — Lines Theory

Sub-topic 1.2 — Digital Transmissions

Sub-topic 1.3 — Types of Lines

TOPIC 2 — Specific Links

Sub-topic 2.1 — Microwave Link

Sub-topic 2.2 — Satellite

Subject 3: RECORDERS

TOPIC 1 — Legal Recorders

Sub-topic 1.1 — Regulations

Sub-topic 1.2 — Principles

Subject 4: FUNCTIONAL SAFETY

TOPIC 1 — Safety Attitude

Sub-topic 1.1 — Safety Attitude

TOPIC 2 — Functional Safety

Sub-topic 2.1 — Functional safety

2. COMMUNICATION — DATA

Subject 1: DATA

TOPIC 1 — Introduction to Networks

Sub-topic 1.1 — Types

Sub-topic 1.2 — Networks

Sub-topic 1.3 — External Network Services

Sub-topic 1.4 — Measuring Tools

Sub-topic 1.5 — Troubleshooting

TOPIC 2 — Protocols

Sub-topic 2.1 — Fundamental Theory

Sub-topic 2.2 — General Protocols

Sub-topic 2.3 — Specific Protocols

TOPIC 3 — National Networks

Sub-topic 3.1 — National Networks

TOPIC 4 — European Networks

Sub-topic 4.1 — Network Technologies

TOPIC 5 — Global Networks

Sub-topic 5.1 — Networks and Standards

Sub-topic 5.2 — Description

Sub-topic 5.3 — Global Architecture

Sub-topic 5.4 — Air-Ground Sub-Networks

Sub-topic 5.5 — Ground-Ground Sub-Networks

Sub-topic 5.6 — Networks on Board of the Aircraft

Sub-topic 5.7 — Air-Ground Applications

Subject 2: TRANSMISSION PATH

TOPIC 1 — Lines

Sub-topic 1.1 — Lines Theory

Sub-topic 1.2 — Digital Transmission

Sub-topic 1.3 — Types of Lines

TOPIC 2 — Specific Links

Sub-topic 2.1 — Microwave Link

Sub-topic 2.2 — Satellite

Subject 3: RECORDERS

TOPIC 1 — Legal Recorders

Sub-topic 1.1 — Regulations

Sub-topic 1.2 — Principles

Subject 4: FUNCTIONAL SAFETY

TOPIC 1 — Safety Altitude

Sub-topic 1.1 — Safety Attitude

TOPIC 2 — Functional Safety

Sub-topic 2.1 — Functional Safety

3. NAVIGATION — NON-DIRECTIONAL BEACON (NDB)

Subject 1: PERFORMANCE-BASED NAVIGATION

TOPIC 1 — Navigation Concepts

Sub-topic 1.1 — Operational Requirements

Sub-topic 1.2 — Performance-based Navigation

Sub-topic 1.3 — Area Navigation Concept (RNAV)

Sub-topic 1.4 — NOTAM

Subject 2: GROUND-BASED SYSTEMS — NDB

TOPIC 1 — NDB/Locator

Sub-topic 1.1 — Use of the System

Sub-topic 1.2 — Ground Station Architecture

Sub-topic 1.3 — Transmitter Sub-system

Sub-topic 1.4 — Antenna Sub-system

Sub-topic 1.5 — Monitoring and Control Sub-systems

Sub-topic 1.6 — On-board Equipment

Sub-topic 1.7 — System Check and Maintenance

Subject 3: GLOBAL NAVIGATION SATELLITE SYSTEM

TOPIC 1 — GNSS

Sub-topic 1.1 — General View

Subject 4: ON-BOARD EQUIPMENT

TOPIC 1 — On-board Systems

Sub-topic 1.1 — On-board Systems

TOPIC 2 — Autonomous Navigation

Sub-topic 2.1 — Inertial Navigation

TOPIC 3 — Vertical Navigation

Sub-topic 3.1 — Vertical Navigation

Subject 5: FUNCTIONAL SAFETY

TOPIC 1 — Safety Attitude

Sub-topic 1.1 — Safety Attitude

TOPIC 2 — Functional Safety

Sub-topic 2.1 — Functional Safety

4. NAVIGATION — DIRECTION FINDING (DF)

Subject 1: PERFORMANCE-BASED NAVIGATION

TOPIC 1 — Navigation Concepts

Sub-topic 1.1 — Operational Requirements

Sub-topic 1.2 — Performance-Based Navigation

Sub-topic 1.3 — Area Navigation Concept (RNAV)

Sub-topic 1.4 — NOTAM

Subject 2: GROUND-BASED SYSTEMS — DF

TOPIC 1 — DF

Sub-topic 1.1 — Use of the System

Sub-topic 1.2 — VDF/DDF Equipment Architecture

Sub-topic 1.3 — Receiver Sub-system

Sub-topic 1.4 — Antenna Sub-system

Sub-topic 1.5 — Monitoring and Control Sub-systems

Sub-topic 1.6 — System Check and Maintenance

Subject 3: GLOBAL NAVIGATION SATELLITE SYSTEM

TOPIC 1 — GNSS

Sub-topic 1.1 — General View

Subject 4: ON-BOARD EQUIPMENT

TOPIC 1 — On-board Systems

Sub-topic 1.1 — On-board Systems

TOPIC 2 — Autonomous Navigation

Sub-topic 2.1 — Inertial Navigation

TOPIC 3 — Vertical Navigation

Sub-topic 3.1 — Vertical Navigation

Subject 5: FUNCTIONAL SAFETY

TOPIC 1 — Safety Attitude

Sub-topic 1.1 — Safety Attitude

TOPIC 2 — Functional Safety

Sub-topic 2.1 — Functional Safety

5. NAVIGATION — VHF OMNIDIRECTIONAL RADIO RANGE (VOR)

Subject 1: PERFORMANCE-BASED NAVIGATION

TOPIC 1 — Navigation Concepts

Sub-topic 1.1 — Operational Requirements

Sub-topic 1.2 — Performance-Based Navigation

Sub-topic 1.3 — Area Navigation Concept (RNAV)

Sub-topic 1.4 — NOTAM

Subject 2: GROUND-BASED SYSTEMS — VOR

TOPIC 1 — VOR

Sub-topic 1.1 — Use of the System

Sub-topic 1.2 — Fundamentals of CVOR and/or DVOR

Sub-topic 1.3 — Ground Station Architecture

Sub-topic 1.4 — Transmitter Sub-system

Sub-topic 1.5 — Antenna Sub-system

Sub-topic 1.6 — Monitoring and Control Sub-system

Sub-topic 1.7 — On-board Equipment

Sub-topic 1.8 — System Check and Maintenance

Subject 3: GLOBAL NAVIGATION SATELLITE SYSTEM

TOPIC 1 — GNSS

Sub-topic 1.1 — General View

Subject 4: ON-BOARD EQUIPMENT

TOPIC 1 — On-board Systems

Sub-topic 1.1 — On-board Systems

TOPIC 2 — Autonomous Navigation

Sub-topic 2.1 — Inertial Navigation

TOPIC 3 — Vertical Navigation

Sub-topic 3.1 — Vertical Navigation

Subject 5: — FUNCTIONAL SAFETY

TOPIC 1 — Safety Attitude

Sub-topic 1.1 — Safety Attitude

TOPIC 2 — Functional Safety

Sub-topic 2.1 — Functional Safety

6. NAVIGATION — DISTANCE MEASURING EQUIPMENT (DME)

Subject 1: PERFORMANCE-BASED NAVIGATION

TOPIC 1 — Navigation concepts

Sub-topic 1.1 — Operational Requirements

Sub-topic 1.2 — Performance-Based Navigation

Sub-topic 1.3 — Area Navigation Concept (RNAV)

Sub-topic 1.4 — NOTAM

Subject 2: GROUND-BASED SYSTEMS — DME

TOPIC 1 — DME

Sub-topic 1.1 — Use of the System

Sub-topic 1.2 — Fundamentals of DME

Sub-topic 1.3 — Ground Station Architecture

Sub-topic 1.4 — Receiver Sub-system

Sub-topic 1.5 — Signal Processing

Sub-topic 1.6 — Transmitter Sub-system

Sub-topic 1.7 — Antenna Sub-system

Sub-topic 1.8 — Monitoring and Control Sub-system

Sub-topic 1.9 — On-board Equipment

Sub-topic 1.10 — System Check and Maintenance

Subject 3: GLOBAL NAVIGATION SATELLITE SYSTEM

TOPIC 1 — GNSS

Sub-topic 1.1 — General View

Subject 4: ON-BOARD EQUIPMENT

TOPIC 1 — On-board Systems

Sub-topic 1.1 — On-board Systems

TOPIC 2 — Autonomous Navigation

Sub-topic 2.1 — Inertial Navigation

TOPIC 3 — Vertical Navigation

Sub-topic 3.1 — Vertical Navigation

Subject 5: FUNCTIONAL SAFETY

TOPIC 1 — Safety Attitude

Sub-topic 1.1 — Safety Attitude

TOPIC 2 — Functional Safety

Sub-topic 2.1 — Functional Safety

7. NAVIGATION — INSTRUMENT LANDING SYSTEM (ILS)

Subject 1: PERFORMANCE-BASED NAVIGATION

TOPIC 1 — Navigation concepts

Sub-topic 1.1 — Operational Requirements

Sub-topic 1.2 — Performance-Based Navigation

Sub-topic 1.3 — Area Navigation Concept (RNAV)

Sub-topic 1.4 — NOTAM

Subject 2: GROUND-BASED SYSTEMS — ILS

TOPIC 1 — ILS

Sub-topic 1.1 — Use of the System

Sub-topic 1.2 — Fundamentals of ILS

Sub-topic 1.3 — 2F-Systems

Sub-topic 1.4 — Ground Station Architecture

Sub-topic 1.5 — Transmitter Sub-system

Sub-topic 1.6 — Antenna Sub-system

Sub-topic 1.7 — Monitoring and Control Sub-system

Sub-topic 1.8 — On-board Equipment

Sub-topic 1.9 — System Check and Maintenance

Subject 3: GLOBAL NAVIGATION SATELLITE SYSTEM

TOPIC 1 — GNSS

Sub-topic 1.1 — General View

Subject 4: ON-BOARD EQUIPMENT

TOPIC 1 — On-board Systems

Sub-topic 1.1 — On-board Systems

TOPIC 2 — Autonomous navigation

Sub-topic 2.1 — Inertial Navigation

TOPIC 3 — Vertical Navigation

Sub-topic 3.1 — Vertical Navigation

Subject 5: FUNCTIONAL SAFETY

TOPIC 1 — Safety Attitude

Sub-topic 1.1 — Safety Attitude

TOPIC 2 — Functional Safety

Sub-topic 2.1 — Functional Safety

8. NAVIGATION — MICROWAVE LANDING SYSTEM (MLS)

Subject 1: PERFORMANCE-BASED NAVIGATION

TOPIC 1 — Navigation Concepts

Sub-topic 1.1 — Operational Requirements

Sub-topic 1.2 — Performance-Based Navigation

Sub-topic 1.3 — Area Navigation Concept (RNAV)

Sub-topic 1.4 — NOTAM

Subject 2: GROUND-BASED SYSTEMS — MLS

TOPIC 1 — MLS

Sub-topic 1.1 — Use of the System

Sub-topic 1.2 — Fundamentals of MLS

Sub-topic 1.3 — Ground Station Architecture

Sub-topic 1.4 — Transmitter Sub-system

Sub-topic 1.5 — Antenna Sub-system

Sub-topic 1.6 — Monitoring and Control Sub-system

Sub-topic 1.7 — On-board Equipment

Sub-topic 1.8 — System Check and Maintenance

Subject 3: GLOBAL NAVIGATION SATELLITE SYSTEM

TOPIC 1 — GNSS

Sub-topic 1.1 — General View

Subject 4: ON-BOARD EQUIPMENT

TOPIC 1 — On-board Systems

Sub-topic 1.1 — On-board Systems

TOPIC 2 — Autonomous navigation

Sub-topic 2.1 — Inertial Navigation

TOPIC 3 — Vertical navigation

Sub-topic 3.1 — Vertical Navigation

Subject 5: FUNCTIONAL SAFETY

TOPIC 1 — Safety attitude

Sub-topic 1.1 — Safety Attitude

TOPIC 2 — Functional safety

Sub-topic 2.1 — Functional Safety

9. SURVEILLANCE — PRIMARY SURVEILLANCE RADAR

Subject 1: PRIMARY SURVEILLANCE RADAR

TOPIC 1 — ATC surveillance

Sub-topic 1.1 — Use of PSR for Air Traffic Services

Sub-topic 1.2 — Antenna (PSR)

Sub-topic 1.3 — Transmitters

Sub-topic 1.4 — Characteristics of Primary Targets

Sub-topic 1.5 — Receivers

Sub-topic 1.6 — Signal Processing and Plot Extraction

Sub-topic 1.7 — Plot Combining

Sub-topic 1.8 — Characteristics of Primary Radar

TOPIC 2 — SURPSR — Surface Movement Radar

Sub-topic 2.1 — Use of SMR for Air Traffic Services

Sub-topic 2.2 — Radar Sensor

TOPIC 3 — SURPSR — Test and Measurement

Sub-topic 3.1 — Test and Measurement

Subject 2: HUMAN MACHINE INTERFACE (HMI)

TOPIC 1 — SURPSR — HMI

Sub-topic 1.1 — ATCO HMI

Sub-topic 1.2 — ATSEP HMI

Sub-topic 1.3 — Pilot HMI

Sub-topic 1.4 — Displays

Subject 3: SURVEILLANCE DATA TRANSMISSION

TOPIC 1 — SDT

Sub-topic 1.1 — Technology and Protocols

Sub-topic 1.2 — Verification Methods

Subject 4: FUNCTIONAL SAFETY

TOPIC 1 — SURPSR — Safety Attitude

Sub-topic 1.1 — Safety Attitude

TOPIC 2 — SURPSR — Functional Safety

Sub-topic 2.1 — Functional Safety

Subject 5: DATA PROCESSING SYSTEMS

TOPIC 1 — System Components

Sub-topic 1.1 — Surveillance Data Processing Systems

10. SURVEILLANCE — SECONDARY SURVEILLANCE RADAR

Subject 1: SECONDARY SURVEILLANCE RADAR (SSR)

TOPIC 1 — SSR and Mono-pulse SSR

Sub-topic 1.1 — Use of SSR for Air Traffic Services

Sub-topic 1.2 — Antenna (SSR)

Sub-topic 1.3 — Interrogator

Sub-topic 1.4 — Transponder

Sub-topic 1.5 — Receivers

Sub-topic 1.6 — Signal Processing and Plot Extraction

Sub-topic 1.7 — Plot Combining

Sub-topic 1.8 — Test and Measurement

TOPIC 2 — Mode S

Sub-topic 2.1 — Introduction to Mode S

Sub-topic 2.2 — Mode S System

TOPIC 3 — Multilateration

Sub-topic 3.1 — MLAT in use

Sub-topic 3.2 — MLAT Principles

TOPIC 4 — SURSSR — Environment

Sub-topic 4.1 — SSR Environment

Subject 2: HUMAN MACHINE INTERFACE (HMI)

TOPIC 1 — HMI

Sub-topic 1.1 — ATCO HMI

Sub-topic 1.2 — ATSEP HMI

Sub-topic 1.3 — Pilot HMI

Sub-topic 1.4 — Displays

Subject 3: SURVEILLANCE DATA TRANSMISSION

TOPIC 1 — SDT

Sub-topic 1.1 — Technology and Protocols

Sub-topic 1.2 — Verification Methods

Subject 4: FUNCTIONAL SAFETY

TOPIC 1 — Safety attitude

Sub-topic 1.1 — Safety Attitude

TOPIC 2 — Functional safety

Sub-topic 2.1 — Functional Safety

Subject 5: DATA PROCESSING SYSTEMS

TOPIC 1 — System components

Sub-topic 1.1 — Surveillance Data Processing Systems

11. SURVEILLANCE — AUTOMATIC DEPENDENT SURVEILLANCE

Subject 1: AUTOMATIC DEPENDENT SURVEILLANCE (ADS)

TOPIC 1 — General view on ADS

Sub-topic 1.1 — Definition of ADS

TOPIC 2 — SURADS — ADS-B

Sub-topic 2.1 — Introduction to ADS-B

Sub-topic 2.2 — Techniques of ADS-B

Sub-topic 2.3 — VDL Mode 4 (STDMA)

Sub-topic 2.4 — Mode S Extended Squitter

Sub-topic 2.5 — UAT

Sub-topic 2.6 — ASTERIX

TOPIC 3 — ADS-C

Sub-topic 3.1 — Introduction to ADS-C

Sub-topic 3.2 — Techniques in ADS-C

Subject 2: HUMAN MACHINE INTERFACE (HMI)

TOPIC 1 — HMI

Sub-topic 1.1 — ATCO HMI

Sub-topic 1.2 — ATSEP HMI

Sub-topic 1.3 — Pilot HMI

Sub-topic 1.4 — Displays

Subject 3: SURVEILLANCE DATA TRANSMISSION

TOPIC 1 — SDT

Sub-topic 1.1 — Technology and Protocols

Sub-topic 1.2 — Verification Methods

Subject 4: FUNCTIONAL SAFETY

TOPIC 1 — Safety Attitude

Sub-topic 1.1 — Safety Attitude

TOPIC 2 — SURADS — Functional Safety

Sub-topic 2.1 — Functional Safety

Subject 5: DATA PROCESSING SYSTEMS

TOPIC 1 — System components

Sub-topic 1.1 — Surveillance Data Processing Systems

12. DATA — DATA PROCESSING

Subject 1: FUNCTIONAL SAFETY

TOPIC 1 — Functional Safety

Sub-topic 1.1 — Functional Safety

Sub-topic 1.2 — Software Integrity and Security

TOPIC 2 — Safety Attitude

Sub-topic 2.1 — Safety Attitude

Subject 2: DATA PROCESSING SYSTEMS

TOPIC 1 — User requirements

Sub-topic 1.1 — Controller requirements

Sub-topic 1.2 — Trajectories, Prediction and Calculation

Sub-topic 1.3 — Ground-based Safety Nets

Sub-topic 1.4 — Decision Support

TOPIC 2 — System Components Data

Sub-topic 2.1 — Data processing Systems

Sub-topic 2.2 — Flight Data Processing Systems

Sub-topic 2.3 — Surveillance Data Processing Systems

Subject 3: DATA PROCESS

TOPIC 1 — Software process

Sub-topic 1.1 — Middleware

Sub-topic 1.2 — Operating Systems

Sub-topic 1.3 — Configuration Control

Sub-topic 1.4 — Software Development Process

TOPIC 2 — Hardware platform

Sub-topic 2.1 — Equipment Upgrade

Sub-topic 2.2 — COTS

Sub-topic 2.3 — Interdependence

Sub-topic 2.4 — Maintainability

TOPIC 3 — Testing

Sub-topic 3.1 — Testing

Subject 4: DATA

TOPIC 1 — Data Essential Features

Sub-topic 1.1 — Data Significance

Sub-topic 1.2 — Data Configuration Control

Sub-topic 1.3 — Data Standards

TOPIC 2 — ATM Data — Detailed structure

Sub-topic 2.1 — System Area

Sub-topic 2.2 — Characteristic Points

Sub-topic 2.3 — Aircraft Performances

Sub-topic 2.4 — Screen Manager

Sub-topic 2.5 — Auto-coordination Messages

Sub-topic 2.6 — Configuration Control Data

Sub-topic 2.7 — Physical Configuration Data

Sub-topic 2.8 — Relevant Meteo Data

Sub-topic 2.9 — Alert and Error Messages to ATSEP

Sub-topic 2.10 — Alert and Error Messages to ATCO

Subject 5: COMMUNICATION DATA

TOPIC 1 — Introduction to Networks

Sub-topic 1.1 — Types

Sub-topic 1.2 — Networks

Sub-topic 1.3 — External Network Services

Sub-topic 1.4 — Measuring Tools

Sub-topic 1.5 — Troubleshooting

TOPIC 2 — Protocols

Sub-topic 2.1 — Fundamental Theory

Sub-topic 2.2 — General Protocols

Sub-topic 2.3 — Specific Protocols

TOPIC 3 — DATDP — National Networks

Sub-topic 3.1 — National Networks

Subject 6: SURVEILLANCE — PRIMARY

TOPIC 1 — ATC Surveillance

Sub-topic 1.1 — Use of PSR for Air Traffic Services

Subject 7: SURVEILLANCE — SECONDARY

TOPIC 1 — SSR AND MSSR

Sub-topic 1.1 — Use of SSR for Air Traffic Services

TOPIC 2 — Mode S

Sub-topic 2.1 — Introduction to Mode S

TOPIC 3 — Multilateration

Sub-topic 3.1 — MLAT Principles

Subject 8: SURVEILLANCE — HMI

TOPIC 1 — HMI

Sub-topic 1.1 — ATCO HMI

Subject 9: SURVEILLANCE DATA TRANSMISSION

TOPIC 1 — Surveillance Data Transmission

Sub-topic 1.1 — Technology and Protocols

13. SYSTEM MONITORING AND CONTROL — COMMUNICATION

Subject 1: ANS STRUCTURE

TOPIC 1 — ANSP Organisation and Operation

Sub-topic 1.1 — SMCCOM — ANSP Organisation and Operation

TOPIC 2 — ANSP Maintenance Program

Sub-topic 2.1 — Policy

TOPIC 3 — ATM Context

Sub-topic 3.1 — ATM Context

TOPIC 4 — ANSP Administrative Practices

Sub-topic 4.1 — Administration

Subject 2: ANS SYSTEM/EQUIPMENT

TOPIC 1 — Operational Impacts

Sub-topic 1.1— Degradation or Loss of System/Equipment Services

TOPIC 2 — SMCCOM — User Working Position Functionality and Operation

Sub-topic 2.1 — User Working Position

Sub-topic 2.2 — SMC Working Position

Subject 3: TOOLS, PROCESSES AND PROCEDURES

TOPIC 1 — Requirements

Sub-topic 1.1 — SMS

Sub-topic 1.2 — QMS

Sub-topic 1.3 — SMS application in the working environment

TOPIC 2 — Maintenance Agreements with Outside Agencies

Sub-topic 2.1 — Principles of agreements

TOPIC 3 — SMC General Processes

Sub-topic 3.1 — Roles and responsibilities

TOPIC 4 — Maintenance Management Systems

Sub-topic 4.1 — Reporting

Subject 4: TECHNOLOGY

TOPIC 1 — Technologies and Principles

Sub-topic 1.1 — General

Sub-topic 1.2 — Communication

Sub-topic 1.3 — Facilities

Subject 5: COMMUNICATION VOICE

TOPIC 1 — Air-Ground

Sub-topic 1.1 — Controller Working Position

TOPIC 2 — Ground-Ground

Sub-topic 2.1 — Interfaces

Sub-topic 2.2 — Switch

Sub-topic 2.3 — Controller Working Position

Subject 6: COMMUNICATION — DATA

TOPIC 1 — European Networks

Sub-topic 1.1 — Network Technologies

TOPIC 2 — Global Networks

Sub-topic 2.1 — Networks and Standards

Sub-topic 2.2 — Description

Sub-topic 2.3 — Global Architecture

Sub-topic 2.4 — Air-Ground Sub-networks

Sub-topic 2.5 — Ground-Ground Sub-networks

Sub-topic 2.6 — Air-Ground Applications

Subject 7: COMMUNICATION — RECORDERS

TOPIC 1 —Legal recorders

Sub-topic 1.1 — Regulations

Sub-topic 1.2 — Principles

Subject 8: NAVIGATION — PBN

TOPIC 1 — NAV Concepts

Sub-topic 1.1 — NOTAM

14. SYSTEM MONITORING AND CONTROL — NAVIGATION

Subject 1: ANS STRUCTURE

TOPIC 1 — ANSP Organisation and Operation

Sub-topic 1.1 — ANSP Organisation and Operation

TOPIC 2 — ANSP Maintenance Program

Sub-topic 2.1 — Policy

TOPIC 3 — ATM Context

Sub-topic 3.1 — ATM Context

TOPIC 4 — ANSP Administrative Practices

Sub-topic 4.1 — Administration

Subject 2: ANS SYSTEM/EQUIPMENT

TOPIC 1 — Operational Impacts

Sub-topic 1.1 — SMCNAV — Degradation or Loss of System/Equipment Services

TOPIC 2 — User Position Functionality and Operation

Sub-topic 2.1 — User Working Position

Sub-topic 2.2 — SMC Working Position

Subject 3: TOOLS, PROCESSES AND PROCEDURES

TOPIC 1 — SMCNAV — Requirements

Sub-topic 1.1 — SMS

Sub-topic 1.2 — QMS

Sub-topic 1.3 — SMS application in the working environment

TOPIC 2 — Maintenance Agreements with Outside Agencies

Sub-topic 2.1 — Principles of agreements

TOPIC 3 — SMC General Processes

Sub-topic 3.1 — Roles and responsibilities

TOPIC 4 — SMCNAV — Maintenance Management Systems

Sub-topic 4.1 — Reporting

Subject 4: TECHNOLOGY

TOPIC 1 — SMCNAV — Technologies and Principles

Sub-topic 1.1 — General

Sub-topic 1.2 — Communication

Sub-topic 1.3 — Facilities

Subject 5: COMMUNICATION — DATA

TOPIC 1 — SMCNAV — European Networks

Sub-topic 1.1 — Network Technologies

TOPIC 2 — Global Networks

Sub-topic 2.1 — Networks and Standards

Sub-topic 2.2 — Description

Sub-topic 2.3 — Global Architecture

Sub-topic 2.4 — Air-Ground Sub-networks

Sub-topic 2.5 — Ground-Ground Sub-networks

Sub-topic 2.6 — Air-Ground Applications

Subject 6: COMMUNICATION — RECORDERS

TOPIC 1 — Legal Recorders

Sub-topic 1.1 — Regulations

Sub-topic 1.2 — Principles

Subject 7: NAVIGATION — PBN

TOPIC 1 — NAV Concepts

Sub-topic 1.1 — NOTAM

Subject 8: NAVIGATION — GROUND-BASED SYSTEMS — NDB

TOPIC 1 — NDB/Locator

Sub-topic 1.1 — Use of the System

Subject 9: NAVIGATION — GROUND-BASED SYSTEMS — DFI

TOPIC 1 — SMCNAV — DF

Sub-topic 1.1 — Use of the System

Subject 10: NAVIGATION — GROUND-BASED SYSTEMS — VOR

TOPIC 1 — VOR

Sub-topic 1.1 — Use of the System

Subject 11: NAVIGATION — GROUND-BASED SYSTEMS — DME

TOPIC 1 — DME

Sub-topic 1.1 — Use of the System

Subject 12: NAVIGATION — GROUND-BASED SYSTEMS — ILS

TOPIC 1 — ILS

Sub-topic 1.1 — Use of the System

15. SYSTEM MONITORING AND CONTROL — SURVEILLANCE

Subject 1: ANS STRUCTURE

TOPIC 1 — ANSP Organisation and Operation

Sub-topic 1.1 — ANSP Organisation and Operation

TOPIC 2 — ANSP Maintenance Program

Sub-topic 2.1 — Policy

TOPIC 3 — ATM Context

Sub-topic 3.1 — ATM Context

TOPIC 4 — ANSP Administrative Practices

Sub-topic 4.1 — Administration

Subject 2: ANS SYSTEM/EQUIPMENT

TOPIC 1 — Operational Impacts

Sub-topic 1.1 — SMCSUR — Degradation or Loss of System/Equipment Services

TOPIC 2 — User Position Functionality and Operation

Sub-topic 2.1 — User Working Position

Sub-topic 2.2 — SMC Working Position

Subject 3: TOOLS, PROCESSES AND PROCEDURES

TOPIC 1 — Requirements

Sub-topic 1.1 — SMS

Sub-topic 1.2 — QMS

Sub-topic 1.3 — SMS application in the working environment

TOPIC 2 — Maintenance Agreements with Outside Agencies

Sub-topic 2.1 — Principles of agreements

TOPIC 3 — SMC General Processes

Sub-topic 3.1 — Roles and responsibilities

TOPIC 4 — Maintenance Management Systems

Sub-topic 4.1 — Reporting

Subject 4: TECHNOLOGY

TOPIC 1 — Technologies and Principles

Sub-topic 1.1 — General

Sub-topic 1.2 — Communication

Sub-topic 1.3 — Facilities

Subject 5: COMMUNICATION — DATA

TOPIC 1 — European Networks

Sub-topic 1.1 — Network Technologies

TOPIC 2 — Global Networks

Sub-topic 2.1 — Networks and Standards

Sub-topic 2.2 — Description

Sub-topic 2.3 — Global Architecture

Sub-topic 2.4 — Air-Ground Sub-networks

Sub-topic 2.5 — Ground-Ground sub-networks

Sub-topic 2.6 — Air-Ground Applications

Subject 6: COMMUNICATION — RECORDERS

TOPIC 1 — Legal Recorders

Sub-topic 1.1 — Regulations

Sub-topic 1.2 — Principles

Subject 7: NAVIGATION — PBN

TOPIC 1 — NAV Concepts

Sub-topic 1.1 — NOTAM

Subject 8: SURVEILLANCE — PRIMARY

TOPIC 1 — ATC Surveillance

Sub-topic 1.1 — Use of PSR for Air Traffic Services

Subject 9: SURVEILLANCE — SECONDARY

TOPIC 1 — SSR AND MSSR

Sub-topic 1.1 — Use of SSR for Air Traffic Services

TOPIC 2 — Mode S

Sub-topic 2.1 — Introduction to Mode S

TOPIC 3 — Multilateration

Sub-topic 3.1 — MLAT Principles

Subject 10: SURVEILLANCE — HMI

TOPIC 1 — HMI

Sub-topic 1.1 — ATCO HMI

Subject 11: SURVEILLANCE — DATA TRANSMISSION

TOPIC 1 — Surveillance Data Transmission

Sub-topic 1.1 — Technology and Protocols

16. SYSTEM MONITORING AND CONTROL — DATA

Subject 1: ANS STRUCTURE

TOPIC 1 — ANSP Organisation and Operation

Sub-topic 1.1 — ANSP Organisation and Operation

TOPIC 2 — ANSP Maintenance Program

Sub-topic 2.1 — Policy

TOPIC 3 — ATM Context

Sub-topic 3.1 — ATM Context

TOPIC 4 — ANSP ADMINISTRATIVE PRACTICES

Sub-topic 4.1 — Administration

Subject 2: ANS SYSTEM/EQUIPMENT

TOPIC 1 — Operational Impacts

Sub-topic 1.1 — Degradation or Loss of System/Equipment Services

TOPIC 2 — User Position Functionality and Operation

Sub-topic 2.1 — User Working Position

Sub-topic 2.2 — SMC Working Position

Subject 3: TOOLS, PROCESSES AND PROCEDURES

TOPIC 1 — SMCDAT — Requirements

Sub-topic 1.1 — SMS

Sub-topic 1.2 — QMS

Sub-topic 1.3 — SMS application in the working environment

TOPIC 2 — Maintenance Agreements with Outside Agencies

Sub-topic 2.1 — Principles of agreements

TOPIC 3 — SMC General Processes

Sub-topic 3.1 — Roles and responsibilities

TOPIC 4 — Maintenance Management Systems

Sub-topic 4.1 — Reporting

Subject 4: TECHNOLOGY

TOPIC 1 — Technologies and Principles

Sub-topic 1.1 — General

Sub-topic 1.2 — Communication

Sub-topic 1.3 — Facilities

Subject 5: COMMUNICATION — DATA

TOPIC 1 — European Networks

Sub-topic 1.1 — Network Technologies

TOPIC 2 — Global Networks

Sub-topic 2.1 — Networks and Standards

Sub-topic 2.2 — Description

Sub-topic 2.3 — Global Architecture

Sub-topic 2.4 — Air-Ground Sub-networks

Sub-topic 2.5 — Ground-Ground sub-networks

Sub-topic 2.6 — Air-Ground Applications

Subject 6: COMMUNICATION — RECORDERS

TOPIC 1 — Legal Recorders

Sub-topic 1.1 — Regulations

Sub-topic 1.2 — Principles

Subject 7: NAVIGATION — PBN

TOPIC 1 — SMCDAT — NAV Concepts

Sub-topic 1.1 — NOTAM

Subject 8: SURVEILLANCE — PRIMARY

TOPIC 1 — ATC Surveillance

Sub-topic 1.1 — Use of PSR for Air Traffic Services

Subject 9: SURVEILLANCE — SECONDARY

TOPIC 1 — SSR AND MSSR

Sub-topic 1.1 — Use of SSR for Air Traffic Services

TOPIC 2 — Mode S

Sub-topic 2.1 — Introduction to Mode S

TOPIC 3 — Multilateration

Sub-topic 3.1 — MLAT Principles

Subject 10: SURVEILLANCE — HMI

TOPIC 1 — HMI

Sub-topic 1.1 — ATCO HMI

Subject 11: SURVEILLANCE — DATA TRANSMISSION

TOPIC 1 — Surveillance Data Transmission

Sub-topic 1.1 — Technology and Protocols

Subject 12: SURVEILLANCE — DATA PROCESSING SYSTEMS

TOPIC 1 — User Requirements

Sub-topic 1.1 — Controller requirements

Sub-topic 1.2 — Trajectories, Prediction and Calculation

Sub-topic 1.3 — Ground-based Safety Nets

Sub-topic 1.4 — Decision Support

Subject 13: SURVEILLANCE — DATA PROCESS

TOPIC 1 — Hardware Platform

Sub-topic 1.1 — Equipment Upgrade

Sub-topic 1.2 — COTS

Sub-topic 1.3 — Interdependence

Subject 14: SURVEILLANCE — DATA

TOPIC 1 — Data Essentials Features

Sub-topic 1.1 — Data Significance

Sub-topic 1.2 — Data Configuration Control

Sub-topic 1.2 — Data Standards

Appendix 4a — Qualification training — Streams

ED Decision 2017/001/R

Subjects, topics and sub-topics from Appendix 4a are repeated in this AMC for the convenience of the reader and do not form a part of it.

Stream Communication — Voice

ED Decision 2017/001/R

SUBJECT 1: VOICE

TOPIC 1: AIR-GROUND

SUB-TOPIC 1.1: Transmission/reception

1.1.1	Perform typical measurements on a transmitter	3	Frequency (single carrier, offset carrier), modulation, channel spacing, output power, SWR
1.1.2	Adjust a generic radio transmitter	4	Noise, intermodulation, harmonics, power, bandwidth
1.1.3	Analyse the block diagram of a generic radio transmitter	4	Characteristics (modulation, single carrier, channel spacing), functionalities
1.1.4	Perform typical measurements on a receiver	3	Frequency, modulation, channel spacing, sensitivity, selectivity
1.1.5	Adjust a generic radio receiver	4	Signal to noise ratio, harmonics
1.1.6	Analyse the block diagram of a generic radio receiver	4	Characteristics (single carrier, channel spacing, sensitivity, selectivity)

SUB-TOPIC 1.2: Radio antenna systems

1.2.1	Explain antenna parameters	2	Impedance, polar diagram, bandwidth, polarisation, types of antennas
1.2.2	Characterise the coverage of the radio system	2	Polar diagram, types of antennas, frequency bands, propagation mode
1.2.3	Characterise budget link according to various conditions	2	Output power, antennae, propagation, geographic, meteorological, day and night
1.2.4	Characterise the elements of a generic antenna system	2	Filters, combiners, multi-cavity system
1.2.5	Check the conformity of a system to ITU and national regulation	3	Ref.: ICAO Annex 10 (VHF, UHF)
1.2.6	Perform measurements with generic radio test equipment	3	Spectrum analyser e.g. scanner

SUB-TOPIC 1.3: Voice switch

1.3.1	Analyse switching functionalities	4	General architecture, digital, analogue, multiplex types, PCM e.g. cross-coupling, split headset (radio both ears, telephone single ear)
1.3.2	Explain the principles of non-blocking switches	2	Advantages, disadvantages, delays (digital)
1.3.3	Describe the signal processing all along the chain	2	Signal tracing treatment, protocols (a few), data flow

SUB-TOPIC 1.4: Controller working position

1.4.1	Describe the most common features of a controller working position	2	Frequency selection, emergency, station selection, coupling, headset, loudspeaker, footswitch, Push to Talk e.g. microphone (noise cancelling), short time recording

SUB-TOPIC 1.5: Radio interfaces

1.5.1	Describe the different types of interface	2	Internal, external, phantom keying, in-band signal

TOPIC 2: GROUND-GROUND

SUB-TOPIC 2.1: Interfaces

2.1.1	Describe the different types of interfaces	2	Analogue (2, 4, 6 and 8 wires), digital (ISDN; 64 Kb, 2 Mb)
2.1.2	Explain the advantages and disadvantages of each type	2	Analogue (2, 4, 6 and 8 wires), digital (ISDN; 64 Kb, 2 Mb)
2.1.3	Operate measuring equipment	3	e.g. dB meters, level meters, generators, sniffer

SUB-TOPIC 2.2: Protocols

2.2.1	Operate standard protocol analysers	3	e.g. MFC R2 and/or ATS QSIG (rerouting), impulse dialling and DTMF dialling, ISDN
2.2.2	Analyse communication protocol with appropriate tools and documentation	4	e.g. MFC R2 , ATS QSIG (rerouting), impulse dialling and DTMF dialling, ISDN, national protocols

SUB-TOPIC 2.3: Switch

2.3.1	State the similarities between ground-ground and air-ground switches	1	Switching techniques
2.3.2	Describe the most commonly used functionality of PABX	2	General architecture, digital, analogue, multiplex types, PCM30
2.3.3	Analyse conversion analogue-digital, digital-analogue	4	General architecture, analogue-digital-analogue

SUB-TOPIC 2.4: Communication chain

2.4.1	Appreciate the replacement of components in a communication chain in a safe way	3	Continuity of service, communication chain integrity Additional: for achievement of competence, this objective shall be applied practically, at the latest, by the end of the S/E rating training

SUB-TOPIC 2.5: Controller working position

2.5.1	Describe the most common features of a controller working position and the HMI	2	—

SUBJECT 2: TRANSMISSION PATH

TOPIC 1: LINES

SUB-TOPIC 1.1: Lines theory

1.1.1	Calculate parameters of a line	3	e.g. equation, attenuation, impedance, S-parameters, Smith chart, bandwidth, HF specifics (dipoles, multipoles), SWR

SUB-TOPIC 1.2: Digital transmission

1.2.1	Calculate parameters for digital transmission	3	e.g. signal definition, Fourier Theory, signal processing (sampling, etc.), bandwidth, carrier, modulation, noises, S/N, delays, group delay, line quality (signal distortion, rate of failure), transmission speed

SUB-TOPIC 1.3: Types of lines

1.3.1	Describe the different types of lines and their physical characteristics	2	e.g. copper wires (twisted pairs, symmetrical cables), optic fibres (monomodes or multimodes, connectors, splicer), coaxial attenuation, losses, bending, characteristic impedance, EMC and noise immunity
1.3.2	Appreciate the appropriate type of line for a given specific application	3	e.g. bandwidth, noise immunity
1.3.3	Check the typical parameters of lines	3	e.g. impedance, insulation, signal level, time delay

TOPIC 2: SPECIFIC LINKS

SUB-TOPIC 2.1: Microwave link

2.1.1	Describe a microwave link	2	e.g. carrier frequency, type of modulation, Fresnel Theory, loss, atmospheric influences

SUB-TOPIC 2.2: Satellite

2.2.1	Describe the parameters of a satellite link	2	Uplinks, downlinks, antennas, footprint, delays, atmospheric influences

SUBJECT 3: RECORDERS

TOPIC 1: LEGAL RECORDERS

SUB-TOPIC 1.1: Regulations

1.1.1	Explain the international regulations	2	ICAO (recording and reproducing)
1.1.2	Explain national regulations	2	Appropriate national regulations
1.1.3	Explain how service providers comply with the regulations	2	e.g. storage media, access to recording and reproducing room, time to store information (overwrite/erase voice or data), procedure to reproduce information.

SUB-TOPIC 1.2: Principles

1.2.1	Explain the principles of recording and reproducing	2	e.g. storage media (tape, optical and magnetic disc), A/D-D/A converters, frequency range (300 to 3 400 Hz), channel capacity, time synchronisation, connection to a network, synchronisation of radar and voice recording, replay limitations

SUBJECT 4: FUNCTIONAL SAFETY

TOPIC 1: SAFETY ATTITUDE

SUB-TOPIC 1.1: Safety attitude

1.1.1	State the role of ATSEP in safety management routines and in reporting processes	1	Safety assessment documentation related to communication system, safety reports and occurrences, safety monitoring

TOPIC 2: FUNCTIONAL SAFETY

SUB-TOPIC 2.1: Functional safety

2.1.1	Describe the implications of functional failures in terms of exposure time, environment, effect on controller and effect on pilot	2	Total or partial, premature or delayed operation, spurious, intermittent, loss or corruption of data, missing or incorrect input or output. Ref.: safety policy and implementation

Stream Communication — Data

ED Decision 2017/001/R

SUBJECT 1: DATA

TOPIC 1: INTRODUCTION TO NETWORKS

SUB-TOPIC 1.1: Types

1.1.1	State the evolution of network topologies	1	LAN, WAN e.g. architectures, size of the segments, length of the systems, quality of service
1.1.2	Explain how networks meet requirements	2	Redundancy, bandwidth, BER, time delay, network security

SUB-TOPIC 1.2: Networks

1.2.1	Analyse the features of a network	4	Routing scheme, rate, internal networking, routers, bridges, gateways, modems, switches, firewalls e.g. wireless networks
1.2.2	Describe network standards and devices	2	Ethernet, fibre optic, wireless
1.2.3	Appreciate the replacement of components in a network in a safe way	3	Continuity of service, network integrity Additional: for achievement of competence, this objective shall be applied practically, at the latest, by the end of the S/E rating training

SUB-TOPIC 1.3: External network services

1.3.1	Define aspects of external network services	1	Provided QoS e.g. SLAs

SUB-TOPIC 1.4: Measuring tools

1.4.1	Operate the usual set of network measuring or monitoring tools to find the values of the main parameters	3	Data analyser (sniffer) e.g.net scout
1.4.2	Perform analysis to support fault-finding for correction	3	Data analyser (sniffer) e.g.net scout

SUB-TOPIC 1.5: Troubleshooting

1.5.1	Appreciate how to troubleshoot a network	3	Additional: for achievement of competence, this objective shall be applied practically, at the latest, by the end of the S/E rating training e.g. broken lines, unusable network components, overload, integrity problems

TOPIC 2: PROTOCOLS

SUB-TOPIC 2.1: Fundamental theory

2.1.1	Apply the principles of layers	3	Differences between layers e.g. layer(s) of sniffer information
2.1.2	Apply the principles of addressing strategy	3	Masks, subnets IP addressing, MAC addressing e.g. same logical network computers and systems
2.1.3	Apply the principles of routing strategy	3	Routing tables, priorities, fault tolerance, management of routing strategy, static and dynamic routing e.g. unicast, multicast, broadcast

SUB-TOPIC 2.2: General protocols

2.2.1	Describe the general protocols	2	TCP/IP (segments, packets, addressing) e.g. X25, LAPB, pdH, sdH
2.2.2	Analyse the general protocols using the appropriate tools and documentation	4	TCP/IP e.g. X25, LAPB

SUB-TOPIC 2.3: Specific protocols

2.3.1	Describe the specific protocols	2	e.g. BATAP — ARINC 620, FMTP

TOPIC 3: NATIONAL NETWORKS

SUB-TOPIC 3.1: National networks

3.1.1	Name the national networks to which the organisation is connected	1	e.g. ANSP, MET, military, PTT, airlines, national network(s)
3.1.2	Describe the interfaces between national and global networks	2	—

TOPIC 4: EUROPEAN NETWORKS

SUB-TOPIC 4.1: Network technologies

4.1.1	State emerging network technologies	1	e.g.as used in EAN, NEAN, AMHS, PENS
4.1.2	Describe the characteristics of current networks	2	Surveillance data, flight plan data and AIS networks e.g. CIDIN, OLDI, CFMU-RCA, quality of service, architecture, FMTP, AMHS

TOPIC 5: GLOBAL NETWORKS

SUB-TOPIC 5.1: Networks and standards

5.1.1	List the global networks and the standards on which they are based	1	e.g. ICAO for AFTN/CIDIN/AMHS, ICAO for ATN, FANS 1 and FANS A for ACARS applications (SITA and ARINC)

SUB-TOPIC 5.2: Description

5.2.1	Describe the characteristics of the AFTN networks	2	Users and data, architectures, quality of service

SUB-TOPIC 5.3: Global architecture

5.3.1	Describe the architecture of the ATN	2	Air-ground subnetworks, ground-ground subnetworks, airborne networks

SUB-TOPIC 5.4: Air-ground subnetworks

5.4.1	Describe the air-ground subnetworks	2	VDL (mode 2), HFDL, AMSS, SATCOM

SUB-TOPIC 5.5: Ground-ground subnetworks

5.5.1	Describe the composition of ground-ground subnetworks	2	PTT, commercial telecom providers, ARINC, SITA

SUB-TOPIC 5.6: Networks on board of the aircraft

5.6.1	State the existence of subnetworks inside the aircraft relevant for ATM communications	1	e.g. AFDX — ARINC 429

SUB-TOPIC 5.7: Air-ground applications

5.7.1	State the main communication applications using data link systems	1	e.g. CPDLC, DLIC/AFN, ATIS, DCL

SUBJECT 2: TRANSMISSION PATH

TOPIC 1: LINES

SUB-TOPIC 1.1: Lines theory

1.1.1	Calculate parameters of a line	3	e.g. equation, attenuation, impedance, S-parameters, Smith chart, bandwidth, HF specifics (dipoles, multipoles), SWR

SUB-TOPIC 1.2: Digital transmission

1.2.1	Calculate parameters for digital transmission	3	e.g. signal definition, Fourier Theory, signal processing (sampling, etc.), bandwidth, carrier, modulation, noises, S/N, delays, group delay, line quality (signal distortion, rate of failure), transmission speed

SUB-TOPIC 1.3: Types of lines

1.3.1	Describe the different types of lines and their physical characteristics	2	e.g. copper wires (twisted pairs, symmetrical cables), optic fibres (monomodes or multimodes, connectors, splicer), coaxial attenuation, losses, bending, characteristic impedance, EMC and noise immunity
1.3.2	Appreciate the appropriate type of line for a given specific application	3	e.g. bandwidth, noise immunity
1.3.3	Check the typical parameters of lines	3	e.g. impedance, insulation, signal level, time delay

TOPIC 2: SPECIFIC LINKS

SUB-TOPIC 2.1: Microwave link

2.1.1	Describe a microwave link	2	e.g. carrier frequency, type of modulation, Fresnel Theory, loss, atmospheric influences

SUB-TOPIC 2.2: Satellite

2.2.1	Describe the parameters of a satellite link	2	Uplinks, downlinks, antennas, footprint, delays, atmospheric influences

SUBJECT 3: RECORDERS

TOPIC 1: LEGAL RECORDERS

SUB-TOPIC 1.1: Regulations

1.1.1	Explain the international regulations	2	ICAO (recording and reproducing)
1.1.2	Explain national regulations	2	Appropriate national regulations

1.1.3	Explain how service providers comply with the regulations	2	e.g. confidentiality when handling recorders, procedures for access to recorders, storage media, access to recording and reproducing room, time to store information (overwrite/erase voice or data), procedure to reproduce information

SUB-TOPIC 1.2: Principles

1.2.1	Explain the principles of recording and reproducing	2	e.g. storage media (tape, optical and magnetic disc), A/D-D/A converters, frequency range (300 to 3 400 Hz), channel capacity, time synchronisation, connection to a network, synchronisation of radar and voice recording, replay limitations

SUBJECT 4: FUNCTIONAL SAFETY

TOPIC 1: SAFETY ATTITUDE

SUB-TOPIC 1.1: Safety attitude

1.1.1	State the role of ATSEP in safety management routines and in reporting processes	1	Safety assessment documentation related to communication system, safety reports and occurrences, safety monitoring

TOPIC 2: FUNCTIONAL SAFETY

SUB-TOPIC 2.1: Functional safety

2.1.1	Describe the implications of functional failures in terms of exposure time, environment, effect on controller and effect on pilot	2	Total or partial, premature or delayed operation, spurious, intermittent, loss or corruption of data, missing or incorrect input or output. Ref.: safety policy and implementation

Stream Navigation — Non-directional beacon (NDB)

ED Decision 2017/001/R

SUBJECT 1: PERFORMANCE-BASED NAVIGATION

TOPIC 1: NAV CONCEPTS

SUB-TOPIC 1.1: Operational requirements

1.1.1	Explain the main performance characteristics of a navigation system	2	Accuracy, precision, stability, integrity, availability, continuity of service, coverage, robustness e.g. Time To First Fix
1.1.2	Explain the relationship between performance measures and the phases of flight	2	PBN Manual ICAO Doc 9613

SUB-TOPIC 1.2: Performance-based navigation

1.2.1	Describe the PBN concept	2	ICAO and EUROCONTROL documents, airspace concept, application supported by navigation infrastructure and navigation specifications, functionality of the avionics
1.2.2	Differentiate between an RNAV and an RNP navigation specification	2	On-Board Performance Monitoring and Alerting
1.2.3	State which navigation applications support the different phases of flight	1	PBN Manual ICAO Doc 9613

SUB-TOPIC 1.3 Area navigation concept (RNAV)

1.3.1	Differentiate between conventional navigation and area navigation	2	Fixed route vs flexible route structure

SUB-TOPIC 1.4: NOTAM

1.4.1	Explain the need for NOTAMs	2	—

SUBJECT 2 GROUND-BASED SYSEMS — NDB

TOPIC 1: NDB/LOCATOR

SUB-TOPIC 1.1: Use of the system

1.1.1	Appreciate the principles of NDB	3	Relative bearing, measuring method
1.1.2	Describe the overall performance	2	Coverage, accuracy, availability of the system, integrity, continuity
1.1.3	Explain the technical limitations of NDB	2	Lack of accuracy, lack of integrity, sensitivity to interference
1.1.4	Describe the current situation	2	e.g. number, type, users, user groups, European context

SUB-TOPIC 1.2: Ground station architecture

1.2.1	Describe the main components of an NDB ground station	2	Electronic cabinet, antennas, power supply, remote controls and monitoring e.g. auto-tune antenna units
1.2.2	Relate NDB station design to operational requirements	4	Coverage, ID code, VOR backup, double beacon approach, siting

SUB-TOPIC 1.3: Transmitter subsystem

1.3.1	Characterise the main NDB signal parameters	2	Carrier and ident frequency, output power, depth of modulation
1.3.2	Perform typical measurements on the main NDB signal parameters	3	e.g. carrier and ident frequency, power measurements, depth of modulation, audio distortion, antenna current, spectrum measurements, ID code

SUB-TOPIC 1.4: Antenna subsystem

1.4.1	Explain NDB antenna characteristics	2	Impedance, polar diagram, polarisation, ground reflections
1.4.2	Appreciate the interface between power stage and the antenna	3	SWR, radiated power

SUB-TOPIC 1.5: Monitoring and control subsystems

1.5.1	Describe the purpose of monitoring	2	Integrity, continuity of service, availability
1.5.2	Describe which parameters are used for the monitoring	2	Antenna current, ID code, depth of modulation
1.5.3	Appreciate how the operational status of the NDB monitoring system is checked	3	System status Additional: for achievement of competence, this objective shall be applied practically, at the latest, by the end of the S/E rating training
1.5.4	Describe the issues associated with NDB obstacle limitations and obstacle removal	2	Siting

SUB-TOPIC 1.6: On-board equipment

1.6.1	Describe the on-board equipment (ADF)	2	Receiver, antenna, displays
1.6.2	Describe how NDB information is used on-board	2	ADF indicator, RMI, HSI, ND

SUB-TOPIC 1.7: System check and maintenance

1.7.1	Appreciate the conformity to international and national regulations	3	ITU regulations (EMC + SAR), ICAO Annex 10 e.g. European regulations
1.7.2	Appreciate calibration tasks and flight inspection results	3	Additional: for achievement of competence, this objective shall be applied practically, at the latest, by the end of the S/E rating training e.g. maintenance and flight inspection manuals, procedures and reports
1.7.3	Appreciate troubleshooting of an NDB	3	Additional: for achievement of competence, this objective shall be applied practically, at the latest, by the end of the S/E rating training e.g. maintenance and flight inspection manuals, procedures and reports
1.7.4	Appreciate the origins of NDB errors	3	Additional: for achievement of competence, this objective shall be applied practically, at the latest, by the end of the S/E rating training e.g. multipath, EMC, interference with radio broadcast transmissions

SUBJECT 3: GLOBAL NAVIGATION SATELLITE SYSTEM

TOPIC 1: GNSS

SUB-TOPIC 1.1: General view

1.1.1	Explain the importance and continuing development of GNSS	2	FANS CNS/ATM concept, ICAO Doc 9849, Navigation Application & NAVAID Infrastructure Strategy for the ECAC Area up to 2020, EUROCONTROL GNSS Policy, SESAR ATM Master Plan
1.1.2	Describe the elements of GNSS within Europe	2	Core constellations, ABAS, SBAS (EGNOS) e.g. GBAS, SCAT 1, APV, ICAO Annex 10
1.1.3	Appreciate the sources of interference to GNSS signals	3	Intentional, unintentional, ionospheric interference, solar activity
1.1.4	Explain who has responsibility for GNSS oversight in your State and how it is carried out	2	e.g. EASA, GSA, NSA, ANSP
1.1.5	Appreciate the impact of the modernisation of GNSS on the ARNS bands	3	Introduction of L5, E5A, E5B e.g. COMPASS
1.1.6	Explain the need for a minimum number of visible satellites needed to provide integrity monitoring	2	e.g. AUGUR
1.1.7	Describe the purpose of the GNSS NOTAM	2	ICAO Annex 10, Vol. 1

SUBJECT 4: ON-BOARD EQUIPMENT

TOPIC 1: ON-BOARD SYSTEMS

SUB-TOPIC 1.1: On-board systems

1.1.1	Explain the purpose and use of a navigation computer	2	Sensors, navigation database
1.1.2	Explain the purpose and use of an FMS	2	Sensors, navigation database, path steering, displays

TOPIC 2: AUTONOMOUS NAVIGATION

SUB-TOPIC 2.1: Inertial navigation

2.1.1	Describe the principles and key features of INS/IRS navigation	2	Gyros, accelerometer, accuracy, drift, updating

TOPIC 3: VERTICAL NAVIGATION

SUB-TOPIC 3.1: Vertical navigation

3.1.1	Describe the different types of vertical sensors and their limitations	2	Barometric, radio altimetry, geodetic e.g. air data computers, manual intervention, dynamic information (AGL), undulation (WGS84)

SUBJECT 5: FUNCTIONAL SAFETY

TOPIC 1: SAFETY ATTITUDE

SUB-TOPIC 1.1: Safety attitude

1.1.1	State the role of ATSEP in safety management routines and in reporting processes	1	Safety assessment documentation related to navigation systems, safety monitoring

TOPIC 2: FUNCTIONAL SAFETY

SUB-TOPIC 2.1: Functional safety

2.1.1	Describe in terms of exposure time, environment, effect on controller and effect on pilot, the types of functional failures	2	Total or partial, premature or delayed operation, spurious, intermittent, loss or corruption of data, missing or incorrect input or output Ref.: Safety policy and implementation

Stream Navigation — Direction finding (DF)

ED Decision 2017/001/R

SUBJECT 1: PERFORMANCE-BASED NAVIGATION

TOPIC 1: NAV CONCEPTS

SUB-TOPIC 1.1: Operational requirements

1.1.1	Explain the main performance characteristics of a navigation system	2	Accuracy, precision, stability, integrity, availability, continuity of service, coverage, robustness e.g. Time To First Fix
1.1.2	Explain the relationship between performance measures and the phases of flight	2	PBN Manual ICAO Doc 9613

SUB-TOPIC 1.2: Performance-based navigation

1.2.1	Describe the PBN concept	2	ICAO and EUROCONTROL documents, airspace concept, application supported by navigation infrastructure and navigation specifications, functionality of the avionics
1.2.2	Differentiate between an RNAV and an RNP navigation specification	2	On-board performance monitoring and alerting
1.2.3	State which navigation applications support the different phases of flight	1	PBN Manual ICAO Doc 9613

SUB-TOPIC 1.3 Area navigation concept (RNAV)

1.3.1	Differentiate between conventional navigation and area navigation	2	Fixed route vs flexible route structure

SUB-TOPIC 1.4: NOTAM

1.4.1	Explain the need for NOTAMs	2	—

SUBJECT 2: GROUND-BASED SYSTEMS — DFI

TOPIC 1: DF

SUB-TOPIC 1.1: Use of the system

1.1.1	State the different types of DF	1	VDF, DDF, IDF
1.1.2	Describe the user HMI	2	Indication on radar picture, DF indicator
1.1.3	Appreciate the principles of DF	3	Bearing, measuring method (standard, Doppler, interferometry)

1.1.4	Describe the overall performance	2	Coverage, accuracy, availability of the system, integrity, continuity
1.1.5	Explain the technical limitations of DF	2	Sensitivity to interference
1.1.6	Describe the current situation	2	e.g. number, type, users, national context

SUB-TOPIC 1.2: VDF/DDF equipment architecture

1.2.1	Describe the main components of DF equipment	2	Electronic cabinet, antennas, power supply, remote controls and monitoring

SUB-TOPIC 1.3: Receiver subsystem

1.3.1	Explain the main signal parameters	2	Frequency band (UHF, VHF)

SUB-TOPIC 1.4: Antenna subsystem

1.4.1	Explain DF antenna characteristics	2	Impedance, polar diagram, polarisation, types of antennas
1.4.2	Appreciate protection areas	3	Obstacles, ICAO Annex 10 e.g. manufacturers manuals

SUB-TOPIC 1.5: Monitoring and control subsystems

1.5.1	Describe the purpose of monitoring	2	Integrity, continuity of service, availability
1.5.2	Describe which parameters are used for the monitoring	2	Noise figure, stability of measurement
1.5.3	Appreciate how the operational status of the DF monitoring system is checked	3	System status Additional: for achievement of competence, this objective shall be applied practically, at the latest, by the end of the S/E rating training
1.5.4	Describe the issues associated with DF obstacle limitations and obstacle removal	2	Surrounding environment, protection of bearing accuracy

SUB-TOPIC 1.6: System check and maintenance

1.6.1	Appreciate the conformity to international and national regulations	3	ITU regulations (EMV + SAR), ICAO Annex 10 e.g. European regulations
1.6.2	Perform typical measurements on a DF system	3	Frequency, channel spacing, sensitivity, selectivity, bearing accuracy
1.6.3	Appreciate calibration tasks and flight inspection results	3	Ground-based bearing checks, test oscillator Additional: for achievement of competence, this objective shall be applied practically, at the latest, by the end of the S/E rating training e.g. North setting, range, multipath Maintenance and flight inspection manuals, procedures and reports
1.6.4	Appreciate troubleshooting of DF	3	Additional: for achievement of competence, this objective shall be applied practically, at the latest, by the end of the S/E rating training

			e.g. sensitivity, local oscillator level Maintenance and flight inspection manuals, procedures and reports
1.6.5	Appreciate the origin of DF errors	3	Additional: for achievement of competence, this objective shall be applied practically, at the latest, by the end of the S/E rating training e.g. multipath, EMC, interference with radio broadcast transmissions

SUBJECT 3: GNSS

TOPIC 1: GNSS

SUB-TOPIC 1.1: General view

1.1.1	Explain the importance and continuing development of GNSS	2	FANS CNS/ATM concept, ICAO Doc 9849, Navigation Application & NAVAID Infrastructure Strategy for the ECAC Area up to 2020, EUROCONTROL GNSS Policy, SESAR ATM Master Plan
1.1.2	Describe the elements of GNSS within Europe	2	Core constellations, ABAS, SBAS (EGNOS) e.g. GBAS, SCAT 1, APV, ICAO Annex 10
1.1.3	Appreciate the sources of interference to GNSS signals	3	Intentional, unintentional, ionospheric interference, solar activity
1.1.4	Explain who has responsibility for GNSS oversight in your State and how it is carried out	2	e.g. e.g. EASA, GSA, NSA, ANSP
1.1.5	Appreciate the impact of the modernisation of GNSS on the ARNS bands	3	Introduction of L5, E5A, E5B e.g. COMPASS
1.1.6	Explain the need for a minimum number of visible satellites needed to provide integrity monitoring	2	e.g. AUGUR
1.1.7	Describe the purpose of the GNSS NOTAM	2	ICAO Annex 10, Vol. 1

SUBJECT 4: ON-BOARD EQUIPMENT

TOPIC 1: ON-BOARD SYSTEMS

SUB-TOPIC 1.1: On-board systems

1.1.1	Explain the purpose and use of a navigation computer	2	Sensors, navigation database
1.1.2	Explain the purpose and use of an FMS	2	Sensors, navigation database, path steering, displays

TOPIC 2: AUTONOMOUS NAVIGATION

SUB-TOPIC 2.1: Inertial navigation

2.1.1	Describe the principles and key features of INS/IRS navigation	2	Gyros, accelerometer, accuracy, drift, updating

TOPIC 3: VERTICAL NAVIGATION

SUB-TOPIC 3.1: Vertical navigation

3.1.1	Describe the different types of vertical sensors and their limitations	2	Barometric, radio altimetry, geodetic e.g. air data computers, manual intervention, dynamic information (AGL), undulation (WGS84)

SUBJECT 5: FUNCTIONAL SAFETY

TOPIC 1: SAFETY ATTITUDE

SUB-TOPIC 1.1: Safety attitude

1.1.1	State the role of ATSEP in safety management routines and in reporting processes	1	Safety assessment documentation related to navigation systems, safety monitoring

TOPIC 2: FUNCTIONAL SAFETY

SUB-TOPIC 2.1: Functional safety

2.1.1	Describe in terms of exposure time, environment, effect on controller and effect on pilot, the types of functional failures	2	Total or partial, premature or delayed operation, spurious, intermittent, loss or corruption of data, missing or incorrect input or output Ref.: Safety policy and implementation

Stream Navigation — VHF Omnidirectional radio range (VOR)

ED Decision 2017/001/R

SUBJECT 1: PERFORMANCE-BASED NAVIGATION

TOPIC 1: NAV CONCEPTS

SUB-TOPIC 1.1: Operational requirements

1.1.1	Explain the main performance characteristics of a navigation system	2	Accuracy, precision, stability, integrity, availability, continuity of service, coverage, robustness e.g. Time To First Fix
1.1.2	Explain the relationship between performance measures and the phases of flight	2	PBN Manual ICAO Doc 9613

SUB-TOPIC 1.2: Performance-based navigation

1.2.1	Describe the PBN concept	2	ICAO and EUROCONTROL documents, airspace concept, application supported by navigation infrastructure and navigation specifications, functionality of the avionics
1.2.2	Differentiate between an RNAV and an RNP navigation specification	2	On-board performance monitoring and alerting
1.2.3	State which navigation applications support the different phases of flight	1	PBN Manual ICAO Doc 9613

SUB-TOPIC 1.3: Area navigation concept (RNAV)

1.3.1	Differentiate between conventional navigation and area navigation	2	Fixed route vs flexible route structure

SUB-TOPIC 1.4: NOTAM

1.4.1	Explain the need for NOTAMs	2	—

SUBJECT 2: GROUND-BASED SYSTEMS — VOR

TOPIC 1: VOR

SUB-TOPIC 1.1: Use of the system

1.1.1	State the types of VOR Systems	1	Conventional, doppler
1.1.2	Describe the overall performance	2	Coverage, accuracy, availability of the system, integrity, continuity
1.1.3	Explain the technical limitations of CVOR	2	Type of information (azimuth), accuracy, integrity, suitable for a network of fixed routes
1.1.4	Appreciate the differences between CVOR and DVOR	3	Signal broadcast differences, bearing information robustness
1.1.5	Describe the current situation	2	e.g. number, type, users, user groups, national context, European context

SUB-TOPIC 1.2: Fundamentals of CVOR and/or DVOR

1.2.1	Appreciate the mathematical signal description	3	Declination, equations of CVOR and/or DVOR, reference and variable signals
1.2.2	Appreciate the principles for generating the variable signal	3	CVOR Rotating antenna principle Generating a rotating radiation pattern with static antennas and/or DVOR Frequency modulation through switching antenna

SUB-TOPIC 1.3: Ground station architecture

1.3.1	Describe the main components of a CVOR and/or DVOR ground station	2	Electronic cabinet, antenna system, power supply, remote controls and monitoring
1.3.2	Relate VOR station design to operational requirements	4	Siting, coverage, ID code, NDB backup

SUB-TOPIC 1.4: Transmitter subsystem

1.4.1	Characterise main signal parameters for a CVOR and/or DVOR	2	Carrier frequency stability, output power, signals generated
1.4.2	Perform typical transmitter measurements on VOR signals	3	Radiation pattern accuracy, power and modulation measurements, spectrum measurements, ID coding

SUB-TOPIC 1.5: Antenna subsystem

1.5.1	Explain VOR antenna characteristics	2	Impedance, polar diagram, polarisation, types of antennas
1.5.2	Appreciate the interface between power stage and the antennae	3	SWR, radiated power
1.5.3	Appreciate protection areas	3	Obstacles, ICAO Annex 10 e.g. manufacturers manuals

SUB-TOPIC 1.6: Monitoring and control subsystem

1.6.1	Describe the purpose of monitoring	2	Integrity, continuity of service, availability
1.6.2	Describe which VOR parameters are monitored	2	ICAO and RTCA/EUROCAE requirements e.g. NSA requirements
1.6.3	Describe the principles of the CVOR and/or DVOR monitoring systems	2	Near field sensors, far field sensors, recombination Local and remote monitoring
1.6.4	Appreciate how the operational status of the CVOR and/or DVOR monitoring systems are checked	3	Near field sensors, far field sensors, recombination Local and remote monitoring Additional: for achievement of competence, this objective should be applied practically, at the latest, by the end of the S/E rating training e.g. BITE, Watchdog
1.6.5	Describe the issues associated with VOR obstacle limitations and obstacle removal	2	Surrounding environment, multipath prevention
1.6.6	Explain the optional ILS interface	2	—

SUB-TOPIC 1.7: On-board equipment

1.7.1	Describe the on-board equipment	2	Antenna, receiver HMI e.g. CDI, RMI, HSI, ND, PFD
1.7.2	Describe how the VOR information is used on board	2	e.g. single VOR, VOR-VOR, approach procedures, manual mode, automatic mode

SUB-TOPIC 1.8: System check and maintenance

1.8.1	Appreciate the conformity to international and national regulations	3	ITU regulations (EMC + SAR), ICAO Annex 10
1.8.2	Perform typical system measurements	3	In space modulation, phase sideband/carrier, ground check for bearing errors
1.8.3	Appreciate calibration tasks and flight inspection results	3	Flight inspection (coverage, flight check for bearing errors and modulation) Additional: for achievement of competence, this objective shall be applied practically, at the latest, by the end of the S/E rating training e.g. maintenance manuals, procedures and reports

1.8.4	Appreciate troubleshooting of a CVOR and/or DVOR	3	Carrier frequency deviation, depth of modulation, lack of power, harmonics ratio Additional: for achievement of competence, this objective shall be applied practically, at the latest, by the end of the S/E rating training e.g. maintenance and flight inspection manuals, procedures and reports
1.8.5	Analyse the origins of CVOR and/or DVOR errors	4	CVOR System-dependent, adjustments, drifts, multipath, on-board errors and/or DVOR North Adjustment e.g. DVOR: antenna feeding DVOR and CVOR: multipath, EMC, interference with radio broadcast transmissions

SUBJECT 3: GNSS

TOPIC 1: GNSS

SUB-TOPIC 1.1: General view

1.1.1	Explain the importance and continuing development of GNSS	2	FANS CNS/ATM concept, ICAO Doc 9849, Navigation Application & NAVAID Infrastructure Strategy for the ECAC Area up to 2020, EUROCONTROL GNSS Policy, SESAR ATM Master Plan
1.1.2	Describe the elements of GNSS within Europe	2	Core constellations, ABAS, SBAS (EGNOS) e.g. GBAS, SCAT 1, APV, ICAO Annex 10
1.1.3	Appreciate the sources of interference to GNSS signals	3	Intentional, unintentional, ionospheric interference, solar activity
1.1.4	Explain who has responsibility for GNSS oversight in your State and how it is carried out	2	e.g. EASA, GSA, NSA, ANSP
1.1.5	Appreciate the impact of the modernisation of GNSS on the ARNS bands	3	Introduction of L5, E5A, E5B e.g. COMPASS
1.1.6	Explain the need for a minimum number of visible satellites needed to provide integrity monitoring	2	e.g. AUGUR
1.1.7	Describe the purpose of the GNSS NOTAM	2	ICAO Annex 10, Vol. 1

SUBJECT 4: ON-BOARD EQUIPMENT

TOPIC 1: ON-BOARD SYSTEMS

SUB-TOPIC 1.1: On-board systems

1.1.1	Explain the purpose and use of a navigation computer	2	Sensors, navigation database
1.1.2	Explain the purpose and use of an FMS	2	Sensors, navigation database, path steering, displays

TOPIC 2: AUTONOMOUS NAVIGATION

SUB-TOPIC 2.1: Inertial navigation

2.1.1	Describe the principles and key features of INS/IRS navigation	2	Gyros, accelerometer, accuracy, drift, updating

TOPIC 3: VERTICAL NAVIGATION

SUB-TOPIC 3.1: Vertical navigation

3.1.1	Describe the different types of vertical sensors and their limitations	2	Barometric, radio altimetry, geodetic e.g. air data computers, manual intervention, dynamic information (AGL), undulation (WGS84)

SUBJECT 5: FUNCTIONAL SAFETY

TOPIC 1: SAFETY ATTITUDE

SUB-TOPIC 1.1: Safety attitude

1.1.1	State the role of ATSEP in safety management routines and in reporting processes	1	Safety assessment documentation related to navigation systems, safety monitoring

TOPIC 2: FUNCTIONAL SAFETY

SUB-TOPIC 2.1: Functional safety

2.1.1	Describe in terms of exposure time, environment, effect on controller and effect on pilot, the types of functional failures	2	Total or partial, premature or delayed operation, spurious, intermittent, loss or corruption of data, missing or incorrect input or output Ref.: Safety policy and implementation

Stream Navigation — Distance measuring equipment (DME)

ED Decision 2017/001/R

SUBJECT 1: PERFORMANCE-BASED NAVIGATION

TOPIC 1: NAV CONCEPTS

SUB-TOPIC 1.1: Operational requirements

1.1.1	Explain the main performance characteristics of a navigation system	2	Accuracy, precision, stability, integrity, availability, continuity of service, coverage, robustness e.g. Time To First Fix
1.1.2	Explain the relationship between performance measures and the phases of flight	2	PBN Manual ICAO Doc 9613

SUB-TOPIC 1.2: Performance-based navigation

1.2.1	Describe the PBN concept	2	ICAO and EUROCONTROL documents, airspace concept, application supported by navigation infrastructure and navigation specifications, functionality of the avionics
1.2.2	Differentiate between an RNAV and an RNP navigation specification	2	On-board performance monitoring and alerting
1.2.3	State which navigation applications support the different phases of flight	1	PBN Manual ICAO Doc 9613

SUB-TOPIC 1.3: Area navigation concept (RNAV)

1.3.1	Differentiate between conventional navigation and area navigation	2	Fixed route vs flexible route structure

SUB-TOPIC 1.4: NOTAM

1.4.1	Explain the need for NOTAMs	2	—

SUBJECT 2: GROUND-BASED SYSTEMS — DME

TOPIC 1: DME

SUB-TOPIC 1.1: Use of the system

1.1.1	Describe the overall performances for DME	2	Coverage, accuracy, availability of the system, integrity, continuity, number of users
1.1.2	Explain the limitations of DME	2	Accuracy, integrity, capacity
1.1.3	Describe the current situation	2	e.g. number, types, users, user groups, national context, European context
1.1.4	State the role of the DME infrastructure in the future navigation applications	1	PBN
1.1.5	Explain the differences between DME and TACAN for civilian use	2	e.g. azimuth and range

SUB-TOPIC 1.2: Fundamentals of DME

1.2.1	Describe the key elements of DME system operation	2	Two-way ranging technique, slant range, time measurement A/c interrogation, pulse pairs, ground reply, fixed time delay, interrogation stagger, 'X' and 'Y' channels
1.2.2	Explain the frequency spectrum and the channel spacing allocated	2	ICAO Annex 10, L-band

SUB-TOPIC 1.3: Ground station architecture

1.3.1	Describe the main components of a DME ground station	2	Electronic cabinet, antenna system, power supply, remote controls and monitoring
1.3.2	Relate DME station design to operational requirements	4	Coverage, ID code, siting

SUB-TOPIC 1.4: Receiver subsystem

1.4.1	Explain the main receiver parameters for a DME	2	Sensitivity, selectivity, dynamic range, jamming immunity
1.4.2	Perform the typical measurements on the interrogation signals	3	Sensitivity, selectivity, dynamic range, jamming immunity

SUB-TOPIC 1.5: Signal processing

1.5.1	Explain the functions performed by a DME/N signal processor	2	Decode, Reply Delay, Automatic Reply Rate Control, Encode, priority (Ident, DME signal, Squitter)
1.5.2	Perform the typical measurement on the DME/N transponder signals	3	Reply delay, Reply delay offset, decode parameters, rate of replies

SUB-TOPIC 1.6: Transmitter subsystem

1.6.1	Characterise the main signal parameters from the ground station	2	Carrier frequency, output power, pulse shape, pulse spacing, pulse repetition frequency, main delay, ID code
1.6.2	Perform the typical measurements on a DME	3	Power and pulse measurements, spectrum measurements, modulation measurements

SUB-TOPIC 1.7: Antenna subsystem

1.7.1	Explain DME antenna characteristics	2	Patterns, antennas
1.7.2	Appreciate the interface between power stage and the antenna	3	SWR, radiated power, propagation delay, distribution circuit (e.g. duplexer, circulator)
1.7.3	Appreciate protection areas	3	ICAO Annex 10, protection area criteria and enforcement e.g. manufacturers manuals

SUB-TOPIC 1.8: Monitoring and control subsystem

1.8.1	Describe the purpose of monitoring	2	Integrity, continuity of service
1.8.2	Describe which DME parameters are monitored	2	ICAO and RTCA/EUROCAE requirements e.g. NSA requirements
1.8.3	Appreciate how the operational status of the DME monitoring system is checked	3	Additional: for achievement of competence, this objective shall be applied practically, at the latest, by the end of the S/E rating training
1.8.4	Describe the issues associated with DME obstacle limitations and obstacle removal	2	Multipath, blanking

SUB-TOPIC 1.9: On-board equipment

1.9.1	Describe the on-board equipment	2	Transmitter, antenna, receiver, HMI e.g. HSI, DME range indication, ND
1.9.2	Describe how the DME information is used on board	2	e.g. single DME, multi-DME navigation (rho rho), approach procedures, manual mode, automatic mode

SUB-TOPIC 1.10: System check and maintenance

1.10.1	Appreciate the conformity to international and national regulations	3	ITU regulations (EMC + SAR), ICAO Annex 10 e.g. European regulations
1.10.2	Appreciate calibration tasks and flight inspection results	3	Additional: for achievement of competence, this objective shall be applied practically, at the latest, by the end of the S/E rating training e.g. maintenance and flight inspection manuals, procedures and reports
1.10.3	Appreciate troubleshooting of a DME	3	Carrier frequency deviation, depth of modulation, lack of power, harmonics ratio Additional: for achievement of competence, this objective shall be applied practically, at the latest, by the end of the S/E rating training e.g. main delay and monitor shutdown errors, interference Maintenance and flight inspection manuals, procedures and reports
1.10.4	Appreciate the origin of DME errors	3	Additional: for achievement of competence, this objective shall be applied practically, at the latest, by the end of the S/E rating training e.g. Multipath, EMC, interference with radio broadcast transmissions (harmonics)

SUBJECT 3: GNSS

TOPIC 1: GNSS

SUB-TOPIC 1.1: General view

1.1.1	Explain the importance and continuing development of GNSS	2	FANS CNS/ATM concept, ICAO Doc 9849, Navigation Application & NAVAID Infrastructure Strategy for the ECAC Area up to 2020, EUROCONTROL GNSS Policy, SESAR ATM Master Plan
1.1.2	Describe the elements of GNSS within Europe	2	Core constellations, ABAS, SBAS (EGNOS) e.g. GBAS, SCAT 1, APV, ICAO Annex 10
1.1.3	Appreciate the sources of interference to GNSS signals	3	Intentional, unintentional, ionospheric interference, solar activity
1.1.4	Explain who has responsibility for GNSS oversight in your State and how it is carried out	2	e.g. EASA, GSA, NSA, ANSP
1.1.5	Appreciate the impact of the modernisation of GNSS on the ARNS bands	3	Introduction of L5, E5A, E5B e.g. COMPASS
1.1.6	Explain the need for a minimum number of visible satellites needed to provide integrity monitoring	2	e.g. AUGUR
1.1.7	Describe the purpose of the GNSS NOTAM	2	ICAO Annex 10, Vol. 1

SUBJECT 4: ON-BOARD EQUIPMENT

TOPIC 1: ON-BOARD SYSTEMS

SUB-TOPIC 1.1: On-board systems

1.1.1	Explain the purpose and use of a navigation computer	2	Sensors, navigation database
1.1.2	Explain the purpose and use of an FMS	2	Sensors, navigation database, path steering, displays

TOPIC 2: AUTONOMOUS NAVIGATION

SUB-TOPIC 2.1: Inertial navigation

2.1.1	Describe the principles and key features of INS/IRS navigation	2	Gyros, accelerometer, accuracy, drift, updating

TOPIC 3: VERTICAL NAVIGATION

SUB-TOPIC 3.1: Vertical navigation

3.1.1	Describe the different types of vertical sensors and their limitations	2	Barometric, radio altimetry, geodetic e.g. air data computers, manual intervention, dynamic information (AGL), undulation (WGS84)

SUBJECT 5: FUNCTIONAL SAFETY

TOPIC 1: SAFETY ATTITUDE

SUB-TOPIC 1.1: Safety attitude

1.1.1	State the role of ATSEP in safety management routines and in reporting processes	1	Safety assessment documentation related to navigation systems, safety monitoring

TOPIC 2: FUNCTIONAL SAFETY

SUB-TOPIC 2.1: Functional safety

2.1.1	Describe in terms of exposure time, environment, effect on controller and effect on pilot, the types of functional failures	2	Total or partial, premature or delayed operation, spurious, intermittent, loss or corruption of data, missing or incorrect input or output Ref.: Safety policy and implementation

Stream Navigation — Instrument landing system (ILS)

ED Decision 2017/001/R

SUBJECT 1: PERFORMANCE-BASED NAVIGATION

TOPIC 1: NAV CONCEPTS

SUB-TOPIC 1.1: Operational requirements

1.1.1	Explain the main performance characteristics of a navigation system	2	Accuracy, precision, stability, integrity, availability, continuity of service, coverage, robustness e.g. Time To First Fix
1.1.2	Explain the relationship between performance measures and the phases of flight	2	PBN Manual ICAO Doc 9613

SUB-TOPIC 1.2: Performance-based navigation

1.2.1	Describe the PBN concept	2	ICAO and EUROCONTROL documents, airspace concept, application supported by navigation infrastructure and navigation specifications, functionality of the avionics
1.2.2	Differentiate between an RNAV and an RNP navigation specification	2	On-board performance monitoring and alerting
1.2.3	State which navigation applications support the different phases of flight	1	PBN Manual ICAO Doc 9613

SUB-TOPIC 1.3: Area navigation concept (RNAV)

1.3.1	Differentiate between conventional navigation and area navigation	2	Fixed route vs flexible route structure

SUB-TOPIC 1.4: NOTAM

1.4.1	Explain the need for NOTAMs	2	—

SUBJECT 2: GROUND-BASED SYSTEMS — ILS

TOPIC 1: ILS

SUB-TOPIC 1.1: Use of the system

1.1.1	Describe the overall performance for ILS	2	ICAO Annexes 10 and 14 Coverage, accuracy, availability of the system, integrity, continuity, number of users
1.1.2	Explain the limitations of ILS	2	ICAO Annexes 10 and 14 Only 40 channels, no segmented paths of approach, beam corruption due to multipath
1.1.3	Interpret ILS facility performance categories	5	ICAO Annexes 10 and 14 Cat I, Cat II, Cat III Different operational category depending on operational minima, equipment and airport facilities
1.1.4	Define obstacle-free zones for ILS components	1	ICAO Annexes 10 and 14 Dimensions

			e.g. national regulations
1.1.5	Explain the importance and need for ILS obstacle-free zones	2	ILS beam protection, increased significance during LVP conditions
1.1.6	Explain the current situation	2	e.g. number, type, users, national context
1.1.7	Consider the need for ATC ILS status indications	2	No continuous monitoring by ATSEP

SUB-TOPIC 1.2: Fundamentals of ILS

1.2.1	Explain how to obtain a change in depth of modulation of an amplitude-modulated signal as a function of angular position	2	Addition of a carrier signal and a side band signal in space
1.2.2	Characterise the signals to be radiated	2	Amplitude and phase relationship, antenna systems
1.2.3	Relate the adjustment of signals generated to the resulting beam patterns and standards	4	Phases and amplitudes in antenna array, modulations on carrier signal, phase and amplitude of side band
1.2.4	Describe the required performance of an antenna array	2	Beam bend potential, coverage, impact on location of critical and sensitive area

SUB-TOPIC 1.3: 2F-Systems

1.3.1	Explain the limitations of a 1F system	2	Multipath in adverse environment and terrain
1.3.2	Describe the capture effect	2	Capture effect in receiver circuits
1.3.3	Describe radiation parameters for 2F-LOC and 2F-GP	2	Types of antenna arrays, patterns, coverage, signal distribution, radiated power

SUB-TOPIC 1.4: Ground station architecture

1.4.1	Describe the layout of an ILS	2	—
1.4.2	Describe the main components of the LOC (1F and 2F), GP (1F and 2F), markers and field monitors	2	Electronic cabinet, antennas, power supply, remote controls and monitoring, tower indication e.g. DME
1.4.3	Relate ILS station design to operational requirements	4	Coverage, ID code, siting

SUB-TOPIC 1.5: Transmitter subsystem

1.5.1	Describe the main components of the LOC (1F and 2F), GP (1F and 2F), markers and field monitors	2	Electronic cabinet, antennas, power supply, remote controls and monitoring, tower indication e.g. DME
1.5.2	Relate ILS station design to operational requirements	4	Coverage, ID code, siting

SUB-TOPIC 1.6: Antenna subsystem

1.6.1	Explain ILS antenna characteristics: LOC, GP and Marker Beacons	2	Types, position, polarisation, patterns, coverage, antenna matching, distribution circuits, radiated power, ground reflection

SUB-TOPIC 1.7: Monitoring and control subsystem

1.7.1	Describe the purpose of monitoring	2	Integrity, continuity of service
1.7.2	Describe the parameters for the monitoring according to ICAO Annex 10: LOC, GP and Marker Beacons	2	RF level, DDM, SDM on position and width
1.7.3	Explain the key additional required monitoring: LOC and GP	2	External, internal and integral monitoring
1.7.4	Explain the purpose, advantages and disadvantages of the FFM system	2	e.g. content position, width, requirement for Cat III operations (some States)
1.7.5	Draw a diagram of the monitoring system: LOC, GP, FFM and Marker Beacons	1	Near-field, integral network, internal network, monitor signal processor e.g. DME
1.7.6	Explain the optional DME interface	2	Identity coding ratio

SUB-TOPIC 1.8: On-board equipment

1.8.1	Describe the on-board equipment associated with LOC, GP and Marker Beacon	2	Antennas, receiver, pilot interface (cross pointer) e.g. FMS
1.8.2	Describe how ILS information is used on board	2	e.g. approach procedures, landing, roll-out, manual, automatic mode (auto-pilot)

SUB-TOPIC 1.9: System check and maintenance

1.9.1	Appreciate the conformity of LOC, GP and marker beacons to international and national regulations	3	ITU regulations (EMC + SAR), ICAO Annex 10 e.g. European regulations
1.9.2	Justify the occasions when it is necessary to downgrade an ILS facility performance category	4	e.g. system failures, environmental changes/disturbance
1.9.3	Explain the implications of ILS facility performance categories to the pilot	2	Link with prevailing Instrument RVR, weather dictating decision height
1.9.4	Perform some typical measurements	3	Output power, spectrum analysis, modulation, ID code
1.9.5	Appreciate calibration tasks and flight inspection results	3	LOC, GP and marker beacons Flight inspection and ground calibration results, LOC Centreline measurement, width and centreline field measurements Additional: for achievement of competence, this objective shall be applied practically, at the latest, by the end of the S/E rating training e.g. RF interference monitoring maintenance and flight inspection manuals, procedures and reports

1.9.6	Appreciate troubleshooting of ILS LOC, GP and marker beacons	3	DDM and SDM misalignment, coverage pilot reported errors, field checks, monitor checks Additional: for achievement of competence, this objective shall be applied practically, at the latest, by the end of the S/E rating training e.g. lack of power, carrier frequency deviation, harmonic ratio, depth of modulation maintenance and flight inspection manuals, procedures and reports
1.9.7	Appreciate the origin of ILS errors	3	Additional: for achievement of competence, this objective shall be applied practically, at the latest, by the end of the S/E rating training e.g. Multipath, EMC, interference with radio broadcast transmissions (harmonics)

SUBJECT 3: GNSS

TOPIC 1: GNSS

SUB-TOPIC 1.1: General view

1.1.1	Explain the importance and continuing development of GNSS	2	FANS CNS/ATM concept, ICAO Doc 9849, Navigation Application & NAVAID Infrastructure Strategy for the ECAC Area up to 2020, EUROCONTROL GNSS Policy, SESAR ATM Master Plan
1.1.2	Describe the elements of GNSS within Europe	2	Core constellations, ABAS, SBAS (EGNOS) e.g. GBAS, SCAT 1, APV, ICAO Annex 10
1.1.3	Appreciate the sources of interference to GNSS signals	3	Intentional, unintentional, ionospheric interference, solar activity
1.1.4	Explain who has responsibility for GNSS oversight in your State and how it is carried out	2	e.g. EASA, GSA, NSA, ANSP
1.1.5	Appreciate the impact of the modernisation of GNSS on the ARNS bands	3	Introduction of L5, E5A, E5B e.g. COMPASS
1.1.6	Explain the need for a minimum number of visible satellites needed to provide integrity monitoring	2	e.g. AUGUR
1.1.7	Describe the purpose of the GNSS NOTAM	2	ICAO Annex 10, Vol. 1

SUBJECT 4: ON-BOARD EQUIPMENT

TOPIC 1: ON-BOARD SYSTEMS

SUB-TOPIC 1.1: On-board systems

1.1.1	Explain the purpose and use of a navigation computer	2	Sensors, navigation database
1.1.2	Explain the purpose and use of an FMS	2	Sensors, navigation database, path steering, displays

TOPIC 2: AUTONOMOUS NAVIGATION

SUB-TOPIC 2.1: Inertial navigation

2.1.1	Describe the principles and key features of INS/IRS navigation	2	Gyros, accelerometer, accuracy, drift, updating

TOPIC 3: VERTICAL NAVIGATION

SUB-TOPIC 3.1: Vertical navigation

3.1.1	Describe the different types of vertical sensors and their limitations	2	Barometric, radio altimetry, geodetic e.g. air data computers, manual intervention, dynamic information (AGL), undulation (WGS84)

SUBJECT 5: FUNCTIONAL SAFETY

TOPIC 1: SAFETY ATTITUDE

SUB-TOPIC 1.1: Safety attitude

1.1.1	State the role of ATSEP in safety management routines and in reporting processes	1	Safety assessment documentation related to navigation systems, safety monitoring

TOPIC 2: FUNCTIONAL SAFETY

SUB-TOPIC 2.1: Functional safety

2.1.1	Describe in terms of exposure time, environment, effect on controller and effect on pilot, the types of functional failures	2	Total or partial, premature or delayed operation, spurious, intermittent, loss or corruption of data, missing or incorrect input or output Ref.: Safety policy and implementation

Stream Navigation — Microwave landing system (MLS)

ED Decision 2017/001/R

SUBJECT 1: PERFORMANCE-BASED NAVIGATION

TOPIC 1: NAV CONCEPTS

SUB-TOPIC 1.1: Operational requirements

1.1.1	Explain the main performance characteristics of a navigation system	2	Accuracy, precision, stability, integrity, availability, continuity of service, coverage, robustness e.g. Time To First Fix
1.1.2	Explain the relationship between performance measures and the phases of flight	2	PBN Manual ICAO Doc 9613

SUB-TOPIC 1.2: Performance-based navigation

1.2.1	Describe the PBN concept	2	ICAO and EUROCONTROL documents, airspace concept, application supported by navigation infrastructure and navigation specifications, functionality of the avionics
1.2.2	Differentiate between an RNAV and an RNP navigation specification	2	On-board performance monitoring and alerting
1.2.3	State which navigation applications support the different phases of flight	1	PBN Manual ICAO Doc 9613

SUB-TOPIC 1.3: Area navigation concept (RNAV)

1.3.1	Differentiate between conventional navigation and area navigation	2	Fixed route vs flexible route structure

SUB-TOPIC 1.4: NOTAM

1.4.1	Explain the need for NOTAMs	2	—

2. SUBJECT 2: GROUND-BASED SYSTEMS — MLS

TOPIC 1: MLS

SUB-TOPIC 1.1: Use of the system

1.1.1	Describe approach and landing path	2	Azimuth station, elevation station, back azimuth station, approach DME, equipment layout, ICAO defined benchmarks
1.1.2	Describe the overall performances for MLS	2	Coverage, accuracy, availability of the system, integrity, continuity, category and level
1.1.3	Explain the technical limitations of MLS	2	Sensitivity to weather conditions, complexity, sensitively to multipath, criticality of signal at edge of coverage
1.1.4	Explain the advantages of MLS	2	Type of information, accuracy, small critical and sensitive areas, number of channels, complex approach paths, less prone to interference, reduced sensitivity to multipath, size of antennae array
1.1.5	Interpret MLS facility performance categories	5	Cat 1, 2, 3 Different operational category depending on operational minima, equipment and airport facilities
1.1.6	Define MLS critical and sensitive areas	1	Critical and sensitive area dimensions
1.1.7	Explain the importance and need for MLS critical and sensitive areas	2	MLS beam protection, increased significance during LVP conditions
1.1.8	Describe the current situation	2	Multi-mode receivers, ground and aircraft equipment e.g. low equipage, users, number of manufacturers
1.1.9	Consider the need for ATC MLS status indications	2	No continuous monitoring by ATSEP

SUB-TOPIC 1.2: Fundamentals of MLS

1.2.1	Explain the principle for generating a scanning beam	2	Phase changes, phase relations
1.2.2	Describe the relationship between beam pattern and accuracy	2	Beam width, side lobe level reduction
1.2.3	Explain why data transmission is necessary	2	Station coordinates, ident, function synchronisation, time reference
1.2.4	Describe the data transmission structure	2	ICAO specification

SUB-TOPIC 1.3: Ground station architecture

1.3.1	Describe the layout of an MLS	2	—
1.3.2	Describe the main components of the azimuth, elevation, back azimuth and DME stations	2	Electronic cabinet, antennas, power supply, remote controls and monitoring, tower indication
1.3.3	Relate MLS station design to operational requirements	4	Coverage, ID code, siting

SUB-TOPIC 1.4: Transmitter subsystem

1.4.1	Characterise main signal parameters for azimuth, elevation and back azimuth station	2	Carrier frequency, output power, signals generated
1.4.2	Explain the main components of the transmitters	2	Azimuth, elevation, back azimuth station synthesiser, modulator, power amplifier, control coupler, RF changeover

SUB-TOPIC 1.5: Antenna subsystem

1.5.1	Explain MLS antenna characteristics: azimuth, elevation and back azimuth stations	2	Types, location, polarisation, pattern, coverage, distribution circuits, radiated power

SUB-TOPIC 1.6: Monitoring and control subsystem

1.6.1	Describe the purpose of monitoring	2	Integrity, continuity of service
1.6.2	Describe the parameters for the monitoring according to ICAO Annex 10: azimuth, elevation and back azimuth stations	2	RF level, beam width, scan speed
1.6.3	Explain how the parameters are monitored: azimuth, elevation and back azimuth station	2	External and internal monitoring
1.6.4	Explain the FFM system	2	Requirements for CAT 3 operations
1.6.5	Draw a diagram of the monitoring system	1	—

SUB-TOPIC 1.7: On-board equipment

1.7.1	Describe the on-board equipment	2	Antennas, receiver, pilot interface, HMI e.g. FMS
1.7.2	Describe how the MLS information is used on board	2	Approach procedures, ILS-like display

SUB-TOPIC 1.8: System check and maintenance

1.8.1	Appreciate the conformity to international and national regulations	3	ITU regulations (EMC + SAR), ICAO Annex 10 e.g. European regulations
1.8.2	Justify the occasions when it is necessary to downgrade an MLS facility performance category	4	—
1.8.3	Explain the implications of MLS facility performance categories to the pilot	2	Link with prevailing instrument RVR, weather dictating decision height
1.8.4	Consider the need for ATSEP MLS remote maintenance and monitoring systems	2	Control, status, performance monitoring including alarm logging
1.8.5	Perform the typical system measurements	3	Output power, spectrum analysis, data link modulation, ID code, Ground field checks
1.8.6	Appreciate calibration tasks and flight inspection results	3	Azimuth, back azimuth, azimuth centreline measurement, width and centreline measurements, elevation Flight inspection and ground calibration results Additional: for achievement of competence, this objective shall be applied practically, at the latest, by the end of the S/E rating training e.g. maintenance manuals, procedures and reports
1.8.7	Appreciate troubleshooting of an MLS	3	Lack of power, carrier frequency deviation, harmonic ratio, beam pattern Additional: for achievement of competence, this objective shall be applied practically, at the latest, by the end of the S/E rating training e.g. maintenance and flight inspection manuals, procedures and reports
1.8.8	Appreciate the origin of MLS errors	3	Additional: for achievement of competence, this objective shall be applied practically, at the latest, by the end of the S/E rating training e.g. Multipath, EMC, weather influence

SUBJECT 3: GNSS

TOPIC 1: GNSS

SUB-TOPIC 1.1: General view

1.1.1	Explain the importance and continuing development of GNSS	2	FANS CNS/ATM concept, ICAO Doc 9849, Navigation Application & NAVAID Infrastructure Strategy for the ECAC Area up to 2020, EUROCONTROL GNSS Policy, SESAR ATM Master Plan
1.1.2	Describe the elements of GNSS within Europe	2	Core constellations, ABAS, SBAS (EGNOS) e.g. GBAS, SCAT 1, APV, ICAO Annex 10
1.1.3	Appreciate the sources of interference to GNSS signals	3	Intentional, unintentional, ionospheric interference, solar activity
1.1.4	Explain who has responsibility for GNSS oversight in your State and how it is carried out	2	e.g. EASA, GSA, NSA, ANSP
1.1.5	Appreciate the impact of the modernisation of GNSS on the ARNS bands	3	Introduction of L5, E5A, E5B e.g. COMPASS

1.1.6	Explain the need for a minimum number of visible satellites needed to provide integrity monitoring	2	e.g. AUGUR
1.1.7	Describe the purpose of the GNSS NOTAM	2	ICAO Annex 10, Vol. 1

SUBJECT 4: ON-BOARD EQUIPMENT

TOPIC 1: ON-BOARD SYSTEMS

SUB-TOPIC 1.1: On-board systems

1.1.1	Explain the purpose and use of a navigation computer	2	Sensors, navigation database
1.1.2	Explain the purpose and use of an FMS	2	Sensors, navigation database, path steering, displays

TOPIC 2: AUTONOMOUS NAVIGATION

SUB-TOPIC 2.1: Inertial navigation

2.1.1	Describe the principles and key features of INS/IRS navigation	2	Gyros, accelerometer, accuracy, drift, updating

TOPIC 3: VERTICAL NAVIGATION

SUB-TOPIC 3.1: Vertical navigation

3.1.1	Describe the different types of vertical sensors and their limitations	2	Barometric, radio altimetry, geodetic e.g. air data computers, manual intervention, dynamic information (AGL), undulation (WGS84)

SUBJECT 5: FUNCTIONAL SAFETY

TOPIC 1: SAFETY ATTITUDE

SUB-TOPIC 1.1: Safety attitude

1.1.1	State the role of ATSEP in safety management routines and in reporting processes	1	Safety assessment documentation related to navigation systems, safety monitoring

TOPIC 2: FUNCTIONAL SAFETY

SUB-TOPIC 2.1: Functional safety

2.1.1	Describe in terms of exposure time, environment, effect on controller and effect on pilot, the types of functional failures	2	Total or partial, premature or delayed operation, spurious, intermittent, loss or corruption of data, missing or incorrect input or output Ref.: Safety policy and implementation

Stream Surveillance — Primary surveillance radar

ED Decision 2017/001/R

SUBJECT 1: PRIMARY SURVEILLANCE RADAR

TOPIC 1: ATC SURVEILLANCE

SUB-TOPIC 1.1: Use of PSR for Air Traffic Services

1.1.1	Describe the operational requirements of an en-route or an approach PSR	2	Range, resolution, coverage, availability
1.1.2	Relate key parameters of PSR to system performance	4	Key parameters: PRF, signal energy, frequency diversity, antenna gain, update rate, polarisation, receiver MDS, beamwidth Performance: range, accuracy, resolution, extractor minimum target threshold, weather influence, PD, blind speed, ambiguities, capacity e.g. weather channel

SUB-TOPIC 1.2: Antenna (PSR)

1.2.1	Describe antenna types, accuracy and problems	2	Antenna beam(s), side lobes, reflector antenna, active (phased array) antenna, rotating joints, waveguide interface, pressurisation, dehumidification, polarisation, azimuth encoding, drive systems

SUB-TOPIC 1.3: Transmitters

1.3.1	Describe the basic characteristics of a transmitter	2	Supply, EHT, RF source (appropriate to type chosen), modulation, interlocks
1.3.2	Describe the signals at all key points	2	Supply, EHT, RF source (appropriate to type chosen), modulation, interlocks
1.3.3	Describe a generic transmitter block diagram for both compressed and non-compressed system	2	e.g. solid state, klystron, magnetron, travelling wave tube
1.3.4	State possible failures and where they can occur in the transmitter system	1	e.g. solid state modules, arcing, corona discharge, component stress, control loops, isolation
1.3.5	State constraints and problems on the high voltage circuitry	1	e.g. corona discharge, dielectric stress, isolation, arcing, ageing, interlocks, stability (including control loop)

SUB-TOPIC 1.4: Characteristics of primary targets

1.4.1	Appreciate the characteristics of targets detected by PSR	3	Backscatter, radar cross section (such as reflectivity, stealth technologies, aspect), Doppler shift, ground speed, wind turbines e.g. Swerling Case

SUB-TOPIC 1.5: Receivers

1.5.1	Describe the basic characteristics of a receiver	2	Low noise, high dynamic range, bandwidth, detection, frequency, sensitivity, selectivity

1.5.2	Describe the basic elements of a generic receiver	2	LNA, local oscillator, coherent oscillator, down-converter, filtering, rejection, IF, PSD, AGC, STC, beam switching
1.5.3	Appreciate the importance of STC	3	Saturation, RF-IF dynamic range

SUB-TOPIC 1.6: Signal processing and plot extraction

1.6.1	Describe the basic function of data processing	2	Plot extraction (range bin reports, range correlation, azimuth correlation), target reports, sliding window, weighted centre, local tracking
1.6.2	Appreciate the basic functions of a current radar signal processor	3	A/D conversion, I/Q matching, target detection, detection criteria (fixed, adaptive), MTD and clutter maps
1.6.3	Describe the processing techniques to improve the quality of target reports using scan-to-scan information	2	Tracking, environment mapping, adaptive feedback to extraction parameters

SUB-TOPIC 1.7: Plot combining

1.7.1	Describe the basic function of plot combining	2	Secondary/primary combining, secondary/primary assigning, prime target, range and azimuth collimation
1.7.2	Describe the basic functions of a current radar plot combiner	2	Scan-to-scan correlation, angel filtering, vehicle filtering, output format

SUB-TOPIC 1.8: Characteristics of primary radar

1.8.1	Explain the basic principles of electromagnetism, propagation, signal detection, RF power generation and distribution	2	Frequency and phase, electromagnetic radiation, spectrum and bandwidth, noise, HPA, waveguide problems

TOPIC 2: SURFACE MOVEMENT RADAR

SUB-TOPIC 2.1: Use of SMR for Air Traffic Services

2.1.1	Describe the operational requirements of SMR	2	Range, resolution, coverage, MTBF, availability
2.1.2	Relate key parameters and necessity to achieve performances	4	Specific equations for ranging and power budget, PRF, frequency with respect to range and accuracy, PD, frequency diversity, range with respect to TX power, antenna gain, receiver MDS, update rate, beamwidth, extractor minimum target threshold, polarisation, influence to meteorology

SUB-TOPIC 2.2: Radar sensor

2.2.1	Explain the layout of the SMR	2	Dual system, service display
2.2.2	Describe the basic functions of the receiver/transmitter unit	2	Hardware/function overview

2.2.3	Describe how to operate a sensor	2	e.g. block diagram, timing relations, video path, frequency diversity, polarisation, controller structure
2.2.4	Describe the basic functions of the antenna unit	2	e.g. hardware function overview, control/switch unit, external interface, azimuth encoding, monopulse techniques

TOPIC 3: TEST AND MEASUREMENT

SUB-TOPIC 3.1: Test and measurement

3.1.1	Appreciate how measurements can be made on PSR and SMR	3	Additional: for achievement of competence, this objective shall be applied practically, at the latest, by the end of the S/E rating training e.g. spectrum analyser, vector voltmeter, oscilloscope, SWR meter, sensor analysis tools

SUBJECT 2: HUMAN MACHINE INTERFACE (HMI)

TOPIC 1: HMI

SUB-TOPIC 1.1: ATCO HMI

1.1.1	Describe the display types available	2	Video, synthetic, mixed
1.1.2	State the type of selections available	1	Source, range, maps, filters
1.1.3	Describe the advantages of different display types	2	Clarity, configurability, fallback, data integration

SUB-TOPIC 1.2: ATSEP HMI

1.2.1	Describe the user interface scope and ergonomics as seen by different users and at different locations	2	System management displays characteristics both control and monitoring
1.2.2	Describe the analytical and status data available to the users	2	Radar video, front panel and CMS data, HMI on each subsystem

SUB-TOPIC 1.3: Pilot HMI

1.3.1	Describe the transponder interface	2	Mode A, change procedure, SPI, Mode C, deselection, hijack
1.3.2	Be aware of the ACAS/TCAS display and future potential developments	0	Characteristics, accuracy, alerts, ADS B, CDTI
1.3.3	Be aware of the EGPWS display and of future potential developments	0	—

SUB-TOPIC 1.4: Displays

1.4.1	Describe the display types available and their advantages and disadvantages	2	Raster/rotating, raw/synthetic, monochrome/colour, CRT/LCD, performances (cost, availability, maintainability, ergonomics)

SUBJECT 3: SURVEILLANCE DATA TRANSMISSION

TOPIC 1: SURVEILLANCE DATA TRANSMISSION

SUB-TOPIC 1.1: Technology and protocols

1.1.1	Describe the implementation of formats and protocols	2	Network protocols, Surveillance Data Networks e.g. RADNET, messages CAT 1+
1.1.2	Decode ASTERIX messages	3	e.g. categories 1, 2, 20, 21, 34, 48, 62
1.1.3	Identify the data transmission architecture in a multisensor environment	3	Fault tolerance, redundancy of line equipment e.g. software fallback capability, contingency of service, RADNET
1.1.4	Characterise the degradations of the surveillance transmission network	2	e.g. saturation, excess latency

SUB-TOPIC 1.2: Verification methods

1.2.1	Identify the causes of a fault, based on test tool measurements	3	Additional: for achievement of competence, this objective shall be applied practically, at the latest, by the end of the S/E rating training e.g. data analyser, line analyser

SUBJECT 4: FUNCTIONAL SAFETY

TOPIC 1: SAFETY ATTITUDE

SUB-TOPIC 1.1: Safety attitude

1.1.1	State the role of ATSEP in safety management routines and in reporting processes	1	Safety assessment documentation related to the surveillance systems, safety reports and occurrences, safety monitoring

TOPIC 2: FUNCTIONAL SAFETY

SUB-TOPIC 2.1: Functional safety

2.1.1	Describe the implications of functional failures in terms of exposure time, environment, effect on controller and effect on pilot	2	Total or partial, premature or delayed operation, spurious, intermittent, loss or corruption of data, missing or incorrect input or output Ref.: Safety policy and implementation

SUBJECT 5: DATA PROCESSING SYSTEMS

TOPIC 1: SYSTEM COMPONENTS

SUB-TOPIC 1.1: Surveillance data processing systems

1.1.1	Identify all functions of an SDP system	3	Plot processing, tracking, single-sensor and multisensor tracker e.g. radar, ADS, MLAT, estimating limits and accuracy of multisensor tracker, recording e.g. ARTAS tracker
1.1.2	Describe all major components of an SDP	2	Functional architecture, technical architecture
1.1.3	Differentiate SDP features in the ATS units	2	Area control centres Approach control units

			Aerodrome control towers
1.1.4	Appreciate how to operate the system	3	e.g. configuration, adjust parameters, start up and shut down, monitoring
1.1.5	Explain the principles of emergency switching	2	—

Stream Surveillance — Secondary surveillance radar

ED Decision 2017/001/R

SUBJECT 1: SECONDARY SURVEILLANCE RADAR (SSR)

TOPIC 1: SSR AND MONO-PULSE SSR

SUB-TOPIC 1.1: Use of SSR for Air Traffic Services

1.1.1	Describe the operational requirements of an en-route or an approach SSR	2	Range, coverage, resolution, performance, update rate ICAO Doc 9684
1.1.2	Relate key parameters of SSR to system performance	4	Key parameters: rotation rate, PRF, interlaced modes, capacity, frequencies, power budget (uplink, downlink), monopulse techniques Consequences: FRUIT, garbling, side lobes reception and transmission, transponder availability, PD, 2nd recurrence replies

SUB-TOPIC 1.2: Antenna (SSR)

1.2.1	Describe the principles of SSR/MSSR antenna	2	Monopulse antenna techniques, coaxial connection, sum, difference and control pattern, error angle measurement, azimuth encoding, beam sharpening, side lobes

SUB-TOPIC 1.3: Interrogator

1.3.1	Describe the characteristics of an interrogator	2	Frequency, spectrum, interrogation modes, duty cycle, ISLS, IISLS, staggering
1.3.2	Explain a generic interrogator	2	Timing, interface, modulator, BITE
1.3.3	Explain the need for integrity monitoring	2	Safeguards against erroneous transmission, BITE

SUB-TOPIC 1.4: Transponder

1.4.1	Explain the operational use of the transponder	2	Diagram of interaction between transponder and aeroplane
1.4.2	Define the global performances	1	Range, accuracy, fixed delay to respond
1.4.3	Describe the basic characteristics of a transponder	2	Transceiver, aerial location, switching and polar diagram, size ACAS Mode S and ADS compatibility, maximum reply rate, ISLS compatibility
1.4.4	Explain the advantages of the transponder	2	Longer range, more information
1.4.5	Explain the limitations of the transponder	2	Hundreds of feet precision, 3A limited codes
1.4.6	Describe the conformity to regulations	2	Equipage obligations, ICAO Annex 10

1.4.7	Describe the data format of the received transponder messages	2	P1, P2, P3, P4, P5, P6 signals and DPSK modulation (P6)
1.4.8	Describe the data format of the transmitted transponder messages	2	Field lengths, data bits, Gray code, unused bits, Mode S reply (preamble and data)
1.4.9	Describe the basic characteristics of a transmitter	2	Timing, modulation, pulse width, power output
1.4.10	Describe the use of the transponder as a field monitor	2	—

SUB-TOPIC 1.5: Receivers

1.5.1	Describe the basic characteristics of an SSR receiver	2	Standard/MSSR receiver, sensibility, bandwidth, dynamic range, GTC (normal, sectorised), monopulse processor, RSLS, multi-path and interferences

SUB-TOPIC 1.6: Signal processing and plot extraction

1.6.1	Describe monopulse extraction	2	Phase and amplitude modulation, off boresight angle calculation, azimuth encoding
1.6.2	Describe sliding window SSR extraction	2	Leading edge, trailing edge, azimuth accuracy, azimuth encoding
1.6.3	Describe the signal processing	2	Video digitiser, pulse processor, reply decoder (bracket pair detector), synchronous reply correlator
1.6.4	Decode a transponder message	3	Standard message with SPI set e.g. Mode S
1.6.5	Describe the SSR processing techniques	2	Discrete code correlation, general association, zones, categories, code swapping, general correlation Mode A code data, Mode C data, target position report
1.6.6	Explain the reasons for surveillance processing and the key options	2	False target identification and elimination, data validation, data correction, reflection identification and processing, enhanced resolution performance

SUB-TOPIC 1.7: Plot combining

1.7.1	Describe the basic function of plot combining	2	Secondary/primary combining, secondary/primary assigning, prime target, range and azimuth collimation
1.7.2	Describe the basic functions of a current radar plot combiner	2	_

SUB-TOPIC 1.8: Test and measurement

1.8.1	Appreciate how measurements can be made on SSR	3	Additional: for achievement of competence, this objective should be applied practically, at the latest, by the end of the S/E rating training e.g. spectrum analyser, vector voltmeter, oscilloscope, SWR meter, sensor analysis tools

TOPIC 2: MODE S

SUB-TOPIC 2.1: Introduction to Mode S

2.1.1	Explain the need for and benefits of Mode S	2	Classical SSR limitations, resolution, accuracy, integrity, enhanced data (e.g. 25 ft resolution, aircraft ID, BDS information)
2.1.2	Explain the working principles of Mode S	2	Mode S interrogation, Mode S reply, Mode S uplink and downlink capability, Mode S formats/protocols, ELS, EHS
2.1.3	Explain the complementary use of Mode S and conventional SSR	2	Mode interlace pattern, operational use of all-call, roll-call
2.1.4	Explain Mode S implementation	2	Elementary and enhanced surveillance, II and SI codes, use of BDS

SUB-TOPIC 2.2: Mode S system

2.2.1	Describe the theory of operation of Mode S hardware and software	2	Performance of the system, theory of operation of the system, interfaces to customer equipment
2.2.2	Describe testing possibilities for Mode S	2	e.g. SASS-C, SASS-S

TOPIC 3: MULTILATERATION

SUB-TOPIC 3.1: MLAT in use

3.1.1	Explain how pilot and controller operations are impacted by the use of an MLAT system	2	Mode A assigned at gate, coverage of MLAT
3.1.2	Describe the ground mode of transponders	2	Aircraft interrogations, squitters, change of transponder mode

SUB-TOPIC 3.2: MLAT principles

3.2.1	Explain the MLAT system architecture	2	Standards, transmitters and receivers, data processing/fusion, redundancy, performance, costs, timing solutions, etc.
3.2.2	Appreciate the principles of MLAT system	3	Triangulation, coverage, position calculation e.g. SCAS
3.2.3	Describe how to operate the system	2	Tracking, map creation and blanking
3.2.4	Describe testing possibilities for MLAT	2	e.g. SASS-C

TOPIC 4: SSR ENVIRONMENT

SUB-TOPIC 4.1: SSR Environment

4.1.1	Explain the operational use of ACAS and implications for pilots and controllers	2	Traffic Advisories, Resolution Advisories, pilot responses and controller information
4.1.2	Describe the users of the 1 030 MHz 1 090 MHz channels	2	Modes 1, 3, A, C and S, military, Mode S uplink and downlink capability, ACAS (TCAS), acquisition and extended squitter, PRF-FRUIT ratios, DME and other interferences

SUBJECT 2: HUMAN MACHINE INTERFACE (HMI)

TOPIC 1: HMI

SUB-TOPIC 1.1: ATCO HMI

1.1.1	Describe the display types available	2	Video, synthetic, mixed
1.1.2	State the type of selections available	1	Source, range, maps, filters
1.1.3	Describe the advantages of different display types	2	Clarity, configurability, fallback, data integration

SUB-TOPIC 1.2: ATSEP HMI

1.2.1	Describe the user interface scope and ergonomics as seen by different users and at different locations	2	System management displays characteristics, both control and monitoring
1.2.2	Describe the analytical and status data available to the users	2	Radar video, front panel and CMS data, HMI on each subsystem

SUB-TOPIC 1.3: Pilot HMI

1.3.1	Describe the transponder interface	2	Mode A, change procedure, SPI, Mode C, deselection, hijack
1.3.2	Be aware of the ACAS/TCAS display and future potential developments	0	Characteristics, accuracy, alerts, ADS B, CDTI
1.3.3	Be aware of the EGPWS display and of future potential developments	0	—

SUB-TOPIC 1.4: Displays

1.4.1	Describe the display types available and their advantages and disadvantages	2	Raster/rotating, raw/synthetic, monochrome/colour, CRT/LCD, performances (cost, availability, maintainability, ergonomics)

SUBJECT 3: SURVEILLANCE DATA TRANSMISSION

TOPIC 1: SURVEILLANCE DATA TRANSMISSION

SUB-TOPIC 1.1: Technology and protocols

1.1.1	Describe the implementation of formats and protocols	2	Network protocols, Surveillance Data Networks e.g. RADNET, messages CAT 1+
1.1.2	Decode ASTERIX messages	3	e.g. categories 1, 2, 20, 21, 34, 48, 62
1.1.3	Identify the data transmission architecture in a multisensor environment	3	Fault tolerance, redundancy of line equipment e.g. software fallback capability, contingency of service, RADNET
1.1.4	Characterise the degradations of the surveillance transmission network	2	e.g. saturation, excess latency

SUB-TOPIC 1.2: Verification methods

1.2.1	Identify the causes of a fault, based on test tool measurements	3	Additional: for achievement of competence, this objective shall be applied practically, at the latest, by the end of the S/E rating training e.g. data analyser, line analyser

SUBJECT 4: FUNCTIONAL SAFETY

TOPIC 1: SAFETY ATTITUDE

SUB-TOPIC 1.1: Safety attitude

1.1.1	State the role of ATSEP in safety management routines and in reporting processes	1	Safety assessment documentation related to the surveillance systems, safety reports and occurrences, safety monitoring

TOPIC 2: FUNCTIONAL SAFETY

SUB-TOPIC 2.1: Functional safety

2.1.1	Describe the implications of functional failures in terms of exposure time, environment, effect on controller and effect on pilot	2	Total or partial, premature or delayed operation, spurious, intermittent, loss or corruption of data, missing or incorrect input or output Ref.: Safety policy and implementation,

SUBJECT 5: DATA PROCESSING SYSTEMS

TOPIC 2: SYSTEM COMPONENTS

SUB-TOPIC 1.1: Surveillance data processing systems

1.1.1	Identify all functions of an SDP system	3	Plot processing, tracking, single-sensor and multisensor tracker (e.g. radar, ADS, MLAT), estimating limits and accuracy of multisensor tracker, recording e.g. ARTAS tracker
1.1.2	Describe all major components of an SDP	2	Functional architecture, technical architecture
1.1.3	Differentiate SDP features in the ATS units	2	Area control centres Approach control units Aerodrome control towers
1.1.4	Appreciate how to operate the system	3	e.g. configuration, adjust parameters, start up and shut down, monitoring
1.1.5	Explain the principles of emergency switching	2	—

Stream Surveillance — Automatic dependent surveillance

ED Decision 2017/001/R

SUBJECT 1: AUTOMATIC DEPENDENT SURVEILLANCE (ADS)

TOPIC 1: GENERAL VIEW ON ADS

SUB-TOPIC 1.1: Definition of ADS

1.1.1	Describe the basic characteristics of a ADS	2	Performance, integrity, latency, QoS, implementation options (e.g. ATN/FANS)
1.1.2	List the types of navigation sensors	1	GNSS, INS, radio NAVAIDs, navigation solutions from FMS, FoM

1.1.3	State the latest developments, implementation plans and projects	1	e.g. current and recent test and trials, ICAO status, EUROCONTROL, FAA and other authorities positions, airline and equipment manufacturer positions, ATC procedures, time scales

TOPIC 2: ADS-B

SUB-TOPIC 2.1: Introduction to ADS-B

2.1.1	Explain the basic principles of ADS-B	2	Autonomous operation, navigation solutions, link options, aircraft situation awareness
2.1.2	Identify the major elements of ADS-B	3	e.g. ADS-B global chain (from the aircraft to the controller HMI), GNSS, FMS, encoding, scheduling, link

SUB-TOPIC 2.2: Techniques of ADS-B

2.2.1	Explain the characteristics of the data links used in ADS B	2	VDL Mode 4, Mode S extended squitter, UAT
2.2.2	Describe the major ADS-B applications	2	e.g. ADS-B-NRA, ADS-B-RAD, ASAS

SUB-TOPIC 2.3: VDL Mode 4 (STDMA)

2.3.1	Describe the use of VDL Mode 4	2	High-level description

SUB-TOPIC 2.4: Mode S extended squitter

2.4.1	Describe the use of the Mode S extended squitter	2	High-level description
2.4.2	Explain the principles related to signals in space	2	Modulation scheme, signal structure, key data and frequency
2.4.3	Explain the principles related to random access technology	2	Consequences on the RF environment (1 090 MHz)
2.4.4	Explain the relevant messages	2	Information in each field, information encoding and decoding
2.4.5	Recognise the structure of a Mode S extended squitter signal	1	Signal timing and sequencing, data encoding
2.4.6	Explain the interface between the BDS and the extended squitter message	2	—

SUB-TOPIC 2.5: UAT

2.5.1	State the use of the UAT	1	High-level description

SUB-TOPIC 2.6: ASTERIX

2.6.1	Decode and analyse a signal coded according to the ASTERIX category 21 standard	3	Reference to ASTERIX standard Decode position, call sign, Mode S address, etc.

TOPIC 3: ADS-C

SUB-TOPIC 3.1: Introduction to ADS-C

3.1.1	Explain the basic principles of ADS-C	2	Contract, multi-contract, time, event triggering
3.1.2	Identify the major elements of the ADS-C system	3	ADS-C global chain (from the aircraft to the controller HMI), GNSS, processor, link, ground station

SUB-TOPIC 3.2: Techniques in ADS-C

3.2.1	Explain the characteristics of the data links used in ADS-C	2	e.g. subnetworks (VDLs, AMSS, HFDL)

SUBJECT 2: HUMAN MACHINE INTERFACE (HMI)

TOPIC 1: HMI

SUB-TOPIC: 1.1 ATCO HMI

1.1.1	Describe the display types available	2	Video, synthetic, mixed
1.1.2	State the type of selections available	1	Source, range, maps, filters
1.1.3	Describe the advantages of different display types	2	Clarity, configurability, fallback, data integration

SUB-TOPIC 1.2: ATSEP HMI

1.2.1	Describe the display types available	2	Video, synthetic, mixed
1.2.2	State the type of selections available	1	Source, range, maps, filters

SUB-TOPIC 1.3: Pilot HMI

1.3.1	Describe the transponder interface	2	Mode A, change procedure, SPI, Mode C, deselection, hijack
1.3.2	Be aware of the ACAS/TCAS display and future potential developments	0	Characteristics, accuracy, alerts, ADS B, CDTI
1.3.3	Be aware of the EGPWS display and of future potential developments	0	—

SUB-TOPIC 1.4: Displays

1.4.1	Describe the display types available and their advantages and disadvantages	2	Raster/rotating, raw/synthetic, monochrome/colour, CRT/LCD, performances (cost, availability, maintainability, ergonomics)

SUBJECT 3: SURVEILLANCE DATA TRANSMISSION

TOPIC 1: SURVEILLANCE DATA TRANSMISSION

SUB-TOPIC 1.1: Technology and protocols

1.1.1	Describe the implementation of formats and protocols	2	Network protocols, surveillance data networks e.g. RADNET, messages CAT 1+
1.1.2	Decode ASTERIX messages	3	e.g. categories 1, 2, 20, 21, 34, 48, 62

1.1.3	Identify the data transmission architecture in a multisensor environment	3	Fault tolerance, redundancy of line equipment e.g. software fallback capability, contingency of service, RADNET
1.1.4	Characterise the degradations of the surveillance transmission network	2	e.g. saturation, excess latency

SUB-TOPIC 1.2: Verification methods

1.2.1	Identify the causes of a fault, based on test tool measurements	3	Additional: for achievement of competence, this objective shall be applied practically, at the latest, by the end of the S/E rating training e.g. data analyser, line analyser

SUBJECT 4: FUNCTIONAL SAFETY

TOPIC 1 SAFETY ATTITUDE

SUB-TOPIC 1.1: Safety attitude

1.1.1	State the role of ATSEP in safety management routines and in reporting processes	1	Safety assessment documentation related to surveillance systems, safety monitoring

TOPIC 2: FUNCTIONAL SAFETY

SUB-TOPIC 2.1: Functional safety

2.1.1	Describe the implications of functional failures in terms of exposure time, environment, effect on controller and effect on pilot	2	Total or partial, premature or delayed operation, spurious, intermittent, loss or corruption of data, missing or incorrect input or output Ref.: Safety policy and implementation

SUBJECT 5: DATA PROCESSING SYSTEMS

TOPIC 2: SYSTEM COMPONENTS

SUB-TOPIC 1.1: Surveillance data processing systems

1.1.1	Identify all functions of an SDP system	3	Plot processing, tracking, single-sensor and multisensor tracker (e.g. radar, ADS, MLAT), estimating limits and accuracy of multisensor tracker, recording e.g. ARTAS tracker
1.1.2	Describe all major components of an SDP	2	Functional architecture, technical architecture
1.1.3	Differentiate SDP features in the ATS units	2	Area Control Centres Approach Control Units Aerodrome Control Towers
1.1.4	Appreciate how to operate the system	3	e.g. configuration, adjust parameters, start up and shut down, monitoring
1.1.5	Explain the principles of emergency switching	2	—

Stream Data — Data processing

ED Decision 2017/001/R

SUBJECT 1: FUNCTIONAL SAFETY

TOPIC 1: FUNCTIONAL SAFETY

SUB-TOPIC 1.1: Functional safety

1.1.1	Describe the implications of functional failure in terms of exposure time, environment, effect on controller and effect on pilot	2	Total or partial, premature or delayed operation, spurious, intermittent, loss or corruption of data, missing or incorrect input or output Ref.: Safety policy and implementation

SUB-TOPIC 1.2: Software integrity and security

1.2.1	Appreciate how a system can be defended against potential hostile intent via the data processing systems	3	Input verification, secure sources e.g. leased lines, private networks, eligibility
1.2.2	Explain how the normal output of a system could be used by non-authorised persons with hostile intent	2	e.g. terrorists using radar data to coordinate an attack
1.2.3	Estimate the impact of security and integrity failure to the operational service	3	e.g. system crashes due to incorrect input data, main and standby and fallback systems all have same input, possible loss in total of system, results in capacity reductions and safety consequences
1.2.4	Appreciate error detection and handling in data, hardware and process	3	Identification, consequence, scope, reporting, fault tolerance, soft fail, failsafe, monitoring, fallback

TOPIC 2: SAFETY ATTITUDE

SUB-TOPIC 2.1: Safety attitude

2.1.1	State the role of ATSEP in safety management routines and in reporting processes	1	Safety assessment documentation related to data processing systems, safety monitoring

SUBJECT 2: DATA PROCESSING SYSTEMS

TOPIC 1: USER REQUIREMENTS

SUB-TOPIC 1.1: Controller requirements

1.1.1	Explain ATCO missions and services needed in an area control centre	2	Operational requirements e.g. separation, flight progress monitoring and coordination, trajectory prediction, coordination with adjacent centres
1.1.2	Explain ATCO missions and services needed in an approach control unit	2	Operational requirements e.g. vectoring, sequencing, AMAN, CDM
1.1.3	Explain ATCO missions and services needed in an aerodrome control tower	2	Operational requirements e.g. runway management, DMAN

SUB-TOPIC 1.2: Trajectories, prediction and calculation

1.2.1	State different types of trajectories	1	e.g. FPL-based, surveillance data-based, FMS-based
1.2.2	Explain the main processes for trajectory prediction	2	SDP trajectory, FPL trajectory, merged trajectory, predicted trajectory

SUB-TOPIC 1.3: Ground safety nets

1.3.1	Describe the function of safety nets and their legal status	2	STCA, APW, MSAW, ASMGCS-based safety nets

SUB-TOPIC 1.4: Decision support

1.4.1	Explain the major steps in the air traffic planning process	2	ATFCM with strategic, pre-tactical and tactical, ATC sector planning, tactical control
1.4.2	Explain the principles of trajectory prediction, conformance monitoring and medium term conflict detection processes	2	Route adherence monitoring e.g. CORA, MTCD, CLAM, Level adherence monitoring
1.4.3	Explain the benefit of these tools for safety and efficiency	2	—

TOPIC 2: SYSTEM COMPONENTS

SUB-TOPIC 2.1: Processing systems

2.1.1	Describe all major components of a data processing system	2	Functional architecture, technical architecture, supervision

SUB-TOPIC 2.2: Flight data processing systems

2.2.1	Identify all functions of an FDP system	3	FDPS reference model, message handling, initial flight data handling, relationship with other functions, air-ground data link processing, trajectory prediction, flight data management and distribution, SSR Mode A code assignment and management, correlation, coordination and transfer
2.2.2	Describe all major components of an FDP	2	Functional architecture, technical architecture e.g. HMI, ATC tools, support tools (technical supervision, QoS monitors and logging)
2.2.3	Differentiate FDP features in the ATS units	2	Area control centres Approach control units Aerodrome control towers
2.2.4	Appreciate how to operate the system	3	e.g. configuration, adjust parameters, start up and shut down, monitoring
2.2.5	Explain the principles of emergency switching	2	—

SUB-TOPIC 2.3: Surveillance data processing systems

2.3.1	Identify all functions of an SDP system	3	Plot processing, tracking, single sensor and multisensor tracker (e.g. radar, ADS, MLAT), estimating limits and accuracy of multisensor tracker, recording e.g. ARTAS tracker
2.3.2	Describe all major components of an SDP	2	Functional architecture, technical architecture
2.3.3	Differentiate SDP features in the ATS units	2	Area control centres Approach control units Aerodrome control towers
2.3.4	Appreciate how to operate the system	3	e.g. configuration, adjust parameters, start up and shut down, monitoring
2.3.5	Explain the principles of emergency switching	2	—

SUBJECT 3: DATA PROCESS

TOPIC 1: SOFTWARE PROCESS

SUB-TOPIC 1.1: Middleware

1.1.1	Define middleware	1	Additional specialised functional built on the OS
1.1.2	List the middleware used on the national major systems	1	e.g. CORBA, UBSS, OTM, EJB
1.1.3	Demonstrate the use of a middleware in an ATM environment	2	Duel processing system

SUB-TOPIC 1.2: Operating systems

1.2.1	Describe the major aspects of a relevant operating system	2	e.g. design, start-up, configuration, back-up and restore
1.2.2	Perform relevant operating system commands	3	—
1.2.3	Characterise typical consequences of an OS upgrade	2	Some possible implications on HW (performance, memory), middleware (compatibility) and SW components
1.2.4	Explain downward compatibility	2	Checks on embedded SW modules ability to run under new OS version
1.2.5	Take account of hardware/software compatibility	2	Examples of HW requirements of specific SW implementations
1.2.6	Describe interactions between application and OS	2	Examples of OS calls by the application software if no middleware is in use
1.2.7	Describe the life cycle management of an operating system	2	e.g. versions, releases, patches, migration

SUB-TOPIC 1.3: Configuration control

1.3.1	Describe the principles of configuration control	2	Clear identification of all versions, proof of testing and 'build state', tool and mechanisms to aid control, authorisation, audit trail, appropriate quality standard requirements of the administration

SUB-TOPIC 1.4: Software development process

1.4.1	State the main software development processes	1	SWALs e.g. life cycle, waterfall model, RUP
1.4.2	List the main steps of two of the main software development processes	1	—
1.4.3	Explain the main differences between two software development processes	2	e.g. advantages/disadvantages

TOPIC 2: HARDWARE PLATFORM

SUB-TOPIC 2.1: Equipment upgrade

2.1.1	Explain the key factors that have to be considered when data processing equipment is upgraded or changed	2	Specification, compatibility, 'proven' or 'state-of-the-art' technology, maintenance and operating consequence (e.g. personnel, training, spares, procedures), environmental requirements (e.g. size, power requirements, temperature, interfaces), testing

SUB-TOPIC 2.2: COTS

2.2.1	Explain the advantages and disadvantages of commercial off-the-shelf equipment	2	Cost, multiplicity of suppliers, quality, maintainability, life cycle, liability

SUB-TOPIC 2.3: Interdependence

2.3.1	Describe the technical issues regarding the interdependence of various equipment and systems	2	Interface requirements, common point of failure, data conditioning, response time

SUB-TOPIC 2.4: Maintainability

2.4.1	Identify the issues that will affect the maintainability of hardware for the planned life of a system	3	Commercial product life, commercial support commitments, company volatility, spares provision, shelf life and logistics

TOPIC 3: TESTING

SUB-TOPIC 3.1: Testing

3.1.1	Appreciate the techniques available for system and performance requirements testing	3	e.g. code walkthrough, modelling, simulation real time and fast time, black box testing, formal methods, use of independent test personnel, data corruption simulation, hardware failure simulation
3.1.2	Appreciate the techniques available for system testing and integration	3	e.g. system integration testing, load testing, regression testing

SUBJECT 4: — DATA

TOPIC 1: DATA ESSENTIALS FEATURES

SUB-TOPIC 1.1: Data significance

1.1.1	Explain the significance of data	2	Criticality (critical/non critical), legality (ICAO, CAA, organisation), use (advisory, control)

SUB-TOPIC 1.2: Data configuration control

1.2.1	Explain the control procedures for changes to operational data	2	Designated roles/persons for authorising changes and verifying/checking changes

SUB-TOPIC 1.3 Data Standards

1.3.1	Name the authority responsible for standards	1	e.g. EUROCONTROL, ICAO, ISO
1.3.2	State the standards related to ATM data, their sources and their status	1	e.g. ASTERIX, WGS84, OLDI, FMTP, AMHS, ADEX-P, FPL
1.3.3	Decode a typical OLDI message	3	e.g. ACT, PAC
1.3.4	State the nature of ATM processing requirements	1	Data volatility (e.g. radar), system integrity, consequence of failure

TOPIC 2: ATM DATA DETAILED STRUCTURE

SUB-TOPIC 2.1: System area

2.1.1	Describe how a system area is defined	2	e.g. size, system centre (reference point)
2.1.2	Describe the data related to the system area	2	e.g. radar data, flight plan data, maps, coordinates

SUB-TOPIC 2.2: Characteristic points

2.2.1	State types of characteristic points used in an ATM system and their structure	1	Geographic, routing, sector e.g. Geographic: airports and runways, ILS, radar, limit points Routing and sectors: coded routes, SID allocation parameters, area navigation waypoints, adjacent FIRs, holding, sectors
2.2.2	Explain the importance of characteristic points in the correct presentation of data	2	—
2.2.3	Describe the process by which amended adaptation files are introduced	2	—

SUB-TOPIC 2.3: Aircraft performances

2.3.1	List the performance data used in FDPS	1	Example of data from in-house system
2.3.2	Describe the structure of aircraft performance data	2	—
2.3.3	Define speeds, rates and levels	1	—
2.3.4	Explain the consequences of the use of the wrong type of aircraft	2	—

SUB-TOPIC 2.4: Screen manager

2.4.1	Describe how the screen manager is used to set up the ATC HMI	2	—

SUB-TOPIC 2.5: Auto-coordination messages

2.5.1	Describe the meaning of coordination messages in the control process	2	Coordination parameters, conditions groups, OLDI conditions groups, characteristics of remote centres
2.5.2	Describe the characteristics of the remote centres relevant to OLDI	2	Civil and military

SUB-TOPIC 2.6: Configuration control data

2.6.1	Explain the structure of the configuration data	2	Sector CSU link, sectorisation plan, control parameters

SUB-TOPIC 2.7: Physical configuration data

2.7.1	Explain the structure of the physical configuration data	2	External configuration, device configuration

SUB-TOPIC 2.8: Relevant meteorology data

2.8.1	Explain the organisation of the data related to meteorology	2	Meteorology, QNH TL areas, CB activity

SUB-TOPIC 2.9: Alert and error messages to ATSEP

2.9.1	Explain the importance of alert and error messages	2	—
2.9.2	Describe different categories of two alert and error messages	2	—

SUB-TOPIC 2.10 Alert and error messages to ATCO

2.10.1	Describe the structure of the data used in these types of message	2	MSAW, conflict alert parameters
2.10.2	Explain alerts and error messages, and their importance from an ATCO point of view	2	e.g. MSAW, conflict alert, MTCD

SUBJECT 5: COMMUNICATION DATA

TOPIC 1: INTRODUCTION TO NETWORKS

SUB-TOPIC: 1.1 Types

1.1.1	State the evolution of network topologies	1	LAN, WAN e.g. architectures, size of the segments, length of the systems, quality of service
1.1.2	Explain how networks meet requirements	2	Redundancy, bandwidth, BER, time delay, network security

SUB-TOPIC 1.2: Networks

1.2.1	Analyse the features of a network	4	Routing scheme, rate, internal networking, routers, bridges, gateways, modems, switches, firewalls e.g. wireless networks
1.2.2	Describe network standards and devices	2	Ethernet, fibre optic, wireless
1.2.3	Appreciate the replacement of components in a network in a safe way	3	Continuity of service, network integrity Additional: for achievement of competence, this objective shall be applied practically, at the latest, by the end of the S/E rating training

SUB-TOPIC 1.3: External network services

1.3.1	Define aspects of external network services	1	Provided QoS e.g. SLAs

SUB-TOPIC 1.4: Measuring tools

1.4.1	Operate the usual set of network measuring or monitoring tools to find the values of the main parameters	3	Data analyser (sniffer) e.g. net scout
1.4.2	Perform analysis to support fault-finding for correction	3	Data analyser (sniffer) e.g. net scout

SUB-TOPIC 1.5: Troubleshooting

1.5.1	Appreciate how to troubleshoot a network	3	Additional: for achievement of competence, this objective shall be applied practically, at the latest, by the end of the S/E rating training e.g. broken lines, unusable network components, overload, integrity problems

TOPIC 2: PROTOCOLS

SUB-TOPIC 2.1: Fundamental theory

2.1.1	Apply the principles of layers	3	Differences between layers e.g. layer(s) of sniffer information
2.1.2	Apply the principles of the addressing strategy	3	Masks, subnets IP addressing, MAC addressing e.g. same logical network computers and systems
2.1.3	Apply the principles of the routing strategy	3	Routing tables, priorities, fault tolerance, management of routing strategy, static and dynamic routing e.g. unicast, multicast, broadcast

SUB-TOPIC 2.2: General protocols

2.2.1	Describe the general protocols	2	TCP/IP (segments, packets, addressing) e.g. X25, LAPB, pdH, sdH
2.2.2	Analyse the general protocols using the appropriate tools and documentation	4	TCP/IP e.g. X25, LAPB

SUB-TOPIC 2.3: Specific protocols

2.3.1	Describe the specific protocols	2	e.g. BATAP — ARINC 620, FMTP

TOPIC 3: NATIONAL NETWORKS

SUB-TOPIC 3.1: National networks

3.1.1	Name the national networks to which the organisation is connected	1	e.g. ANSP, MET, military, PTT, airlines, national network(s)
3.1.2	Describe the interfaces between national and global networks	2	—

SUBJECT 6: SURVEILLANCE PRIMARY

TOPIC 1: ATC SURVEILLANCE

SUB-TOPIC 1.1: Use of PSR for Air Traffic Services

1.1.1	Describe the operational requirements of an en-route or an approach PSR	2	Range, resolution, coverage, availability

SUBJECT 7: SURVEILLANCE SECONDARY

TOPIC 1: SSR AND MSSR

SUB-TOPIC 1.1: Use of SSR for Air Traffic Services

1.1.1	Describe the operational requirements of an en-route or an approach SSR	2	Range, coverage, resolution, performance, update rate ICAO Doc 9684
1.1.2	Relate key parameters of SSR to system performance	4	Key parameters: rotation rate, PRF, interlaced modes, capacity, frequencies, power budget (uplink, downlink), monopulse techniques Consequences: FRUIT, garbling, side lobes reception and transmission, transponder availability, PD, 2nd recurrence replies

TOPIC 2: MODE S

SUB-TOPIC 2.1: Introduction to Mode S

2.1.1	Explain the need for and benefits of Mode S	2	Classical SSR limitations, resolution, accuracy, integrity, enhanced data (e.g. 25 ft resolution, aircraft ID, BDS information)
2.1.2	Explain the working principles of Mode S	2	Mode S interrogation, Mode S reply, Mode S uplink and downlink capability, Mode S formats/protocols, ELS, EHS
2.1.3	Explain the complementary use of Mode S and conventional SSR	2	Mode interlace pattern, operational use of all-call, roll-call
2.1.4	Explain Mode S implementation	2	Elementary and enhanced surveillance, II and SI codes, use of BDS

TOPIC 3: MULTILATERATION

SUB-TOPIC 3.1: MLAT principles

3.1.1	Explain the MLAT system architecture	2	Standards, transmitters and receivers, data processing/fusion, redundancy, performance, costs, timing solutions, etc.
3.1.2	Appreciate the principles of MLAT system	3	Triangulation, coverage, position calculation e.g. SCAS
3.1.3	Describe how to operate the system	2	Tracking, map creation and blanking
3.1.4	Describe testing possibilities for MLAT	2	e.g. SASS-C

SUBJECT 8: SURVEILLANCE — HMI

TOPIC 1: HMI

SUB-TOPIC 1.1: ATCO HMI

1.1.1	Describe the display types available	2	Video, synthetic, mixed
1.1.2	State the type of selections available	1	Source, range, maps, filters
1.1.3	Describe the advantages of different display types	2	Clarity, configurability, fallback, data integration

SUBJECT 9: SURVEILLANCE DATA TRANSMISSION

TOPIC 1: SURVEILLANCE DATA TRANSMISSION

SUB-TOPIC 1.1: Technology and protocols

1.1.1	Describe the implementation of formats and protocols	2	Network protocols, surveillance data networks (e.g. RADNET), messages CAT 1+
1.1.2	Decode ASTERIX messages	3	e.g. categories 1, 2, 20, 21, 34, 48, 62
1.1.3	Identify the data transmission architecture in a multisensor environment	3	Fault tolerance, redundancy of line equipment e.g. software fallback capability, contingency of service, RADNET
1.1.4	Characterise the degradations of the surveillance transmission network	2	e.g. saturation, excess latency

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SUBJECT 1: SMC — ANS STRUCTURE

TOPIC 1: ANSP ORGANISATION AND OPERATION

SUB-TOPIC 1.1: ANSP organisation and operation

1.1.1	Describe the SMC function within the organisation	2	What the SMC does, interfaces with other functions, similarities and major differences between SMC function at different sites
1.1.2	Describe the structure, roles and responsibilities of the SMC team and any direct interfaces	2	—
1.1.3	Explain the duties of the ATC supervisor	2	—

TOPIC 2: ANSP MAINTENANCE PROGRAM

SUB-TOPIC 2.1: Policy

2.1.1	Describe, in general terms, the ANSP maintenance policy	2	—
2.1.2	Describe the aspects of the maintenance policy that apply specifically to SMC	2	—

TOPIC 3: ATM CONTEXT

SUB-TOPIC 3.1: ATM Context

3.1.1	Describe the ATM requirements and the related services provided by the SMC	2	Service level agreements, working arrangements e.g. ASM, ATFCM

TOPIC 4: ANSP ADMINISTRATIVE PRACTICES

SUB-TOPIC 4.1: Administration

4.1.1	Describe any ANSP administrative procedures, specifically applicable to SMC	2	Any non-technical practices e.g. security, access control (building and platform), safety, fire

SUBJECT 2: SMC — ANS SYSTEM/EQUIPMENT

TOPIC 1: OPERATIONAL IMPACTS

SUB-TOPIC 1.1: Degradation or loss of system/equipment services

1.1.1	Describe the importance of monitoring system performance	2	—
1.1.2	Describe possible ways in which the SMC may become aware of degradation of services and/or systems	2	e.g. monitoring systems, telephone calls, aural alerts, user complaint
1.1.3	Take account of the end users/customers affected	2	e.g. ATC Units, airports, airlines
1.1.4	Appreciate the implications for end users/customers	3	—
1.1.5	Appreciate the appropriate actions to restore service	3	e.g. switching, replacing, reconfiguration, calling external service provider
1.1.6	Appreciate the need for appropriate communication before and after restoring service	3	e.g. users, customers, external and internal providers

TOPIC 2: USER POSITION FUNCTIONALITY AND OPERATION

SUB-TOPIC 2.1 User working position

2.1.1	Appreciate working position performance to agreed parameters	3	e.g. ATCO, Met, ATSEP, airport positions

SUB-TOPIC 2.2: SMC working position

2.2.1	Appreciate SMC working position performance to agreed parameters	3	—

SUBJECT 3: SMC — TOOLS, PROCESSES AND PROCEDURES

TOPIC 1: REQUIREMENTS

SUB-TOPIC 1.1: SMS

1.1.1	Describe the ICAO and European requirements and the national and ATSP SMS	2	ICAO Annex 19, Annex IV to Regulation (EU) 2017/373

SUB-TOPIC 1.2: QMS

1.2.1	Describe the quality management system requirements	2	e.g. ISO, EFQM

SUB-TOPIC 1.3: SMS application in the working environment

1.3.1	Describe the relationship between the SMS and the application of SMC	2	Reporting procedures
1.3.2	Explain which occurrences require incident reporting and follow-up action(s)	2	e.g. national categories for reporting, safety event processing
1.3.3	Apply incident reporting procedures to example occurrence(s)	3	e.g. safety event procedure

TOPIC 2: MAINTENANCE AGREEMENTS WITH OUTSIDE AGENCIES REQUIREMENTS

SUB-TOPIC 2.1: Principles of agreements

2.1.1	Describe the principles and need for maintenance agreements	2	e.g. types of service level provided
2.1.2	Describe within which functional areas maintenance agreements will occur	2	e.g. network providers, facilities management, communications
2.1.3	Describe where in the SMS manual these agreements are included or referenced	2	—

TOPIC 3: SMC GENERAL PROCESSES

SUB-TOPIC 3.1: Roles and responsibilities

3.1.1	Describe the role and general method of operations of the SMC	2	—
3.1.2	Describe the need to monitor service conditions and the way to take appropriate action to ensure service performance	2	e.g. process to interrupt services for planned maintenance purposes, management of service provision during corrective maintenance, continuity of service, availability
3.1.3	Describe the coordination role of the SMC	2	e.g. ATSEPs, ATCOs, external service providers, ATM stakeholders
3.1.4	Describe how risk analysis can contribute towards decision-making	2	e.g. assessing risk, handling of service interventions

TOPIC 4: MAINTENANCE MANAGEMENT SYSTEMS

SUB-TOPIC 4.1: Reporting

4.1.1	Describe how maintenance activities and SMC events/actions are recorded	2	e.g. procedures to follow, terminology to use, record keeping for traceability
4.1.2	Explain the importance of accurate record keeping and dissemination for handover and quality management purposes	2	e.g. information is logged in database or report is generated and distributed according to defined procedures

SUBJECT 4: SMC — TECHNOLOGY

TOPIC 1: TECHNOLOGIES AND PRINCIPLES

SUB-TOPIC 1.1: General

1.1.1	Describe the principles of control and monitoring systems used	2	e.g. national basis, colour codes, ergonomics

SUB-TOPIC 1.2: Communication

1.2.1	Describe the key aspects of control and monitoring system capability	2	e.g. parameters presented to the SMC and types of actions that can be taken
1.2.2	Appreciate the impact of the replacement of components in a communication chain	3	Continuity of service, communication chain integrity

SUB-TOPIC 1.3: Facilities

1.3.1	Describe the key aspects of system management capability	2	e.g. parameters presented to the SMC and types of actions that can be taken
1.3.2	Appreciate the impact of the loss of supply and/or replacement of components in facility equipment	3	Continuity of service, integrity

SUBJECT 5: COMMUNICATION VOICE

TOPIC 1: AIR-GROUND

SUB-TOPIC 1.1: Controller working position

1.1.1	Describe the most common features of a controller working position	2	Frequency selection, emergency, station selection, coupling, headset, loudspeaker, footswitch, push to talk e.g. microphone (noise cancelling), short time recording

TOPIC 2: GROUND-GROUND

SUB-TOPIC 2.1: Interfaces

2.1.1	Describe the different types of interfaces	2	Analogue (2, 4, 6 and 8 wires), digital ISDN (64 Kb, 2 Mb)

SUB-TOPIC 2.2: Switch

2.2.1	State the similarities between ground-ground and air-ground switches	1	Switching techniques
2.2.2	Describe the most commonly used functionality of PABX	2	General architecture, digital, analogue, multiplex types, PCM30
2.2.3	Analyse conversion analogue-digital, digital-analogue	4	General architecture, analogue-digital-analogue

SUB-TOPIC 2.3: Controller working position

2.3.1	Describe the two most common features of a controller working position and the HMI	2	—

SUBJECT 6: COMMUNICATION DATA

TOPIC 1: EUROPEAN NETWORKS

SUB-TOPIC 1.1: Network technologies

1.1.1	State emerging network technologies	1	e.g. as used in EAN, NEAN, AMHS, PENS
1.1.2	Describe the characteristics of the current networks	2	Surveillance data, flight plan data and AIS networks e.g. CIDIN, OLDI, CFMU-RCA, quality of service, architecture, FMTP, AMHS

TOPIC 2: GLOBAL NETWORKS

SUB-TOPIC 2.1: Networks and standards

2.1.1	List the global networks and the standards on which they are based	1	e.g. ICAO for AFTN/CIDIN/AMHS, ICAO for ATN, FANS 1 and FANS A for ACARS applications (SITA and ARINC)

SUB-TOPIC 2.2: Description

2.2.1	Describe the characteristics of the AFTN networks	2	Users and data, architectures, quality of service

SUB-TOPIC 2.3: Global architecture

2.3.1	Describe the architecture of the ATN	2	Air-ground subnetworks, ground-ground subnetworks, airborne networks

SUB-TOPIC 2.4: Air-ground subnetworks

2.4.1	Describe air-ground subnetworks	2	VDL (mode 2), HFDL, AMSS, SATCOM

SUB-TOPIC 2.5: Ground-ground subnetworks

2.5.1	Describe the composition of ground-ground subnetworks	2	PTT, commercial telecom providers, ARINC, SITA

SUB-TOPIC 2.6: Air-ground applications

2.6.1	State the main communication applications using data link systems	1	e.g. CPDLC, DLIC/AFN, ATIS, DCL

SUBJECT 7: COMMUNICATION RECORDERS

TOPIC 1: LEGAL RECORDERS

SUB-TOPIC 1.1: Regulations

1.1.1	Explain international regulations	2	ICAO (recording and reproducing)
1.1.2	Explain national regulations	2	Appropriate national regulations
1.1.3	Explain how the service provider complies with the regulations	2	e.g. storage media, access to recording and reproducing room, time to store information (overwrite/erase voice or data), procedure to reproduce information

SUB-TOPIC 1.2: Principles

1.2.1	Explain the principles of recording and reproducing	2	e.g. storage media (tape, optical and magnetic disc), A/D-D/A converters, frequency range (300 to 3 400 Hz), channel capacity, time synchronisation, connection to a network, synchronisation of radar and voice recording, replay limitations

SUBJECT 8: NAVIGATION — PBN

TOPIC 1: NAV CONCEPTS

SUB-TOPIC 1.1: NOTAM

1.1.1	Explain the need for NOTAMs	2	—

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SUBJECT 1: SMC — ANS STRUCTURE

TOPIC 1: ANSP ORGANISATION AND OPERATION

SUB-TOPIC 1.1: ANSP organisation and operation

1.1.1	Describe the SMC function within the organisation	2	What the SMC does, interfaces with other functions, similarities and major differences between SMC function at different sites
1.1.2	Describe the structure, roles and responsibilities of the SMC team and any direct interfaces	2	—
1.1.3	Explain the duties of the ATC supervisor	2	—

TOPIC 2: ANSP MAINTENANCE PROGRAM

SUB-TOPIC 2.1: Policy

2.1.1	Describe, in general terms, the ANSP maintenance policy	2	—
2.1.2	Describe the aspects of the maintenance policy that apply specifically to SMC	2	—

TOPIC 3: ATM CONTEXT

SUB-TOPIC 3.1: ATM context

3.1.1	Describe the ATM requirements and the related services provided by the SMC	2	Service level agreements, working arrangements e.g. ASM, AFTCM

TOPIC 4: ANSP ADMINISTRATIVE PRACTICES

SUB-TOPIC 4.1: Administration

4.1.1	Describe any ANSP administrative procedures, specifically applicable to SMC	2	Any non-technical practices e.g. security, access control (building and platform), safety, fire

SUBJECT 2: SMC — ANS SYSTEM/EQUIPMENT

TOPIC 1: OPERATIONAL IMPACTS

SUB-TOPIC 1.1: Degradation or loss of system/equipment services

1.1.1	Describe the importance of monitoring system performance	2	—
1.1.2	Describe possible ways in which the SMC may become aware of degradation of services and/or systems	2	e.g. monitoring systems, telephone calls, aural alerts, user complaint
1.1.3	Take account of the end users/customers affected	2	e.g. ATC units, airports, airlines
1.1.4	Appreciate the implications for end users/customers	3	—
1.1.5	Appreciate the appropriate actions to restore service	3	e.g. switching, replacing, reconfiguration, calling external service provider
1.1.6	Appreciate the need for appropriate communication before and after restoring service	3	e.g. users, customers, external and internal providers

TOPIC 2: USER POSITION FUNCTIONALITY AND OPERATION

SUB-TOPIC 2.1: User working position

2.1.1	Appreciate working position performance to agreed parameters	3	e.g. ATCO, MET, ATSEP, airport positions

SUB-TOPIC 2.2: SMC working position

2.2.1	Appreciate SMC working position performance to agreed parameters	3	—

SUBJECT 3: SMC — TOOLS, PROCESSES AND PROCEDURES

TOPIC 1: REQUIREMENTS

SUB-TOPIC 1.1: SMS

1.1.1	Describe the ICAO and European requirements and the national and ATSP SMS	2	ICAO Annex 19

SUB-TOPIC 1.2: QMS

1.2.1	Describe the quality management system requirements	2	e.g. ISO, EFQM

SUB-TOPIC 1.3: SMS application in the working environment

1.3.1	Describe the relationship between the SMS and the application of SMC	2	Reporting procedures
1.3.2	Explain which occurrences require incident reporting and follow-up action(s)	2	e.g. national categories for reporting, Safety Event Processing
1.3.3	Apply incident reporting procedures to example occurrence(s)	3	e.g. Safety Event Procedure

TOPIC 2: MAINTENANCE AGREEMENTS WITH OUTSIDE AGENCIES REQUIREMENTS

SUB-TOPIC 2.1: Principles of agreements

2.1.1	Describe the principles and need for maintenance agreements	2	e.g. types of service level provided
2.1.2	Describe within which functional areas maintenance agreements will occur	2	e.g. network providers, facilities management, communications
2.1.3	Describe where in the SMS manual these agreements are included or referenced	2	—

TOPIC 3: SMC GENERAL PROCESSES

SUB-TOPIC 3.1: Roles and responsibilities

3.1.1	Describe the role and general method of operations of the SMC	2	—
3.1.2	Describe the need to monitor service conditions and the way to take appropriate action to ensure service performance	2	e.g. process to interrupt services for planned maintenance purposes, management of service provision during corrective maintenance, continuity of service, availability
3.1.3	Describe the coordination role of the SMC	2	e.g. ATSEPs, ATCOs, external service providers, ATM stakeholders
3.1.4	Describe how risk analysis can contribute towards decision-making	2	e.g. assessing risk, handling of service interventions

TOPIC 4: MAINTENANCE MANAGEMENT SYSTEMS

SUB-TOPIC 4.1: Reporting

4.1.1	Describe how maintenance activities and SMC events/actions are recorded	2	e.g. procedures to follow, terminology to use, record keeping for traceability
4.1.2	Explain the importance of accurate record keeping and dissemination for handover and quality management purposes	2	e.g. information is logged in database or report is generated and distributed according to defined procedures

SUBJECT 4: SMC — TECHNOLOGY

TOPIC 1: TECHNOLOGIES AND PRINCIPLES

SUB-TOPIC 1.1: General

1.1.1	Describe the principles of control and monitoring systems used	2	e.g. national basis, colour codes, ergonomics

SUB-TOPIC 1.3: Navigation

1.3.1	Describe the key aspects of control and monitoring system capability	2	e.g. parameters presented to the SMC and types of actions that can be taken
1.3.2	Appreciate the impact of the replacement of components in navigation equipment	3	Continuity of service, navigation aid integrity

SUB-TOPIC 1.6: Facilities

1.6.1	Describe the key aspects of system management capability	2	e.g. parameters presented to the SMC and types of actions that can be taken
1.6.2	Appreciate the impact of the loss of supply and/or replacement of components in facility equipment	3	Continuity of service, integrity

SUBJECT 5: COMMUNICATION DATA

TOPIC 1: EUROPEAN NETWORKS

SUB-TOPIC 1.1: Network technologies

1.1.1	State emerging network technologies	1	e.g. as used in EAN, NEAN, AMHS, PENS
1.1.2	Describe the characteristics of the current networks	2	Surveillance data, flight plan data and AIS networks e.g. CIDIN, OLDI, CFMU-RCA, quality of service, architecture, FMTP, AMHS

TOPIC 2: GLOBAL NETWORKS

SUB-TOPIC 2.1: Networks and standards

2.1.1	List the global networks and the standards on which they are based	1	e.g. ICAO for AFTN/CIDIN/AMHS, ICAO for ATN, FANS 1 and FANS A for ACARS applications (SITA and ARINC)

SUB-TOPIC 2.2: Description

2.2.1	Describe the characteristics of the AFTN networks	2	Users and data, architectures, quality of service

SUB-TOPIC 2.3: Global architecture

2.3.1	Describe the architecture of the ATN	2	Air-ground subnetworks, ground-ground subnetworks, airborne networks

SUB-TOPIC 2.4: Air-ground subnetworks

2.4.1	Describe the air-ground subnetworks	2	VDL (mode 2), HFDL, AMSS, SATCOM

SUB-TOPIC 2.5: Ground-ground subnetworks course

2.5.1	Describe the composition of ground-ground subnetworks	2	PTT, commercial telecom providers, ARINC, SITA

SUB-TOPIC 2.6: Air-ground applications

2.6.1	State the main communication applications using data link systems	1	e.g. CPDLC, DLIC/AFN, ATIS, DCL

SUBJECT 6: COMMUNICATION RECORDERS

TOPIC 1: LEGAL RECORDERS

SUB-TOPIC 1.1: Regulations

1.1.1	Explain international regulations	2	ICAO (recording and reproducing)
1.1.2	Explain national regulations	2	Appropriate national regulations
1.1.3	Explain how service providers comply with the regulations	2	e.g. storage media, access to recording and reproducing room, time to store information (overwrite/erase voice or data), procedure to reproduce information.

SUB-TOPIC 1.2: Principles

1.2.1	Explain the principles of recording and reproducing	2	e.g. storage media (tape, optical and magnetic disc), A/D-D/A converters, frequency range (300 to 3 400 Hz), channel capacity, time synchronisation, connection to a network, synchronisation of radar and voice recording, replay limitations

SUBJECT 7: NAVIGATION — PBN

TOPIC 1: NAV CONCEPTS

SUB-TOPIC 1.1: NOTAM

1.1.1	Explain the need for NOTAMs	2	—

SUBJECT 8: NAVIGATION — GROUND-BASED SYSTEMS-NDB

TOPIC 1: NDB LOCATOR

SUB-TOPIC 1.1: Use of the system

1.1.1	Appreciate the principles of NDB	3	Relative bearing, measuring method
1.1.2	Describe the overall performance	2	Coverage, accuracy, availability of the system, integrity, continuity
1.1.3	Explain the technical limitations of NDB	2	Lack of accuracy, lack of integrity, sensitivity to interference
1.1.4	Describe the current situation	2	e.g. number, type, users, user groups, European context

SUBJECT 9: NAVIGATION — GROUND-BASED SYSTEMS-DF

TOPIC 1: DF

SUB-TOPIC 1.1: Use of the system

1.1.1	State the different types of DF	1	VDF, DDF, IDF
1.1.2	Describe the user HMI	2	Indication on radar picture, DF indicator
1.1.3	Appreciate the principles of DF	3	Bearing, measuring method (standard, Doppler, interferometry)
1.1.4	Describe the overall performance	2	Coverage, accuracy, availability of the system, integrity, continuity
1.1.5	Explain the technical limitations of DF	2	Sensitivity to interference
1.1.6	Describe the current situation	2	e.g. number, type, users, national context

SUBJECT 10: NAVIGATION — GROUND-BASED SYSTEMS-VOR

TOPIC 1 VOR

SUB-TOPIC 1.1: Use of the system

1.1.1	State the types of VOR Systems	1	Conventional, doppler
1.1.2	Describe the overall performance	2	Coverage, accuracy, availability of the system, integrity, continuity
1.1.3	Explain the technical limitations of CVOR	2	Type of information (azimuth), accuracy, integrity, suitable for a network of fixed routes
1.1.4	Appreciate the differences between CVOR and DVOR	3	Signal broadcast differences, bearing information robustness
1.1.5	Describe the current situation	2	e.g. number, type, users, user groups, national context, European context

SUBJECT 11: NAVIGATION — GROUND-BASED SYSTEMS-DME

TOPIC 1: DME

SUB-TOPIC 1.1: Use of the system

1.1.1	Describe the overall performances for DME	2	Coverage, accuracy, availability of the system, integrity, continuity, number of users
1.1.2	Explain the limitations of DME	2	Accuracy, integrity, capacity

1.1.3	Describe the current situation	2	e.g. number, types, users, user groups, national context, European context
1.1.4	State the role of the DME infrastructure in the future navigation applications	1	PBN
1.1.5	Explain the differences between DME and TACAN for civilian use	2	e.g. azimuth and range

SUBJECT 12: NAVIGATION — GROUND-BASED SYSTEMS-ILS

TOPIC 1: ILS

SUB-TOPIC 1.1: Use of the system

1.1.1	Describe the overall performances for ILS	2	ICAO Annexes 10 and 14 Coverage, accuracy, availability of the system, integrity, continuity, number of users
1.1.2	Explain the technical limitations of ILS	2	ICAO Annexes 10 and 14 Only 40 channels, no segmented paths of approach, beam corruption due to multi-path
1.1.3	Interpret ILS Facility Performance Categories	5	ICAO Annexes 10 and 14 Cat I, Cat II, Cat III Different operational category depending on operational minima, equipment and airport facilities
1.1.4	Define obstacle free zones for ILS components	1	ICAO Annexes 10 and 14 Dimensions e.g. national regulations
1.1.5	Explain the importance and need for ILS obstacle free zones	2	ILS beam protection, increased significance during LVP conditions
1.1.6	Explain the current situation	2	e.g. number, type, users, national context
1.1.7	Consider the need for ATC ILS status indications	2	No continuous monitoring by ATSEP

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SUBJECT 1: SMC — ANS STRUCTURE

TOPIC 1: ANSP ORGANISATION AND OPERATION

SUB-TOPIC 1.1: ANSP organisation and operation

1.1.1	Describe the SMC function within the organisation	2	What the SMC does, interfaces with other functions, similarities and major differences between SMC function at different sites
1.1.2	Describe the structure, roles and responsibilities of the SMC team and any direct interfaces	2	—
1.1.3	Explain the duties of the ATC supervisor	2	—

TOPIC 2: ANSP MAINTENANCE PROGRAM

SUB-TOPIC 2.1: Policy

2.1.1	Describe, in general terms, the ANSP maintenance policy	2	—
2.1.2	Describe the aspects of the maintenance policy that apply specifically to SMC	2	—

TOPIC 3: ATM CONTEXT

SUB-TOPIC 3.1: ATM context

3.1.1	Describe the ATM requirements and the related services provided by the SMC	2	Service level agreements, working arrangements e.g. ASM, AFTCM

TOPIC 4: ANSP ADMINISTRATIVE PRACTICES

SUB-TOPIC 4.1: Administration

4.1.1	Describe any ANSP administrative procedures, specifically applicable to SMC	2	Any non-technical practices e.g. security, access control (building and platform), safety, fire

SUBJECT 2: SMC — ANS SYSTEM/EQUIPMENT

TOPIC 1: OPERATIONAL IMPACTS

SUB-TOPIC 1.1: Degradation or loss of system/equipment services

1.1.1	Describe the importance of monitoring system performance	2	—
1.1.2	Describe possible ways in which the SMC may become aware of degradation of services and/or systems	2	e.g. monitoring systems, telephone calls, aural alerts, user complaint
1.1.3	Take account of the end users/customers affected	2	e.g. ATC units, airports, airlines
1.1.4	Appreciate the implications for end users/customers	3	—
1.1.5	Appreciating the appropriate actions to restore service	3	e.g. switching, replacing, reconfiguration, calling external service provider
1.1.6	Appreciate the need for appropriate communication before and after restoring service	3	e.g. users, customers, external and internal providers

TOPIC 2: USER POSITION FUNCTIONALITY AND OPERATION

SUB-TOPIC 2.1: User working position

2.1.1	Appreciate working position performance to agreed parameters	3	e.g. ATCO, MET, ATSEP, airport positions

SUB-TOPIC 2.2: SMC working position

2.2.1	Appreciate SMC working position performance to agreed parameters	3	—

SUBJECT 3: SMC — TOOLS, PROCESSES AND PROCEDURES

TOPIC 1: REQUIREMENTS

SUB-TOPIC 1.1: SMS

1.1.1	Describe the ICAO and European requirements and the national and ATSP SMS	2	ICAO Annex 19

SUB-TOPIC 1.2: QMS

1.2.1	Describe the quality management system requirements	2	e.g. ISO, EFQM

SUB-TOPIC 1.3: SMS application in the working environment

1.3.1	Describe the relationship between the SMS and the application of SMC	2	Reporting procedures
1.3.2	Explain which occurrences require incident reporting and follow-up action(s)	2	e.g. national categories for reporting, safety event processing
1.3.3	Apply incident reporting procedures to example occurrence(s)	3	e.g. safety event procedure

TOPIC 2: MAINTENANCE AGREEMENTS WITH OUTSIDE AGENCIES REQUIREMENTS

SUB-TOPIC 2.1: Principles of agreements

2.1.1	Describe the principles and need for maintenance agreements	2	e.g. types of service level provided
2.1.2	Describe within which functional areas maintenance agreements will occur	2	e.g. network providers, facilities management, communications
2.1.3	Describe where in the SMS Manual these agreements are included or referenced	2	—

TOPIC 3: SMC GENERAL PROCESSES

SUB-TOPIC 3.1: Roles and responsibilities

3.1.1	Describe the role and general method of operations of the SMC	2	—
3.1.2	Describe the need to monitor service conditions and the way to take appropriate action to ensure service performance	2	e.g. process to interrupt services for planned maintenance purposes, management of service provision during corrective maintenance, continuity of service, availability
3.1.3	Describe the coordination role of the SMC	2	e.g. ATSEPs, ATCOs, external service providers, ATM stakeholders
3.1.4	Describe how risk analysis can contribute towards decision-making	2	e.g. assessing risk, handling of service interventions

TOPIC 4: MAINTENANCE MANAGEMENT SYSTEMS

SUB-TOPIC 4.1: Reporting

4.1.1	Describe how maintenance activities and SMC events/actions are recorded	2	e.g. procedures to follow, terminology to use, record keeping for traceability
4.1.2	Explain the importance of accurate record keeping and dissemination for handover and quality management purposes	2	e.g. information is logged in database or report is generated and distributed according to defined procedures

SUBJECT 4: SMC — TECHNOLOGY

TOPIC 1: TECHNOLOGIES AND PRINCIPLES

SUB-TOPIC 1.1: General

1.1.1	Describe the principles of control and monitoring systems used	2	e.g. national basis, colour codes, ergonomics

SUB-TOPIC 1.4 Surveillance

1.4.1	Describe the key aspects of control and monitoring system capability	2	e.g. parameters presented to the SMC and types of actions that can be taken
1.4.2	Appreciate the impact of the replacement of components in a surveillance chain	3	Continuity of service, surveillance chain integrity

SUB-TOPIC 1.6 Facilities

1.6.1	Describe the key aspects of system management capability	2	e.g. parameters presented to the SMC and types of actions that can be taken
1.6.2	Appreciate the impact of the loss of supply and/or replacement of components in facility equipment	3	Continuity of service, integrity

SUBJECT 5: COMMUNICATION DATA

TOPIC 1: EUROPEAN NETWORKS

SUB-TOPIC 1.1: Network technologies

1.1.1	State emerging network technologies	1	e.g. as used in EAN, NEAN, AMHS, PENS
1.1.2	Describe the characteristics of the current networks	2	Surveillance data, flight plan data and AIS networks e.g. CIDIN, OLDI, CFMU-RCA, quality of service, architecture, FMTP, AMHS

TOPIC 2: GLOBAL NETWORKS

SUB-TOPIC 2.1: Networks and standards

2.1.1	List the global networks and the standards on which they are based	1	e.g. ICAO for AFTN/CIDIN/AMHS, ICAO for ATN, FANS 1 and FANS A for ACARS applications (SITA and ARINC)

SUB-TOPIC 2.2: Description

2.2.1	Describe the characteristics of the AFTN networks	2	Users and data, architectures, quality of service

SUB-TOPIC 2.3: Global architecture

2.3.1	Describe the architecture of the ATN	2	Air-ground subnetworks, ground-ground subnetworks, airborne networks

SUB-TOPIC 2.4: Air-ground subnetworks

2.4.1	Describe the air-ground subnetworks	2	VDL (mode 2), HFDL, AMSS, SATCOM

SUB-TOPIC 2.5: Ground-ground subnetworks

2.5.1	Describe the composition of ground-ground subnetworks	2	PTT, commercial telecom providers, ARINC, SITA

SUB-TOPIC 2.6: Air-ground applications

2.6.1	State the main communication applications using data link systems	1	e.g. CPDLC, DLIC/AFN, ATIS, DCL

SUBJECT 6: COMMUNICATION RECORDERS

TOPIC 1: LEGAL RECORDERS

SUB-TOPIC 1.1: Regulations

1.1.1	Explain the international regulations	2	ICAO (recording and reproducing)
1.1.2	Explain national regulations	2	Appropriate national regulations
1.1.3	Explain how service providers comply with the regulations	2	e.g. storage media, access to recording and reproducing room, time to store information (overwrite/erase voice or data), procedure to reproduce information

SUB-TOPIC 1.2: Principles

1.2.1	Explain the principles of recording and reproducing	2	e.g. storage media (tape, optical and magnetic disc), A/D-D/A converters, frequency range (300 to 3 400 Hz), channel capacity, time synchronisation, connection to a network, synchronisation of radar and voice recording, replay limitations

SUBJECT 7: NAVIGATION — PBN

TOPIC 1: NAV CONCEPTS

SUB-TOPIC 1.1: NOTAM

1.1.1	Explaining the need for NOTAMs	2	—

SUBJECT 8: SURVEILLANCE — PRIMARY

TOPIC 1: ATC SURVEILLANCE

SUB-TOPIC 1.1: Use of PSR for Air Traffic Services

1.1.1	Describe the operational requirements of an en-route or an approach PSR	2	Range, resolution, coverage, availability

SUBJECT 9: SURVEILLANCE — SECONDARY

TOPIC 1: SSR AND MSSR

SUB-TOPIC 1.1: Use of SSR for Air Traffic Services

1.1.1	Describe the operational requirements of an en-route or an approach SSR	2	Range, coverage, resolution, performance, update rate ICAO Doc 9684

TOPIC 2: MODE S

SUB-TOPIC 2.1: Introduction to Mode S

2.1.1	Explain the need for and benefits of Mode S	2	Classical SSR limitations, resolution, accuracy, integrity, enhanced data (e.g. 25 ft resolution, aircraft ID, BDS information)
2.1.2	Explain the working principles of Mode S	2	Mode S interrogation, Mode S reply, Mode S uplink and downlink capability, Mode S formats/protocols, ELS, EHS
2.1.3	Explain the complementary use of Mode S and conventional SSR	2	Mode Interlace Pattern, Operational use of All-call, Roll-call
2.1.4	Explain Mode S implementation	2	Elementary and enhanced surveillance, II and SI codes, use of BDS

TOPIC 3: MULTILATERATION

SUB-TOPIC 3.1: MLAT principles

3.1.1	Explain the MLAT system architecture	2	Standards, transmitters and receivers, data processing/fusion, redundancy, performance, costs, timing solutions, etc.
3.1.2	Appreciate the principles of MLAT system	3	Triangulation, coverage, position calculation e.g. SCAS
3.1.3	Describe how to operate the system	2	Tracking, map creation and blanking
3.1.4	Describe testing possibilities for MLAT	2	e.g. SASS-C

SUBJECT 10: SURVEILLANCE — HMI

TOPIC 1: HMI

SUB-TOPIC 1.1: ATCO HMI

1.1.1	Describe the display types available	2	Video, synthetic, mixed
1.1.2	State the type of selections available	1	Source, range, maps, filters
1.1.3	Describe the advantages of different display types	2	Clarity, configurability, fallback, data integration

SUBJECT 11: SURVEILLANCE — DATA TRANSMISSION

TOPIC 1: SURVEILLANCE DATA TRANSMISSION

SUB-TOPIC 1.1: Technology and protocols

1.1.1	Describe the implementation of formats and protocols	2	Network protocols, surveillance data networks e.g. RADNET, messages CAT 1+
1.1.2	Decode ASTERIX messages	3	e.g. categories 1, 2, 20, 21, 34, 48, 62
1.1.3	Identify the data transmission architecture in a multisensor environment	3	Fault tolerance, redundancy of line equipment e.g. software fallback capability, contingency of service, RADNET
1.1.4	Characterise the degradations of the surveillance transmission network	2	e.g. saturation, excess latency

Stream System monitoring and control — Data

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SUBJECT 1: SMC — ANS STRUCTURE

TOPIC 1: ANSP ORGANISATION AND OPERATION

SUB-TOPIC 1.1: ANSP organisation and operation

1.1.1	Describe the SMC function within the organisation	2	What the SMC does, interfaces with other functions, similarities and major differences between SMC function at different sites
1.1.2	Describe the structure, roles and responsibilities of the SMC team and any direct interfaces	2	—
1.1.3	Explain the duties of the ATC supervisor	2	—

TOPIC 2: ANSP MAINTENANCE PROGRAM

SUB-TOPIC 2.1: Policy

2.1.1	Describe, in general terms, the ANSP maintenance policy	2	—
2.1.2	Describe the aspects of the maintenance policy that apply specifically to SMC	2	—

TOPIC 3: ATM CONTEXT

SUB-TOPIC 3.1: ATM context

3.1.1	Describe the ATM requirements and the related services provided by the SMC	2	Service level agreements, working arrangements e.g. ASM, AFTCM

TOPIC 4: ANSP ADMINISTRATIVE PRACTICES

SUB-TOPIC 4.1: Administration

4.1.1	Describe any ANSP administrative procedures, specifically applicable to SMC	2	Any non-technical practices e.g. security, access control (building and platform), safety, fire

SUBJECT 2: SMC — ANS SYSTEM/EQUIPMENT

TOPIC 1: OPERATIONAL IMPACTS

SUB-TOPIC 1.1: Degradation or loss of system/equipment services

1.1.1	Describe the importance of monitoring system performance	2	—
1.1.2	Describe possible ways in which the SMC may become aware of degradation of services and/or systems	2	e.g. monitoring systems, telephone calls, aural alerts, user complaint
1.1.3	Take account of the end users/customers affected	2	e.g. ATC Units, airports, airlines
1.1.4	Appreciate the implications for end users/customers	3	—
1.1.5	Appreciate the appropriate actions to restore service	3	e.g. switching, replacing, reconfiguration, calling external service provider
1.1.6	Appreciate the need for appropriate communication before and after restoring service	3	e.g. users, customers, external and internal providers

TOPIC 2: USER POSITION FUNCTIONALITY AND OPERATION

SUB-TOPIC 2.1: User working position

2.1.1	Appreciate working position performance to agreed parameters	3	e.g. ATCO, MET, ATSEP, airport positions

SUB-TOPIC 2.2: SMC working position

2.2.1	Appreciate SMC working position performance to agreed parameters	3	—

SUBJECT 3: SMC — TOOLS, PROCESSES AND PROCEDURES

TOPIC 1: REQUIREMENTS

SUB-TOPIC 1.1: SMS

1.1.1	Describe the ICAO and European requirements and the national and ATSP SMS	2	ICAO Annex 19, Annex II to Regulation (EU) 2017/373.

SUB-TOPIC 1.2: QMS

1.2.1	Describe the quality management system requirements	2	e.g. ISO, EFQM

SUB-TOPIC 1.3: SMS application in the working environment

1.3.1	Describe the relationship between the SMS and the application of SMC	2	Reporting procedures
1.3.2	Explain which occurrences require incident reporting and follow-up action(s)	2	e.g. national categories for reporting, safety event processing
1.3.3	Apply incident reporting procedures to example occurrence(s)	3	e.g. safety event procedure

TOPIC 2: MAINTENANCE AGREEMENTS WITH OUTSIDE AGENCIES REQUIREMENTS

SUB-TOPIC 2.1: Principles of agreements

2.1.1	Describe the principles and need for maintenance agreements	2	e.g. types of service level provided
2.1.2	Describe within which functional areas maintenance agreements will occur	2	e.g. network providers, facilities management, communications
2.1.3	Describe where in the SMS Manual these agreements are included or referenced	2	—

TOPIC 3: SMC GENERAL PROCESSES

SUB-TOPIC 3.1: Roles and responsibilities

3.1.1	Describe the role and general method of operations of the SMC	2	—
3.1.2	Describe the need to monitor service conditions and the way to take appropriate action to ensure service performance	2	e.g. process to interrupt services for planned maintenance purposes, management of service provision during corrective maintenance, continuity of service, availability
3.1.3	Describe the coordination role of the SMC	2	e.g. ATSEPs, ATCOs, external service providers, ATM stakeholders
3.1.4	Describe how risk analysis can contribute towards decision-making	2	e.g. assessing risk, handling of service interventions

TOPIC 4: MAINTENANCE MANAGEMENT SYSTEMS

SUB-TOPIC 4.1: Reporting

4.1.1	Describe how maintenance activities and SMC events/actions are recorded	2	e.g. procedures to follow, terminology to use, record keeping for traceability
4.1.2	Explain the importance of accurate record keeping and dissemination for handover and quality management purposes	2	e.g. information is logged in database or report is generated and distributed according to defined procedures

SUBJECT 4: SMC — TECHNOLOGY

TOPIC 1: TECHNOLOGIES AND PRINCIPLES

SUB-TOPIC 1.1: General

1.1.1	Describe the principles of control and monitoring systems used	2	e.g. national basis, colour codes, ergonomics

SUB-TOPIC 1.5: Data processing

1.5.1	Describe the key aspects of control and monitoring system capability	2	e.g. parameters presented to the SMC and types of actions that can be taken
1.5.2	Appreciate the impact of the replacement of components in data processing chain	3	Continuity of service, data processing, chain integrity

SUB-TOPIC 1.6: Facilities

1.6.1	Describe the key aspects of system management capability	2	e.g. parameters presented to the SMC and types of actions that can be taken
1.6.2	Appreciate the impact of the loss of supply and/or replacement of components in facility equipment	3	Continuity of service, integrity

SUBJECT 5: COMMUNICATION DATA

TOPIC 1: EUROPEAN NETWORKS

SUB-TOPIC 1.1: Network technologies

1.1.1	State emerging network technologies	1	e.g. as used in EAN, NEAN, AMHS, PENS
1.1.2	Describe the characteristics of the current networks	2	Surveillance data, flight plan data and AIS networks e.g. CIDIN, OLDI, CFMU-RCA, quality of service, architecture, FMTP, AMHS

TOPIC 2: GLOBAL NETWORKS

SUB-TOPIC 2.1: Networks and standards

2.1.1	List the global networks and the standards on which they are based	1	e.g. ICAO for AFTN/CIDIN/AMHS, ICAO for ATN, FANS 1 and FANS A for ACARS applications (SITA and ARINC)

SUB-TOPIC 2.2: Description

2.2.1	Describe the characteristics of the AFTN networks	2	Users and data, architectures, quality of service

SUB-TOPIC 2.3: Global architecture

2.3.1	Describe the architecture of the ATN	2	Air-ground subnetworks, ground-ground subnetworks, airborne networks

SUB-TOPIC 2.4: Air-ground subnetworks

2.4.1	Describe the air-ground subnetworks	2	VDL (mode 2), HFDL, AMSS, SATCOM

SUB-TOPIC 2.5: Ground-ground subnetworks

2.5.1	Describe the composition of ground-ground subnetworks	2	PTT, commercial telecom providers, ARINC, SITA

SUB-TOPIC 2.6: Air-ground applications

2.6.1	State the main communication applications using data link systems	1	e.g. CPDLC, DLIC/AFN, ATIS, DCL

SUBJECT 6: COMMUNICATION RECORDERS

TOPIC 1: LEGAL RECORDERS

SUB-TOPIC 1.1: Regulations

1.1.1	Explain the international regulations	2	ICAO (recording and reproducing)
1.1.2	Explain national regulations	2	Appropriate national regulations
1.1.3	Explain how the service provider complies with the regulations	2	e.g. storage media, access to recording and reproducing room, time to store information (overwrite/erase voice or data), procedure to reproduce information

SUB-TOPIC 1.2: Principles

1.2.1	Explain the principles of recording and reproducing	2	e.g. storage media (tape, optical and magnetic disc), A/D-D/A converters, frequency range (300 to 3 400 Hz), channel capacity, time synchronisation, connection to a network, synchronisation of radar and voice recording, replay limitations

SUBJECT 7: NAVIGATION — PBN

TOPIC 1: NAV CONCEPTS

SUB-TOPIC 1.1: NOTAM

1.1.1	Explain the need for NOTAMs	2	—

SUBJECT 8: SURVEILLANCE — PRIMARY

TOPIC 1: ATC SURVEILLANCE

SUB-TOPIC 1.1: Use of PSR for Air Traffic Services

1.1.1	Describe the operational requirements of an en-route or an approach PSR	2	Range, resolution, coverage, availability

SUBJECT 9: SURVEILLANCE — SECONDARY

TOPIC 1: SSR AND MSSR

SUB-TOPIC 1.1: Use of SSR for Air Traffic Services

1.1.1	Describe the operational requirements of an en-route or an approach SSR	2	Range, coverage, resolution, performance, update rate ICAO Doc 9684

TOPIC 2: MODE S

SUB-TOPIC 2.1: Introduction to Mode S

2.1.1	Explain the need for and benefits of Mode S	2	Classical SSR limitations, resolution, accuracy, integrity, enhanced data (e.g. 25 ft resolution, aircraft ID, BDS information)
2.1.2	Explain the working principles of Mode S	2	Mode S interrogation, Mode S reply, Mode S uplink and downlink capability, Mode S formats/protocols, ELS, EHS
2.1.3	Explain the complementary use of Mode S and conventional SSR	2	Mode interlace pattern, operational use of all-call, roll-call
2.1.4	Explain Mode S implementation	2	Elementary and enhanced surveillance, II and SI codes, use of BDS

TOPIC 3: MULTILATERATION

SUB-TOPIC 3.1: MLAT principles

3.1.1	Explain the MLAT system architecture	2	Standards, transmitters and receivers, data processing/fusion, redundancy, performance, costs, timing solutions, etc.
3.1.2	Appreciate the principles of MLAT system	3	Triangulation, coverage, position calculation e.g. SCAS
3.1.3	Describe how to operate the system	2	Tracking, map creation and blanking
3.1.4	Describe testing possibilities for MLAT	2	e.g. SASS-C

SUBJECT 10: SURVEILLANCE — HMI

TOPIC 1: HMI

SUB-TOPIC 1.1: ATCO HMI

1.1.1	Describe the display types available	2	Video, synthetic, mixed
1.1.2	State the type of selections available	1	Source, range, maps, filters
1.1.3	Describe the advantages of different display types	2	Clarity, configurability, fallback, data integration

SUBJECT 11: SURVEILLANCE — DATA TRANSMISSION

TOPIC 1: SURVEILLANCE DATA TRANSMISSION

SUB-TOPIC 1.1: Technology and protocols

1.1.1	Describe the implementation of formats and protocols	2	Network protocols, surveillance data networks e.g. RADNET, messages CAT 1+
1.1.2	Decode ASTERIX messages	3	e.g. categories 1, 2, 20, 21, 34, 48, and 62
1.1.3	Identify the data transmission architecture in a multisensor environment	3	Fault tolerance, redundancy of line equipment e.g. software fallback capability, contingency of service, RADNET
1.1.4	Characterise the degradations of the surveillance transmission network	2	e.g. saturation, excess latency

SUBJECT 12: DATA PROCESSING — DPS SYSTEMS

TOPIC 1: USER REQUIREMENTS

SUB-TOPIC 1.1: Controller requirements

1.1.1	Explain ATCO missions and services needed in an area control centre	2	Operational requirements e.g. separation, flight progress monitoring and coordination, trajectory prediction, coordination with adjacent centres
1.1.2	Explain ATCO missions and services needed in an approach control unit	2	Operational requirements e.g. vectoring, sequencing, AMAN, CDM
1.1.3	Explain ATCO missions and services needed in an aerodrome control tower	2	Operational requirements e.g. runway management, DMAN

SUB-TOPIC 1.2: Trajectories, prediction and calculation

1.2.1	State different types of trajectories	1	e.g. FPL-based, surveillance data-based, FMS-based
1.2.2	Explain the main processes for trajectory prediction	2	SDP trajectory, FPL trajectory, merged trajectory, predicted trajectory

SUB-TOPIC 1.3: Ground safety nets

1.3.1	Describe the function of safety nets and their legal status	2	STCA, APW, MSAW, ASMGCS-based safety nets

SUB-TOPIC 1.4: Decision support

1.4.1	Explain the major steps in the air traffic planning process	2	ATFCM with strategic, pre-tactical and tactical, ATC sector planning, tactical control
1.4.2	Explain the principles of trajectory prediction, conformance monitoring and medium term conflict detection processes	2	Route adherence monitoring e.g. CORA, MTCD, CLAM, level adherence monitoring
1.4.3	Explain the benefit of these tools for safety and efficiency	2	—

SUBJECT 13: DATA PROCESSING — DATA PROCESS

TOPIC 1: HARDWARE PLATFORM

SUB-TOPIC 1.1: Equipment upgrade

1.1.1	Explain the key factors that have to be considered when data processing equipment is upgraded or changed	2	Specification, compatibility, ‘proven’ or ‘state-of-the-art’ technology, maintenance and operating consequence (e.g. personnel, training, spares, procedures), environmental requirements (e.g. size, power requirements, temperature, interfaces), testing

SUB-TOPIC 2.2: COTS

2.2.1	Explain the advantages and disadvantages of commercial off-the-shelf equipment	2	Cost, multiplicity of suppliers, quality, maintainability, life cycle, liability

SUB-TOPIC 2.3: Interdependence

2.3.1	Describe the technical issues regarding the interdependence of various equipment and systems	2	Interface requirements, common point of failure, data conditioning, response time

SUBJECT 14: DATA PROCESSING — DATA

TOPIC 1: DATA ESSENTIALS FEATURES

SUB-TOPIC 1.1: Data significance

1.1.1	Explain the significance of data	2	Criticality (critical/non critical), legality (ICAO, CAA, organisations), use (advisory, control)

SUB-TOPIC 1.2: Data configuration control

1.2.1	Explain the control procedures for changes to operational data	2	Designated roles/persons for authorising changes and verifying/checking changes

SUB-TOPIC 1.3: Data standards

1.3.1	Name the authority responsible for standards	1	e.g. EUROCONTROL, ICAO, ISO
1.3.2	State the standards related to ATM data, their sources and their status	1	e.g. ASTERIX, WGS84, OLDI, FMTP, AMHS, ADEX-P, FPL,
1.3.3	Decode a typical OLDI message	3	e.g. ACT, PAC
1.3.4	State the nature of ATM processing requirements	1	Data volatility (e.g. radar), system integrity, consequence of failure

Appendix 5a

ED Decision 2017/001/R

SYLLABI STRUCTURE

This guidance material provides explanatory material on how to read the tables in the appendices contained in this Subpart A of ANNEX XIII.

(a) Structure of the syllabi

Each table represents a syllabus which has been structured according to the following:

(1) for ease of reading, each table repeats the titles of all subjects that are listed in the Implementing Rule; and

(2) these subjects are further divided into the topics that are listed in the Implementing Rule; then

(3) topics are divided into one or more sub-topics; and

(4) sub-topics contain one or more training objectives.

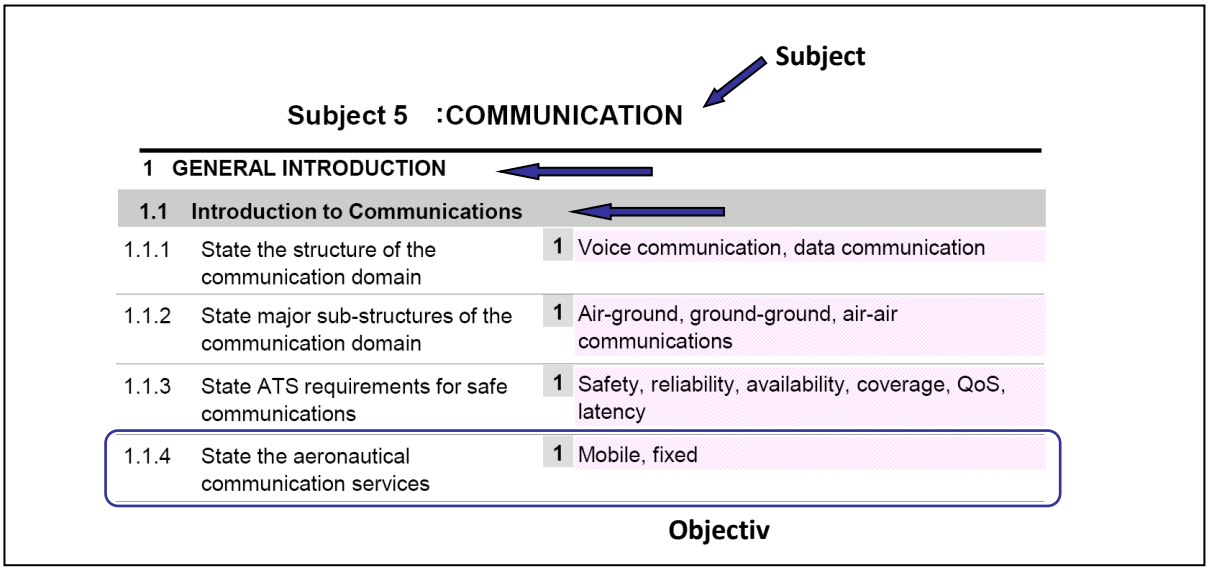

Figure 1: Structure of tables

(b) Training objectives

Each training objective should be understood to contain three mandatory elements:

(1) Corpus, which is a description of the required performance. It always contains an action verb at the beginning of the sentence to ensure that the outcome is observable. The action verb is always associated with a defined taxonomy.

(2) Taxonomy Level, which is the numerical representation of the classification of the action verb.

(3) Content.

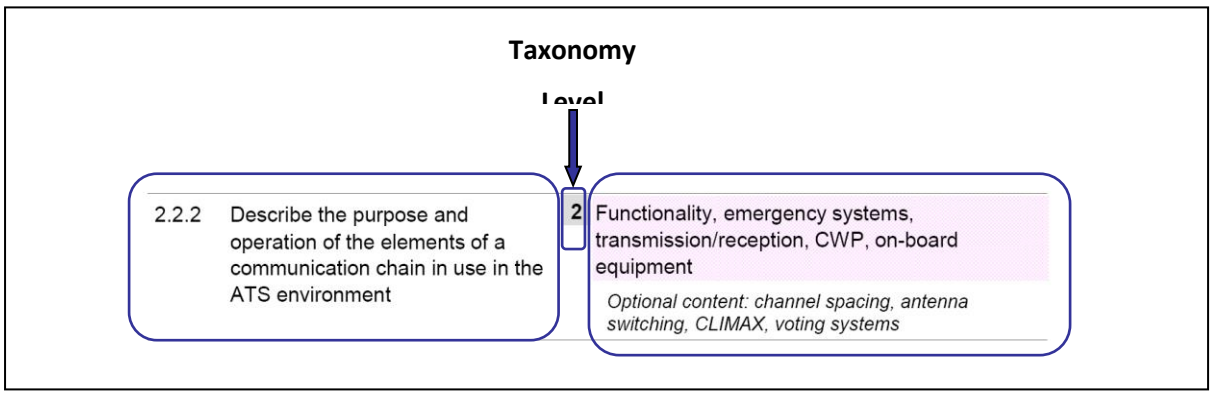

Figure 2: A training objective consists of corpus, taxonomy level and content.

(c) Corpus

Objectives relate to single activities, where possible.

A number of the objectives refer to 'generic equipment' within the corpus. In this context, generic equipment is considered a piece of equipment and/or didactic device which can be used to meet objectives. The equipment/device is not necessarily identical or similar to the operational equipment.

Note: Generic equipment gives flexibility to the course designer. In some instances, operating organisations may, as an alternative to the above, choose to conduct the training on equipment that is similar or identical to the operational equipment that will be used during system/equipment rating training.

1.1.2	Adjust a generic radio transmitter	4	Noise, intermodulation, harmonics, power, bandwidth

Figure 3: Example of an objective with generic equipment

The objective above may be achieved through the use of any type of radio transmitter.

(d) Taxonomy levels

The five taxonomy levels should be understood to have the following levels of complexity:

(1) Level 1 — Basic knowledge of the subject. It is the ability to remember essential points, to memorise data, and retrieve it.

(2) Level 2 — The ability to understand and to discuss the subject matter intelligently in order to represent and act upon certain objects and events.

(3) Level 3 — Thorough knowledge of the subject and the ability to apply it with accuracy. The ability to make use of the repertoire of knowledge to develop plans and activate them.

(4) Level 4 — The ability to establish a line of action within a unit of known applications following the correct chronology and the adequate method to resolve a problem situation. This involves the integration of known applications in a familiar situation.

(5) Level 5 — The ability to analyse new situations in order to elaborate and apply one or another relevant strategy to solve a complex problem. The defining feature is that the situation is qualitatively different to those previous met, requiring judgement and evaluation of options.

(e) Content

The content illustrates and details performance.

It may be composed of two parts: implicit and explicit. The explicit content is what is written in the content field proper to the objective, while the implicit content is not written in the content field of each objective, but rather implied in the corpus of the objective and other elements (stream, subject, etc.).

When the items are in a list, each of them is to be addressed as a minimum.

Optional content items are italicised and clearly preceded with the words 'Optional content'. They help to illustrate the type of content that may be used to achieve given objectives.

Even when all of the items are optional, the objective has to be performed according to the action verb included.

Where content refers to other documents (e.g. ICAO Standards and Recommended Practices), users should take care to use the most recent version of the referenced document(s) or its parts.

(f) Additional note in content

(1) Contained within the content of some objectives that have been assigned, the action verb 'Appreciate' is an additional note that elaborates on the ultimate intentions of the objective. The additional note states: 'For achievement of competence, this objective shall be applied practically, at the latest, by the end of the S/E rating training.'

1.2.1	Identify the causes of a fault, based on test tool measurements	3	Additional: for achievement of competence, this objective should be applied practically, at the latest, by the end of the S/E rating training e.g. data analyser, line analyser

Figure 4: Example of an objective with 'Appreciate + additional note'

(2) When the verb 'appreciate' is used with the additional note, the objective may, as a minimum, be taught as a theoretical objective during qualification training. This is permitted when using 'appreciate', i.e. learners should be able to understand a situation and know what is involved in a problem-solving situation, to state a plan without applying it. However, it is acknowledged that these objectives, without any practical application, are of extremely limited operational competence value. Therefore, these objectives should, at the latest, be achieved practically during system/equipment rating training.

(g) Common training objectives

An objective should be considered common to two or more qualification streams if the objective recurs verbatim and the context within which the objective is applied does not change.

Common objectives should be taught at least once when:

(1) training for two or more qualification streams are combined to form one course; or

(h) a course is provided for the purpose of an ATSEP acquiring an additional qualification stream.

Action verbs

The tables below list action verbs and their associated taxonomy levels that are used in training objectives.

Definition of verbs — Level 1

Verb	Definition	Example
Define	State what it is and what its limits are; state the definition.	Define airborne safety nets.
Draw	Produce a picture, pattern, or diagram.	Draw the MLAT system architecture.
List	Say one after the other.	List the most common weather messages.
Name	Give the name of objects or procedures.	Name a range of air-ground aviation-related network concepts.
Recognise	Know what it is, because you have seen it before.	Recognise surveillance information on a display.
State	Say or write in a formal or definite way.	State the function of a network management system.

Definition of verbs — Level 2

Verb	Definition	Example
Characterise	Describe the quality of features in something.	Characterise navigation methods.
Consider	Think carefully about it.	Consider the benefits of Critical Incident Stress Management (CISM).
Demonstrate	Describe and explain. Logically or mathematically, prove the truth of the statement.	Demonstrate the use of middleware in an ATM environment.
Describe	Say what it is like or what happened.	Describe the elements of Global Navigation Satellite System (GNSS) in Europe.
Differentiate	Show the difference between things.	Differentiate conventional navigation from area navigation.
Explain	Give details about something or describe so that it can be understood.	Explain the function of FDP.
Take account of	Take into consideration before deciding.	Take account of hardware/software compatibility.

Definition of verbs — Level 3

Verb	Definition	Example
Apply	Use something in a situation or activity.	Apply the principles of layers.
Appreciate	Understand a situation and know what is involved in a problem-solving situation, to state a plan without applying it.	Appreciate how to troubleshoot a network.
Calculate	Discover from information you already have by arithmetic; to think about a possible cause of action in order to form an opinion or decide what to do.	Calculate parameters of a line.
Check	Make sure the information is correct (satisfactory).	Check the conformity of a system to ITU and national regulation.
Decode	Turn into ordinary writing, decipher.	Decode a typical OLDI message.

Verb	Definition	Example
Estimate	Form an approximate judgement of a number, form an opinion.	Estimate the impact of security and integrity failure to the operational service.
Identify	Associate oneself inseparably with, establish the identity.	Identify the major elements of the ADS-C system.
Operate	Conduct work on equipment.	Operate measuring equipment.
Perform	Carry into effect, go through, execute.	Perform measurements with generic radio test equipment.
Use	Employ for a purpose, handle as instrument, put into operation.	Use appropriate vocabulary to communicate effectively on technical matters.

Definition of verbs — Level 4

Verb	Definition	Example
Adjust	Change to a new position, value or setting.	Adjust a generic radio receiver.
Analyse	Examine minutely the constitution of.	Analyse the block diagram of a generic radio receiver.
Justify	Show the rightness of a choice or of an option.	Justify the occasions when it is necessary to downgrade an ILS facility performance category.
Relate	Establish link with.	Relate VOR station design to operational requirement.

Definition of verbs — Level 5

Verb	Definition	Example
Interpret	Decide on the meaning or significance of something when there is a choice.	Interpret ILS facility performance categories.

(i) Acronyms

The following abbreviations are applied within the tables:

AAIM	Aircraft Autonomous Integrity Monitoring
ABAS	Aircraft-Based Augmentation System
ACARS	Aircraft Communications Addressing and Reporting System
ACAS	Airborne Collision Avoidance System
ACC	Area Control Centre
A/D	Analogue/Digital
ADEX-P	ATS Data Exchange Presentation
ADS	Automatic Dependent Surveillance
ADS B	ADS — Broadcast
ADS C	ADS — Contract
ADF	Automatic Direction Finder
AFDX	Avionics Full-duplex Ethernet Switch
AFTN	Aeronautical Fixed Telecommunications Network
AGC	Automatic Gain Control
AIC	Aeronautical Information Circular
AIDC	ATS Interfacility Data Communications
AIP	Aeronautical Information Publication

AIRAC	Aeronautical Information Regulation and Control
AIS	Aeronautical Information Services
ALARP	As Low As Reasonably Practicable
AMAN	Arrival Manager
AMHS	Aeronautical Message Handling System
AMSS	Automatic Message Switching System
ANS	Air Navigation Services
ANSP	ANS Provider
APV	Approach Procedure with Vertical guidance
APW	Area Proximity Warning
ARINC	Aeronautical Radio Incorporated
ARTAS	ATC Radar Tracker and Server
ASAS	Airborne Separation Assistance/Assurance System
ASM	Airspace Management
ASMGCS	Advanced SMGCS
ASTERIX	All-purpose Structured EUROCONTROL Radar Information Exchange
ATC	Air Traffic Control
ATFCM	Air Traffic Flow and Capacity Management
ATIS	Automatic Terminal Information Service
ATM	Air Traffic Management
ATN	Aeronautical Telecommunication Network
ATS	Air Traffic Services
ATSEP	Air Traffic Safety Electronics Personnel
AUGUR	EUROCONTROL RAIM Prediction Tool
BATAP	'Type-B' Application-to-Application Protocol
BDS	Binary Data Store
BER	Bit Error Rate
BITE	Built-In Test Equipment
B-RNAV	Basic-RNAV
CAA	Civil Aviation Authority
CB	Cumulonimbus
CBT	Computer-Based Training
CDM	Collaborative Decision-Making
CDTI	Cockpit Display of Traffic Information
CFMU	Central Flow Management Unit
CIDIN	Common ICAO Data Interchange Network
CISM	Critical Incident Stress Management
CIV	Civil
CLAM	Cleared flight Level Adherence Monitoring
CLIMAX	Multi-station carrier offset mode, with voting override
CMS	Control and Monitoring System
CNS/ATM	Communication Navigation and Surveillance/Air Traffic Management
CORA	Conflict Resolution Advisory
CORBA	Common Object Request Broker Architecture
COTS	Commercial off-the-Shelf
CPDLC	Controller-Pilot Data Link Communications

CRT	Cathode Ray Tube
CSU	Control Sector Unit
CTR	Control Zone
CVOR	Conventional VOR
CWP	Controller Work Position
DCL	Departure Clearance
DDF	Doppler DF
DDM	Difference of Depth of Modulation
DF	Direction Finding
DLIC	Data Link Initiation Capability
DMAN	Departure Manager
DME	Distance Measuring Equipment
DME/N	DME/Normal
DME/P	DME/Precision
DPSK	Differential Phase Shift Keying
DTMF	Dual Tone Modulation-Frequency
DVOR	Doppler VOR
EAD	European Aeronautical Database
EAN	European ANSP Network
EASA	European Aviation Safety Agency
ECAC	European Civil Aviation Conference
EFQM	European Foundation for Quality Management
EGNOS	European Geostationary Navigation Overlay Service
EGPWS	Enhanced Ground Proximity Warning System
EHS	Enhanced Mode S
EHT	Extremely High Tension
EJB	Enterprise Java Bean
ELS	Elementary Mode S
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
ETFMS	Enhanced Tactical FMS
EU	European Union
EUROCAE	European Civil Aviation Electronics
EUROCONTROL	European Organisation for the Safety of Air Navigation
FAA	Federal Aviation Administration (US)
FANS	Future Air Navigation Systems
FDP	Flight Data Processing
FDPS	FDP System
FFM	Far Field Monitor
FHA	Functional Hazard Assessment
FIR	Flight Information Region
FMS	Flight Management System
FMTP	Flight Plan Messaging Transport Protocol
FoM	Figures of Merit
FPL	(Filed) Flight Plan
FRUIT	False Reply Unsynchronised in Time

FUA	Flexible Use of Airspace
GALILEO	Satellite radio navigation system
GBAS	Ground-Based Augmentation System
GLONASS	GLObal'naya NAvigatsionnaya Sputnikovaya Sistema (Global Navigation Satellite System)
GNSS	Global Navigation Satellite System
GP	Glide Path
GPS	Global Positioning System
GRAS	Ground-based Regional Augmentation System
GSA	GNSS Supervisory Authority
GTC	Gain/Time Control
HF	High Frequency
HFDL	High Frequency Data Link
HMI	Human-Machine Interface
HPA	High Power Amplifier
HSI	Horizontal Situation Indication
HV	High Voltage
HW	Hardware
Hz	Hertz
ICAO	International Civil Aviation Organization
IDF	Interferometric DF
IF	Intermediate Frequency
IFF	Identification Friend/Foe
IFPS	(Integrated) Initial Flight Plan Processing System
ILS	Instrument Landing System
INS	Inertial Navigation System
I/O	Input/Output
IP	Internet Protocol
IRS	Inertial Reference System
IRVR	Instrument Runway Visual Range
I/Q	In phase and Quadrature
ISDN	Integrated Services Digital Network
ISLS	Interrogator Side Lobe Suppression
IISLS	Improved Interrogator Side Lobe Suppression
iTEC	Interoperability Through European Collaboration
ITU	International Telecommunication Union
ISO	International Standards Organisation
LAM	Local Area Multilateration
LAN	Local Area Network
LAPB	Link Access Protocol, Balanced
LCD	Liquid-Crystal Display
LLZ	Localiser
LNA	Low Noise Amplifier
LVP	Low Visibility Procedures
MDS	Minimum Detectable Signal
MET	Meteorology
METAR	Meteorological Actual Report

MFC	Multi-Frequency Coding
MHz	Megahertz
MIL	Military
MLAT	Multilateration
MLS	Microwave Landing System
MOTNE	Meteorological Operational Telecommunications Network Europe
MRP	Multi-radar Processing
MRT	Multi-radar Tracker
MSAW	Minimum Safe Altitude Warning
MSSR	Mono-pulse SSR
MTBF	Mean Time Between Failure
MTCD	Medium-Term Conflict Detection
MTD	Moving Target Detection
NAVAID	Navigation(al) Aid
ND	Navigation Display
NEAN	North European ADS-B Network
NDB	Non-Directional Beacon
NOP	Network Operations Plan
NOTAM	Notice to Airmen
NPA	Non-Precision Approach
NRA	Non-Radar Area
NSA	National Supervisory Authority
OJTI	On-The-Job Training Instructor
OLDI	On-Line Data Interchange
OS	Operating System
OSI	Open System Interconnection
OST	On-site Training
OTM	Object Transaction Monitor
PA	Precision Approach
PABX	Private Automatic Branch Exchange
PBN	Performance-Based Navigation
PCM	Pulse Code Modulation
PD	Probability of Detection
PENS	Pan-European Fixed Network Services
PFD	Primary Flight Display
PPI	Plan Position Indicator
PRF	Pulse Repetition Frequency
P-RNAV	Precision RNAV
PSD	Phase Sensitive Detector
PSSA	Preliminary System Safety Assessment
PSR	Primary Surveillance Radar
PTT	Post, Telephone and Telegraph (generic term to identify the provider)
QoS	Quality of Service
QNH	Q-code for atmospheric pressure at sea level
Qsig	Quality of signal
RAIM	Receiver Autonomous Integrity Monitoring

RAPNET	(European) Regional Aeronautical Packet switched Network (CBN + DAKOS)
RAPS	Recording, Analysis, Playback and Simulation system for radar data (COMSOFT)
RDP	Radar Data Processing
RCA	Remote Client Application
RF	Radio Frequency
RMI	Relative Magnetic Indicator
RNAV	Area Navigation
RNP	Required Navigation Performance
RPL	Repetitive Flight Plan
RSLS	Receiver Sidelobe Suppression
R/T	Radiotelephony
RTCA	Radio Technical Commission for Aeronautics
RUP	Rational Unified Process
RVR	Runway Visual Range
RX	Receiver
SAR	Specific Energy Absorption Rate
SARPS	Standards And Recommended Practices
SASS	Surveillance Analysis Support System
SASS-C	SASS-Centre
SASS-S	SASS-Sensor
SATCOM	Satellite Communications
SBAS	Space/Satellite-Based Augmentation System
SCAS	Surveillance Coverage Analysis Suite
SCAT-1	Special Category 1
SDM	Sum of Depth of Modulation
SDP	Surveillance Data Processing
S/E	System/Equipment
SELCAL	Selective Calling
SESAR	Single European Sky AM Research
SID	Standard Instrument Departure
SITA	Société Internationale de Télécommunications Aéronautiques (France)
SMC	System Monitoring and Control
SMR	Surface Movement Radar
SMS	Safety Management System
S/N	Signal/Noise
SNOWTAM	NOTAM on Snow conditions
SNMP	Simple Network Management Protocol
SPI	Special Pulse Identification or Special Position Identification Pulse (SSR)
SRC	Safety Regulation Commission (EUROCONTROL)
SSA	System Safety Assessment
SSR	Secondary Surveillance Radar
STC	Sensitivity Time Control
STCA	Short-Term Conflict Alert
SV	Supervisor
SW	Software
SWALs	Software Assurance Levels

SWIM	System Wide Information Management
SWR	Standing Wave Ratio
TACAN	UHF Tactical Air Navigation aid
TAF	Terminal Area Forecast
TCAS	Transponder Collision Avoidance System
TCP	Transmission Control Protocol
TDOA	Time Difference on Arrival
TFT	Thin Film Transistor
TIS	Traffic Information Service
TMA	Terminal Area
TRM	Team Resource Management
TX	Transmitter
UAT	Universal Access Transceiver
UBSS	UNIX Basic System Software
UHF	Ultra High Frequency
UPS	Uninterruptible Power Supply
UTA	Upper (Traffic) Control Area
VCS	Voice Communications System
VDF	VHF DF Station
VDL	VHF Digital/Data Link
VESDA	Very Early Smoke Detection Alarm
VHF	Very High Frequency
VOLMET	Routine Voice broadcasts for Meteorological Information
VOR	VHF Omnidirectional Radio Range
VORTAC	VOR and TACAN combination
WAAS	Wide Area Augmentation System (US)
WAM	Wide Area Multilateration
WAN	Wide Area Network
WGS84	World Global System 84
X25	Packet Switched Data Network Protocol