United Kingdom

Civil Aviation Authority

Official Record Series 9

CAA Decision to adopt AMC and GM for UK Reg (EU) No 965/2012 pursuant to Article 76(3) UK Reg (EU) 2018/1139 and revoke AltMoC pursuant to UK Reg (EU) No 965/2012 Annex II Part ARO ARO.GEN.120

DECISION No. 15

Publication date: 7 November 2022

Decision amending Acceptable Means of Compliance (AMC) and Guidance Material (GM) for UK Reg (EU) No 965/2012 regarding aeroplane performance, non-extended range twin operations (ETOPS) extended operations, lightweight flight recorders and performance-based communication requirements and changes associated with the introduction of the Global Reporting Format including runway surface condition reporting and in-flight assessment of landing performance

Background

1. CAA UK-EU Transition Decision No. 1, dated 22 December 2020, adopted a form of Acceptable Means of Compliance (**"AMC"**) as the means by which the requirements in Commission Regulation (EU) No. 965/2012, as retained (and amended in UK domestic law) under the European Union (Withdrawal) Act 2018 (**"UK Reg (EU) No 965/2012"**), could be met. That decision also adopted Guidance Material (**"GM"**) as non-binding explanatory and interpretation material on how to achieve the requirements in the Air Operations Regulation. The CAA has decided to adopt revised AMC and GM in respect of UK Reg. (EU) No 965/2012.
2. The CAA has decided to revoke UK Alternative Means of Compliance (**"AltMoC"**) for UK Reg (EU) No 965/2012 previously accepted by the CAA.

Decision

1. The CAA, under Article 76(3) of Regulation (EU) No 2018/1139 as retained (and amended in UK domestic law) under the European Union (Withdrawal) Act 2018, has decided to adopt the AMC and GM attached at Schedule 1.
2. This AMC and GM supplements and/or replaces that which was adopted for UK Reg (EU) No 965/2012 by CAA UK-EU Transition Decision No. 1 dated 22 December 2020.
3. This Decision will remain in force unless revoked or amended by the CAA.
4. Pursuant to UK Reg (EU) No 965/2012, Annex II Part ARO ARO.GEN.120 the following UK AltMoC are revoked:
   a. EASA Ref 2015-00033 – CAT.IDE.A.285(a) (Access to life jackets)
   b. EASA Ref 2020-00031 – CAT.OP.MPA.140 (non-ETOPS operations)

Definitions

All references to UK Reg (EU) No 965/2012 are to those Regulations as retained and amended in UK domestic law pursuant to the European Union (Withdrawal) Act 2018.

Rob Bishton
For the Civil Aviation Authority and the United Kingdom

Date of Decision: 7 November 2022

Date of Decision Coming into force: 7 November 2022

Schedule 1

Includes the Acceptable Means of Compliance (AMC) and Guidance Material (GM) documents referenced below.

The text of the amendment is arranged to show deleted text, new or amended text as shown below:

(a) ~~Text to be deleted is shown struck through~~;

(b) New text is highlighted in grey;

(c) ~~Text to be deleted is shown struck through~~ followed by the replacement text which is highlighted in grey.

GM1 ORO.GEN.130(b) Changes related to an AOC holder

CHANGES REQUIRING PRIOR APPROVAL

The following list is a non-exhaustive checklist of items that require prior approval from the CAA as specified in the applicable Implementing Rules:

(a) alternative means of compliance;

(b) procedures regarding items to be notified to the CAA;

(c) cabin crew:

  (1) conduct of the training, examination and checking required by UK Regulation (EU) No 1178/2011 Annex V (Part-CC) and issue of cabin crew attestations;

  (2) procedures for cabin crew to operate on four aircraft types;

  (3) training programmes, including syllabi;

(d) leasing agreements;

(e) procedure for the use of aircraft included in an AOC by other operators for NCC, NCO and specialised operations, as required by **ORO.GEN.310**;

(f) specific approvals in accordance with Annex V (Part-SPA);

(g) dangerous goods training programmes;

(h) flight crew:

  (1) alternative training and qualification programmes (ATQPs);

  (2) procedures for flight crew to operate on more than one type or variant;

  (3) training and checking programmes, including syllabi and use of flight simulation training devices (FSTDs);

(i) fuel policy;

(j) helicopter operations:

  (1) over a hostile environment located outside a congested area, unless the operator holds an approval to operate according to Subpart J of Annex V (SPA.HEMS);

  (2) to/from a public interest site;

  (3) without an assured safe forced landing capability;

(k) mass and balance: standard masses for load items other than standard masses for passengers and checked baggage;

(l) minimum equipment list (MEL):

(1) MEL;

(2) operating other than in accordance with the MEL, but within the constraints of the master minimum equipment list (MMEL);

(3) rectification interval extension (RIE) procedures;

(m) minimum flight altitudes:

(1) the method for establishing minimum flight altitudes;

(2) descent procedures to fly below specified minimum altitudes;

(n) performance:

(1) increased bank angles at take-off (for performance class A aeroplanes);

(2) short landing operations (for performance class A and B aeroplanes);

(3) steep approach operations (for performance class A and B aeroplanes);

(4) reduced required landing distance operations (for performance class A and B aeroplanes);

(o) isolated aerodrome: using an isolated aerodrome as destination aerodrome for operations with aeroplanes;

(p) approach flight technique:

(1) all approaches not flown as stabilised approaches for a particular approach to a particular runway;

(2) non-precision approaches not flown with the continuous descent final approach (CDFA) technique for each particular approach/runway combination;

(q) maximum distance from an adequate aerodrome for two-engined aeroplanes without an extended range operations with two-engined aeroplanes (ETOPS) approval:

(1) air operations with two-engined performance class A aeroplanes with a maximum operational passenger seating configuration (MOPSC) of 19 or less and a maximum take-off mass less than 45 360 kg, over a route that contains a point further than 120 minutes from an adequate aerodrome, under standard conditions in still air;

(r) aircraft categories:

(1) Applying a lower landing mass than the maximum certified landing mass for determining the indicated airspeed at threshold (VAT).

(s) commercial air transport operations with single-engined turbine aeroplanes in instrument meteorological conditions or at night (CAT SET-IMC).

AMC1 ORO.AOC.130Flight data monitoring – aeroplanes

FLIGHT DATA MONITORING (FDM) PROGRAMME

(a) The safety manager, as defined under **AMC1-ORO.GEN.200(a)(1),** should be responsible for the identification and assessment of issues and their transmission to the manager(s) responsible for the process(es) concerned. The latter should be responsible for taking appropriate and practicable safety action within a reasonable period of time that reflects the severity of the issue.

(b) An FDM programme should allow an operator to:

(1) identify areas of operational risk and quantify current safety margins;

(2) identify and quantify operational risks by highlighting occurrences of non-standard, unusual or unsafe circumstances;

(3) use the FDM information on the frequency of such occurrences, combined with an estimation of the level of severity, to assess the safety risks and to determine which may become unacceptable if the discovered trend continues;

(4) put in place appropriate procedures for remedial action once an unacceptable risk, either actually present or predicted by trending, has been identified; and

(5) confirm the effectiveness of any remedial action by continued monitoring.

(c) FDM analysis techniques should comprise the following:

(1) Exceedance detection: searching for deviations from aircraft flight manual limits and standard operating procedures. A set of core events should be selected to cover the main areas of interest to the operator and as much as possible, the most significant risks identified by the operator. A~~sample list is provided in Appendix 1 to AMC1 ORO.AOC.130.~~ The event definitions ~~detection limits~~ should be continuously reviewed to reflect the operator's current operating procedures.

(2) All flights measurement: a system defining what is normal practice. This may be accomplished by retaining various snapshots of information from each flight.

(3) Statistics — a series of data collected to support the analysis process: this technique should include the number of flights flown per aircraft and sector details sufficient to generate rate and trend information.

(d) FDM analysis, assessment and process control tools: the effective assessment of information obtained from digital flight data should be dependent on the provision of appropriate information technology tool sets.

(e) Education and publication: sharing safety information should be a fundamental principle of aviation safety in helping to reduce accident rates. The operator should pass on the lessons learnt to all relevant personnel and, where appropriate, industry.

(f) Accident and incident data requirements specified in **CAT.GEN.MPA.195** take precedence over the requirements of an FDM programme. In these cases the FDR data should be retained as part of the investigation data and may fall outside the de-identification agreements.

(g) Every crew member should be responsible for reporting events. Significant risk-bearing incidents detected by FDM should therefore normally be the subject of mandatory occurrence reporting by the crew. If this is not the case, then they should submit a retrospective report that should be included under the normal process for reporting and analysing hazards, incidents and accidents.

(h) The data recovery strategy should ensure a sufficiently representative capture of flight information to maintain an overview of operations. Data analysis should be performed sufficiently frequently to enable action to be taken on significant safety issues.

(i) The data retention strategy should aim at providing the greatest safety benefits practicable from the available data. A full dataset should be retained until the action and review processes are complete; thereafter, a reduced dataset relating to closed issues should be maintained for longer-term trend analysis. Programme managers may wish to retain samples of de-identified full-flight data for various safety purposes (detailed analysis, training, benchmarking, etc.).

(j) The data access and security policy should restrict information access to authorised persons. When data access is required for airworthiness and maintenance purposes, a procedure should be in place to prevent disclosure of crew identity.

(k) The procedure to prevent disclosure of crew identity should be written in a document, which should be signed by all parties (airline management, flight crew member representatives nominated either by the union or the flight crew themselves). This procedure should, as a minimum, define:

(1) the aim of the FDM programme;

(2) a data access and security policy that should restrict access to information to specifically authorised persons identified by their position;

(3) the method to obtain de-identified crew feedback on those occasions that require specific flight follow-up for contextual information; where such crew contact is required the authorised person(s) need not necessarily be the programme manager or safety manager, but could be a third party (broker) mutually acceptable to unions or staff and management;

(4) the data retention policy and accountability, including the measures taken to ensure the security of the data;

(5) the conditions under which advisory briefing or remedial training should take place; this should always be carried out in a constructive and non-punitive manner;

(6) the conditions under which the confidentiality may be withdrawn for reasons of gross negligence or significant continuing safety concern;

(7) the participation of flight crew member representative(s) in the assessment of the data, the action and review process and the consideration of recommendations; and

(8) the policy for publishing the findings resulting from FDM.

(l) Airborne systems and equipment used to obtain FDM data should range from a ~~an already installed~~ ~~full~~ quick access recorder (QAR) in an ~~a modern~~ aircraft with digital systems, to a ~~basic~~ crash-protected flight recorder in an older or less sophisticated aircraft. The analysis potential of the reduced data set available in the latter case may reduce the safety benefits obtainable. The operator should ensure that FDM use does not adversely affect the serviceability of equipment required for accident investigation.

GM1 ORO.AOC.130 Flight data monitoring – aeroplanes

~~DEFINITION~~ IMPLEMENTATION OF AN FDM PROGRAMME

Flight data monitoring is defined in Annex I to this Regulation~~. For the purposes of this Guidance Material, an FDM programme may be defined as a proactive and non-punitive programme for gathering and analysing data recorded during routine flights to improve aviation safety.~~ It should be noted that the requirement to establish a FDM programme is applicable to all individual aircraft in the scope of **ORO.AOC.130**, not to a subset selected by the operator.

(a) FDM analysis techniques

(1) Exceedance detection

(i) FDM programmes are used for detecting exceedances, such as deviations from flight manual limits, standard operating procedures (SOPs), or good airmanship. Typically, a set of core events establishes the main areas of interest that are based on a prior assessment of the most significant risks by ~~to~~ the operator~~s~~. In addition, it is advisable to consider the following risks: risk of runway excursion or abnormal runway contact at take-off or landing, risk of loss of control in flight, risk of airborne collision, and risk of collision with terrain.

Examples: low or high lift-off rotation rate, stall warning, ground proximity warning system (GPWS) warning, flap limit speed exceedance, fast approach, high or ~~/~~low on glideslope, ~~and~~ heavy landing.

(ii) Trigger logic expressions may be simple exceedances such as redline values. The majority, however, are composites that define a certain flight mode, aircraft configuration or payload-related condition. Analysis software can also assign different sets of rules dependent on airport or geography. For example, noise sensitive airports may use higher than normal glideslopes on approach paths over populated areas. In addition, it might be valuable to define several levels of exceedance severity (such as low, medium and high).

(iii) Exceedance detection provides useful information, which can complement that provided in crew reports.

Examples: reduced flap landing, emergency descent, engine failure, rejected take-off, go-around, airborne collision avoidance system (ACAS) or GPWS warning, and system malfunctions.

(iv) The operator may also modify the standard set of core events to account for unique situations they regularly experience, or the SOPs they use.

Example: to avoid nuisance exceedance reports from a non-standard instrument departure.

(v) The operator may also define new events to address specific problem areas.

Example: restrictions on the use of certain flap settings to increase component life.

(2) All-flights measurements

FDM data are retained from all flights, not just the ones producing significant events. A selection of parameters is retained that is sufficient to characterise each flight and allow a comparative analysis of a wide range of operational variability. Emerging trends and tendencies may be identified and monitored before the trigger levels associated with exceedances are reached.

Examples of parameters monitored: take-off weight, flap setting, temperature, rotation and lift-off speeds versus scheduled speeds, maximum pitch rate and attitude during rotation, and gear retraction speeds, heights and times.

Examples of comparative analyses: pitch rates from high versus low take-off weights, good versus bad weather approaches, and touchdowns on short versus long runways.

(3) Statistics

Series of data are collected to support the analysis process: these usually include the numbers of flights flown per aircraft and sector details sufficient to generate rate and trend information.

(4) Investigation of incidents flight data

Recorded flight data provide valuable information for follow-up to incidents and other technical reports. They are useful in adding to the impressions and information recalled by the flight crew. They also provide an accurate indication of system status and performance, which may help in determining cause and effect relationships.

Examples of incidents where recorded data could be useful:

high cockpit workload conditions as corroborated by such indicators as late descent, late localizer and/or glideslope interception, late landing configuration;

unstabilised and rushed approaches, glide path excursions, etc.;

exceedances of prescribed operating limitations (such as flap limit speeds, engine overtemperatures); and

wake vortex encounters, turbulence encounters or other vertical accelerations.

It should be noted that recorded flight data have limitations, e.g. not all the information displayed to the flight crew is recorded, the source of recorded data may be different from the source used by a flight instrument, the sampling rate or the recording resolution of a parameter may be insufficient to capture accurate information.

(5) Continuing airworthiness

Data of all-flight measurements and exceedance detections can be utilised to assist the continuing airworthiness function. For example, engine-monitoring programmes look at measures of engine performance to determine operating efficiency and predict impending failures.

Examples of continuing airworthiness uses: engine thrust level and airframe drag measurements, avionics and other system performance monitoring, flying control performance, and brake and landing gear usage.

(b) FDM equipment

(1) General

FDM programmes generally involve systems that capture flight data, transform the data into an appropriate format for analysis, and generate reports and visualisation to assist in assessing the data. Typically, the following equipment capabilities are needed for effective FDM programmes:

(i) an on-board device to capture and record data on a wide range of in-flight parameters;

(ii) a means to transfer the data recorded on board the aircraft to a ground-based processing station;

(iii) a ground-based computer system to analyse the data, identify deviations from expected performance, generate reports to assist in interpreting the read-outs, etc.; and

(iv) optional software for a flight animation capability to integrate all data, presenting them as a simulation of in-flight conditions, thereby facilitating visualisation of actual events.

(2) Airborne equipment

(i) The flight parameters and recording capacity required for flight data recorders (FDR) to support accident investigations may be insufficient to support an effective FDM programme. Other technical solutions are available, including the following:

(A) Quick access recorders (QARs). QARs are installed in the aircraft and record flight data onto a low-cost removable medium.

(B) Some systems automatically download the recorded information via secure wireless systems when the aircraft is in the vicinity of the gate. There are also systems that enable the recorded data to be analysed on board while the aircraft is airborne.

(ii) Fleet composition, route structure and cost considerations will determine the most cost-effective method of removing the data from the aircraft.

(3) Ground replay and analysis equipment

(i) Data are downloaded from the aircraft recording device into a ground-based processing station, where the data are held securely to protect this sensitive information.

(ii) FDM programmes generate large amounts of data requiring specialised analysis software.

(iii) The analysis software checks the downloaded flight data for abnormalities.

(iv) The analysis software may include: annotated data trace displays, engineering unit listings, visualisation for the most significant incidents, access to interpretative material, links to other safety information and statistical presentations.

(c) FDM in practice

(1) FDM process

Typically, operators follow a closed-loop process in applying an FDM programme, for example:

(i) Establish a baseline: initially, operators establish a baseline of operational parameters against which changes can be detected and measured.

Examples: rate of unstable approaches or hard landings.

(ii) Highlight unusual or unsafe circumstances: the user determines when non-standard, unusual or basically unsafe circumstances occur; by comparing them to the baseline margins of safety, the changes can be quantified.

Example: increases in unstable approaches (or other unsafe events) at particular locations.

(iii) Identify unsafe trends: based on the frequency and severity of occurrence, trends are identified. Combined with an estimation of the level of severity, the risks are assessed to determine which may become unacceptable if the trend continues.

Example: a new procedure has resulted in high rates of descent that are nearly triggering GPWS warnings.

(iv) Mitigate risks: once an unacceptable risk has been identified, appropriate risk mitigation actions are decided on and implemented.

Example: having found high rates of descent, the SOPs are changed to improve aircraft control for optimum/maximum rates of descent.

(v) Monitor effectiveness: once a remedial action has been put in place, its effectiveness is monitored, confirming that it has reduced the identified risk and that the risk has not been transferred elsewhere.

Example: confirm that other safety measures at the aerodrome with high rates of descent do not change for the worse after changes in approach procedures.

(2) Analysis and follow-up

(i) FDM data are typically compiled every month or at shorter intervals. The data are then reviewed to identify specific exceedances and emerging undesirable trends and to disseminate the information to flight crews.

(ii) If deficiencies in pilot handling technique are evident, the information is usually de-identified in order to protect the identity of the flight crew. The information on specific exceedances is passed to a person (safety manager, agreed flight crew representative, honest broker) assigned by the operator for confidential discussion with the pilot. The person assigned by the operator provides the necessary contact with the pilot in order to clarify the circumstances, obtain feedback and give advice and recommendations for appropriate action. Such appropriate action could include re-training for the pilot (carried out in a constructive and non-punitive way), revisions to manuals, changes to ATC and airport operating procedures.

(iii) Follow-up monitoring enables the effectiveness of any corrective actions to be assessed. Flight crew feedback is essential for the identification and resolution of safety problems and could be collected through interviews, for example by asking the following:

(A) Are the desired results being achieved soon enough?

(B) Have the problems really been corrected, or just relocated to another part of the system?

(C) Have new problems been introduced?

(iv) All events are usually archived in a database. The database is used to sort, validate and display the data in easy-to-understand management reports. Over time, this archived data can provide a picture of emerging trends and hazards that would otherwise go unnoticed.

(v) Lessons learnt from the FDM programme may warrant inclusion in the operator’s safety promotion programmes. Safety promotion media may include newsletters, flight safety magazines, highlighting examples in training and simulator exercises, periodic reports to industry and the competent authority. Care is required, however, to ensure that any information acquired through FDM is de-identified before using it in any training or promotional initiative.

(vi) All successes and failures are recorded, comparing planned programme objectives with expected results. This provides a basis for review of the FDM programme and the foundation for future programme development.

(d) Preconditions for an effective FDM programme

(1) Protection of FDM data

The integrity of FDM programmes rests upon protection of the FDM data. Any disclosure for purposes other than safety management can compromise the voluntary provision of safety data, thereby compromising flight safety.

(2) Essential trust

The trust established between management and flight crew is the foundation for a successful FDM programme. This trust can be facilitated by:

(i) early participation of the flight crew representatives in the design, implementation and operation of the FDM programme;

(ii) a formal agreement between management and flight crew, identifying the procedures for the use and protection of data; and

(iii) data security, optimised by:

(A) adhering to the agreement;

(B) the operator strictly limiting data access to selected individuals;

(C) maintaining tight control to ensure that identifying data is kept securely; and

(D) ensuring that operational problems are promptly addressed by management.

(3) Requisite safety culture

Indicators of an effective safety culture typically include:

(i) top management's demonstrated commitment to promoting a proactive safety culture;

(ii) a non-punitive operator policy that covers the FDM programme;

(iii) FDM programme management by dedicated staff under the authority of the safety manager, with a high degree of specialisation and logistical support;

(iv) involvement of persons with appropriate expertise when identifying and assessing the risks (for example, pilots experienced on the aircraft type being analysed);

(v) monitoring fleet trends aggregated from numerous operations, not focusing only on specific events;

(vi) a well-structured system to protect the confidentiality of the data; and

(vii) an efficient communication system for disseminating hazard information (and subsequent risk assessments) internally and to other organisations to permit timely safety action.

(e) Implementing an FDM programme

(1) General considerations

(i) Typically, the following steps are necessary to implement an FDM programme:

(A) implementation of a formal agreement between management and flight crew;

(B) establishment and verification of operational and security procedures;

(C) installation of equipment;

(D) selection and training of dedicated and experienced staff to operate the programme; and

(E) commencement of data analysis and validation.

(ii) An operator with no FDM experience may need a year to achieve an operational FDM programme. Another year may be necessary before any safety and cost benefits appear. Improvements in the analysis software, or the use of outside specialist service providers, may shorten these time frames.

(2) Aims and objectives of an FDM programme

(i) As with any project there is a need to define the direction and objectives of the work. A phased approach is recommended so that the foundations are in place for possible subsequent expansion into other areas. Using a building block approach will allow expansion, diversification and evolution through experience.

Example: with a modular system, begin by looking at basic safety-related issues only. Add engine health monitoring, etc. in the second phase. Ensure compatibility with other systems.

(ii) A staged set of objectives starting from the first week's replay and moving through early production reports into regular routine analysis will contribute to a sense of achievement as milestones are met.

Examples of short-term, medium-term and long-term goals:

(A) Short-term goals:

establish data download procedures, test replay software and identify aircraft defects;

validate and investigate exceedance data; and

establish a user-acceptable routine report format to highlight individual exceedances and facilitate the acquisition of relevant statistics.

(B) Medium-term goals:

produce an annual report — include key performance indicators;

add other modules to the analysis (e.g. continuing airworthiness); and

plan for the next fleet to be added to programme.

(C) Long-term goals:

network FDM information across all of the operator's safety information systems;

ensure FDM provision for any proposed alternative training and qualification programme (ATQP); and

use utilisation and condition monitoring to reduce spares holdings.

(iii) Initially, focusing on a few known areas of interest will help prove the system's effectiveness. In contrast to an undisciplined 'scatter-gun' approach, a focused approach is more likely to gain early success.

Examples: rushed approaches, or rough runways at particular aerodromes. Analysis of such known problem areas may generate useful information for the analysis of other areas.

(3) The FDM team

(i) Experience has shown that the 'team' necessary to run an FDM programme could vary in size from one person for a small fleet, to a dedicated section for large fleets. The descriptions below identify various functions to be fulfilled, not all of which need a dedicated position.

(A) Team leader: it is essential that the team leader earns the trust and full support of both management and flight crew. The team leader acts independently of others in line management to make recommendations that will be seen by all to have a high level of integrity and impartiality. The individual requires good analytical, presentation and management skills.

(B) Flight operations interpreter: this person is usually a current pilot (or perhaps a recently retired senior captain or instructor), who knows the operator's route network and aircraft. This team member's in-depth knowledge of SOPs, aircraft handling characteristics, aerodromes and routes is used to place the FDM data in a credible context.

(C) Technical interpreter: this person interprets FDM data with respect to the technical aspects of the aircraft operation and is familiar with the power plant, structures and systems departments' requirements for information and any other engineering monitoring programmes in use by the operator.

(D) Gate-keeper: this person provides the link between the fleet or training managers and flight crew involved in events highlighted by FDM. The position requires good people skills and a positive attitude towards safety education. The person is typically a representative of the flight crew association or an ‘honest broker’ and is the only person permitted to connect the identifying data with the event. It is essential that this person earns the trust of both management and flight crew.

(E) Engineering technical support: this person is usually an avionics specialist, involved in the supervision of mandatory serviceability requirements for FDR systems. This team member is knowledgeable about FDM and the associated systems needed to run the programme.

(F) Replay operative and administrator: this person is responsible for the day-to-day running of the system, producing reports and analysis.

(ii) All FDM team members need appropriate training or experience for their respective area of data analysis. Each team member is allocated a realistic amount of time to regularly spend on FDM tasks.

~~Appendix 1 to AMC1~~ GM2 ORO.AOC.130 Flight data monitoring — aeroplanes

EXAMPLES ~~TABLE~~ OF FDM EVENTS

The following table provides examples of FDM events that may be further developed using operator and aeroplane specific limits. The table is considered illustrative and not exhaustive. Other examples may be found in the documents published by the **European Operators Flight Data Monitoring (EOFDM) forum**.

Event Group	Description
Rejected take-off	High speed rejected take-off
Take-off pitch	Pitch rate low or high on take-off
	Pitch attitude high during take-off
Unstick speeds	Unstick speed high
	Unstick speed low
Height loss in climb-out	Initial climb height loss 20 ft above ground level (AGL) to 400 ft above aerodrome level (AAL)
	Initial climb height loss 400 ft to 1 500 ft AAL
Slow climb-out	Excessive time to 1 000 ft AAL after take-off
Climb-out speeds	Climb-out speed high below 400 ft AAL
	Climb-out speed high 400 ft AAL to 1 000 ft AAL
	Climb-out speed low 35 ft AGL to 400 ft AAL
	Climb-out speed low 400 ft AAL to 1 500 ft AAL
High rate of descent	High rate of descent below 2 000 ft AGL
Missed approach	Missed approach below 1 000 ft AAL
	Missed approach above 1 000 ft AAL
Low approach	Low on approach
Glideslope	Deviation under glideslope
	Deviation above glideslope (below 600 ft AGL)
Approach power	Low power on approach
Approach speeds	Approach speed high within 90 seconds of touchdown
	Approach speed high below 500 ft AAL
	Approach speed high below 50 ft AGL
	Approach speed low within 2 minutes of touchdown
Landing flap	Late land flap (not in position below 500 ft AAL)

Event Group	Description
	Reduced flap landing
	Flap load relief system operation
Landing pitch	Pitch attitude high on landing
	Pitch attitude low on landing
Bank angles	Excessive bank below 100 ft AGL
	Excessive bank 100 ft AGL to 500 ft AAL
	Excessive bank above 500 ft AGL
	Excessive bank near ground (below 20 ft AGL)
Normal acceleration	High normal acceleration on ground
	High normal acceleration in flight flaps up (+/- increment)
	High normal acceleration in flight flaps down(+/- increment)
	High normal acceleration at landing
Abnormal configuration	Take-off configuration warning
	Early configuration change after take-off (flap)
	Speed brake with flap
	Speed brake on approach below 800 ft AAL
	Speed brake not armed below 800 ft AAL
Ground proximity warning	Ground proximity warning system (GPWS) operation - hard warning
	GPWS operation — soft warning
	GPWS operation — windshear warning
	GPWS operation — false warning
Airborne collision avoidance system (ACAS II) warning	ACAS operation — Resolution Advisory
Margin to stall/buffet	Stick shake
	False stick shake
	Reduced lift margin except near ground
	Reduced lift margin at take-off
	Low buffet margin (above 20 000 ft)
Aircraft flight manual limitations	Maximum operating speed limit (V_{MO}) exceedance
	Maximum operating speed limit (M_{MO}) exceedance
	Flap placard speed exceedance
	Gear down speed exceedance
	Gear selection up/down speed exceedance
	Flap/slat altitude exceedance
	Maximum operating altitude exceedance

GM3~~2~~ ORO.AOC.130 Flight data monitoring – aeroplanes

GUIDANCE AND INDUSTRY GOOD PRACTICE ~~FLIGHT DATA MONITORING~~

(a) Additional guidance material for the establishment of flight data monitoring ~~can~~ may be found in:

(1) International Civil Aviation Organization (ICAO) Doc 10000 ‘Manual on Flight Data Analysis Programmes (FDAP)’; and

(2) UK Civil Aviation Authority CAP 739 (Flight Data Monitoring), second edition dated June 2013.

(b) Examples of industry good practice for the establishment of flight data monitoring may be found in the documents published by the **European Operators Flight Data Monitoring (EOFDM) forum**.

AMC3 ORO.MLR.100 Operations manual -

CONTENTS — CAT

OPERATIONS[...]

11 HANDLING, NOTIFYING AND REPORTING ACCIDENTS, INCIDENTS AND OCCURRENCES AND USING
THE CVR

RECORDIN

G[...]

(g) Procedures for the preservation of recordings of the flight recorders following an accident or a serious incident or when so directed by the investigating authority. These procedures should include:

(1) a full quotation of point (a) of CAT.GEN.MPA.195~~(a)~~; and

(2) instructions and means to prevent inadvertent reactivation, repair or reinstallation of theflight recorders by personnel of the operator or of third parties, and to ensure that flightrecorder recordings are preserved for the needs of the investigating authority.

AMC5 ORO.MLR.100 Operations manual — general

CROSSWIND LIMITATIONS IN THE OPERATIONS MANUAL (OM)

When publishing operational crosswind limitations in Part B of the OM in accordance with **AMC3 ORO.MLR.100**, operators should consider:

(a) the following manufacturer’s information:

(1) values published in the ‘Limitations’ Section of the AFM;

(2) maximum demonstrated crosswind values, when more limiting values are not published in the ‘Limitations’ Section of the AFM;

(3) gust values; and

(4) additional guidance or recommendations;

(b) operational experience; and

(c) operating-environment factors such as:

(1) runway width;

(2) runway surface condition; and

(3) prevailing weather conditions.

AMC1 CAT.GEN.MPA.195(b) Handling of flight recorder recordings: preservation, production, protection and use

INSPECTIONS AND CHECKS OF RECORDINGS

~~Whenever a flight recorder is required to be carried:~~

- (a) ~~t~~The operator should perform an inspection of the FDR recording and the CVR recording every year unless one or more of the following applies:

  (1) If the flight recorder records on magnetic wire or uses frequency modulation technology, the time interval between two inspections of the recording should not exceed ~~three~~ 3 months.

  (2) If the flight recorder is solid-state and the flight recorder system is fitted with continuous monitoring for proper operation, the time interval between two inspections of the recording may be up to ~~two~~ 2 years.

  (3) In the case of an aircraft equipped with two solid-state flight data and cockpit voice combination recorders, where:

  (i) the flight recorder systems are fitted with continuous monitoring for proper operation, and

  (ii) the flight recorders share the same flight data acquisition, a comprehensive inspection of the recording needs only to be performed for one flight recorder position. The inspection of the recordings should be performed alternately so that each flight recorder position is inspected at time intervals not exceeding ~~four~~ 4 years.

  (4) Where all ~~of~~ the following conditions are met, the inspection of the FDR recording is not needed:

  (i) the aircraft flight data ~~are~~ is collected in the framework of a flight data monitoring (FDM) programme;

  (ii) the data acquisition of mandatory flight parameters is the same for the FDR and for the recorder used for the FDM programme;

  (iii) an inspection similar to the inspection of the FDR recording and covering all mandatory flight parameters is conducted on the FDM data at time intervals not exceeding ~~two~~ 2 years; and

  (iv) the FDR is solid-state and the FDR system is fitted with continuous monitoring for proper operation.

(b) the operator should perform every ~~five~~ 5 years an inspection of the data link recording;

(c) The operator should perform, at intervals not exceeding 2 years, an inspection of the recordings of flight recorders other than an FDR, which are installed on an aircraft, in order to ensure compliance with CAT.IDE.A.191 or CAT.IDE.H.191

— (d~~c~~) ~~w~~When installed, the aural or visual means for preflight checking of the flight recorders for proper operation should be used ~~every day~~ on each day when the aircraft is operated. When no such means is available for a flight recorder, the operator should perform an operational check of this flight recorder at ~~time~~ intervals not exceeding 150 flight hours or ~~seven~~ 7 calendar days of operation, whichever is considered more suitable by the operator.

- (e~~d~~) t The operator should check every ~~five~~ 5 years, or in accordance with the recommendations of the sensor manufacturer, that the parameters dedicated to the FDR and not monitored by other means are being recorded within the calibration tolerances and that there is no discrepancy in the engineering conversion routines for these parameters.

GM1 CAT.GEN.MPA.195(b) Handling of flight recorder recordings: preservation, production, protection and use

INSPECTION OF THE FLIGHT RECORDERS' RECORDINGS FOR ENSURING SERVICEABILITY

(a) The inspection of recorded flight parameters ~~the FDR recording~~ usually consists of the following:

(1) Making a copy of the complete recording file.

(2) Converting the recording to parameters expressed in engineering units in accordance with the documentation required to be held.

(3) Examining a whole flight in engineering units to evaluate the validity of all mandatory parameters — this could reveal defects or noise in the measuring and processing chains and indicate necessary maintenance actions. The following should be considered:

(i) when applicable, each parameter should be expressed in engineering units and checked for different values of its operational range — for this purpose, some parameters may need to be inspected at different flight phases; and

(ii) (only applicable to an FDR) if the parameter is delivered by a digital data bus and the same data is utilised for the operation of the aircraft, then a reasonableness check may be sufficient; otherwise a correlation check may need to be performed:

(A) a reasonableness check is understood in this context as a subjective, qualitative evaluation, requiring technical judgement, of the recordings from a complete flight; and

(B) a correlation check is understood in this context as the process of comparing data recorded by the flight data recorder against the corresponding data derived from flight instruments, indicators or the expected values obtained during specified portion(s) of a flight profile or during ground checks that are conducted for that purpose.

(4) Retaining the most recent copy of the complete recording file and the corresponding recording inspection report that includes references to the documentation required to be held.

(b) When performing the ~~CVR recording~~ inspection of an audio recording from a flight recorder, precautions need to be taken to comply with **CAT.GEN.MPA.195(f)(1a).** The inspection of the ~~CVR~~ audio recording usually consists of:

(1) checking that the ~~CVR~~ flight recorder operates correctly for the nominal duration of the recording;

(2) examining, where practicable, ~~a~~ samples of in-flight audio recordings ~~of the CVR~~ from the flight recorder for evidence that the signal is acceptable on each channel and in all phases of flight; and

(3) preparing and retaining an inspection report.

(c) [...]

(d) When inspecting images recorded by a flight recorder, precautions need to be taken to comply with **CAT.GEN.MPA.195(f)(3a).** The inspection of such images usually consists of the following:

(1) checking that the flight recorder operates correctly for the nominal duration of the recording;

(2) examining samples of images recorded in different flight phases for evidence that the images of each camera are of acceptable quality; and

(3) preparing and retaining an inspection report.

GM3 CAT.GEN.MPA.195(b) Handling of flight recorder recordings: preservation, production, protection and use

CVR AUDIO QUALITY

Additional guidance material for performing the CVR recording inspections may be found in the document by the French Bureau d'Enquêtes et d'Analyses, titled 'Guidance on CVR recording inspection' and dated October 2018 or later.

~~Examples of CVR audio quality issues and possible causes thereof may be found in the document of the French Bureau d'Enquêtes et d'Analyses, titled 'Study on detection of audio anomalies on CVR recordings' and dated September 2015~~.

AMC1 CAT.GEN.MPA.195(f)(1) Handling of flight recorder recordings: preservation, production, protection and use

USE OF AUDIO ~~CVR~~ RECORDINGS FOR MAINTAINING OR IMPROVING SAFETY

(a) The procedure related to the handling of audio recordings from flight recorders and of their transcripts ~~cockpit voice recorder (CVR) recordings~~ should be ~~written in a document which should be~~ documented and signed by all parties (~~airline management~~ aircraft operator, crew member representatives nominated either by the union or the crew themselves and maintenance personnel representatives, if applicable). This procedure should take into account UK Reg (EU) 2016/679 and as a minimum, define:

(1) the method to obtain the consent of all crew members and maintenance personnel concerned;

(2) an access and security policy that restricts access to audio recordings from flight recorders and their transcripts ~~CVR recordings and identified CVR transcripts~~ to specifically authorised persons identified by their

position;

(3) a retention policy and accountability, including the measures to be taken to ensure the security of audio recordings from flight recorders and their transcripts ~~the CVR recordings and CVR transcripts~~ and their protection from misuse. The retention policy should specify the period of time after which such audio ~~CVR~~ recordings and identified ~~CVR~~ transcripts are destroyed;

(4) a description of the uses made of audio recordings from flight recorders and their transcripts ~~the CVR recordings and of their transcripts~~;

(5) the participation of flight crew member representatives in the assessment of audio recordings from flight recorders and their transcripts ~~the CVR recordings or their transcripts~~;

(6) the conditions under which advisory briefing or remedial training should take place; this should always be carried out in a constructive and non-punitive manner; and

(7) the conditions under which actions other than advisory briefing or remedial training may be taken for reasons of gross negligence or significant continuing safety concern.

(b) Each time an audio recording file from a flight recorder~~a CVR recording file~~ is read out under the conditions defined by CAT.GEN.MPA.195(f)(1):

(1) parts of the ~~CVR~~ audio recording file that contain information with a privacy content should be deleted to the extent possible, and it should not be permitted that the detail of information with a privacy content is transcribed; and

(2) the operator should retain, and when requested, provide to the CAA:

(i) information on the use made (or the intended use) of the ~~CVR~~ audio recording file; and

(ii) evidence that the persons concerned consented to the use made (or the intended use) of the ~~CVR~~ audio recording file.

(c) The safety manager or the person identified by the operator to fulfil this role should be responsible for the protection and use of ~~the CVR recordings and of their transcripts~~, audio recordings from flight recorders and their transcripts, as well as for the assessment of issues and their transmission to the manager(s) responsible for the process concerned. In case a third party is involved in the use of audio recordings from flight recorders~~CVR recordings~~, contractual agreements with this third party should~~, when applicable,~~ cover the aspects enumerated in (a) and (b).

GM1 CAT.GEN.MPA.195(f)(1) Handling of flight recorder recordings: preservation, production, protection and use

USE OF ~~CVR~~ AUDIO RECORDINGS FOR MAINTAINING OR IMPROVING SAFETY

~~(a) The CVR is primarily a tool for the investigation of accidents and serious incidents by investigating authorities. Misuse of CVR recordings is a breach of the right to privacy and it works against an effective safety culture inside the operator.~~

~~(b) It is noteworthy that the flight data recorder (FDR) may be used for a flight data monitoring (FDM) programme; however, in that case the principles of confidentiality and access restriction of the FDM programme apply to the FDR recordings. Because the CVR is recording the voices of the crew and verbal communications with a privacy content, the CVR recordings must be protected and handled with even more care than FDM data.~~

~~(c) Therefore, the use of a CVR recording, when for purposes other than CVR serviceability or those laid down by Regulation (EU) No 996/2010, should be subject to the free prior consent of the persons concerned, and framed by a procedure that is endorsed by all parties and that protects the privacy of crew members and (if applicable) maintenance staff.~~

(a) The audio recordings from flight recorders are primarily a tool for the investigation of accidents and serious incidents by investigating authorities. Misuse of audio recordings and their transcripts are a breach of the right to privacy and it works against an effective safety culture inside the operator.

(b) It is noteworthy that the flight data recorder (FDR) may be used for a flight data monitoring (FDM) programme; however, in that case the principles of confidentiality and access restriction of the FDM programme apply to the FDR recordings. Because the audio recordings are the voices of the crew and verbal communications with a privacy content, the audio recordings must be protected and handled with even more care than FDM data.

(c) Therefore, the use of an audio recording, when used for purposes other than to ensure serviceability or those laid down by UK Regulation (EU) No 996/2010, should be subject to the free prior consent of the persons concerned, and framed by a procedure that is endorsed by all parties and that protects the privacy of crew members and (if applicable) maintenance staff.

AMC1 CAT.GEN.MPA.195(f)(1a) Handling of flight recorder recordings: preservation, production, protection and use

~~CVR RECORDING~~ INSPECTION OF AUDIO RECORDINGS FOR ENSURING SERVICEABILITY

(a) When an inspection of the audio recordings from a flight recorder ~~the CVR recording~~ is performed for ensuring audio quality and intelligibility of recorded communications:

(1) the privacy of the audio ~~CVR~~ recordings should be ensured (e.g. by locating the ~~CVR~~ replay equipment in a separated area and/or using headsets);

(2) access to the ~~CVR~~ replay equipment should be restricted to specifically authorised persons identified by their position;

(3) provision should be made for the secure storage of the ~~CVR~~ recording medium, the audio ~~CVR~~ recording files and copies thereof;

(4) the audio ~~CVR~~ recording files and copies thereof should be destroyed not earlier than 2 ~~two~~ months and not later than 1 ~~one~~ year after completion of the ~~CVR recording~~ inspection of the audio recordings, except that audio samples with no privacy content may be retained for enhancing this ~~the CVR recording~~ inspection (e.g. for comparing audio

quality);only the accountable manager of the operator, and, when identified to comply with ORO.GEN.200, the safety manager should be entitled to request a copy of the audio ~~CVR~~ recording files.

(b) The conditions enumerated in (a) should also be complied with if the inspection of the audio ~~CVR~~ recordings is subcontracted to a third party. The contractual agreements with the third party should explicitly cover these aspects.

AMC1 CAT.GEN.MPA.195(f)(3) Handling of flight recorder recordings: preservation, production, protection and use

USE OF IMAGES FROM THE FLIGHT CREW COMPARTMENT FOR MAINTAINING OR IMPROVING SAFETY

(a) The procedure related to the handling of images of the flight crew compartment that are recorded by a flight recorder should be documented and signed by all parties involved (aircraft operator, crew member representatives nominated either by the union or the crew themselves and maintenance personnel representatives, if applicable). This procedure should take into account UK Reg (EU) 2016/679 and as a minimum, define:(1) the method to obtain the consent of all crew members and maintenance personnel concerned;

(2) an access and security policy that restricts access to the image recordings to specifically authorised persons identified by their position;

(3) a retention policy and accountability, including the measures to ensure the security of the image recordings and their protection from misuse. The retention policy should specify the period of time after which such image recordings are destroyed;

(4) a description of the uses made of the image recordings;

(5) the participation of flight crew member representatives in the assessment of the image recordings;

(6) the conditions under which advisory briefing or remedial training should take place; this should always be carried out in a constructive and non-punitive manner; and

(7) the conditions under which actions other than advisory briefing or remedial training may be taken for reasons of gross negligence or significant continuing safety concern.

(b) Each time an image recording file from a flight recorder that contains images of the flight crew compartment is read out for purposes other than ensuring the serviceability of that flight recorder:

(1) images that contain information with a privacy content should be deleted to the extent possible, and it should not be permitted that the detail of information with a privacy content is transcribed; and

(2) the operator should retain, and when requested, provide the competent authority with:

(i) information on the use made (or the intended use) of this image recording file; and

(ii) evidence that the crew members concerned consented to the use made (or the intended use) of the flight crew compartment images.

(c) The safety manager or the person identified by the operator to fulfil this role should be responsible for the protection and use of images of the flight crew compartment that are recorded by a flight recorder, as well as for the assessment of issues and their transmission to the manager(s) responsible for the process concerned.

(d) In case a third party is involved in the use of images of the flight crew compartment that are recorded by a flight recorder, contractual agreements with this third party should cover the aspects enumerated in (a) and (b).

AMC1 CAT.GEN.MPA.195(f)(3a) Handling of flight recorder recordings: preservation, production, protection and use

INSPECTION OF IMAGES OF THE FLIGHT CREW COMPARTMENT FOR ENSURING SERVICEABILITY

(a) When images of the flight crew compartment recorded by a flight recorder are inspected for ensuring the serviceability of the flight recorder, and any body part of a crew member is likely to be visible on these images, then:

(1) the privacy of the image recordings should be ensured (e.g. by locating the replay equipment in a separated area);

(2) access to the replay equipment should be restricted to specifically authorised persons identified by their position;

(3) provision should be made for the secure storage of the recording medium, the image recording files and copies thereof;

(4) the image recording files and copies thereof should be destroyed not earlier than 2 months and not later than 1 year after completion of the inspection of the image recordings. Images that do not contain any body part of a person may be retained for enhancing this inspection (e.g. for comparing image quality); and

(5) only the accountable manager of the operator and, when identified to comply with **ORO.GEN.200**, the safety manager should be entitled to request a copy of the image recording files.

(b) The conditions enumerated in (a) should also be complied with if the inspection of the image recording is subcontracted to a third party. The contractual agreements with the third party should explicitly cover these aspects.

GM1 CAT.GEN.MPA.195(f) Handling of flight recorder recordings: preservation, production, protection and use

FLIGHT CREW COMPARTMENT

If there are no compartments to physically segregate the flight crew from the passengers during the flight, the ‘flight crew compartment’ in point (f) of **CAT.GEN.MPA.195** should be understood as the area including:

(a) the flight crew seats;

(b) aircraft and engine controls;

(c) aircraft instruments;

(d) windshield and windows used by the flight crew to get an external view while seated at their duty station; and

(e) circuit breakers accessible by the flight crew while seated at their duty station.

AMC1 CAT.OP.MPA.140(d) Maximum distance from an adequate aerodrome for two-engined aeroplanes without an ETOPS approval

OPERATION OF NON-ETOPS-COMPLIANT TWIN TURBO-JET AEROPLANES WITH MOPSC OF 19 OR LESS ~~ANDMCTOM LESS THAN 45 360 KG~~ BETWEEN 120 AND 180 MINUTES FROM AN ADEQUATE AERODROME

(a) For operations between 120 and 180 minutes, ~~due account should be taken of the aeroplane's designand capabilities as outlined below and the operator's experience related to such operations.~~ the operator should include the relevant ~~Relevant~~ information ~~should be included~~ in ~~the~~ its operations manual (OM)and ~~the operator's~~ its maintenance procedures. ~~The term 'the aeroplane's design' in this AMC does notimply any additional type design approval specifications beyond the applicable original type certificate(TC) specifications.~~

(b) The aeroplane should be certified to CS-25 or equivalent (e.g. FAR-25).~~Systems capability~~

~~Aeroplanes should be certified to CS-25 as appropriate or equivalent (e.g. FAR-25). With respect to thecapability of the aeroplane systems, the objective is that the aeroplane is capable of a safe diversion from the maximum diversion distance with particular emphasis on operations with OEI or with degraded system capability. To this end, the operator should give consideration to the capability of the following systems to support such a diversion:~~

~~1. Propulsion systems: the aeroplane engine should meet the applicable specifications prescribed inCS-25 and CS-E or equivalent (e.g. FAR-25, FAR-E), concerning engine TC, installation and system operation. In addition to the performance standards established by the Agency or competent authority at the time of engine certification, the engines should comply with all subsequent mandatory safety standards specified by the Agency or competent authority, including those necessary to maintain an acceptable level of reliability. In addition, consideration should be given to the effects of extended duration single-engine operation (e.g. the effects of higher power demands such as bleed and electrical).~~

~~(i) Airframe systems: with respect to electrical power, three or more reliable as defined by CS-25 or equivalent (e.g. FAR-25) and independent electrical power sources should be available, each of which should be capable of providing power for all essential services which should at least include the following:sufficient instruments for the flight crew providing, as a minimum, attitude, heading, airspeed and altitude information;~~

~~(ii) appropriate pitot heating;~~

~~(iii) adequate navigation capability;~~

~~(iv) adequate radio communication and~~

~~intercommunication capability; (v) adequate flight deck and instrument lighting and emergency lighting; (vi) adequate flight controls;~~

~~(vii) adequate engine controls and restart capability with critical type fuel (from the stand- point of flame-out and restart capability) and with the aeroplane initially at the maximum relight altitude;~~

~~(viii) adequate engine instrumentation;~~

~~(ix) adequate fuel supply system capability including such fuel boost and fuel transfer functions that may be necessary for extended duration single or dual-engine operation;~~

~~(x) such warnings, cautions and indications as are required for continued safe flight and landing;~~

~~(xi) fire protection (engines and auxiliary power unit (APU)); (xii) adequate ice protection including windshield de-icing; and~~

~~(xiii) adequate control of the flight crew compartment and cabin environment including heating and pressurisation.~~

~~The equipment including avionics necessary for extended diversion times should have the ability to operate acceptably following failures in the cooling system or electrical power systems.~~

~~For single-engine operations, the remaining power electrical, hydraulic, and pneumatic should continue to be available at levels necessary to permit continued safe flight and landing, and to provide those services necessary for the overall safety of the passengers and crew. As a minimum, following the failure of any two of the three electrical power sources, the remaining source should be capable of providing power for all of the items necessary for the duration of any diversion. If one or more of the required electrical power sources are provided by an APU, hydraulic system or air driven generator/ram air turbine (ADG/RAT), the following criteria should apply as appropriate:~~

~~(i) to ensure hydraulic power (hydraulic motor generator) reliability, it may be necessary to provide two or more independent energy sources;~~

~~(ii) the ADG/RAT, if fitted, should not require engine dependent power for deployment; and (iii) the APU should meet the criteria in (b)(3).~~

(1) ~~APU: the APU, if required for extended range operations, should be certified as an essential APU and should meet the applicable CS-25 and CS-APU provisions or equivalent (e.g. FAR-25).~~

(2) ~~Fuel supply system: consideration should include the capability of the fuel supply system to provide sufficient fuel for the entire diversion taking account of aspects such as fuel boost and fuel transfer.~~

(c) Engine events and corrective action

(1) All engine events and operating hours should be reported by the operator to the airframe and engine ~~supplemental~~ type certificate (~~S~~TC) holders, as well as to the CAA~~competent authority~~.

(2) These events should be evaluated by the operator in consultation with the CAA and with the engine and airframe TC holders. The CAA may consult with other agencies to ensure that worldwide data are evaluated.

(3) Where statistical assessment alone is not applicable, e.g. where the fleet size or accumulated flight hours are small, individual engine events should be reviewed on a case-by-case basis.

(4) The evaluation or statistical assessment, when available, may result in corrective action required by the operator or the application of operational restrictions.

(5) Engine events could include engine shutdowns, including flameout, both on-ground and in-flight, excluding normal training events, occurrences where the intended thrust level was not achieved or where crew action was taken to reduce thrust below the normal level for whatever reason, and unscheduled removals.

(6) The operator should ~~Arrangements to~~ ensure that all corrective actions required by the CAA are implemented.

(d) Maintenance

~~The maintenance programme in accordance with Annex I to Commission Regulation (EU)No 1321/2014 (Part-M) should be based upon reliability programmes including, but not limited to, the following elements:~~

~~(1) engine oil consumption programmes: such programmes are intended to support engine condition trend monitoring; and~~

~~(2) engine condition monitoring programme: a programme for each engine that monitors engine performance parameters and trends of degradation that provides for maintenance actions to be undertaken prior to significant performance loss or mechanical failure.~~

(1) The operator's oil-consumption-monitoring programme should be based on the engine manufacturer's recommendations, if available. The operator should track oil consumption trends. The monitoring should be continuous and take account of the oil added.

(2) The engine monitoring programme should also provide for engine condition monitoring, describing the parameters to be monitored, the method of data collection and a corrective action process. The programme should be based on the engine manufacturer's instructions. This monitoring will be used to detect propulsion system deterioration at an early stage allowing corrective action to be taken before safe operation is affected.

(e) Flight crew training

The operator should establish a flight ~~Flight~~ crew training programme for this type of operation that ~~should~~ includes, in addition to the requirements of the Air Ops Regulation Annex III (Part-ORO) Subpart FC (Flight Crew) of ~~(ORO.FC)~~, with particular emphasis on the following:

(1) Fuel management: verifying required fuel on board prior to departure and monitoring fuel on board en-route~~te~~, including calculation of fuel remaining. Procedures should provide for an independent cross-check

of fuel quantity indicators, e.g. fuel flow may be used to calculate the fuel burned, which may be compared with the indicated fuel remaining. It should be confirmed that the fuel remaining is sufficient to satisfy the critical fuel reserves.

(2) Procedures for single and multiple failures in flight that may give rise to go/no-go and diversion decisions — policy and guidelines to aid the flight crew in the diversion decision-making process and emphasising the need for constant awareness of the closest weather-permissible alternate aerodrome in terms of time

(3) OEI performance data: drift-down procedures and OEI service ceiling data.

(4) ~~Weather~~ Meteorological reports and flight requirements: meteorological aerodrome reports (METARs) and terminal aerodrome forecast (TAF) reports and obtaining in-flight weather updates on the en-route alternate (ERA), destination and destination alternate aerodromes. Consideration should also be given to forecast winds, including the accuracy of the forecast compared to actual wind experienced during flight and meteorological conditions along the expected flight path at the OEI cruising altitude and throughout the approach and landing.

(f) Pre-departure check

A pre-departure check, additional to the pre-flight inspection required by Part-M and designed to verify the status of the aeroplane's significant systems, should be ~~reflected~~ conducted. Adequate status monitoring information on all significant systems should be available to the flight crew to conduct the pre-departure check. The content of the pre-departure check should be ~~and~~ described in the OM ~~operations manual~~. The operator should ensure that flight ~~Flight~~ crew members ~~who are responsible~~ ~~for the pre-departure check of an aeroplane should~~ are~~be~~ fully trained and competent to conduct a pre-departure check of the aeroplane ~~do it~~. The operator's required training programme ~~required~~ should cover all relevant tasks, with particular emphasis on checking required fluid levels.

(g) MEL

The operator should establish in its MEL the minimum equipment that has to be serviceable for non- ETOPS operations between 120 and 180 minutes. The operator should ensure that the ~~The~~ MEL ~~should~~ takes into account all items specified by the manufacturer relevant to this type of operations~~ in accordance with this AMC~~.

(h) Dispatch/flight planning rules

The operator~~s~~ should establish dispatch procedures ~~rules should~~ that address the following:

(1) Fuel and oil supply: for releasing an aeroplane ~~should not be dispatched~~ on an extended range flight, the operator should ensure that ~~unless~~ it carries sufficient fuel and oil to meet ~~comply with~~ the applicable operational requirements and any additional ~~reserves~~ fuel that may be determined in accordance with the following:

(i) Critica~~l f~~uel scenario: — in establishing the critical fuel reserves, the operator is to determine the fuel necessary to fly to the most critical point of the route and execute a diversion to ~~the critical point is the furthest point from~~ an alternate aerodrome assuming a simultaneous failure of an engine and the cabin air pressurisation system. ~~For those aeroplanes that are type certificated to operate above flight level 450, the critical point is the furthest point from an alternate aerodrome assuming an engine failure.~~ The operator should carry additional fuel for the worst-case fuel burn condition (one engine versus two engines operating) if this is greater than the additional fuel calculated in accordance with the fuel requirements in CAT.OP.MPA, as follows, in order to:

(A) fly from the critical point to an alternate aerodrome:

(a) at 10 000 ft; or

(b) at 25 000 ft or the single-engine ceiling, whichever is lower, provided that all occupants can be supplied with and use oxygen for the time required to fly from the critical point to an alternate aerodrome; ~~or~~

(a) ~~at the single-engine ceiling, provided that the aeroplane is type-certified to operate above flight level 450;~~

(B) descend and hold at 1 500 ft for 15 minutes in international standard atmosphere (ISA) conditions;

(C) descend to the applicable MDA/DH followed by a missed approach (taking into account the complete missed approach procedure); followed by

(D) a normal approach and landing.

(ii) Ice protection: additional fuel used when operating in icing conditions (e.g. operation of ice protection systems (engine/airframe as applicable)) and, when manufacturer's data is~~are~~ available, take account of ice accumulation on unprotected surfaces if icing conditions are likely to be encountered during a diversion.

(ii) APU operation: if an APU has to be used to provide additional electrical power, consideration should be given to the additional fuel required.

(2) Communication facilities: the operator should ensure the availability of communications facilities in order to allow reliable two-way voice communications between the aeroplane and the appropriate ATC unit at OEI cruise altitudes.

(3) The operator should conduct an aircraft technical log review to ensure that proper MEL procedures, deferred items, and required maintenance checks have been completed.

~~**Table 1**~~

~~Planning minima~~

~~**Approach facility**~~	~~**Alternate aerodrome ceiling**~~	~~**Weather minima**~~

		~~RVR/VIS~~
~~PA~~	~~DA/H + 200 ft~~	~~RVR/VIS + 800 m~~
~~NPA~~ ~~Circling approach~~	~~MDA/H + 400 ft~~	~~RVR/VIS + 1 500 m~~

(4) ERA aerodrome(s): ensuring that ERA aerodromes are available for the intended route, within the distance flown in more than 120 minutes but equal to or less than 180 minutes based upon the OEI cruising speed, which is a speed within the certified limits of the aeroplane, selected by the operator and approved by the CAA~~,~~ ~~confirming that~~. The operator should confirm that, based on the available meteorological information, the weather conditions at ERA aerodromes are at or above the applicable minima ~~for the period of time during which the aerodrome(s) may be used~~. from the earliest anticipated time of landing until 1 hour after the latest possible time of landing.

GM1 CAT.OP.MPA.140(d) Maximum distance from an adequate aerodrome for two-engined aeroplanes without an ETOPS approval

SIGNIFICANT SYSTEMS

(a) Definition:

Significant systems to be checked are the aeroplane propulsion system and any other aeroplane systems whose failure could adversely affect the safety of a non-ETOPS diversion flight, or whose functioning is important to continued safe flight and landing during an aeroplane diversion.

(b) When defining the pre-departure check, the operator should give consideration, at least, to the following systems:

(1) electrical;

(2) hydraulic;

(3) pneumatic;

(4) flight instrumentation, including warning and caution systems;

(5) fuel, including potential leakage, fuel drains, fuel boost and fuel transfer;

(6) flight control;

(7) ice protection;

(8) engine start and ignition;

(9) propulsion system instruments;

(10) engine thrust reversers;

(11) navigation and communications, including any route specific long-range navigation and communication equipment;

(12) back-up power systems (i.e. emergency generator and auxiliary power unit);

(13) air conditioning and pressurisation;

(14) cargo fire detection and suppression;

(15) propulsion system fire detection and suppression;

(16) emergency equipment (e.g. ELT, hand fire extinguisher, etc.).

GM1 CAT.OP.MPA.250 Ice and other contaminants — ground procedures

TERMINOLOGY

Terms used in the context of de-icing/anti-icing have the meaning defined in the following subparagraphs.

~~(a) 'Anti-icing fluid' includes, but is not limited to, the following:~~

~~(1) Type I fluid if heated to minimum 60°C at the nozzle;~~

~~(2) mixture of water and Type I fluid if heated to~~

~~minimum 60°C at the nozzle;~~

~~(3) Type II fluid;~~

~~(4) mixture of~~

~~water and Type II~~

~~fluid;~~

~~(5) Type III fluid;~~

~~(6) mixture of~~

~~water and Type III~~

~~fluid;~~

~~(7) Type IV fluid;~~

~~(8) mixture of water and Type IV fluid.~~

~~On uncontaminated aircraft surfaces, Type II, III and IV anti-icing fluids are normally applied unheated.~~

~~(b) 'Clear ice': a coating of ice, generally clear and smooth, but with some air pockets. It forms on exposed objects, the temperatures of which are at, below or slightly above the freezing temperature, by the freezing of super-cooled drizzle, droplets or raindrops.~~

~~(c) Conditions conducive to aircraft icing on the ground (e.g. freezing fog, freezing precipitation, frost, rain or high humidity (on cold soaked wings), snow or mixed rain and snow).~~

~~(d) 'Contamination', in this context, is understood as being all forms of frozen or semi-frozen moisture, such as frost, snow, slush or ice.~~

~~(e) 'Contamination check': a check of aircraft for contamination to establish~~

~~the need for de-icing. (f) 'De-icing fluid': such fluid includes, but is not limited~~

~~to, the following:~~

~~(1) h~~

~~e~~

~~at~~

~~e~~

~~d~~

~~w~~

~~at~~

~~e~~

~~r;~~

~~(2)~~

~~T~~

~~y~~

~~p~~

~~e~~

~~I~~

~~fl~~

~~ui~~

~~d;~~

~~(3) mixture of~~

~~water and Type I~~

~~fluid;~~

~~(4) Type II fluid;~~

~~(5) mixture of~~

~~water and Type II~~

~~fluid;~~

~~(6) Type III fluid;~~

~~(7) mixture of~~

~~water and Type III~~

~~fluid;~~

~~(8) Type IV fluid;~~

~~(9) mixture of water and Type IV fluid~~

~~De-icing fluid is normally applied heated to ensure maximum efficiency.~~

~~(g) 'De-icing/anti-icing': this is the combination of de-icing and anti-icing performed in either one or two steps.~~

~~(h) 'Ground ice detection system (GIDS)': system used during aircraft ground operations to inform the personnel involved in the operation and/or the flight crew about the presence of frost, ice, snow or slush on the aircraft surfaces.~~

~~(i) 'Lowest operational use temperature (LOUT)': the lowest temperature at which a fluid has been tested and certified as acceptable in accordance with the appropriate aerodynamic acceptance test whilst still maintaining a freezing point buffer of not less than:~~

~~(1) 10°C for a Type I de-icing/anti-icing fluid; or~~

~~(2) 7°C for Type II, III or IV de-icing/anti-icing fluids.~~

~~(j) 'Post-treatment check': an external check of the aircraft after de-icing and/or anti-icing treatment accomplished from suitably elevated observation points (e.g. from the de-icing/anti-icing equipment itself or other elevated equipment) to ensure that the aircraft is free from any frost, ice, snow, or slush.~~

~~(k) 'Pre-take-off check': an assessment normally performed by the flight crew, to validate the applied HoT.~~

~~(l) 'Pre-take-off contamination check': a check of the treated surfaces for contamination, performed when the HoT has been exceeded or if any doubt exists regarding the continued effectiveness of the applied anti-icing treatment. It is normally accomplished externally, just before commencement of the take-off run.~~

~~ANTI-ICING CODES~~

~~(m) The following are examples of anti-icing codes:~~

~~(1) 'Type I' at (start time) — to be used if anti-icing treatment has been performed with a Type Ifluid;~~

~~(2) 'Type II/100' at (start time) — to be used if anti-icing treatment has been performed withundiluted Type II fluid;~~

~~(3) 'Type II/75' at (start time) — to be used if anti-icing treatment has been performed with amixture of 75 % Type II fluid and 25 % water;~~

~~(4) 'Type IV/50' at (start time) — to be used if anti-icing treatment has been performed with amixture of 50 % Type IV fluid and 50 % water.~~

~~(n) When a two-step de-icing/anti-icing operation has been carried out, the anti-icing code should be determined by the second step fluid. Fluid brand names may be included, if desired.~~

(a) 'Anti-icing', in the case of ground procedures, means a procedure that provides protection against the formation of frost or ice and accumulation of snow on treated surfaces of the aircraft for a limited period of time (hold-over time);

(b) 'Anti-icing fluid' includes, but is not limited to, the following:

(1) Typically, Type II, III or IV fluid (neat or diluted), normally applied unheated (*);

(2) Type I fluid/water mixture heated to minimum 60°C at the nozzle.

(*) When de-icing and anti-icing in a one-step process, Type II and Type IV fluids are typically applied diluted and heated.

(c) ‘Clear ice’: a coating of ice, generally clear and smooth, but with some air pockets. It forms on exposed objects, the temperatures of which are at, below or slightly above the freezing temperature, by the freezing of super-cooled drizzle, droplets or raindrops. Clear ice is very difficult to be detected visually.

(d) ‘Cold soaked surface frost (CSSF)’: frost developed on cold soaked aircraft surfaces by sublimation of air humidity. This effect can take place at ambient temperatures above 0° C. Cold soaked aircraft surfaces are more common on aircraft that have recently landed. External surfaces of fuel tanks (e.g. wing skins) are typical areas of CSSF formation (known in this case as cold soaked fuel frost (CSFF)), due to the thermal inertia of very cold fuel that remains on the tanks after landing.

(e) ‘Conditions conducive to aircraft icing on the ground’: freezing fog, freezing precipitation, frost, rain or high humidity (on cold soaked wings), hail, ice pellets, snow or mixed rain and snow, etc.

(f) ‘Contamination’: all forms of frozen or semi-frozen deposits on an aircraft, such as frost, snow, slush or ice.

(g) ‘Contamination check’: a check of the aircraft for contamination to establish the need for de-icing.

(h) ‘De-icing’: in the case of ground procedures, means a procedure by which frost, ice, snow or slush is removed from an aircraft in order to provide uncontaminated surfaces

(i) ‘De-icing fluid’: such fluid includes, but is not limited to, the following:

(1) Heated water;

(2) Preferably, Type I fluid (neat or diluted (typically));

(3) Type II, III or IV fluid (neat or diluted).

The de-icing fluid is normally applied heated to ensure maximum efficiency and its freezing point should be at the outside air temperature (OAT) or below.

(j) ‘De-icing/anti-icing’: this is the combination of de-icing and anti-icing performed in either one or two steps.

(k) ‘Ground ice detection system (GIDS)’: a system used during aircraft ground operations to inform the personnel involved in the operation and/or the flight crew about the presence of frost, ice, snow or slush on the aircraft surfaces.

(l) ‘Holdover time (HOT)’: the period of time during which an anti-icing fluid provides protection against frozen contamination to the treated aircraft surfaces. It depends among other variables, on the type and intensity of the precipitation, OAT, wind, the particular fluid (or fluid Type) and aircraft design and aircraft configuration during the treatment.

(m) ‘Liquid water equivalent (LWE) system’: an automated weather measurement system that determines the LWE precipitation rate in conditions of frozen or freezing precipitation. The system provides flight crew with continuously updated information on the fluid protection capability under varying weather conditions.

(n) ‘Lowest operational use temperature (LOUT)’: the lowest temperature at which a fluid has been tested and certified as acceptable in accordance with the appropriate aerodynamic acceptance test whilst still maintaining a freezing point buffer of not less than:

(1) 10°C for a Type I fluid; or

(2) 7°C for Type II, III or IV fluids.

(o) 'Post-treatment check', 'Post- de-icing check' or 'Post- de-icing/anti-icing check': an external check of the aircraft after de-icing and/or anti-icing treatment accomplished by qualified staff and from suitably elevated observation points (e.g. from the de-icing/anti-icing equipment itself or other elevated equipment) to ensure that the aircraft is free from frost, ice, snow, or slush.

(p) 'Pre-take-off check': The flight crew should continuously monitor the weather conditions after the de-icing/anti-icing treatment to assess whether the applied holdover time is still appropriate. Within the aircraft's HOT and prior to take-off, the flight crew should check the aircraft's wings or representative aircraft surfaces for frozen contaminants.

(q) 'Pre-take-off contamination check': a check of the treated surfaces for contamination, performed when the HOT has been exceeded or if any doubt exists regarding the continued effectiveness of the applied anti-icing treatment. It is normally accomplished externally, just before commencement of the take-off run.

ANTI-ICING CODES

(r) Upon completion of the anti-icing treatment, a qualified member of staff provides the anti-icing code to the flight crew as follows: 'the fluid Type/the fluid name (except for Type I)/concentration (except for Type I)/local time at start of anti-icing/date (optional)/the statement 'post- de-icing/anti-icing check completed' (if check completed). Example:

'TYPE II / MANUFACTURER, BRAND X / 75% / 1335 / 15FEB20 / POST- DE-ICING/ANTI-ICING CHECK COMPLETED'.

(s) When a two-step de-icing/anti-icing operation has been carried out, the anti-icing code should be determined by the second step fluid.

GM2 CAT.OP.MPA.250 Ice and other contaminants — ground procedures

DE-ICING/ANTI-ICING — PROCEDURES

(a) De-icing and/or anti-icing procedures should take into account manufacturer's recommendations, including those that are type-specific and cover:

(1) contamination checks, including detection of clear ice and under-wing frost; limits on the thickness/area of contamination published in the AFM or other manufacturers' documentation should be followed;

(2) procedures to be followed if de-icing and/or anti-icing procedures are interrupted or unsuccessful;

(3) Pre-treatment, the aircraft should be configured in accordance with the OEM's requirements

(4~~3~~) post-treatment checks, followed by aircraft reconfiguration;

(5~~4~~) pre-take-off checks;

(6~~5~~) pre-take-off contamination checks;

(7~~6~~) the recording of any incidents relating to de-icing and/or anti-icing; and

(8~~7)~~ the responsibilities of all personnel involved in de-icing and/or anti-icing

(b) Operator's procedures should ensure the following:

(1) When aircraft surfaces are contaminated by ice, frost, slush or snow, they are de-iced prior to take-off according to the prevailing conditions. Removal of

contaminants may be performed with mechanical tools, fluids (including hot water), infrared heat or forced air, taking account of aircraft type-specific provisions.

(2) Account is taken of the wing skin temperature versus ~~outside air temperature~~ OAT, as this may affect:

(i) the need to carry out aircraft de-icing and/or anti-icing; and/or

(ii) the performance of the de-icing/anti-icing fluids.

(3) When freezing precipitation occurs or there is a risk of freezing precipitation occurring that would contaminate the surfaces at the time of take-off, aircraft surfaces should be anti-iced. ~~If both de-icing and anti-icing are required, the procedure may be performed in a one- or two-step process, depending upon weather conditions, available equipment, available fluids and the desired hold-over time (HoT).~~ Anti-icing fluids (neat or diluted) should not be applied at OAT below their LOUT. If both de-icing and anti-icing are required, the procedure may be performed in a one- or two-step process, depending upon weather conditions, available equipment, available fluids and the desired HOT. One-step de-icing/anti-icing means that de-icing and anti-icing are carried out at the same time, using a mixture of de-icing/anti-icing fluid and water. Two-step de-icing/anti-icing means that de-icing and anti-icing are carried out in two separate steps. The aircraft is first de-iced using heated water only or a heated mixture of de-icing/anti-icing fluid and water. After completion of the de-icing operation, a layer of a mixture of de-icing/anti-icing fluid and water, or of de-icing /anti-icing fluid only, is sprayed over the aircraft surfaces. The second step will be taken before the first step fluid freezes (typically within 3 minutes but severe conditions may shorten this) and, if necessary, area by area.

(4) When an aircraft is anti-iced and a longer ~~HoT~~ HOT is needed/desired, the use of a less diluted ~~Type II or Type IV~~ thickened fluid should be considered.

(5) All restrictions relative to OAT and fluid application (including, but not necessarily limited to, temperature and pressure) published by the fluid manufacturer and/or aircraft manufacturer, are followed. and procedures, limitations and recommendations to prevent the formation of fluid residues are followed.

(6) During conditions conducive to aircraft icing on the ground or after de-icing and/or anti-icing, an aircraft is not dispatched for departure unless it has been given a contamination check or a post-treatment check by a trained and qualified person. This check should cover all treated surfaces of the aircraft and be performed from points offering sufficient ~~accessibility~~ visibility of these parts. To ensure that there is no clear ice on suspect areas, it may be necessary to make a physical check (e.g. tactile).

(7) The required entry is made in the technical log.

(8) The commander continually monitors the environmental situation after the performed treatment. Prior to take-off, he/she performs a pre-take-off check, which is an assessment of whether the applied ~~HoT~~ HOT is still appropriate. This pre-take-off check includes, but is not limited to, factors such as precipitation, wind and OAT.

(9) If any doubt exists as to whether a deposit may adversely affect the aircraft's performance and/or controllability characteristics, the commander should arrange for a re-treatment or a pre-take-off contamination check to be performed in order to verify that the aircraft's surfaces are free of contamination. Special methods and/or equipment may be necessary to perform this check, especially at night time or in extremely adverse weather conditions. If this check cannot be performed just before take-off, re-treatment should be applied.

(10) When re-treatment is necessary, any residue of the previous treatment should be removed, and a completely new de-icing/anti-icing treatment should be applied.

(11) When a ground ice detection system (GIDS) is used to perform an aircraft surfaces check prior to and/or after a treatment, the use of GIDS by suitably trained personnel should be part of the procedure.

(c) Special operational considerations

(1) When using thickened de-icing/anti-icing fluids, the operator should consider a two-step de-icing/anti-icing procedure, the first step preferably with hot water and/or un-thickened fluids.

(2) The use of de-icing/anti-icing fluids should be in accordance with the aircraft manufacturer's documentation. This is particularly important for thickened fluids to assure sufficient flow-off during take-off. Avoid applying excessive thickened fluid on the horizontal tail of aircraft with unpowered elevator controls.

(3) The operator should comply with any type-specific operational provision(s), such as an aircraft mass decrease and/or a take-off speed increase associated with a fluid application.

(4) The operator should take into account any flight handling procedures (stick force, rotation speed and rate, take-off speed, aircraft attitude etc.) laid down by the aircraft manufacturer when associated with a fluid application.

(5) The limitations or handling procedures resulting from (c)(3) and/or (c)(4) above should be part of the flight crew pre take-off briefing.

(d) Communications

(1) Before aircraft treatment. When the aircraft is to be treated with the flight crew on board, the flight and personnel involved in the operation should confirm the fluid to be used, the extent of treatment required and any aircraft type-specific procedure(s) to be used. Any other information needed to apply the ~~HoT~~ HOT tables should be exchanged.

(2) Anti-icing code. The operator's procedures should include an anti-icing code, which indicates the treatment the aircraft has received. This code provides the flight crew with the minimum details necessary to estimate a ~~HoT~~ HOT and confirms that the aircraft is free of contamination.

(3) After treatment. Before reconfiguring or moving the aircraft, the flight crew should receive a confirmation from the personnel involved in the operation that all de-icing and/or anti-icing operations are complete and that all personnel and equipment are clear of the aircraft.

(e) Holdover protection & LWE systems

The operator should publish in the OM, when required, the ~~HoTs~~ HOTs in the form of a table or a diagram, to account for the various types of ground icing conditions and the different types and concentrations of fluids used. However, the times of protection shown in these tables are to be used as guidelines only and are normally used in conjunction with the pre-take-off check.

An operator may choose to operate using LWE systems instead of HOT tables whenever the required means for using these systems are in place.

(f) Training

The operator's initial and recurrent de-icing and/or anti-icing training programmes (including communication training) for flight crew and for other ~~those of its~~ personnel involved ~~in the operation who are involved~~ in de-icing and/or anti-icing operations should include additional training if any of the following are ~~is~~ introduced:

(1) a new method, procedure and/or technique;

(2) a new type of fluid and/or equipment; or

(3) a new type of aircraft.

(g) Contracting

When the operator contracts de-icing/anti-icing functions, the operator should ensure that the contractor complies with the operator's training/qualification procedures, together with any specific procedures in respect of:

~~(1) de-icing and/or anti-icing methods and procedures;~~
~~(2) fluids to be used, including precautions for storage and preparation for use~~
~~(3) specific aircraft provisions (e.g. no-spray areas, propeller/engine de-icing, APU operation etc.); and~~
~~(4) checking and communications procedures.~~

(1) roles and responsibilities;

(2) de-icing and/or anti-icing methods and procedures;

(3) fluids to be used, including precautions for storage, preparation for use and chemical incompatibilities;

(4) specific aircraft provisions (e.g. no-spray areas, propeller/engine de-icing, APU operation, etc.);

(5) different checks to be conducted; and

(6) procedures for communications with flight crew and any other third party involved.

(h) Special maintenance considerations

(1) General

The operator should take proper account of the possible side-effects of fluid use. Such effects may include, but are not necessarily limited to, dried and/or re-hydrated residues, corrosion and the removal of lubricants.

(2) Special considerations regarding residues of dried fluids

The operator should establish procedures to prevent or detect and remove residues of dried fluid. If necessary, the operator should establish appropriate inspection intervals based on the recommendations of the airframe manufacturers and/or the operator's own experience:

(i) Dried fluid residues

Dried fluid residues could occur when surfaces have been treated and the aircraft has not subsequently been flown and has not been subject to precipitation. The fluid may then have dried on the surfaces.

(ii) Re-hydrated fluid residues

Repetitive application of thickened de-icing/anti-icing fluids may lead to the subsequent formation/build-up of a dried residue in aerodynamically quiet areas, such as cavities and gaps. This residue may re-hydrate if exposed to high humidity conditions, precipitation, washing, etc., and increase to many times its original size/volume. This residue will freeze if exposed to conditions at or below 0 °C. This may cause moving parts, such as elevators, ailerons, and flap actuating mechanisms to stiffen or jam in-flight. Re-hydrated residues may also form on exterior surfaces, which can reduce lift, increase drag and stall speed. Re-hydrated residues may also collect inside control surface structures and cause clogging of drain holes or imbalances to flight controls. Residues may also collect in hidden areas, such as around flight control hinges, pulleys, grommets, on cables and in gaps.

(iii) Operators are strongly recommended to obtain information about the fluid dry-out and re-hydration characteristics from the fluid manufacturers and to select products with optimised characteristics.

(iv) Additional information should be obtained from fluid manufacturers for handling, storage, application and testing of their products.

GM3 CAT.OP.MPA.250 Ice and other contaminants — ground procedures

DE-ICING/ANTI-ICING BACKGROUND INFORMATION

Further guidance material on this issue is given in the ICAO *Manual of Aircraft Ground De-icing/Anti-icing Operations* (Doc 9640).~~ (hereinafter referred to as the ICAO *Manual of Aircraft Ground De-icing/Anti-icing Operations*~~).

(a) General

(1) Any deposit of frost, ice, snow or slush on the external surfaces of an aircraft may drastically affect its flying qualities because of reduced aerodynamic lift, increased drag, modified stability and control characteristics. Furthermore, freezing deposits may cause moving parts, such as elevators, ailerons, flap actuating mechanism etc., to jam and create a potentially hazardous condition. Propeller/engine/auxiliary power unit (APU)/systems performance may deteriorate due to the presence of frozen contaminants on blades, intakes and components. Also, engine operation may be seriously affected by the ingestion of snow or ice, thereby causing engine stall or compressor damage. In addition, ice/frost may form on certain external surfaces (e.g. wing upper and lower surfaces, etc.) due to the effects of cold fuel/structures, even in ambient temperatures well above 0 °C.

(2) Procedures established by the operator for de-icing and/or anti-icing are intended to ensure that the aircraft is clear of contamination so that degradation of aerodynamic characteristics or mechanical interference will not occur and, following anti-icing, to maintain the airframe in that condition during the appropriate ~~HoT~~ HOT.

(3) Under certain meteorological conditions, de-icing and/or anti-icing procedures may be ineffective in providing sufficient protection for continued operations. Examples of these conditions are freezing rain, ice pellets and hail~~, heavy~~ or snow exceeding certain intensities, high wind velocity, and rapidly ~~fast~~ dropping OAT. No ~~HoT~~ HOT guidelines exist for these conditions.

(4) Material for establishing operational procedures can be found, for example, in:

(i) ICAO Annex 3 ‘Meteorological Service for International Air Navigation’;

(ii) ICAO ‘Manual of Aircraft Ground De-icing/Anti-icing Operations’;

(iii) ~~ISO 11075 Aircraft - De-icing/anti-icing fluids - ISO type I;~~ SAE AS6285 ‘Aircraft Ground Deicing/Anti-Icing Processes’;

(iv) SAE AS6286 ‘Aircraft Ground Deicing/Anti-Icing Training and Qualification Program’;

(iv) ~~ISO 11076 Aircraft - De-icing/anti-icing methods with fluids~~; SAE AS6332 ‘Aircraft Ground Deicing/Anti-icing Quality Management’;

(v) ~~ISO 11077 Aerospace - Self propelled de-icing/anti-icing vehicles - Functional requirements;~~ SAE ARP6257 ‘Aircraft Ground De/Anti-Icing Communication Phraseology for Flight and Ground Crews’;

(vi) ~~ISO 11078 Aircraft - De-icing/anti-icing fluids -- ISO types II, III and IV~~; FAA Holdover Time Guidelines

(vii) ~~AEA ‘Recommendations for de-icing/anti-icing of aircraft on the ground’~~ FAA 8900.xxx series Notice ‘Revised FAA-Approved Deicing Program Updates, Winter 20xx-20yy’.

~~(ix) EUROCAE ED-104A Minimum Operational Performance Specification for Ground Ice Detection Systems;~~

~~(x) SAE AS5681 Minimum Operational Performance Specification for Remote On-Ground Ice Detection Systems;~~

~~(xi) SAE ARP4737 Aircraft - De-icing/anti-icing methods;~~

~~(xii) SAE AMS1424 De-icing/anti-Icing Fluid, Aircraft, SAE Type I;~~

~~(xiii) SAE AMS1428 Fluid, Aircraft De-icing/anti-Icing, Non-Newtonian, (Pseudoplastic), SAE Types II, III, and IV;~~

~~(xiv) SAE ARP1971 Aircraft De-icing Vehicle - Self-Propelled, Large and Small Capacity;~~

~~(xv) SAE ARP5149 Training Programme Guidelines for De-icing/anti-icing of Aircraft on Ground; and~~

~~(xvi) SAE ARP5646 Quality Program Guidelines for De-icing/anti-icing of Aircraft on the Ground.~~

(b) Fluids

(1) Type I fluid: Due to its properties, Type I fluid forms a thin, liquid-wetting film on surfaces to which it is applied which, under certain weather conditions, gives a very limited ~~HoT~~ HOT. ~~With this type of fluid, increasing the concentration of fluid in the fluid/water mix does not provide any extension in HoT.~~ For anti-icing purposes the fluid/water mixture should have a freezing point of at least 10 °C below OAT; increasing the concentration of fluid in the fluid/water mix does not provide any extension in HOT

(2) Type II and Type IV fluids contain thickeners which enable the fluid to form a thicker liquid-wetting film on surfaces to which it is applied. Generally, this fluid provides a longer ~~HoT~~ HOT than Type I fluids in similar conditions. ~~With this type of fluid, the HoT can be extended by increasing the ratio of fluid in the fluid/water mix.~~

(3) Type III fluid is a thickened fluid especially intended for use on aircraft with low rotation speeds.

(4) Fluids used for de-icing and/or anti-icing should be acceptable to the operator and the aircraft manufacturer. These fluids normally conform to specifications such as SAE AMS1424, ~~SAE AMS1428 or equivalent~~. (Type I) or SAE AMS1428 (Types II, III and IV). Use of non-conforming fluids is not recommended due to their characteristics being unknown. The anti-icing and aerodynamic properties of thickened fluids may be seriously degraded by, for example, inappropriate storage, treatment, application, application equipment, age and in case they are applied on top of non-chemically compatible de-icing fluids.

(c) Hold-over protection

(1) Hold-over protection is achieved by a layer of anti-icing fluid remaining on and protecting aircraft surfaces for a period of time. With an one-step de-icing/anti-icing procedure, the ~~HoT~~ HOT begins at the commencement of de-icing/anti-icing. With a two-step procedure, the ~~HoT~~ HOT begins at the commencement of the second (anti-icing) step. The hold-over protection runs out:

(i) at the commencement of the take-off roll (due to aerodynamic shedding of fluid); or

(ii) when frozen deposits start to form or accumulate on treated aircraft surfaces, thereby indicating the loss of effectiveness of the fluid.

(2) The duration of hold-over protection may vary depending on the influence of factors other than those specified in the ~~HoT~~ HOT tables. Guidance should be provided by the operator to take account of such factors, which may include:

(i) atmospheric conditions, e.g. exact type and rate of precipitation, wind direction and velocity, relative humidity and solar radiation; and

(ii) the aircraft and its surroundings, such as aircraft component inclination angle, contour and surface roughness, surface temperature, operation in close proximity to other aircraft (jet or propeller blast) and ground equipment and structures.

(3) ~~HoTs~~ HOTs are not meant to imply that flight is safe in the prevailing conditions if the specified HOT has not been exceeded. Certain meteorological conditions, such as freezing drizzle or freezing rain, may be beyond the certification envelope of the aircraft.

AMC1 CAT.OP.MPA.300(a) Approach and landing conditions - aeroplanes

~~**IN-FLIGHT DETERMINATION OF THE LANDING DISTANCE**~~

~~The in-flight determination of the landing distance should be based on the latest available meteorological or runway state report, preferably not more than 30 minutes before the expected landing time.~~

LANDING DISTANCE ASSESSMENT

Before commencing an approach to land, the commander should ensure that a landing distance assessment has been completed in accordance with CAT.OP.MPA.303 and using the following:

(a) The in-flight landing distance assessment should be based on the latest available weather report and runway condition report (RCR) or equivalent information based on the RCR.

(b) The assessment should be initially carried out when the weather report and the RCR are obtained, usually around top of descent. If the planned duration of the flight does not allow the flight crew to carry out the assessment in non-critical phases of flight, the assessment should be carried out before departure.

(c) When meteorological conditions may lead to a degradation of the runway surface condition, the assessment should include consideration of how much deterioration in runway surface friction characteristics may be tolerated, so that a quick decision can be made prior to landing.

(d) The flight crew should monitor the evolution of the actual conditions during the approach, to ensure that they do not degrade below the condition that was previously determined to be the minimum acceptable.

AMC2 CAT.OP.MPA.300 Approach and landing conditions

IN-FLIGHT DETERMINATION OF THE CONDITION OF THE FATO - HELICOPTERS

The in-flight determination of the final approach and take-off area (FATO) suitability for a safe approach, landing or missed approach should be based on the latest available meteorological or runway condition report, preferably no more than 30 minutes before the expected landing time.

GM1 CAT.OP.MPA.300 Approach and landing conditions

WIND DATA

The information on wind contained in METAR/SPECI/ATIS reports (average of a 10-minute period) should be the basis for the landing performance calculations, while instant wind information reported by the tower should be monitored during the approach to ensure that the wind speed does not exceed the assumptions made for landing performance calculations.

AMC1 CAT.OP.MPA.303 In-flight check of the landing distance at time of arrival — aeroplanes

ASSESSMENT OF THE LDTA BASED ON DISPATCH CRITERIA

(a) The required landing distance for dry runways, determined in accordance with CAT.POL.A.230(a), contains adequate margin to fulfil the intent of the assessment of the landing distance at time of arrival (LDTA) on a dry runway, as it includes allowance for the additional parameters considered in that calculation.

(b) The required landing distance for wet runways also contains adequate margin to fulfil the intent of the assessment of the LDTA on such runways with specific friction-improving characteristics, as it includes allowance for the additional parameters considered in that calculation.

(c) When at the time of arrival the runway is dry or is a wet runway with specific friction-improving characteristics and the overall conditions, including weather at the aerodrome and runway condition, have been confirmed as not changed significantly compared to those assumed at the time of dispatch, the assessment of the LDTA may be carried out by confirming that the assumptions made at the time of dispatch are still valid.

(d) Before taking any performance credit for the assessment of the LDTA for runways with friction-improving characteristics, the operator should verify that the runways intended to be operated on are maintained to the extent necessary to ensure the expected improved friction characteristics.

GM1 CAT.OP.MPA.303 In-flight check of the landing distance at time of arrival — aeroplanes

GENERAL

The assessment of the LDTA begins with the acquisition of the latest available weather information and the RCR. The information provided in the RCR is divided in two sections:

(a) The ‘aircraft performance’ section which contains information that is directly relevant in a performance computation.

(b) The ‘situational awareness’ section which contains information that the flight crew should be aware of for a safe operation, but which does not have a direct impact on the performance assessment.

The ‘aircraft performance’ section of the RCR includes a runway condition code (RWYCC), the contaminant type, depth and coverage for each third of the runway.

The determination of the RWYCC is based on the use of the runway condition assessment matrix (RCAM); however, the presentation of the information in the RCAM is appropriate for use by aerodrome personnel trained and competent in assessing the runway condition in a way that is relevant to aircraft performance.

It is the task of the aerodrome personnel to report the appropriate RWYCC in order to allow the flight crew to assess the landing performance characteristics of the runway in use. When no RWYCC is available in winter conditions, the RCAM provides the flight crew with a combination of the relevant information (runway surface conditions: state and/or contaminant or pilot report of braking action (AIREP)) in order to determine the RWYCC.

Table 1 below is an excerpt of the RCAM and permits to carry out the primary assessment based on the reported contaminant type and depth, as well as on the OAT.

Table 1: Association between the runway surface condition and the RWYCC based on the reported contaminant type and depth and on the OAT

Runway surface condition	Surface condition descriptor	Depth	Notes	RWYCC
Dry		n/a		6
Wet	Damp (any visible dampness)	3 mm or less	Including wet and contaminated runways below 25 % coverage in each runway third	5
	Wet			
Slippery wet				3
Contaminated	Compacted snow	Any	At or below OAT – 15 °C[3]	4
			Above OAT – 15°C[3]	3
	Dry snow	3 mm or less		5
		More than 3 mm up to 100 mm	Including when any depth occurs on top of compacted snow	3
		Any	On top of ice	0[2]
	Frost[1]	Any		5
	Ice	Any	In cold and dry conditions	1

	Slush	3 mm or less		5
		More than 3 mm up to 15 mm		2
	Standing water	3 mm or less		5
		More than 3 mm up to 15 mm		2
		Any	On top of ice	0[2]
	Wet ice	Any		0[2]
	Wet snow	3 mm or less		5
		More than 3 mm up to 30 mm	Including when any depth occurs on top of compacted snow	3
		Any	On top of ice	0[2]

Note 1: Under certain conditions, frost may cause the surface to become very slippery.

Note 2: Operations in conditions where less-than-poor braking action prevails are prohibited.

Note 3: The runway surface temperature should preferably be used where available.

A primary assessment may have to be downgraded by the aerodrome operator based on an AIREP of lower braking action than the one typically associated with the type and depth of contaminant on the runway or any other observation.

Upgrading a RWYCC 5, 4, 3 or 2 determined by the aerodrome operator from the observed contaminant type is not allowed.

A RWYCC 1 or 0 maybe be upgraded by the aerodrome operator to a maximum of RWYCC 3. The reason for the upgrade will be specified in the 'situational awareness' section of the RCR.

When the aerodrome operator is approved for operations on specially prepared winter runways, in accordance with Annex V (Part-ADR.OPS) to UK Regulation (EU) No 139/2014, the RWYCC of a runway that is contaminated with compacted snow or ice, may be reported as RWYCC 4 depending upon a specific treatment of the runway. In such cases, the reason for the upgrade will be specified in the 'situational awareness' section of the RCR. When the aerodrome operator is approved for specially prepared winter runways, in accordance with Annex IV (Part-ADR.OPS) to UK Regulation (EU) No 139/2014, a runway that is contaminated with compacted snow or ice and has been treated according to specific procedures, will normally be reported as a maximum of RWYCC 4 SPECIALLY PREPARED WINTER RUNWAY. If the aerodrome operator is in doubt about the quality of the surface, it will be reported with a lower RWYCC, but the runway descriptor will still be SPECIALLY PREPARED WINTER RUNWAY. The term DOWNGRADED will be used in the 'situational awareness' section of the RCR. A SPECIALLY PREPARED WINTER RUNWAY has no loose contaminant; hence no contaminant drag on acceleration, and stopping performance corresponding to the reported RWYCC.

Performance information for the assessment of the LDTA correlates the aircraft performance with the RWYCC contained in the RCR, hence the calculation will be based on the RWYCC of the intended runway of landing.

GM2 CAT.OP.MPA.303 In-flight check of the landing distance at time of arrival — aeroplanes

RUNWAY CONDITION CONSIDERATIONS

When available for the portion of the runway that will be used for landing, the following elements are relevant for consideration:

(a) RWYCC;

(b) expected runway conditions (contaminant type and depth);

(c) other information contained in the RCR related to the following elements:

(1) width of the runway to which the RWYCC applies if less than the published runway width;

(2) reduced runway length;

(3) drifting snow on the runway;

(4) loose sand on the runway;

(5) chemical treatment on the runway;

(6) snowbanks on the runway;

(7) snowbanks on taxiways;

(8) snowbanks adjacent to the runway;

(9) taxiway conditions;

(10) apron conditions;

(11) State approved and published use of measured friction coefficient;

(12) plain language remarks;

(d) AIREP of braking action.

AIRCRAFT PERFORMANCE CONSIDERATIONS

The following elements may impact landing distance calculations:

(a) runway slope;

(b) aerodrome elevation;

(c) wind;

(d) temperature;

(e) aeroplane mass and configuration;

(f) approach speed at threshold;

(g) eventual adjustments to the landing distance, such as autoland; and

(h) planned use of available and operative aeroplane ground deceleration devices.

AUTOBRAKE USAGE

While autobrakes are a part of the aeroplane's landing configuration, the landing distance assessment at the time of arrival is not intended to force a higher-than-necessary autobrake selection. For operations where the RWYCC is 6 or 5, if the manual braking distance provides at least 15 % safety margin, then the braking technique may include a combination of autobrakes and manual braking even if the selected autobrake landing data does not provide a 15 % safety margin.

GENERAL

Background information and further guidance on the in-flight check of the LDTA may be found in ICAO Doc 10064 'Aeroplane Performance Manual'.

GM3 CAT.OP.MPA.303 In-flight check of the landing distance at time of arrival — aeroplanes

RCR, RWYCC AND RCAM

A detailed description of the RCR format and content, the RWYCC and the RCAM may be found in Annex V (Part-ADR.OPS) to UK Regulation (EU) No 139/2014. Further guidance may be found in the following documents:

(a) ICAO Doc 9981 'PANS Aerodromes';

(b) ICAO Doc 4444 'PANS ATM';

(c) ICAO Doc 10064 'Aeroplane Performance Manual'; and

(d) ICAO Circular 355 'Assessment, Measurement and Reporting of Runway Surface Conditions'.

AMC1 CAT.OP.MPA.303(e) In-flight check of the landing distance at time of arrival — aeroplanes

PERFORMANCE INFORMATION FOR THE ASSESSMENT OF THE LDTA — APPROVED DATA

Approved data for the assessment of the LDTA contained in the AFM should be developed in accordance with AMC 25.1592, or equivalent.

PERFORMANCE INFORMATION FOR THE ASSESSMENT OF THE LDTA — SUPPLEMENTARY DATA

When approved data for the assessment of the LDTA contained in the AFM is insufficient, the content of the AFM should be supplemented with one of the following sets of data, provided by the aircraft manufacturer or the type certificate holder (TCH) or an organisation approved under Part 21 and having the relevant privileges within the scope of its organisation approval:

(a) Data for the assessment of the LDTA produced for aeroplanes not having CS 25.1592 or equivalent in their certification basis. Such data may be presented in terms of runway surface conditions, pilot-reported braking actions, or both, and should include at least:

  (1) an operational airborne distance;

  (2) the range of braking actions as related to the RWYCC;

  (3) the effect of speed increments over threshold;

  (4) the effect of temperature; and

  (5) the effect of runway slope.

  When data is provided only in terms of pilot-reported braking actions, instructions should be provided on how to use such data to carry out an assessment of the LDTA in terms of a runway surface condition description.

(b) Data developed in accordance with FAA AC 25-32.

(c) Data for wet runways corrected to meet the criteria of LDTA, as listed under point (a), in accordance with a methodology provided by the aircraft manufacturer or the type certificate holder (TCH) or an organisation approved under Part 21 and having the relevant privileges in the scope of its organisation approval.

(d) Data for contaminated runways developed in compliance with CS 25.1591 or equivalent, which were in use before the implementation of the LDTA, and are corrected to meet the criteria of the LDTA, as listed under point (a), in accordance with a methodology provided by the aircraft manufacturer or the TCH or an organisation approved under Part 21 and having the relevant privileges within the scope of its organisation approval.

PERFORMANCE INFORMATION FOR THE ASSESSMENT OF THE LDTA — DATA DETERMINED BY EASA

When there is no data available for the assessment of the LDTA, performance information for the assessment of the LDTA may be determined by applying the following method:

(a) Correction factors may be applied to the certified landing distances on dry runway published in the AFM for turbojet-powered aeroplanes and turbopropeller-powered aeroplanes.

(b) For this purpose, the landing distance factors (LDFs) from Table 1 below may be used:

Table 1: LDFs

Runway condition code (RWYCC)	6	5	4	3	2	1
Runway descriptors	Note 1	Note 1	Note 1	Note 1	Note 1	Note 1
Turbojet without reverse	1.67	2.6	2.8	3.2	4.0	5.1
Turbojet with all reversers operating	1.67	2.2	2.3	2.5	2.9	3.4
Turboprop (see Note 2)	1.67	2.0	2.2	2.4	2.7	2.9

Note 1: Runway descriptors may be found in the RCAM for each RWYCC or braking action.

Note 2: These LDFs apply only to modern turboprops with efficient disking drag. For older turboprops without adequate disking drag, use the LDFs for turbojet without reverse.

Note 3: The LDFs can apply to any type of anti-skid system, i.e. fully-modulating, quasi-modulating or on-off system.

(1) To find the LDTA, multiply the AFM (dry, unfactored) landing distance by the applicable LDFs from Table 1 above for the runway conditions existing at the time of arrival. If the AFM landing distances are presented as factored landing distances, then that data needs to be adjusted to remove the applicable dispatch factors applied to that data before the LDFs from Table 1 above are applied.

Note 1: Dispatch factors that are sometimes applied in AFMs to landing distances in order to provide factored distances to operators are not intended to be cumulated with the LDFs for the calculation of the LDTA.

(2) The LDFs given in Table 1 above include a 15 % safety margin and an air distance representative of normal operational practices. They account for variations of temperature up to international standard atmosphere (ISA) + 20 °C, runway slopes between –2 % and +2 %, and an average approach speed increment of 5 up to 20 kt. They may not be conservative for all configurations in case of unfavourable combinations of these parameters.

AMC1 CAT.OP.MPA.311 Reporting on runway braking action

GENERAL

Since both the ATC and the aerodrome operator rely on accurate braking action reports, flight crew should use standardised terminology in accordance with ICAO Doc 4444 'PANS ATM'.

The following Table 1 shows the correlation between the terminology to be used in the AIREP to report the braking action and the RWYCC.

Table 1: Association between AIREP and RWYCC

AIREP (braking action)	Description	RWYCC
N/A		6
GOOD	Braking deceleration is normal for the wheel braking effort applied AND directional control is normal.	5
GOOD TO MEDIUM	Braking deceleration OR directional control is between good and medium.	4
MEDIUM	Braking deceleration is noticeably reduced for the wheel braking effort applied OR directional control is noticeably reduced.	3
MEDIUM TO POOR	Braking deceleration OR directional control is between medium and poor.	2
POOR	Braking deceleration is significantly reduced for the wheel braking effort applied OR directional control is significantly reduced.	1
LESS THAN POOR	Braking deceleration is minimal to non-existent for the wheel braking effort applied OR directional control is uncertain.	0

An AIREP should be transmitted to the ATC, in accordance with one of the following specifications, as applicable:

(a) Good braking action is reported as 'BRAKING ACTION GOOD'.

(b) Good to medium braking action is reported as 'BRAKING ACTION GOOD TO MEDIUM'.

(c) Medium braking action is reported as 'BRAKING ACTION MEDIUM'.

(d) Medium to poor braking action is reported as 'BRAKING ACTION MEDIUM TO POOR'.

(e) Poor braking action is reported as ‘BRAKING ACTION POOR’.

(f) Less than poor braking action is reported as ‘BRAKING ACTION LESS THAN POOR’.

In some cases, the differences between two consecutive levels of the six braking action categories between ‘Good’ and ‘Less than Poor’ may be too subtle for the flight crew to detect. It is therefore acceptable for the flight crew to report on a more coarse scale of ‘Good’, ‘Medium’ and ‘Poor’.

Whenever requested by ATC, or if the braking action encountered during the landing roll is not as previously reported by the aerodrome operator in the RCR, pilots should provide a braking action report. This is especially important and safety relevant where the experienced braking action is worse than the braking action associated with any RWYCC code currently in effect for the portion of the runway concerned.

When the braking action experienced during landing is better than that reported by the aerodrome operator, it is also relevant to report this information, which may trigger further actions for the aerodrome operator in order to update the RCR.

If an aircraft-generated braking action report is available, it should be transmitted, identifying its origin accordingly. If the flight crew have a reason to modify the aircraft-generated braking action report based on their judgement, the commander should be able to amend such report.

A braking action AIREP of ‘Less than Poor’ leads to a runway closure until the aerodrome operator can improve the runway condition.

An air safety report should be submitted whenever flight safety has been endangered due to low braking action.

GM1 CAT.OP.MPA.311 Reporting on runway braking action

GENERAL

The role of the flight crew in the runway surface condition reporting process does not end once a safe landing has been achieved. While the aerodrome operator is responsible for generating the RCR, flight crew are responsible for providing accurate braking action reports.

The flight crew braking action reports provide feedback to the aerodrome operator regarding the accuracy of the RCR resulting from the observed runway surface conditions.

ATC passes these braking action reports to the aerodrome operator, which in turn uses them in conjunction with the RCAM to determine if it is necessary to downgrade or upgrade the RWYCC.

During busy times, runway inspections and maintenance may be less frequent and need to be sequenced with arrivals. Therefore, aerodrome operators may depend on braking action reports to confirm that the runway surface condition is not deviating significantly from the published RCR.

AMC1 CAT.OP.MPA.303 & CAT.OP.MPA.311 In-flight check of the landing distance at time of arrival — aeroplanes & Reporting on runway braking action

FLIGHT CREW TRAINING

Flight crew members should be trained on the use of the RCR, on the use of performance data for the assessment of the LDTA and on reporting braking action using the AIREP format.

GM1 CAT.OP.MPA.303 & CAT.OP.MPA.311 In-flight check of the landing distance at time of arrival — aeroplanes & Reporting on runway braking action

SYLLABUS

A training syllabus should include, in addition to the requirements of Subpart FC of Annex III (ORO.FC), at least the following elements:

(a) General

- (1) Contamination
  - (i) Definition
  - (ii) Contaminants which cause increased drag thus affecting acceleration, and contaminants which cause reduced braking action affecting deceleration
  - (iii) Slippery when wet condition
- (2) Contaminated runway
  - (i) Runway surface condition descriptors
  - (ii) Operational observations with friction devices
  - (iii) Operator´s policy on the usage of:
    - A. reduced take-off thrust
    - B. reports by runway thirds
  - (iv) Stopway
- (3) Runway condition codes
  - (i) RCAM
    - A. Differences between those published for aerodromes and flight crew
    - B. Format in use
    - C. The use of runway friction measurements
    - D. The use of temperature
    - E. RWYCC
    - F. Downgrade/upgrade criteria
    - G. Difference between a calculation and an assessment
  - (ii) Braking action
  - (iii) Use of aircraft wind limit diagram with contamination
- (4) Runway condition report
  - (i) Availability
  - (ii) Validity
  - (iii) Performance and situational awareness
  - (iv) Decoding
  - (v) Promulgation and reception

(5) Aeroplane control in take-off and landing

(i) Lateral control

A. Windcock effect

B. Effect of reversers

C. Cornering forces

D. Crosswind limitations (including operations when the cleared runway width is less than published

(ii) Longitudinal control

A. V1 correction in correlation with minimum control speed on ground

B. Aquaplaning

C. Anti-skid

D. Autobrake

(6) Take-off distance

(i) Acceleration and deceleration

(ii) Take-off performance limitations

(iii) Take-off distance models

(iv) Factors affecting TO distance

(v) Why to use the type and depth of contaminant instead of the RWYCC

(vi) Safety margins

(7) Landing distance

(i) Distance at time of arrival model

(ii) Factors affecting landing distance

(iii) Safety margins

(8) Exceptions

(i) States that do not comply with ICAO standards for RCR and assessment of the LDTA

(b) Flight planning

(1) Dispatch/in-flight conditions

(2) MEL/CDL items affecting take-off and landing performance

(3) Operator´s policy on variable wind and gusts

(4) Landing performance at destination and alternates

(i) Selection of alternates if an aerodrome is not available

A. En-route alternates

B. Destination alternates

(ii) Number of alternates

(iii) Runway condition

(c) Take-off

(1) Runway selection

(2) Take-off from a wet or contaminated runway

(d) In-flight

(1) Landing distance

(i) Distance at time of arrival calculations

A. Considerations for flight crew

B. Operator´s policy

(ii) Factors affecting landing distance

(iii) Runway selection for landing

(iv) Safety margins

(2) Use of aircraft systems

(i) Brakes/autobrakes

(ii) Difference between friction limited braking and different modes of autobrakes

(iii) Reversers

(e) Landing techniques

(1) Flight crew procedures and flying techniques when landing on length limited runway

(f) Safety considerations

(1) Types of errors possible

(2) Mindfulness principles to avoid biases that may lead to errors

(g) Documentation and records

(h) AIREPs

(1) Assessment of braking action

(2) Terminology

(3) Automated/aircraft-generated braking action reports, if applicable

(4) Air safety reports, if flight safety has been endangered due to insufficient braking action

AMC1 CAT.POL.A.200 General

WET AND CONTAMINATED RUNWAY DATA

~~If the performance data have been determined on the basis of a measured runway friction coefficient, the operator should use a procedure correlating the measured runway friction coefficient and the effective braking coefficient of friction of the aeroplane type over the required speed range for the existing runway conditions.~~ The determination of take-off performance data for wet and contaminated runways should be based on the reported runway surface condition in terms of contaminant and depth. The determination of landing performance data should be based on information provided in the OM on the reported RWYCC. The RWYCC is determined by the aerodrome operator using the RCAM and associated procedures defined in Annex V (Part-ADR.OPS) to UK Regulation (EU) No 139/2014. The RWYCC is reported through an RCR in the SNOWTAM format in accordance with ICAO Annex 15.

AMC1 CAT.POL.A.215 En-route – one-engine-inoperative (OEI)

ROUTE ANALYSIS

(a) The high terrain or obstacle analysis required should be carried out by a detailed analysis of the route.

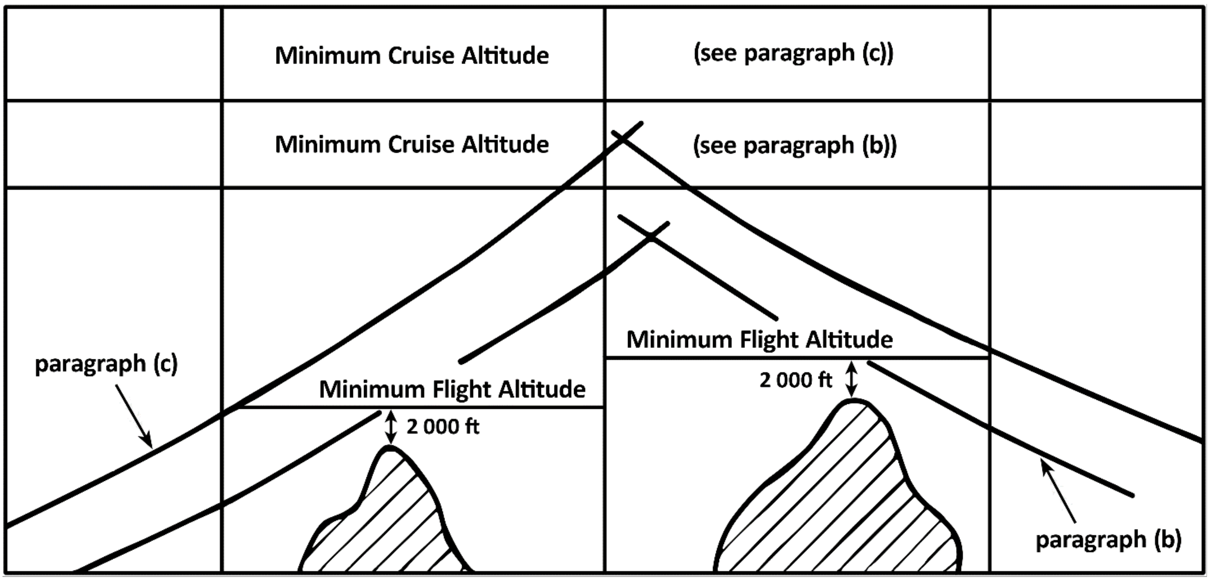
(b) A detailed analysis of the route should be made using contour maps of the high terrain and plotting the highest points within the prescribed corridor's width along the route. The next step is to determine whether it is possible to maintain level flight with OEI 1 000 ft above the highest point of the crossing. If this is not possible, or if the associated weight penalties are unacceptable, a drift down procedure should be worked out, based on engine failure at the most critical point and clearing critical obstacles during the drift down by at least 2 000 ft. The minimum cruise altitude is determined by the intersection of the two drift down paths, taking into account allowances for decision making (see Figure 1). This method is time-consuming and requires the availability of detailed terrain maps.

(c) Alternatively, the published minimum flight altitudes (MEA or minimum off-route altitude (MORA)) should be used for determining whether OEI level flight is feasible at the minimum flight altitude, or if it is necessary to use the published minimum flight altitudes as the basis for the drift down construction (see Figure 1). This procedure avoids a detailed high terrain contour analysis, but could be more penalising than taking the actual terrain profile into account as in (b).

(d) In order to comply with **CAT.POL.A.215** (c), one means of compliance is the use of MORA and, with CAT.POL.A.215 (d), MEA provided that the aeroplane meets the navigational equipment standard assumed in the definition of MEA.

Figure 1

Intersection of the two drift down paths



Note: MEA or MORA normally provide the required 2 000 ft obstacle clearance for drift down. However, at and below 6 000 ft altitude, MEA and MORA cannot be used directly as only 1 000 ft clearance is ensured.

GM1 CAT.POL.A.230 Landing – dry runways

LANDING MASS

CAT.POL.A.230 establishes two considerations in determining the maximum permissible landing mass at the destination and alternate aerodromes:

(a) Firstly, the aeroplane mass will be such that on arrival the aeroplane can be landed within 60 %, ~~or~~ 70 %, or 80 % (as applicable) of the landing distance available (LDA) on the most favourable (normally the longest) runway in still air. Regardless of the wind conditions, the maximum landing mass for an aerodrome/aeroplane configuration at a particular aerodrome cannot be exceeded.

(b) Secondly, consideration should be given to anticipated conditions and circumstances. The expected wind, or ATC and noise abatement procedures, may indicate the use of a different runway. These factors may result in a lower landing mass than that permitted under (a), in which case dispatch should be based on this lesser mass.

(c) The expected wind referred to in (b) is the wind expected to exist at the time of arrival.

GM1 CAT.POL.A.230(a) Landing — dry runways

ALTERNATE AERODROMES

The alternate aerodromes for which the landing mass is required to be determined in accordance with <u>**CAT.POL.A.230**</u> are:

(a) destination alternate aerodromes;

(b) fuel ERA aerodromes; and

(c) re-dispatch or re-clearance aerodromes.

GM1 CAT.POL.A.230(d)(2) Landing — dry runways

AFM LANDING PERFORMANCE CORRECTIONS

Landing performance data is provided in the AFM at least for the certified range of pressure altitudes. AFM data may include other influence parameters such as, but not limited to, runway slope and temperature. The effect of speed increments over threshold should also be accounted for when these increments are required by the applicable AFM procedures, such as autoland or steep approach.

GM1 CAT.POL.A.235(a) and (b) Landing — wet and contaminated runways

DISPATCH CONSIDERATIONS FOR MARGINAL CASES

The LDTA required by **CAT.OP.MPA.303** may, in some cases, and in particular on wet or contaminated runways, exceed the landing distance considered at the time of dispatch. The requirements for dispatch remain unchanged, however, when the conditions at the time of arrival are expected to be marginal, it is a good practice to carry out at the time of dispatch a preliminary calculation of the LDTA.

GM1 CAT.POL.A.235(a)(1) Landing — wet and contaminated runways

AFM LANDING DISTANCES FOR WET RUNWAYS

Specific landing distances provided in the AFM for dispatch on wet runways, unless otherwise indicated, include a safety factor, which renders not necessary the application of the 15 % safety factor used in **CAT.POL.A.235(a)(2).** The operator should confirm that such data includes a safety factor. When the AFM distance is not factored, a safety factor of 15 % should be applied. The resulting distances may be longer or shorter than those resulting from **CAT.POL.A.235(a)(2),** but when provided, they are intended as a replacement of **CAT.POL.A.235(a)(2)** and mandatory for use at the time of dispatch.

AMC1 CAT.POL.A.235(a)(3) Landing — wet and contaminated runways

RUNWAYS WITH FRICTION IMPROVING CHARACTERISTICS

Materials or construction techniques meant to improve the friction characteristics of a runway may be grooved runways, runways treated with porous friction course (PFC) or other materials or techniques for which the AFM provides specific performance data.

Before taking the AFM performance credit for such runways, the operator should verify that the runways intended to be operated on are maintained to the extent necessary to ensure the expected improved friction characteristics.

AMC1 CAT.POL.A.230 & CAT.POL.A.235 Landing — dry runways & Landing — wet and contaminated runways

FACTORING OF AUTOMATIC LANDING DISTANCE PERFORMANCE DATA

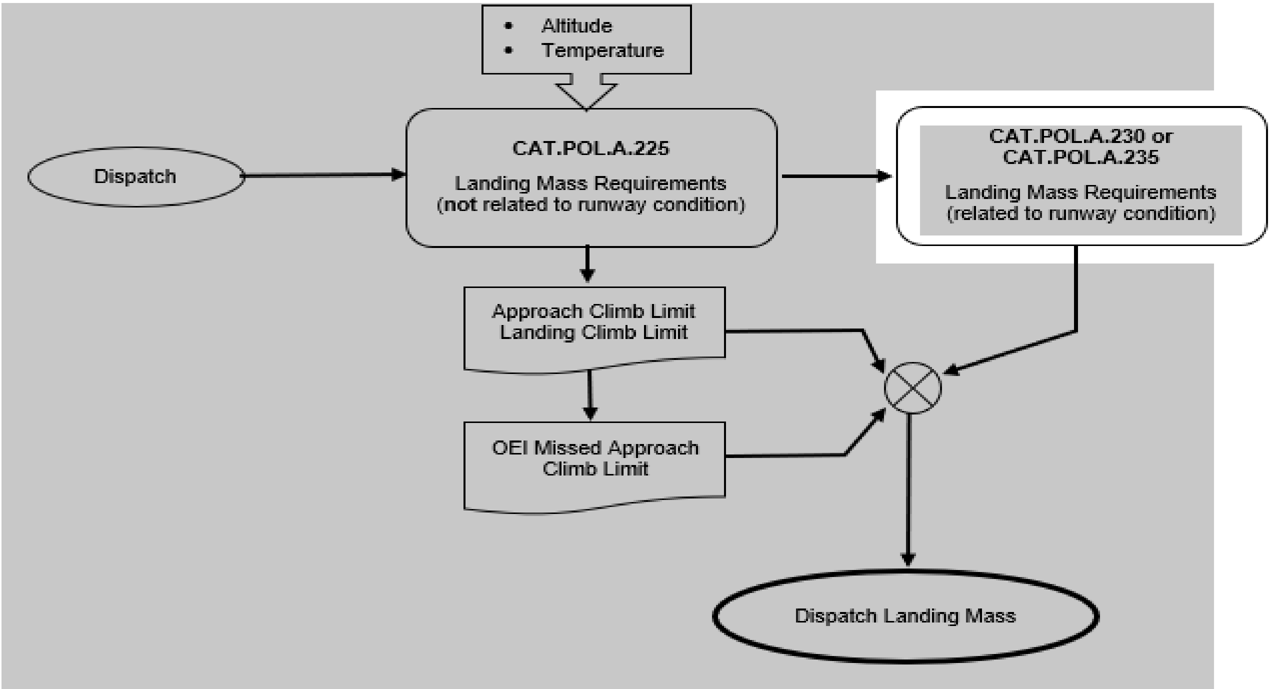
In those cases where the landing requires the use of an automatic landing system, and the distance published in the AFM includes safety margins equivalent to those contained in **CAT.POL.A.230 (a)(1)**, **CAT.POL.A.230(a)(2)** and **CAT.POL.A.235**, the landing mass of the aeroplane should be the lesser of:

(a) the landing mass determined in accordance with **CAT.POL.A.230 (a)(1), CAT.POL.A.230(a)(2)** or **CAT.POL.A.235**, as appropriate; ~~or~~ and

(b) the landing mass determined for the automatic landing distance for the appropriate surface condition, as given in the AFM or equivalent document. Increments due to system features such as beam location or elevations, or procedures such as use of overspeed, should also be included.

GM1 CAT.POL.A.230 & CAT.POL.A.235 Landing — dry runways & Landing — wet and contaminated runways

WORKFLOW OF THE LANDING DISTANCE ASSESSMENT AT THE TIME OF DISPATCH — GENERAL



WORKFLOW OF THE LANDING DISTANCE ASSESSMENT AT THE TIME OF DISPATCH — RUNWAY SUITABILITY CHECK

CAT.POL.A.230(e) and CAT.POL.A.235(e)		
For landing distance assessment at time of dispatch:	Check: - Most favourable runway - at no wind	**And** Check: - Most likely runway to be assigned - at probable wind
	If unable to comply ⇩	
Dry runway	Dispatch not allowed	**CAT.POL.A.230(f)** 1 alternate aerodrome required
Wet runway	Dispatch not allowed	**CAT.POL.A.235(g)** 1 alternate aerodrome required
Contaminated runway	**CAT.POL.A.235(f)** 2 alternate aerodromes required	**CAT.POL.A.235(g)** 1 alternate aerodrome required

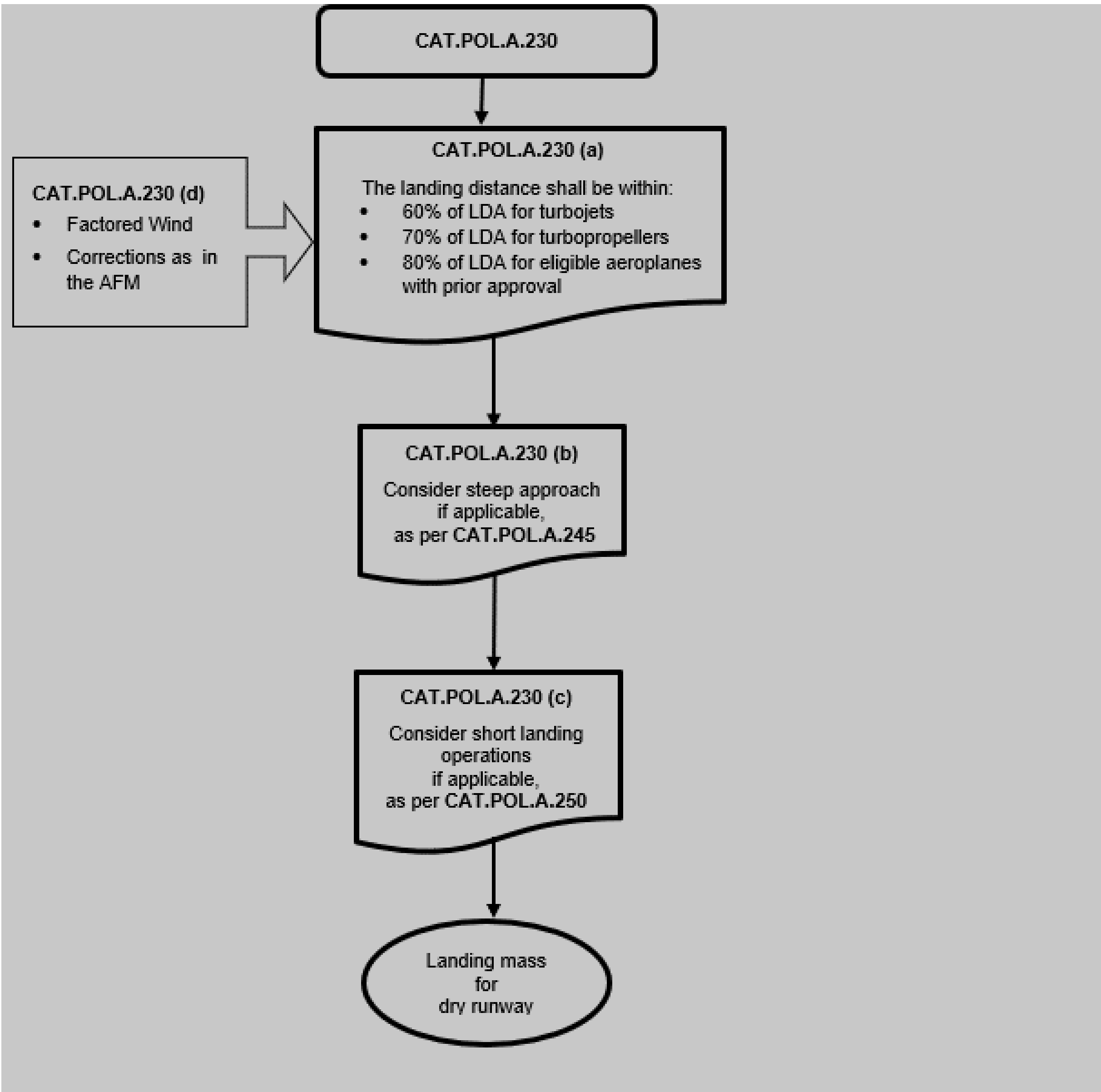
⇩

CAT.POL.A.230 (f) and CAT.POL.A.235 (h)

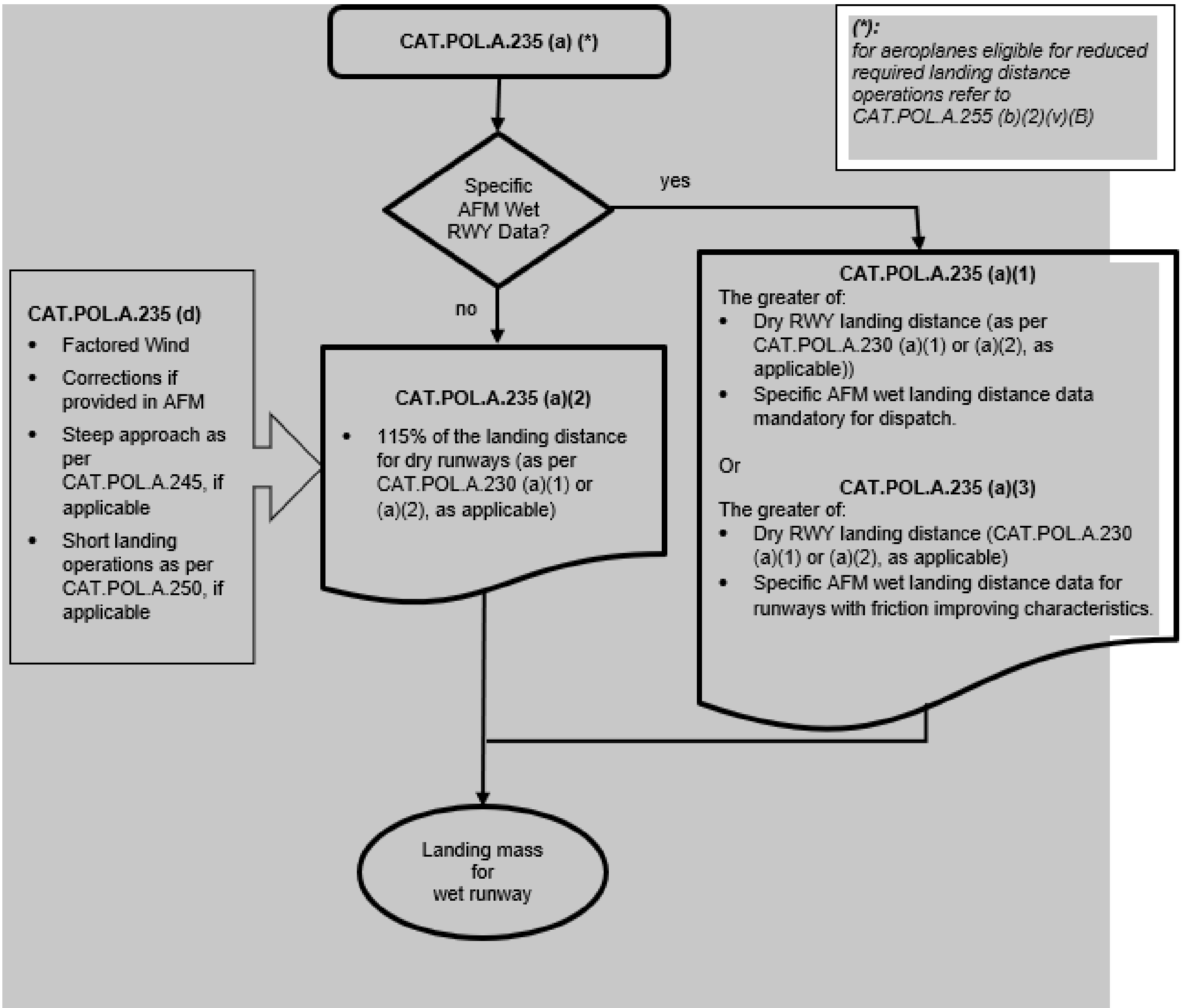
Alternate aerodromes shall permit full compliance with:

- **CAT.POL.A.230 (a) to (d)** for dry runways
- **CAT.POL.A.235 (a) to (d)** for wet or contaminated runways

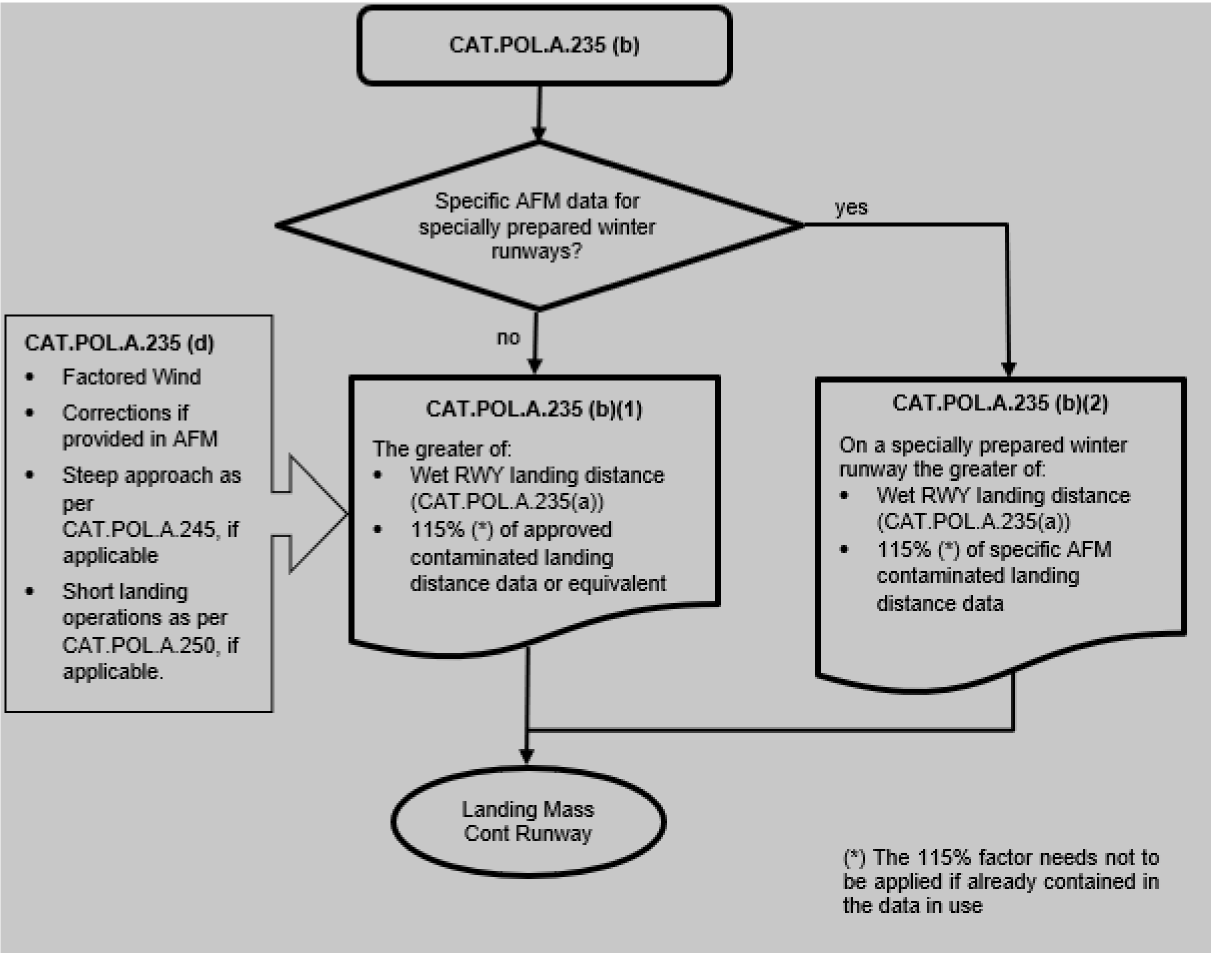
WORKFLOW OF THE LANDING DISTANCE ASSESSMENT AT THE TIME OF DISPATCH — DRY RUNWAYS



WORKFLOW OF THE LANDING DISTANCE ASSESSMENT AT THE TIME OF DISPATCH — WET RUNWAYS



WORKFLOW OF THE LANDING DISTANCE ASSESSMENT AT THE TIME OF DISPATCH — CONTAMINATED RUNWAYS



GM2 CAT.POL.A.230 & CAT.POL.A.235 Landing — dry runways & Landing — wet and contaminated runways

LANDING DISTANCES AND CORRECTIVE FACTORS

The AFM provides performance data for landing distance under conditions defined in the applicable certification standards. This distance, commonly referred to as the actual landing distance (ALD), is the distance from the position on the runway of the screen height to the point where the aeroplane comes to a full stop on a dry runway.

The determination of the ALD is based on the assumption that the landing is performed in accordance with the conditions and the procedures set out in the AFM on the basis of the applicable certification standards.

As a matter of fact, any particular landing may be different from the landing technique that is assumed in the AFM for certification purposes. The aircraft may approach the runway faster and/or higher than assumed; the aircraft may touch down further along the runway than the optimum point; the actual winds and other weather factors may be different from those assumed in the calculation of the ALD; and maximum braking may not be always achievable. For this reason, the LDA is required by **CAT.POL.A.230** and **CAT.POL.A.235** to be longer than the ALD.

The margins by which the LDA shall exceed the ALD on dry runways, in accordance with **CAT.POL.A.230,** are shown in the following Table 1.

Table 1: Corrective factors for dry runways

Aeroplane category	Required margin (dry runway)	Resulting factor (dry runway)
Turbojet-powered aeroplanes	ALD < 60 % of the LDA	LDA = at least 1.67 x ALD
Turbopropeller-powered aeroplanes	ALD < 70 % of the LDA	LDA = at least 1.43 x ALD
Aeroplanes approved under CAT.POL.A.255	ALD < 80 % of the LDA	LDA = at least 1.25 x ALD

If the runway is wet and the AFM does not provide specific performance data for dispatch on wet runways, a further increase of 15 % of the landing distance on dry runways has to be applied, in accordance with **CAT.POL.A.235**, as shown in the following Table 2.

Table 2: Corrective factors for wet runways

Aeroplane category	Resulting factor (dry runway)
Turbojet-powered aeroplanes	LDA = at least 1.15 x 1.67 x ALD = 1.92 x ALD
Turbopropeller-powered aeroplanes	LDA = at least 1.15 x 1.43 x ALD = 1.64 x ALD
Aeroplanes approved under CAT.POL.A.255	LDA = at least 1.15 x 1.25 X ALD = 1.44 x ALD

However, for aeroplanes that are approved under **CAT.POL.A.255,** when landing on wet runways, **CAT.POL.A.255** further requires the flight crew to apply the longer of the landing distance resulting from the above table and the landing distance resulting from the application of **CAT.OP.MPA.303(a) or (b)** as applicable. If performance information for the assessment of LDTA is not available as per **CAT.OP.MPA.303(b)(2)**, the required landing distance on wet runways should be at least: 1.15 x 1.67 x ALD for turbojet-powered aircraft and 1.15 x 1.43 x ALD for turbopropeller-powered aircraft.

GM1 CAT.POL.A.245(a) Approval of steep approach operations

SCREEN HEIGHT

For the purpose of steep approach operations, the screen height is the reference height above the runway surface, typically above the runway threshold, from which the landing distance is measured. The screen height is set at 50 ft for normal operations and at another value between 60 ft and 35 ft for steep approach operations.

GM1 CAT.POL.A.255(a)(2) Approval of reduced required landing distance operations

AEROPLANE ELIGIBILITY

The factors required by **CAT.POL.A.230(a)(1)** or **(a)(2)**, as applicable, provide an operational safety margin to take into account landing distance operational variability in normal operations compared to the conditions and procedures set out to determine the actual landing distances during the certification of the aeroplane. The reduction of this margin, allowed when operating with reduced required landing distance, is based on a set of mitigating conditions required by **CAT.POL.A.255**.

However, if the factors required by **CAT.POL.A.230(a)(1)** or **(a)(2)**, as applicable, have been used during the certification of the aeroplane to demonstrate compliance with certification standards such as, but not limited to, CS 25.1309 or equivalent, the aeroplane is not eligible for a reduction of the margin provided by those factors.

Furthermore, certification methods offer different options for the determination of the air distance portion of the landing distance in terms of assumption that can be made for parameters such as, but not limited to, glide path angle and sink rate at touchdown. The assumptions made during the certification of the aeroplane may increase the landing distance operational variability in normal operations. The effect of parameters such as temperature or runway slope, when these were not considered during certification, may as well increase the landing distances achievable in normal operations. Overall, the set of assumptions made during the certification of the aeroplane may not be always compatible with the operational safety margin reduction allowed in reduced required landing distance operations under **CAT.POL.A.255**.

Whether the factors required by **CAT.POL.A.230(a)(1)** or **(a)(2)**, as applicable, have been used to demonstrate compliance with certification standards, or the set of assumptions made to determine actual landing distances during the certification of the aeroplane are compatible with reduced landing distance operations, may be only declared by the aeroplane manufacturer or by the TC/STC holder.

GM1 CAT.POL.A.255(a)(3) Approval of reduced required landing distance operations

NON-SCHEDULED ON-DEMAND COMMERCIAL AIR TRANSPORT (CAT) OPERATIONS

For the purpose of reduced required landing distance operations, non-scheduled on-demand CAT operations are those CAT operations conducted upon request of the customer.

Non-scheduled on-demand CAT operations eligible for reduced required landing distance operations do not include holiday charters, i.e. charter flights that are part of a holiday travel package.

AMC1 CAT.POL.A.255(b)(1) Approval of reduced required landing distance operations

EQUIVALENT LEVEL OF SAFETY

A level of safety equivalent to that intended by **CAT.POL.A.230(a)(1)** or **CAT.POL.A.230(a)(2)**, as applicable, may be achieved when conducting reduced required landing distance operations if mitigating measures are established and implemented. Such measures should address flight crew, aircraft characteristics and performance, aerodromes and operations. It is, however, essential that all conditions established are adhered to as it is the combination of said conditions that achieves the intended level of safety. The operator should in fact also consider the interrelation of the various mitigating measures.

The mitigating measures may be determined by the operator by using a risk assessment or by fulfilling all the conditions established under **CAT.POL.A.255(b)(2)**. An operator willing to establish a set of conditions different from those under **CAT.POL.A.255(b)(2)** needs to demonstrate to the CAA the equivalent level of safety with **CAT.POL.A.230(a)(1)** or **(a)(2)** as applicable, through a risk assessment.

The risk assessment required by **CAT.POL.A.255(b)(1)** should include at least the following elements:

(a) flight crew qualification in terms of training, checking and recency;

(b) flight crew composition;

(c) runway surface conditions;

(d) dispatch criteria;

(e) weather conditions and limitations, including crosswind;

(f) aerodrome characteristics, including available approach guidance;

(g) aeroplane characteristics and limitations;

(h) aeroplane equipment and systems affecting landing performance;

(i) aeroplane performance data;

(j) operating procedures and operating minima; and

(k) analysis of operators's performance and occurrence reports related to unstable approaches and long landings.

The CAA may require other mitigating measures in addition to those proposed by the operator.

AMC1 CAT.POL.A.255(b)(2)(iv) Approval of reduced required landing distance operations

GENERAL

(a) The operator should ensure that flight crew training programmes for reduced required landing distance operations include ground training, flight simulation training device (FSTD), and/or flight training.

(b) Flight crew with no reduced required landing distance operations experience should have completed the full training programme of (a) above.

(c) Flight crew with previous reduced required landing distance operations experience of a similar type of operation with another UK operator, may undertake the following:

 (1) an abbreviated ground training course if operating an aircraft of a type or class different from that of the aircraft on which the previous reduced required landing distance operations experience was gained;

(2) an abbreviated ground, FSTD and/or flight training course if operating the same type or class and variant of the same aircraft type or class on which the previous reduced required landing distance operations experience was gained; this course should include at least the provisions of the conversion training contained in this AMC; the operator may reduce the number of approaches/landings required by the conversion training if the type/class or the variant of the aircraft type or class has the same or similar operating procedures, handling characteristics and performance characteristics as the previously operated aircraft type or class.

(d) Flight crew with reduced required landing distance operations experience with the operator may undertake an abbreviated ground, FSTD and/or flight training course according to the following conditions:

(1) when changing aircraft type or class, the abbreviated course should include at least the content of the conversion training;

(2) when changing to a different variant of aircraft within the same type or class rating that has the same or similar operating procedures, handling characteristics and performance characteristics, as the previously operated aircraft type or class, a difference course or familiarisation appropriate to the change of variant should fulfil the abbreviated course's purposes; and

(3) when changing to a different variant of aircraft within the same type or class rating that has significantly different operating procedures, handling characteristics and performance characteristics, the abbreviated course should include the content of the conversion training.

GROUND TRAINING

(a) The initial ground training course for reduced required landing distance operations should include at least the following:

(1) operational procedures and limitations, including flight preparation and planning;

(2) characteristics of the runway visual aids and runway markings;

(3) aircraft performance related to reduced required landing distance operations, including:

(i) aircraft-specific decelerating devices and equipment and MEL considerations;

(ii) items that increase the aircraft landing distance, e.g. excess speed at touchdown, threshold crossing height, delayed brake application, delayed spoiler/speed brake or thrust reverser application; and

(iii) weather and runway surface conditions;

(4) in-flight assessment of landing performance, including maximum landing masses and runway conditions;

(5) stabilised approach criteria;

(6) correct vertical flight path after the DA/MDA;

(7) correct flare, touchdown and braking techniques;

(8) touchdown within the appropriate touchdown zone;

(9) recognition of failure of aircraft equipment affecting aircraft performance, and action to be taken in that event;

(10) flight crew task allocation and pilot monitoring duties, including monitoring of the activation of deceleration devices;

(11) go-around/balked-landing criteria and decision-making;

(12) selection of precision approaches versus non-precision approaches if both are available; and

(13) qualification requirements for pilots to obtain and retain reduced required landing distance operations, including aerodrome landing analysis programme (ALAP) procedures.

FSTD TRAINING AND/OR FLIGHT TRAINING

(a) FSTD and/or flight training should be undertaken by all flight crew on flight duty at the controls during landing when performing reduced required landing distance operations.

(b) FSTD and/or flight training for reduced required landing distance operations should include checks of equipment functionality, both on the ground and in flight.

(c) Initial reduced required landing distance operations training should consist of a minimum of two approaches and landings to include at least the following exercises which may be combined:

(1) an approach and landing at the maximum landing mass;

(2) an approach and landing without the use of visual approach aids

(3) a landing on a wet runway;

(4) a landing with crosswind;

(5) a malfunction of a stopping device on landing; and

(6) a go-around/balked landing.

(d) Special emphasis should be given to the following items:

(1) in-flight assessment of landing performance;

(2) stabilised approach, recognition of an unstable approach and, consequentially, a go-around;

(3) flight crew task allocation and pilot monitoring duties, including monitoring of the activation of deceleration devices;

(4) timely and correct activation of deceleration devices;

(5) correct flare technique; and

(6) landing within the appropriate touchdown zone.

CONVERSION TRAINING

Flight crew members should complete the following reduced required landing distance operations training if converting to a new type or class or variant of aircraft in which reduced required landing distance operations will be conducted.

(a) Ground training, taking into account the flight crew member’s reduced required landing distance operations experience.

(b) FSTD training and/or flight training as above.

RECURRENT TRAINING AND CHECKING

(a) The operator should ensure that in conjunction with the normal recurrent training and operator’s proficiency checks, the pilot’s knowledge and ability to perform the tasks associated with reduced required landing distance operations are adequate.

(b) Annual recurrent ground training should cover all required elements over a 3-year period.

(c) An annual reduced required landing distance operations training should consist of a minimum of two approaches and landings so that it includes at least the following exercises which may be combined:

(1) an approach and landing at the maximum landing mass;

(2) an approach and landing without the use of visual approach;

(3) a landing on a wet runway;

(4) a malfunction of a stopping device on landing; and

(5) a go-around/balked landing.

(6) Operations in crosswind conditions

FLIGHT CREW QUALIFICATION AND EXPERIENCE

(a) Flight crew qualification and experience are specific to the operator and type of aircraft operated.

(b) The operator should ensure that each flight crew member successfully completes the specified FSTD and/or flight training before conducting reduced required landing distance operations.

(c) The operator should ensure that no inexperienced flight crew members, as defined in **AMC1.ORO.FC.200(a)**, perform an approach and landing with reduced required landing distance operations.

AMC2 CAT.POL.A.255(b)(2)(iv) Approval of reduced required landing distance operations

MONITORING

(a) Reduced required landing distance operations should be continuously monitored by the operator to detect any undesirable trends before they become hazardous.

(b) A flight data monitoring (FDM) programme, as required by **ORO.AOC.130**, is an acceptable method to monitor operational risks related to reduced required landing distance operations.

(c) When an FDM programme is in use, it should include FDM events or FDM measurements relevant for monitoring the risk of runway excursions at landing.

(d) When FDM is neither required by **ORO.AOC.130**, nor implemented on a voluntary basis, flight crew reports should be used. Specific guidance for reporting events and exceedances during reduced required landing distance operations should be provided to the flight crew.

GM1 CAT.POL.A.255(b)(2)(iv) Approval of reduced required landing distance operations

GENERAL

Flight crew training should be conducted preferably at aerodromes representative of the intended operations. An FSTD generic aerodrome with the same characteristics of an aerodrome requiring the reduced required landing distance is also acceptable for the initial and recurrent training.

GM2 CAT.POL.A.255(b)(2)(iv) Approval of reduced required landing distance operations

MONITORING

(a) Although **ORO.AOC.130** requires an FDM programme only for aeroplanes with a maximum certified take-off mass (MCTOM) of more than 27 000 kg, FDM may be used voluntarily on aeroplanes having a lower MCTOM. It is recommended for all operators conducting reduced required landing distance operations.

(b) Guidance on the definition of FDM events and FDM measurements relevant for monitoring the risk of runway excursion at landing may be found in the publications of the European Operators Flight Data Monitoring (EOFDM) forum.

AMC1 CAT.POL.A.255(b)(2)(v) Approval of reduced required landing distance operations

AERODROME LANDING ANALYSIS PROGRAMME (ALAP)

The intent of an ALAP is to ensure that the aerodrome critical data related to landing performance in reduced required landing distance operations is known and taken into account in order to avoid any further increase of the landing distance. Two important aerodrome-related variables largely contribute to increasing the landing distance: landing (ground) speed and deceleration capability. Related factors to consider should include at least the following elements:

(a) Topography

Terrain around the aerodrome should be considered. High, fast-rising terrain may require special approach or decision points, missed approach or balked landing procedures and may affect landing performance. Aerodromes located on top of hilly terrain or downwind of mountainous terrain may occasionally experience conditions of wind shear and gusts. Such conditions are particularly relevant during the landing manoeuvre, particularly during the flare, and may increase landing distance.

(b) Runway conditions

Runway characteristics, such as unknown slope and surface composition, can cause the actual landing distance to be longer than the calculated landing distance. The braking action always impacts the landing distance required as it deteriorates. To this regard, consideration should be given to, and information obtained on, the maintenance status of the runway, as a wet runway surface may be significantly degraded due to poor aerodrome maintenance.

(c) Aerodrome or area weather

Some aerodromes may not have current weather reports and forecast available for flight planning. Others may have automated observations for operational use. Others may depend on the weather forecast of a nearby aerodrome. Area forecasts are also valuable in evaluating weather conditions for a particular operation. Comparing forecasted conditions to current conditions provides insight on upcoming changes as weather systems move and forecasts are updated. Longer flight segments may lean more heavily on the forecast for the estimated time of arrival (ETA), as current conditions may change significantly as weather systems move. The most important factors that should be considered are contained in **AMC1 CAT.OP.MPA.300(a), AMC1 CAT.OP.MPA.311, GM1 CAT.OP.MPA.311, GM1 CAT.OP.MPA.303** and **GM2 CAT.OP.MPA.303**.

(d) Adverse weather

Adverse weather conditions include, but are not restricted to, thunderstorms, showers, downbursts, squall lines, tornadoes, moderate or severe turbulence on approach, heavy precipitation, wind shear and icing conditions. In general, all weather phenomena having the potential to increase the landing distance should be carefully assessed. Among these, tailwind is particularly relevant.

Wind variations should be carefully monitored as they may lead to variations in the reported and/or actual wind at the touchdown zone. Due consideration should be given also to the crosswind perpendicular to the landing runway as a slight variation in the direction of the crosswind may result in a considerable tailwind component.

(e) Runway safety margins

Displaced thresholds, aerodrome construction, and temporary obstacles (such as cranes and drawbridges) may impact the runway length available for landing. Notices to airmen (NOTAMs) must be consulted during the flight preparation. Another safety margin is the size and adequacy of the runway strip and the runway end safety area (RESA). A well-designed and well-maintained runway strip and RESA decrease the risk of damaging the aircraft in case of a runway excursion. ICAO Annex 14 provides the Standards and Recommended Practices (SARPs) to this regard.

GM1 CAT.POL.A.255(b)(2)(v) Approval of reduced required landing distance operations

AERODROME LANDING ANALYSIS PROGRAMME (ALAP) — AERODROME FACILITIES

The ALAP may also consider the services that are available at the aerodrome. Services such as communications, maintenance, and fuelling, availability of adequate rescue and firefighting services (RFFS) and medical services may have an impact on operations to and from that aerodrome, though not directly related to the landing distance. It is also worth considering whether the aerodrome is only meeting ICAO and national standards or also ICAO recommendations, as well as when the aerodrome bearing ratios are below the design and maintenance criteria indicated in ICAO Doc 9157 ‘Aerodrome Design Manual’.

AMC1 CAT.POL.A.255(b)(2)(vi) Approval of reduced required landing distance operations

EQUIPMENT AFFECTING LANDING PERFORMANCE

Equipment affecting landing performance typically includes flaps, slats, spoilers, brakes, anti-skid, autobrakes, reversers, etc. The operator should establish procedures to identify, based on the aircraft characteristics, those systems and the equipment that are performance relevant, and to ensure that they are verified to be operative before commencing the flight. Appropriate entries should be included in the minimum equipment list (MEL) to prohibit dispatch with such equipment inoperative when conducting reduced required landing distance operations.

GM1 CAT.POL.A.255(b)(2)(vi) Approval of reduced required landing distance operations

EQUIPMENT AFFECTING LANDING PERFORMANCE

Should any item of equipment affecting landing performance become inoperative during flight, the failure will be dealt with in accordance with the abnormal/emergency procedures established in the OM and, based on the prevailing conditions for the remainder of the flight, the commander will decide upon the discontinuation of the planned operation of reduced required landing distance.

AMC1 CAT.POL.A.255(b)(2)(vii) Approval of reduced required landing distance operations

RECENCY

Flight crew conducting reduced landing distance operations should perform at least two landings with reduced landing distance, either in actual operations or in an FSTD, performed within the validity period of the operator proficiency check (OPC). Recurrent training may be counted towards recency requirements.

AMC1 CAT.POL.A.255(b)(2)(ix) Approval of reduced required landing distance operations

ADDITIONAL AERODROME CONDITIONS

(a) Operators should establish procedures to ensure that:

 (1) the aerodrome information is obtained from an authoritative source, or when this is not available, from a source that has been verified by the operator to meet quality standards that are adequate for the intended use;

 (2) any change reducing landing distances that has been declared by the aerodrome operator has been taken into account; and

 (3) no steep approaches, screen heights lower than 35 ft or higher than 60 ft, operations outside the stabilised approach criteria, or low-visibility operations are required at the aerodrome when reduced required landing distance operations are conducted.

(b) Additional aerodrome conditions related to aeroplane type characteristics, orographic characteristics in the approach area, available approach aids and missed approach/balked landing considerations, as well as operating limitations, should also be taken into account.

(c) When assessing the aerodrome characteristics and the level of risk of the aeroplane undershooting or overrunning the runway, the operator should consider the nature and location of any hazard beyond the runway end, including the topography and obstruction environment beyond the runway strip, the length of the RESA and the effectiveness of any other mitigation measures that may be in place to reduce the likelihood and the consequences of a runway overrun.

AMC1 CAT.POL.A.305 Take-off

RUNWAY SURFACE CONDITION

(a) Unless otherwise specified in the AFM or other performance or operating manuals from the manufacturer, the variables affecting the take-off performance and the associated factors that should be applied to the AFM data are shown in Table 1 below. They should be applied in addition to the operational factors as prescribed in **CAT.POL.A.305**.

Table 1

Runway surface condition — Variables

Surface type	Condition	Factor
Grass (on firm soil) up to 20 cm long	Dry	1.2
up to 20 cm long	Wet	1.3
Paved	Wet	1.0

(b) The soil should be considered firm when there are wheel impressions but no rutting.

(c) When taking off on grass with a single-engined aeroplane, care should be taken to assess the rate of acceleration and consequent distance increase.

(d) When making a rejected take-off on very short grass that is wet and with a firm subsoil, the surface may be slippery, in which case the distances may increase significantly.

(e) The determination of take-off performance data for wet and contaminated runways, when such data is available, should be based on the reported runway surface condition in terms of contaminant and depth.

AMC1 CAT.POL.A.330 Landing – dry runways

LANDING DISTANCE CORRECTION FACTORS

(a) Unless otherwise specified in the AFM, or other performance or operating manuals from the manufacturers, the variable affecting the landing performance and the associated factor that should be applied to the AFM data are shown in the table below. It should be applied in addition to the operational factors as prescribed in **CAT.POL.A.330 (a)** and **CAT.POL.A.330(b)**.

Table 1

Landing distance correction factors

Surface type	Factor
Grass (on firm soil up to 20 cm long)	1.15

(b) The soil should be considered firm when there are wheel impressions but no rutting.

GM1 CAT.POL.A.330 Landing — dry runways

LANDING MASS

CAT.POL.A.330 establishes two considerations in determining the maximum permissible landing mass at the destination and alternate aerodromes.

(a) Firstly, the aeroplane mass will be such that on arrival the aeroplane can be landed within 70 % or 80 %, as applicable, of the LDA on the most favourable (normally the longest) runway in still air. Regardless of the wind conditions, the maximum landing mass for an aerodrome/aeroplane configuration at a particular aerodrome cannot be exceeded.

(b) Secondly, consideration should be given to anticipated conditions and circumstances. The expected wind, or ATC and noise abatement procedures, may indicate the use of a different runway. These factors may result in a lower landing mass than that permitted under (a), in which case dispatch should be based on this lesser mass.

(c) The expected wind referred to in (b) is the wind expected to exist at the time of arrival.

GM1 CAT.POL.A.330(a) Landing — dry runways

ALTERNATE AERODROMES

The alternate aerodromes for which the landing mass is required to be determined in accordance with **CAT.POL.A.330** are:

(a) destination alternate aerodromes;

(b) fuel ERA aerodromes; and

(c) re-dispatch or re-clearance aerodromes.

AMC1 CAT.POL.A.335 Landing — wet and contaminated runways

WET AND CONTAMINATED RUNWAY DATA

The determination of landing performance data should be based on information provided in the OM on the reported RWYCC. The RWYCC is determined by the aerodrome operator using the RCAM and associated procedures defined in Annex V (Part-ADR.OPS) to UK Regulation (EU) No 139/2014. The RWYCC is reported through an RCR in the SNOWTAM format in accordance with ICAO Annex 15.

GM2 CAT.POL.A.335 Landing — wet and contaminated runways

DISPATCH CONSIDERATIONS FOR MARGINAL CASES

The LDTA required by **CAT.OP.MPA.303** may, in some cases, and in particular on wet or contaminated runways, exceeds the landing distance considered at the time of dispatch. The requirements for dispatch remain unchanged; however, when the conditions at the time of arrival are expected to be marginal, it is a good practice to carry out at the time of dispatch a preliminary calculation of the LDTA.

GM1 CAT.POL.A.335(a)(1) Landing — wet and contaminated runways

Specific landing distances provided in the AFM for dispatch on wet runways, , include a safety factor, which renders the application of the 15 % safety factor used in **CAT.POL.A.335(a)(2)** unnecessary, unless otherwise indicated**.** The operator should confirm whether or not such data includes a safety factor. When the AFM distance is not factored, a safety factor of 15 % should be applied. The resulting distances may be longer or shorter than those resulting from **CAT.POL.A.335(a)(2),** but when factored distances are provided, they are intended as a replacement for **CAT.POL.A.335(a)(2)** and are mandatory for use at the time of dispatch.

AMC1 CAT.POL.A.335(a)(3) Landing — wet and contaminated runways

RUNWAYS WITH FRICTION IMPROVING CHARACTERISTICS

(a) Materials or construction techniques meant to improve the friction characteristics of a runway may be grooved runways, runways treated with PFC or other materials or techniques for which the AFM provides specific performance data.

(b) Before taking the AFM performance credit for such runways, the operator should verify that the runways intended to be operated on are maintained to the extent necessary to ensure the expected improved friction characteristics.

GM1 CAT.POL.A.330 & CAT.POL.A.335 Landing — dry runways & Landing — wet and contaminated runways

LANDING DISTANCES AND CORRECTIVE FACTORS

The AFM provides performance data for the landing distance under conditions defined in the applicable certification standards. This distance, commonly referred to as the ALD, is the distance from the position on the runway of the screen height to the point where the aeroplane comes to a full stop on a dry runway.

The determination of the ALD is based on the assumption that the landing is performed in accordance with the conditions and the procedures set out in the AFM on the basis of the applicable certification standards.

Operator landing technique may differ from that assumed in the AFM for certification purposes. The aircraft may approach the runway faster and/or higher than assumed; the aircraft may touch down further along the runway than the optimum point; the actual winds and other weather factors may be different from those assumed in the calculation of the ALD; and maximum braking may not be always achievable. For this reason, the LDA is required by **CAT.POL.A.330** and **CAT.POL.A.335** to be longer than the ALD.

The margins by which the LDA shall exceed the ALD on dry runways, in accordance with **CAT.POL.A.330,** are shown in the following Table 1.

Table 1: Corrective factors for dry runways

Aeroplane category	Required Margin (dry runway)	Resulting factor (dry runway)
All aeroplanes	ALD < 70 % of the LDA	LDA = at least 1.43 x ALD
Aeroplanes approved under CAT.POL.A.355	ALD < 80 % of the LDA	LDA = at least 1.25 x ALD

If the runway is wet and the AFM does not provide specific performance data for dispatch on wet runways, a further increase of 15 % of the landing distance on dry runways has to be applied, in accordance with **CAT.POL.A.335**, as shown in the following Table 2:

Table 2: Corrective factors for wet runways

Aeroplane category	Resulting factor (dry runway)
All aeroplanes	LDA = at least 1.15 x 1.43 x ALD = 1.64 x ALD
Aeroplanes approved under CAT.POL.A.355	LDA = at least 1.15 x 1.25 X ALD = 1.44 x ALD

Operations approved under **CAT.POL.A.355,** when landing on wet runways, **CAT.POL.A.355** further requires the flight crew to apply the longer of the landing distance resulting from the above table and the landing distance resulting from the application of **CAT.OP.MPA.303(b)**.). If performance information for the assessment of LDTA is not available as per **CAT.OP.MPA.303(b)(2),** the required landing distance on wet runways should be at least: 1.15 x 1.67 x ALD for turbojet-powered aircraft and 1.15 x 1.43 x ALD for turbopropeller-powered aircraft.

GM1 CAT.POL.A.345(a) Approval of steep approach operations

SCREEN HEIGHT

For the purpose of steep approach operations, the screen height is the reference height above the runway surface, typically above the runway threshold, from which the landing distance is measured. The screen height is set at 50 ft for normal operations and at another value between 60 ft and 35 ft for steep approach operations.

GM1 CAT.POL.A.355(b) Approval of reduced required landing distance operations

EQUIVALENT LEVEL OF SAFETY

A level of safety equivalent to that intended by **CAT.POL.A.330(a**) may be achieved when conducting reduced required landing distance operations if mitigating measures are established and implemented. Such measures should address flight crew, aircraft characteristics and performance, and specific aerodrome considerations. It is essential that all conditions established in the regulation are adhered to as it is the conditions that achieve the intended level of safety. The operator should in fact also consider the interrelation of the various mitigating measures.

The CAA may require other mitigating measures in addition to those proposed by the operator.

AMC1 CAT.POL.A.355(b)(4) Approval of reduced required landing distance operations

CONTROL OF THE TOUCHDOWN AREA

The control of the touchdown area may be assured by using external references visible from the flight crew compartment. The end of the designated touchdown area should be clearly identified with a ground reference point beyond which a go-around is required. Adequate go-around and balked landing instructions should be established in the OM. A written and/or pictorial description of the procedure should be provided for crew use.

AMC1 CAT.POL.A.355(b)(5) and (b)(6) Approval of reduced required landing distance operations

TYPE EXPERIENCE

The operator should specify in the OM the minimum pilot's experience on the aircraft type or class used to conduct such operations.

TRAINING PROGRAMME

(a) Initial training

- (1) The aerodrome training programme shall include ground and flight training with a suitably qualified instructor.
- (2) Flight training should be carried out on the runway of the intended operations, and should include a suitable number of:
  - (i) approaches and landings; and
  - (ii) missed approach/balked landings.
- (3) When performing approaches and landings, particular emphasis should be placed on:
  - (i) stabilised approach criteria;
  - (ii) accuracy of flare and touchdown;
  - (iii) positive identification of the ground reference point controlling the touchdown area; and
  - (iv) correct use of deceleration devices.
- (4) These exercises should be conducted in accordance with the specific control procedure of the touchdown area established by the operator and should enable the flight crew to identify the external visual references and the designated touchdown area.

(b) Recurrent training

The operator should ensure that in conjunction with the recurrent training and checking programme required by Subpart FC of Annex III (Part-ORO) to Regulation (EU) No 965/2012, the pilot's knowledge and ability to perform the tasks associated with this particular operation, for which the pilot is authorised by the operator, are verified.

RECENCY

The operator should define in the OM appropriate recent-experience requirements to ensure that the pilot's ability to perform an approach to and landing on the intended runway is maintained.

GM1 CAT.POL.A.355(b)(7) Approval of reduced required landing distance operations

AERODROME LANDING ANALYSIS PROGRAMME (ALAP)

The intent of an ALAP is to ensure that the aerodrome critical data related to landing performance in reduced required landing distance operations is known and taken into account in order to avoid any further increase of the landing distance. Two important aerodrome-related variables largely contribute to increasing the landing distance: landing (ground) speed and deceleration capability. Related factors to consider should include at least the following elements:

(a) Topography

Terrain around the aerodrome should be considered. High, fast-rising terrain may require special approach or decision points, missed approach or balked landing procedures and may affect landing performance. Aerodromes located on top of hilly terrain or downwind of mountainous terrain may occasionally experience conditions of wind shear and gusts. Such conditions are particularly relevant during the landing manoeuvre, particularly during the flare, and may increase landing distance.

(b) Runway conditions

Runway characteristics, such as unknown slope and surface composition, can cause the actual landing distance to be longer than the calculated landing distance. Braking action always impacts the landing distance required as it deteriorates. To this regard, consideration should be given to, and information obtained on, the maintenance status of the runway, as a wet runway surface may be significantly degraded due to poor aerodrome maintenance.

(c) Aerodrome or area weather

Some aerodromes may not have current weather reports and forecast available for flight planning. Others may have automated observations for operational use. Others may depend on the weather forecast of a nearby aerodrome. Area forecasts are also valuable in evaluating weather conditions for a particular operation. Comparing forecasted conditions to current conditions provides insight on upcoming changes as weather systems move and forecasts are updated. Longer flight segments may lean more heavily on the forecast for the ETA, as current conditions may change significantly as weather systems move. The most important factors that should be considered are contained in **AMC1 CAT.OP.MPA.300(a), AMC1 CAT.OP.MPA.311, GM1 CAT.OP.MPA.311, GM1 CAT.OP.MPA.303** and **GM2 CAT.OP.MPA.303.**

(d) Adverse weather

Adverse weather conditions include, but are not restricted to, thunderstorms, showers, downbursts, squall lines, tornadoes, moderate or severe turbulence on approach, heavy precipitation, wind shear and icing conditions. In general, all weather phenomena having the potential to increase the landing distance should be carefully assessed. Among these, tailwind is particularly relevant.

Wind variations should be carefully monitored as they may lead to variations in the reported and/or actual wind at the touchdown zone. Due consideration should be given also to the crosswind perpendicular to the landing runway as a slight variation in the direction of the crosswind may result in a considerable tailwind component.

(e) Runway safety margins

Displaced thresholds, aerodrome construction, and temporary obstacles (such as cranes and drawbridges) may impact the runway length available for landing. NOTAMs must be consulted during the flight preparation. Another safety margin is the size and adequacy of the runway strip and the RESA. A well-designed and well-maintained runway strip and RESA decrease the risk of damaging

GM2 CAT.POL.A.355(b)(7) Approval of reduced required landing distance operations

AERODROME LANDING ANALYSIS PROGRAMME (ALAP) — AERODROME FACILITIES

The ALAP may also consider the services that are available at the aerodrome. Services such as communications, maintenance, and fuelling, availability of adequate RFFS and medical services may have an impact on operations to and from that aerodrome, though not directly related to the landing distance. It is also worth considering whether the aerodrome is only meeting ICAO and national standards or also ICAO recommendations, as well as when the aerodrome bearing ratios are below the design and maintenance criteria indicated in ICAO Doc 9157 'Aerodrome Design Manual'.

AMC1 CAT.POL.A.355(b)(8)(i) Approval of reduced required landing distance operations

EQUIPMENT AFFECTING LANDING PERFORMANCE

Equipment affecting landing performance typically includes flaps, slats, spoilers, brakes, anti-skid, autobrakes, reversers, etc. The operator should establish procedures to identify, based on the aircraft characteristics, those systems and the equipment that are performance relevant, and to ensure that they are verified to be operative before commencing the flight. Appropriate entries should be included in the MEL to prohibit dispatch with such equipment inoperative when conducting reduced required landing distance operations.

GM1 CAT.POL.A.355(b)(8)(i) Approval of reduced required landing distance operations

EQUIPMENT AFFECTING LANDING PERFORMANCE

Should any item of equipment affecting landing performance become inoperative during flight, the failure will be dealt with in accordance with the abnormal/emergency procedures established in the OM and, based on the prevailing conditions for the remainder of the flight, the commander will decide upon the discontinuation of the planned operation of reduced required landing distance.

GM1 CAT.POL.A.355(b)(8)(ii) Approval of reduced required landing distance operations

CORRECT USE OF DECELERATION DEVICES

Flight crew should use full reverse when landing, irrespective of any noise-related restriction on its use, unless this affects the controllability of the aircraft. The use of all stopping devices, including reverse thrust, should commence immediately after touchdown without any delay.

AMC1 CAT.POL.A.355(b)(9) Approval of reduced required landing distance operations

SPECIFIC MAINTENANCE INSTRUCTIONS

Additional maintenance instructions, such as, but not limited to, more frequent checks for the aircraft's deceleration devices, especially for the reverse system, should be established by the operator in accordance with the manufacturer's recommendations, and be included in the operator's maintenance programme in accordance with Annex I (Part-M) to UK Regulation (EU) No 1321/2014.

SPECIFIC OPERATIONAL PROCEDURES

The operator should establish procedures for the flight crew to check before take-off the correct deployment of the deceleration devices, such as the reverse system.

AMC1 CAT.POL.A.355(b)(11) Approval of reduced required landing distance operations

ADDITIONAL AERODROME CONDITIONS

(a) Operators should establish procedures to ensure that:

  (1) the aerodrome information is obtained from an authoritative source, or when this is not available, from a source that has been verified by the operator to meet quality standards that are adequate for the intended use; and

  (2) any change reducing landing distances that has been declared by the aerodrome operator has been taken into account.

(b) Additional aerodrome conditions related to aeroplane type characteristics, orographic characteristics in the approach area, available approach aids and missed approach/balked landing considerations, as well as operating limitations, should also be taken into account.

(c) When assessing the aerodrome characteristics and the level of risk of the aeroplane undershooting or overrunning the runway, the operator should consider the nature and location of any hazard beyond the runway end, including the topography and obstruction environment beyond the runway strip, the length of the RESA and the effectiveness of any other mitigation measures that may be in place to reduce the likelihood and the consequences of a runway overrun.

AMC1 CAT.POL.A.400 Take-off

LOSS OF RUNWAY LENGTH DUE TO ALIGNMENT

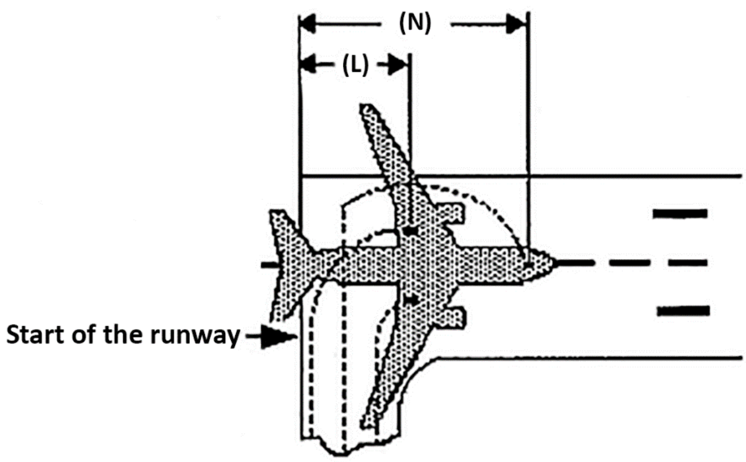
(a) The length of the runway that is declared for the calculation of TODA, ASDA and TORA does not account for line-up of the aeroplane in the direction of take-off on the runway in use. This alignment distance depends on the aeroplane geometry and access possibility to the runway in use. Accountability is usually required for a 90°-taxiway entry to the runway and 180°-turnaround on the runway. There are two distances to be considered:

(1) the minimum distance of the main wheels from the start of the runway for determining TODA and TORA, 'L'; and

(2) the minimum distance of the most forward wheel(s) from the start of the runway for determining ASDA, 'N'.

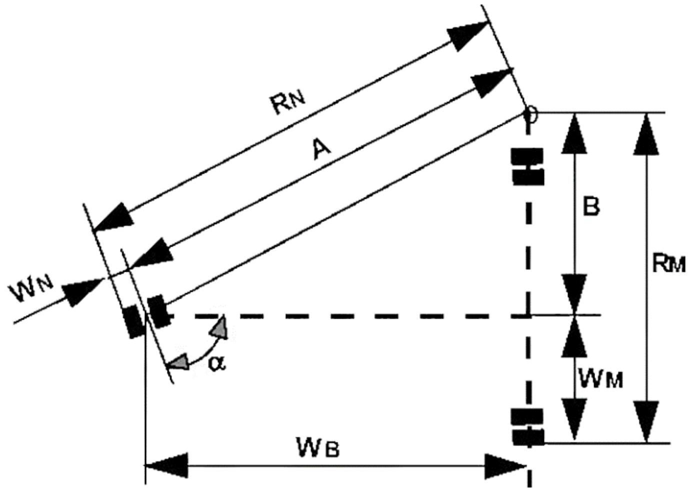
Figure 1

Line-up of the aeroplane in the direction of take-off — L and N



Where the aeroplane manufacturer does not provide the appropriate data, the calculation method given in (b) may be used to determine the alignment distance.

(b) Alignment distance calculation



The distances mentioned in (a)(1) and (a)(2) above are:

	90°-entry	180°-turnaround
L =	RM + X	RN + Y
N =	RM + X + WB	RN + Y + WB

where:

$$RN = \mathrm{A} + \mathrm{WN} = \frac{W_B}{\cos(90° - \alpha)}$$

RN = A + WN = WB/cos(90°-α) + WN

X = safety distance of outer main wheel during turn to the edge of the runway

Y = safety distance of outer nose wheel during turn to the edge of the runway

Note: Minimum edge safety distances for X and Y are specified in FAA AC 150/5300-13 and ICAO Annex 14, 3.8.3

RN = radius of turn of outer nose wheel

RM = radius of turn of outer main wheel

WN = distance from aeroplane centre-line to outer nose wheel

WM = distance from aeroplane centre-line to outer main wheel

WM = wheel base

α = steering angle.

AMC3 CAT.POL.A.400 Take-off

RUNWAY SURFACE CONDITION

The determination of take-off performance data for wet and contaminated runways, when such data is available, should be based on the reported runway surface condition in terms of contaminant and depth.

GM1 CAT.POL.A.430(a) Landing — dry runways

ALTERNATE AERODROMES

The alternate aerodromes for which the landing mass is required to be determined in accordance with **CAT.POL.A.430** are:

(a) destination alternate aerodromes;

(b) fuel ERA aerodromes; and

(c) re-dispatch or re-clearance aerodromes.

AMC1 CAT.POL.A.435 Landing — wet and contaminated runways

WET AND CONTAMINATED RUNWAY DATA

The determination of landing performance data should be based on information provided in the OM on the reported RWYCC. The RWYCC is determined by the aerodrome operator using the RCAM and associated procedures defined in Annex V (Part-ADR.OPS) to UK Regulation (EU) No 139/2014. The RWYCC is reported through an RCR in the SNOWTAM format in accordance with ICAO Annex 15.

GM1 CAT.POL.A.435 Landing — wet and contaminated runways

DISPATCH CONSIDERATIONS FOR MARGINAL CASES

The LDTA required by **CAT.OP.MPA.303** may, in some cases, and in particular on wet or contaminated runways, exceeds the landing distance considered at the time of dispatch. The requirements for dispatch remain unchanged; however, when the conditions at the time of arrival are expected to be marginal, it is a good practice to carry out at the time of dispatch a preliminary calculation of the LDTA.

GM1 CAT.POL.A.435(a)(1) Landing — wet and contaminated runways

AFM LANDING DISTANCES FOR WET RUNWAYS

Specific landing distances provided in the AFM for dispatch on wet runways, include a safety factor, which renders the application of the 15 % safety factor used in **CAT.POL.A.435(a)(2)** unnecessary, unless otherwise indicated**.** The operator should confirm whether or not such data includes a safety factor.

When the AFM distance is not factored, a safety factor of 15 % should be applied. The resulting distances may be longer or shorter than those resulting from **CAT.POL.A.435(a)(2),** but when factored distances are provided, they are intended as a replacement for **CAT.POL.A.435(a)(2)** and are mandatory for use at the time of dispatch.

GM1 CAT.POL.A.430 & CAT.POL.A.435 Landing — dry runways & Landing — wet and contaminated runways

LANDING DISTANCES AND CORRECTIVE FACTORS

The AFM provides performance data for landing distance under conditions defined in the applicable certification standards. This distance, commonly referred to as the ALD, is the distance from the position on the runway of the screen height to the point where the aeroplane comes to a full stop on a dry runway.

The determination of the ALD is based on the assumption that the landing is performed in accordance with the conditions and the procedures set out in the AFM on the basis of the applicable certification standards.

Operator landing technique may differ from that assumed in the AFM for certification purposes. The aircraft may approach the runway faster and/or higher than assumed; the aircraft may touch down further along the runway than the optimum point; the actual winds and other weather factors may be different from those assumed in the calculation of the ALD; and maximum braking may not be always achievable. For this reason, the LDA is required by **CAT.POL.A.430** and **CAT.POL.A.435** to be longer than the ALD.

The margins by which the LDA shall exceed the ALD on dry runways, in accordance with **CAT.POL.A.430,** are shown in the following Table 1.

Table 1: — Corrective factors for dry runways

Aeroplane category	Required Margin (dry runway)	Resulting factor (dry runway)
All aeroplanes	ALD < 70 % of the LDA	LDA = at least 1.43 x ALD

If the runway is wet and the AFM does not provide specific performance data for dispatch on wet runways, a further increase of 15 % of the landing distance on dry runways has to be applied, in accordance with **CAT.POL.A.435**, as shown in the following Table 2.

Table 2: Corrective factors for wet runways

Aeroplane category	Resulting factor (dry runway)
All aeroplanes	LDA = at least 1.15 x 1.43 x ALD = 1.64 x ALD

AMC1 CAT.POL.MAB.100(e) Mass and balance, loading

MASS VALUES FOR PASSENGERS AND BAGGAGE

(a) When the number of passenger seats available is:

   (1) less than 10 for aeroplanes; or

   (2) less than 6 for helicopters,

   passenger mass may be calculated on the basis of a statement by, or on behalf of, each passenger, adding to it a predetermined mass to account for hand baggage and clothing.

The predetermined mass for hand baggage and clothing should be established by the operator on the basis of studies relevant to his particular operation. In any case, it should not be less than:

(1) 4 kg for clothing; and

(2) 6 kg for hand baggage.

The passengers' stated mass and the mass of passengers' clothing and hand baggage should be checked prior to boarding and adjusted, if necessary. The operator should establish a procedure in the operations manual when to select actual or standard masses and the procedure to be followed when using verbal statements.

(b) When determining the actual mass by weighing, passengers' personal belongings and hand baggage should be included. Such weighing should be conducted immediately prior to boarding the aircraft.

(c) When determining the mass of passengers by using standard mass values, the standard mass values in Tables 1 and 2 below should be used. The standard masses include hand baggage and the mass of any infant carried by an adult on one passenger seat. Infants occupying separate passenger seats should be considered as children for the purpose of this AMC. When the total number of passenger seats available on an aircraft is 20 or more, the standard masses for males and females in Table 1 should be used. As an alternative, in cases where the total number of passenger seats available is 30 or more, the 'All Adult' mass values in Table 1 may be used.

Table 1

Standard masses for passengers — aircraft with a total number of passenger seats of 20 or more

Passenger seats:	20 and more		30 and more
	Male	Female	All adult
All flights except holiday charters	88 kg	70 kg	84 kg
Holiday charters(*)	83 kg	69 kg	76 kg
Children	35 kg	35 kg	35 kg

(*) Holiday charter means a charter flight that is part of a holiday travel package. On such flights the entire passenger capacity is hired by one or more charterer(s) for the carriage of passengers who are travelling, all or in part by air, on a round- or circle-trip basis for holiday purposes. The holiday charter mass values apply provided that not more than 5 % of passenger seats installed in the aircraft are used for the non-revenue carriage of certain categories of passengers. Categories of passengers such as company personnel, tour operators' staff, representatives of the press, authority officials, etc. can be included within the 5% without negating the use of holiday charter mass values.

Table 2

Standard masses for passengers — aircraft with a total number of passenger seats of 19 or less

Passenger seats:	1 - 5	6 - 9	10 - 19
Male	104 kg	96 kg	92 kg
Female	86 kg	78 kg	74 kg
Children	35 kg	35 kg	35 kg

(1) On aeroplane flights with 19 passenger seats or less and all helicopter flights where no hand baggage is carried in the cabin or where hand baggage is accounted for separately, 6 kg may be deducted from male and female masses in Table 2. Articles

such as an overcoat, an umbrella, a small handbag or purse, reading material or a small camera are not considered as hand baggage.

(2) For helicopter operations in which a survival suit is provided to passengers, 3 kg should be added to the passenger mass value.

(d) Mass values for baggage

(1) Aeroplanes. When the total number of passenger seats available on the aeroplane is 20 or more, the standard mass values for checked baggage of Table 3 should be used.

(2) Helicopters. When the total number of passenger seats available on the helicopters is 20 or more, the standard mass value for checked baggage should be 13 kg.

(3) For aircraft with 19 passenger seats or less, the actual mass of checked baggage should be determined by weighing.

Table 3

Standard masses for baggage — aeroplanes with a total number of passenger seats of 20 or more

Type of flight	Baggage standard mass
Domestic	11 kg
Within the European region	13 kg
Intercontinental	15 kg
All other	13 kg

(4) For the purpose of Table 3:

(i) domestic flight means a flight with origin and destination within the borders of one State;

(ii) flights within the European region mean flights, other than domestic flights, whose origin and destination are within the area specified in (d)(5); and

(iii) intercontinental flight means flights beyond the European region with origin and destination in different continents.

(5) Flights within the European region are flights conducted within the following area:

N7200 E04500

N4000 E04500

N3500 E03700

N3000 E03700

N3000 W00600

N2700 W00900

N2700 W03000

N6700 W03000

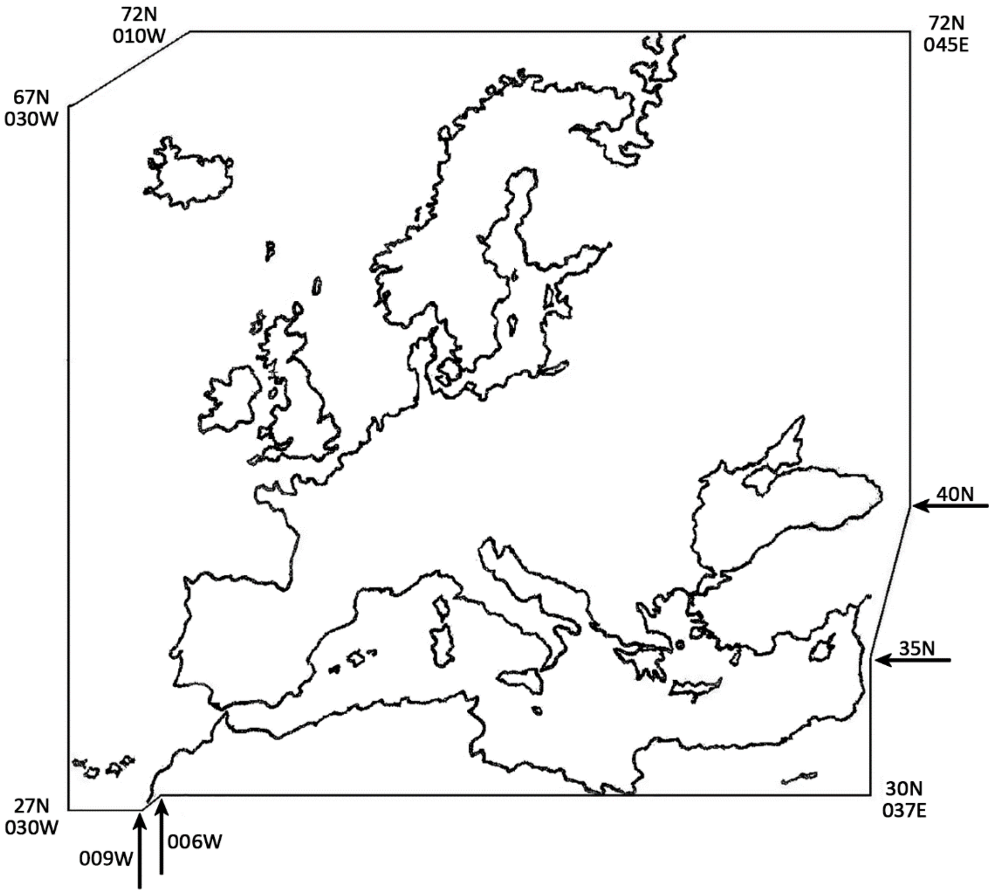
N7200 W01000

N7200 E04500

as depicted in Figure 1.

Figure 1

The European region



(~~f~~ e) Other standard masses may be used provided they are calculated on the basis of a detailed weighing survey plan and a reliable statistical analysis method is applied. The operator should advise the CAA about the intent of the passenger weighing survey and explain the survey plan in general terms. The revised standard mass values should only be used in circumstances comparable with those under which the survey was conducted. Where the revised standard masses exceed those in Tables 1, 2 and 3 of, then such higher values should be used.

(~~f~~ g) On any flight identified as carrying a significant number of passengers whose masses, including hand baggage, are expected to significantly deviate from the standard passenger mass, the operator should determine the actual mass of such passengers by weighing or by adding an adequate mass increment.

(~~g~~ h) If standard mass values for checked baggage are used and a significant number of passengers checked baggage is expected to significantly deviate from the standard baggage mass, the operator should determine the actual mass of such baggage by weighing or by adding an adequate mass increment.

AMC1 CAT.IDE.A.105 Minimum equipment for flight

MANAGEMENT OF THE STATUS OF CERTAIN INSTRUMENTS, EQUIPMENT OR FUNCTIONS

The operator should control and retain the status of the instruments, equipment or functions required for the intended operation, that are not controlled for the purpose of continuing airworthiness management.

GM1 CAT.IDE.A.105 Minimum equipment for flight

MANAGEMENT OF THE STATUS OF CERTAIN INSTRUMENTS, EQUIPMENT OR FUNCTIONS

(a) The operator should define responsibilities and procedures to retain and control the status of instruments, equipment or functions required for the intended operation, that are not controlled for the purpose of continuing airworthiness management.

(b) Examples of such instruments, equipment or functions may be, but are not limited to, equipment related to navigation approvals as FM immunity or certain software versions.

AMC1 CAT.IDE.A.185 Cockpit voice recorder

OPERATIONAL PERFORMANCE REQUIREMENTS

(a) For aeroplanes first issued with an individual CofA on or after 1 April 1998 and before 1 January 2016, the operational performance requirements for cockpit voice recorders (CVRs) and their dedicated equipment should be those laid down in the European Organisation for Civil Aviation Equipment (EUROCAE) Document ED-56A (Minimum Operational Performance Requirements For Cockpit Voice Recorder Systems) dated December 1993, or EUROCAE Document ED-112 (Minimum Operational Performance Specification for Crash Protected Airborne Recorder Systems) dated March 2003, including Amendments No 1 and No 2, or any later equivalent standard produced by EUROCAE.

(b) For aeroplanes first issued with an individual CofA on or after 1 January 2016:

(1) the operational performance requirements for CVRs should be those laid down in EUROCAE Document ED-112 (Minimum Operational Performance Specification for Crash Protected Airborne Recorder Systems) dated March 2003, including Amendments No 1 and No 2, or any later equivalent standard produced by EUROCAE; and

(2) the operational performance requirements for equipment dedicated to the CVR should be those laid down in the European Organisation for Civil Aviation Equipment (EUROCAE) Document ED-56A (Minimum Operational Performance Requirements For Cockpit Voice Recorder Systems) dated December 1993, or EUROCAE Document ED-112 (Minimum Operational Performance Specification for Crash Protected Airborne Recorder Systems) dated March 2003, including Amendments n°1 and n°2, or any later equivalent standard produced by EUROCAE.

(c) If required to be installed, the alternate power source should provide electrical power to operate both the CVR and the cockpit-mounted area microphone for at least 10 minutes, with a tolerance of 1 minute.

GM1 CAT.IDE.A.185 Cockpit voice recorder

TERMINOLOGY

The terms used in **CAT.IDE.A.185** should be understood as follows:

(a) 'Alternate power source' means a power source that is different from the source(s) that normally provides (provide) power to the cockpit voice recorder function.

(b) 'Cockpit-mounted area microphone' means a microphone located in the flight crew compartment for the purpose of recording voice communications originating at the first and second pilot stations and voice communications of other crew members in the flight crew compartment when directed to those stations.

AMC1.2 CAT.IDE.A.190 Flight data recorder

OPERATIONAL PERFORMANCE REQUIREMENTS FOR AEROPLANES FIRST ISSUED WITH AN INDIVIDUAL CofA ON OR AFTER 1 JANUARY 2023

(a) The operational performance requirements for FDRs should be those laid down in EUROCAE Document 112A (Minimum Operational Performance Specification for Crash Protected Airborne Recorder Systems) dated September 2013, or any later equivalent standard produced by EUROCAE.

(b) The FDR should, with reference to a timescale, record:

(1) the list of parameters in Table 1 below;

(2) the additional parameters listed in Table 2 below, when the information data source for the parameter is used by aeroplane systems or is available on the instrument panel for use by the flight crew to operate the aeroplane; and

(3) any dedicated parameters related to novel or unique design or operational characteristics of the aeroplane as determined by the CAA.

(c) The parameters to be recorded should meet the performance specifications (range, sampling intervals, accuracy limits and resolution in read-out) as defined in the relevant tables of EUROCAE Document 112A, or any later equivalent standard produced by EUROCAE.

Table 1: FDR — All aeroplanes

No*	Parameter
1a 1b 1c	Time; or Relative time count Global navigation satellite system (GNSS) time synchronisation
2	Pressure altitude (including altitude values displayed on each flight crew member's primary flight display, unless the aeroplane is type certified before 1 January 2023 and recording the values displayed at the captain position or the first officer position would require extensive modification)
3	Indicated airspeed or calibrated airspeed (including values of indicated airspeed or calibrated airspeed displayed on each flight crew member's primary flight display, unless the aeroplane is type certified before 1 January 2023 and recording the values displayed at the captain position or the first officer position would require extensive modification)
4	Heading (primary flight crew reference) — when true or magnetic heading can be selected as the primary heading reference, a discrete indicating selection should be recorded.
5	Normal acceleration
6	Pitch attitude — pitch attitude values displayed on each flight crew member's primary flight display should be recorded, unless the aeroplane is type certified before 1 January 2023 and recording the values displayed at the captain position or the first officer position would require extensive modification.

7	Roll attitude — roll attitude values displayed on each flight crew member's primary flight display should be recorded, unless the aeroplane is type certified before 1 January 2023 and recording the values displayed at the captain position or the first officer position would require extensive modification.
8	Manual radio transmission keying and CVR/FDR synchronisation reference
9 9a 9b	Engine thrust/power: Parameters required to determine propulsive thrust/power on each engine, in both normal and reverse thrust Flight crew compartment thrust/power lever position (for aeroplanes with non-mechanically linked engine controls in the flight crew compartment)
14	Total or outside air temperature
16	Longitudinal acceleration (body axis)
17	Lateral acceleration
18 18a 18b 18c	Primary flight control surface and/or primary flight control pilot input (For aeroplanes with control systems in which the movement of a control surface will back drive the pilot's control, 'or' applies. For aeroplanes with control systems in which the movement of a control surface will not back drive the pilot's control, 'and' applies. For multiple or split surfaces, a suitable combination of inputs is acceptable in lieu of recording each surface separately. For aeroplanes that have a flight control break-away capability that allows either pilot to operate the controls independently, record both inputs): Pitch axis Roll axis Yaw axis
19	Pitch trim surface position
23	Marker beacon passage
24	Warnings — In addition to the master warning, each 'red' warning that cannot be determined from other parameters or from the CVR and each smoke warning from other compartments should be recorded.
25	Each navigation receiver frequency selection
27	Air–ground status. Air–ground status and a sensor of each landing gear if installed

* The number in the left-hand column reflects the serial number depicted in EUROCAE Document 112A.

Table 2: FDR — Aeroplanes for which the data source for the parameter is either used by the aeroplane systems or is available on the instrument panel for use by the flight crew to operate the aeroplane

No*	Parameter
10 10a 10b	Flaps: Trailing edge flap position Flight crew compartment control selection
11 11a 11b	Slats: Leading edge flap (slat) position Flight crew compartment control selection
12	Thrust reverse status
13 13a 13b 13c 13d	Ground spoiler and speed brake: Ground spoiler position Ground spoiler selection Speed brake position Speed brake selection
15	Autopilot, autothrottle and automatic flight control system (AFCS): mode and engagement status (showing which systems are engaged and which primary modes are controlling the flight path and speed of the aircraft)
20	Radio altitude. For auto-land/category III operations, each radio altimeter should be recorded.

No*	Parameter
21	Vertical deviation — the approach aid in use should be recorded. For auto-land/category III operations, each system should be recorded:
21a	ILS/GPS/GLS glide path
21b	MLS elevation
21c	Integrated approach navigation (IAN) /Integrated Area Navigation (IRNAV), vertical deviation
22	Horizontal deviation — the approach aid in use should be recorded. For auto-land/category III operations, each system should be recorded:
22a	ILS/GPS/GLS localiser
22b	MLS azimuth
22c	GNSS approach path/IRNAV lateral deviation
26	Distance measuring equipment (DME) 1 and 2 distances:
26a	Distance to runway threshold (GLS)
26b	Distance to missed approach point (IRNAV/IAN)
28	Ground proximity warning system (GPWS)/terrain awareness warning system (TAWS)/ground collision avoidance system (GCAS) status — a suitable combination of discretes unless recorder capacity is limited in which case a single discrete for all modes is acceptable:
28a	Selection of terrain display mode, including pop-up display status
28b	Terrain alerts, including cautions and warnings and advisories
28c	On/off switch position
29	Angle of attack
30	Low pressure warning (each system):
30a	Hydraulic pressure
30b	Pneumatic pressure
31	Ground speed
32	Landing gear:
32a	Landing gear position
32b	Gear selector position
33	Navigation data:
33a	Drift angle
33b	Wind speed
33c	Wind direction
33d	Latitude
33e	Longitude
33f	GNSS augmentation in use
34	Brakes:
34a	Left and right brake pressure
34b	Left and right brake pedal position
35	Additional engine parameters (if not already recorded in parameter 9 of Table 1, and if the aeroplane is equipped with a suitable data source):
35a	Engine pressure ratio (EPR)
35b	N1
35c	Indicated vibration level
35d	N2
35e	Exhaust gas temperature (EGT)
35f	Fuel flow
35g	Fuel cut-off lever position
35h	N3
35i	Engine fuel metering valve position (or equivalent parameter from the system that directly controls the flow of fuel into the engine) – for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification.
36	Traffic alert and collision avoidance system (TCAS)/airborne collision avoidance system (ACAS) — a suitable combination of discretes should be recorded to determine the status of the system:
36a	Combined control
36b	Vertical control

No*	Parameter
36c 36d 36e	Up advisory Down advisory Sensitivity level
37	Wind shear warning
38 38a 38b	Selected barometric setting — to be recorded for the aeroplane where the parameter is displayed electronically: Pilot selected barometric setting Co-pilot selected barometric setting
39	Selected altitude (all pilot selectable modes of operation) — to be recorded for the aeroplane where the parameter is displayed electronically
40	Selected speed (all pilot selectable modes of operation) — to be recorded for the aeroplane where the parameter is displayed electronically
41	Selected Mach (all pilot selectable modes of operation) — to be recorded for the aeroplane where the parameter is displayed electronically
42	Selected vertical speed (all pilot selectable modes of operation) — to be recorded for the aeroplane where the parameter is displayed electronically
43	Selected heading (all pilot selectable modes of operation) — to be recorded for the aeroplane where the parameter is displayed electronically
44 44a 44b 44c	Selected flight path (all pilot selectable modes of operation) — to be recorded for the aeroplane where the parameter is displayed electronically: Course/desired track (DSTRK) Path angle Coordinates of final approach path (IRNAV/IAN)
45	Selected decision height — to be recorded for the aeroplane where the parameter is displayed electronically
46 46a 46b	Electronic flight instrument system (EFIS) display format, showing the display system status: Pilot Co-pilot
47	Multi-function/engine/alerts display format, showing the display system status
48	Alternating current (AC) electrical bus status — each bus
49	Direct current (DC) electrical bus status — each bus
50	Engine bleed valve(s) position
51	Auxiliary power unit (APU) bleed valve(s) position
52	Computer failure — all critical flight and engine control systems
53	Engine thrust command
54	Engine thrust target
55	Computed centre of gravity (CG)
56	Fuel quantity in CG trim tank
57	Head-up display in use
58	Paravisual display on
59	Operational stall protection, stick shaker and pusher activation
60 60a 60b 60c 60d 60e 60f	Primary navigation system reference: GNSS Inertial navigational system (INS) VHF omnidirectional radio range (VOR)/distance measuring equipment (DME) MLS Loran C ILS
61	Ice detection
62	Engine warning — each engine vibration
63	Engine warning — each engine over temperature

No*	Parameter
64	Engine warning — each engine oil pressure low
65	Engine warning — each engine overspeed
66	Yaw trim surface position
67	Roll trim surface position
68	Yaw or sideslip angle
69	De-icing and/or anti-icing systems selection
70	Hydraulic pressure — each system
71	Loss of cabin pressure
72	Trim control input position in the flight crew compartment, pitch — when mechanical means for control inputs are not available, displayed trim position or trim command should be recorded.
73	Trim control input position in the flight crew compartment, roll — when mechanical means for control inputs are not available, displayed trim position or trim command should be recorded.
74	Trim control input position in the flight crew compartment, yaw — when mechanical means for control inputs are not available, displayed trim position or trim command should be recorded.
75	All flight control input forces (for fly-by-wire flight control systems, where control surface position is a function of the displacement of the control input device only, it is not necessary to record this parameter):
75a	Control wheel input forces
75b	Control column input forces
75c	Rudder pedal input forces
76	Event marker
77	Date
78	Actual navigation performance (ANP) or estimate of position error (EPE) or estimate of position uncertainty (EPU)
79	Cabin pressure altitude – for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification
80	Aeroplane computed weight – for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification
81	Flight director command:
81a	Left flight director pitch command – for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification
81b	Left flight director roll command – for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification
81c	Right flight director pitch command – for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification
81d	Right flight director roll command – for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification
82	Vertical speed – for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification

* The number in the left-hand column reflects the serial number depicted in EUROCAE Document 112A.

AMC1 CAT.IDE.A.191 Lightweight flight recorder

OPERATIONAL PERFORMANCE REQUIREMENTS

(a) If the flight recorder records flight data, it should record at least the following parameters:

(1) pitch attitude or pitch rate,

(2) roll attitude or roll rate,

(3) heading (magnetic or true) or yaw rate,

(4) latitude,

(5) longitude,

(6) positioning system: estimated error (if available),

(7) pressure altitude or altitude from a positioning system,

(8) time,

(10) ground speed,

(11) positioning system: track (if available),

(12) normal acceleration,

(13) longitudinal acceleration, and

(14) lateral acceleration.

(b) If the flight recorder records images, it should capture views of the main instrument displays at the pilot station, or at both pilot stations when the aeroplane is certified for operation with a minimum crew of two pilots. Where the recorded image is used to meet the requirements of CAT.IDE.A.191(b), then the quality of the recorded image should allow reading the following indications during most of the flight:

(1) magnetic heading,

(2) time,

(3) pressure altitude,

(4) indicated airspeed,

(5) vertical speed,

(6) turn and slip,

(7) attitude,

(8) Mach number (if displayed),

(9) stabilised heading, and

(10) tachometer indication or equivalent indication of propulsive thrust or power.

(c) If the flight recorder records a combination of images and flight data, each flight parameter listed in (a) should be recorded as flight data or by means of images.

(d) The flight parameters listed in (a), which are recorded as flight data, should meet the performance specifications (range, sampling intervals, accuracy limits and resolution in read-out) as defined in the relevant table of EUROCAE Document ED-112 ‘Minimum Operational Performance Specification for Crash Protected Airborne Recorder Systems’, dated March 2003, or EUROCAE Document ED-155 ‘Minimum Operational Performance Specification for Lightweight Flight Recording Systems’, dated July 2009, or any later equivalent standard accepted by the CAA.

(e) The operational performance requirements for the flight recorder should be those laid down in:

(1) EUROCAE Document ED-155 or any later equivalent standard accepted by the CAA for lightweight flight recorders; or

(2) EUROCAE Document ED-112 or any later equivalent standard accepted by the CAA for crash-protected flight recorders.

GM1 CAT.IDE.A.191 Lightweight flight recorder

ADDITIONAL USEFUL INFORMATION

(a) Experience has shown the usefulness, for analysing incidents and for training purposes, of recording additional information. In particular, audio of the flight crew compartment and information on the handling of the aircraft (such as position of flight controls, position of engine controls, fuel and oil indications, aircraft configuration selection), and an external view are very useful for such purposes. To capture such information, simple equipment such as an integrated microphone and integrated camera may be sufficient.

(b) If the flight recorder includes optional capabilities such as described in (a), their recording duration is recommended to be at least 2 hours.

(c) If the flight recorder is capable of acquiring flight parameters from some aircraft systems, it is advised to give priority to the flight parameters listed in Annex II-B to EUROCAE Document ED-155 or the flight parameters listed in Annex II-A to EUROCAE Document ED-112. Indeed, these flight parameters were selected based on their relevance in many safety investigations.

GM2 CAT.IDE.A.191 Lightweight flight recorder

INSTALLATION OF CAMERAS

When cameras are installed for the purpose of **CAT.IDA.A.191**, it is advised to install them so that they do not capture images of head and shoulders of the flight crew members whilst seated in their normal operating position.

GM3 CAT.IDE.A.191 Lightweight flight recorder

RECORDING ACCURACY OF ATTITUDE RATE PARAMETERS

In the case of attitude rate parameters (pitch rate parameter, yaw rate parameter, roll rate parameter), the accuracy limit specified in EUROCAE Document ED-155, dated July 2009, was found to be unclear. Therefore, the following additional guidance is provided:

(a) If the attitude rate parameter is provided by an approved system of the aeroplane, accuracy greater than as provided by this system is not expected for this attitude rate parameter.

(b) If the attitude rate parameter is provided by a dedicated gyroscope, it is advisable that the gyroscope meets the following performance:

   (1) errors caused by linear accelerations less than ±3°/sec (equivalent to ±1% of 300°/sec recording range) for all combinations of parameter values and linear acceleration values in the respective ranges [-300°/sec; +300°/sec] and [-3g; +6g];

   (2) errors caused by temperature less than ±5°/sec for all combinations of parameter values and temperature values in the respective ranges [-300°/sec; +300°/sec] and [-40°C; +85°C];

   (3) angular random walk of the gyroscope equal to or less than 2°/sqrt(hour); and

   (4) bias stability of the gyroscope significantly less than 360°/hour (for instance, 50°/hour).

GM1 CAT.IDE.A.191(e) Lightweight flight recorder

FUNCTION TO MODIFY IMAGE AND AUDIO RECORDINGS

The purpose of the function modifying the image and audio recordings is to allow the flight crew to protect their privacy by making such recordings inaccessible using normal techniques. The activation of this function is subject to the commander’s approval (refer to **CAT.GEN.MPA.105**). However, the equipment manufacturer or a safety investigation authority might still be able to retrieve these recordings using special techniques.

AMC1 CAT.IDE.A.200 Combination recorder

GENERAL

(a) When two flight data and cockpit voice combination recorders are installed, one should be located near the flight crew compartment, in order to minimise the risk of data loss due to a failure of the wiring that gathers data to the recorder. The other should be located at the rear section of the aeroplane, in order to minimise the risk of data loss due to recorder damage in the case of a crash.

(b) When two flight data and cockpit voice combination recorders are installed and an alternate power source is required for the CVR function, it is acceptable to provide this alternate power source only to the cockpit-mounted area microphone and to one recorder.

AMC1 CAT.IDE.A.230(d) First-aid oxygen

R

GENERAL

(a) The mass flow of oxygen should be in accordance with CS-25.1443 or equivalent.

(b) The oxygen supply may be calculated by assuming an average flow rate of at least 3 litres standard temperature pressure dry (STPD)/minute/person, or equivalent, as demonstrated during the certification of the dispensing unit.

GM1 CAT.IDE.A.230 First-aid oxygen

GENERAL

(a) First-aid oxygen is intended for those passengers who still need to breath oxygen when the amount of supplemental oxygen required under **CAT.IDE.A.235** or **CAT.IDE.A.240** has been exhausted.

(b) When calculating the amount of first-aid oxygen, the operator should take into account the fact that, following a cabin depressurisation, supplemental oxygen as calculated in accordance with Table 1 of **CAT.IDE.A.235** and Table 1 of **CAT.IDE.A.240** should be sufficient to cope with potential effects of hypoxia for:

  (1) all passengers when the cabin altitude is above 15 000 ft;

(2) at least 30 % of the passengers, for any period when, in the event of loss of pressurisation and taking into account the circumstances of the flight, the pressure altitude in the passenger compartment will be between 14 000 ft and 15 000 ft; and

(3) at least 10 % of the passengers for any period in excess of 30 minutes when the pressure altitude in the passenger compartment will be between 10 000 ft and 14 000 ft.

(c) For the above reasons, the amount of first-aid oxygen should be calculated for the part of the flight after cabin depressurisation during which the cabin altitude is between 8 000 ft and 15 000 ft, when supplemental oxygen may no longer be available.

(d) Moreover, following cabin depressurisation, an emergency descent should be carried out to the lowest altitude compatible with the safety of the flight. In addition, in these circumstances, the aeroplane should land at the first available aerodrome at the earliest opportunity.

(e) The conditions above may reduce the period of time during which the first-aid oxygen may be required and consequently may limit the amount of first-aid oxygen to be carried on board.

(f) ~~Means may be provided to decrease the flow to not less than 2 litres per minute, STPD, at any altitude.~~

AMC1 CAT.IDE.A.285 Flight over water

ACCESSIBILITY OF LIFE-JACKETS

(a) The life-jacket should be accessible from the seat or berth of the person for whose use it is provided, with a safety belt or restraint system fastened.

(b) On Aeroplanes where the certification basis allows the life jacket to be stowed under the passenger seat cushion, the life-jacket should dbe accessible from the seat or berth of the person whose use it is provided, when that person is standing in a position adjacent to their seat.

AMC1 CAT.IDE.A.345(a) Communication, navigation and surveillance equipment for operations under IFR or under VFR over routes not navigated by reference to visual landmarks

PERFORMANCE-BASED COMMUNICATION AND SURVEILLANCE (PBCS) OPERATIONS

For operations in airspaces where required communication performance (RCP) and required surveillance performance (RSP) for PBCS have been prescribed, the operator should:

(a) ensure that the communication equipment and surveillance equipment meet the prescribed RCP and RSP specifications respectively, as shown by an AFM statement or equivalent;

(b) ensure that operational constraints are reflected in the MEL;

(c) establish and include in the OM:

(1) normal, abnormal and contingency procedures;

(2) the flight crew qualification and proficiency constraints; and

(3) a training programme for relevant personnel consistent with the intended operations;

(d) ensure continued airworthiness of the communication equipment and surveillance equipment in accordance with the appropriate RCP and RSP specifications respectively;

(e) ensure that the contracted communication service provider (CSP) for the airspace being flown complies with the required RCP and RSP specifications as well as with monitoring, recording and notification requirements; and

(f) participate to monitoring programmes established in the airspace being flown in order to:

(1) submit the relevant reports of observed communication and surveillance performance respectively; and

(2) establish a process for immediate corrective action in case non-compliance with the appropriate RCP or RSP specifications is detected.

GM1 CAT.IDE.A.345(a) Communication, navigation and surveillance equipment for operations under IFR or under VFR over routes not navigated by reference to visual landmarks

PBCS OPERATIONS — GENERAL

Detailed guidance material on PBCS operations may be found in the following documents:

(a) ICAO Doc 9869 'Performance-based Communication and Surveillance (PBCS) Manual'

(b) ICAO Doc 10037 'Global Operational Data Link (GOLD) Manual'

PBCS OPERATIONS — AIRCRAFT ELIGIBILITY

(a) The aircraft eligibility for compliance with the required RCP/RSP specifications should be demonstrated by the aircraft manufacturer or equipment supplier and be specific to each individual aircraft or the combination of the aircraft type and the equipment. The demonstrated compliance with specific RCP/RSP specifications may be documented in one of the following documents:

(1) the type certificate (TC);

(2) the supplemental type certificate (STC);

(3) the aeroplane flight manual (AFM) or AFM Supplement;

(4) a compliance statement from the manufacturer or the holder of the design approval of the data link installation, approved by the State of Design; or

(b) In addition to the indication of compliance with specific RCP/RSP specifications, the operator should comply with any associated operating limitations, information and procedures specified by the aircraft manufacturer or equipment supplier in the AFM or other appropriate documents.

PBCS OPERATIONS — MEL ENTRIES

(a) The operator should amend the MEL, in accordance with the items identified by the aircraft manufacturer or equipment supplier in the master minimum equipment list (MMEL) or MMEL supplement, in relation to PBCS capability, to address the impact of losing an associated system/sub-system on data link operational capability.

(b) As an example, equipment required in current FANS 1/A-capable aircraft, potentially affecting RCP and RSP capabilities, may be the following:

(1) VHF, SATCOM, or HFDL1 radios, as applicable;

(2) ACARS management unit (MU)/communications management unit (CMU);

(3) flight management computer (FMC) integration; and

(4) printer, if procedures require its use.

PBCS OPERATIONS — OPERATING PROCEDURES

The operator should establish operating procedures for the flight crew and other relevant personnel, such as but not limited to, flight dispatchers and maintenance personnel. These procedures should cover the usage of PBCS-relevant systems and include as a minimum:

(a) pre-flight planning requirements including MEL consideration and flight plan filing;

(b) actions to be taken in the data link operation, to include specific RCP/RSP required cases;

(c) actions to be taken for the loss of data link capability while in and prior to entering the airspace requiring specific RCP/RSP specifications. Examples may be found in ICAO Doc 10037;

(d) problem reporting procedures to the local/regional PBCS monitoring body or central reporting body as applicable; and

(e) compliance with specific regional requirements and procedures, if applicable.

PBCS OPERATIONS — QUALIFICATION AND TRAINING

(a) The operator should ensure that flight crew and other relevant personnel such as flight dispatchers and maintenance personnel are proficient with PBCS operations. A separate training programme is not required if data link communication is integrated in the current training programme. However, the operator should ensure that the existing training programme incorporates a basic PBCS concept and requirements for flight crew and other personnel that have direct impact on overall data link performance required for the provisions of air traffic services such as reduced separation.

(b) The elements covered during the training should be as a minimum:

(1) Flight crew

(i) Data link communication system theory relevant to operational use;

(ii) AFM limitations;

(iii) Normal pilot response to data link communication messages;

(iv) Message elements in the message set used in each environment;

(v) RCP/RSP specifications and their performance requirements;

(vi) Implementation of performance-based reduced separation with associated RCP/RSP specifications or other possible performance requirements associated with their routes;

(vii) Other ATM operations involving data link communication services;

(viii) Normal, non-normal and contingency procedures; and

(ix) Data link communication failure/problem and reporting.

Note (1) If flight crew has already been trained on data link operations, additional training only on PBCS is required, addressing a basic concept and requirements that have direct impact on overall data link performance required for provisions of air traffic services (e.g. reduced separation).

Note (2) Training may be provided through training material and other means that simulate the functionality.

(2) Dispatchers/flight operations officers

(i) Proper use of data link and PBCS flight plan designators;

(ii) Air traffic service provider’s separation criteria and procedures relevant to RCP/RSP specifications;

(iii) MEL remarks or exceptions based on data link communication;

(iv) Procedures for transitioning to voice communication and other contingency procedures related to the operation in the event of abnormal behaviour of the data link communication;

(v) Coordination with the ATS unit related to, or following a special data link communication exceptional event (e.g. log-on or connection failures); and

(vi) Contingency procedures to transition to a different separation standard when data link communication fails.

(3) Engineering and maintenance personnel

(i) Data link communication equipment including its installation, maintenance and modification;

(ii) MEL relief and procedures for return to service authorisations; and

(iii) Correction of reported non-performance of data link system.

PBCS OPERATIONS — CONTINUED AIRWORTHINESS

(a) The operator should ensure that aircraft systems are properly maintained to continue to meet the applicable RCP/RSP specifications.

(b) The operator should ensure that the following elements are documented and managed appropriately:

(1) configuration and equipment list detailing the pertinent hardware and software components for the aircraft/fleet(s) applicable to the specific RCP/RSP operation;

(2) configuration control for subnetwork, communication media and routing policies; and

(3) description of systems including display and alerting functions (including message sets).

PBCS OPERATIONS — CSP COMPLIANCE

(a) The operator should ensure that their contracted CSPs notify the ATS units of any failure condition that may have an impact on PBCS operations. Notification should be made to all relevant ATS units regardless of whether the CSP has a contract with them.

(b) The operator may demonstrate the compliance of their contracted CSP through service level agreements (SLAs)/contractual arrangements for data link services or through a joint agreement among PBCS stakeholders such as a Memorandum of Understanding (MOU) or a PBCS Charter.

PBCS OPERATIONS — PBCS CHARTER

A PBCS charter has been developed by PBCS stakeholders and is available as an alternative to SLAs in order to validate the agreement between the operator and the CSP for compliance with RCP/RSP required for PBCS operations. The charter is hosted on the website www.FANS-CRA.com where operators and CSPs can subscribe.

PBCS OPERATIONS — PARTICIPATION IN MONITORING PROGRAMMES

(a) The operator should establish a process to participate in local or regional PBCS monitoring programmes and provide the following information, including any subsequent changes, to monitoring bodies:

(1) operator name;

(2) operator contact details; and

(3) other coordination information as applicable, including appropriate information means for the CSP/SSP service fail notification.

(b) The process should also address the actions to be taken with respect to problem reporting and resolution of deficiencies, such as:

(1) reporting problems identified by the flight crew or other personnel to the PBCS monitoring bodies associated with the route of the flight on which the problem occurred;

(2) disclosing operational data in a timely manner to the appropriate PBCS monitoring bodies when requested for the purposes of investigating a reported problem; and

(3) investigating and resolving the cause of the deficiencies reported by the PBCS monitoring bodies

AMC1 CAT.IDE.H.105 Minimum equipment for flight

MANAGEMENT OF THE STATUS OF CERTAIN INSTRUMENTS, EQUIPMENT OR FUNCTIONS

The operator should control and retain the status of the instruments, equipment or functions required for the intended operation, that are not controlled for the purpose of continuing airworthiness management.

GM1 CAT.IDE.H.105 Minimum equipment for flight

MANAGEMENT OF THE STATUS OF CERTAIN INSTRUMENTS, EQUIPMENT OR FUNCTIONS

(a) The operator should define responsibilities and procedures to retain and control the status of instruments, equipment or functions required for the intended operation, that are not controlled for the purpose of continuing airworthiness management.

(b) Examples of such instruments, equipment or functions may be, but are not limited to, equipment related to navigation approvals as FM immunity or certain software versions.

AMC1 CAT.IDE.H.191 Lightweight flight recorder

OPERATIONAL PERFORMANCE REQUIREMENTS

(a) If the flight recorder records flight data, it should record at least the following parameters:

(1) relative time count,

(2) pitch attitude or pitch rate,

(3) roll attitude or roll rate,

(4) heading (magnetic or true) or yaw rate,

(5) latitude,

(6) longitude,

(7) positioning system: estimated error (if available),

(8) pressure altitude or altitude from a positioning system,

(9) time,

(10) ground speed,

(11) positioning system: track (if available),

(12) normal acceleration,

(13) longitudinal acceleration, and

(14) lateral acceleration.

(b) If the flight recorder records images, it should capture views of the main instrument displays at the pilot station, or at both pilot stations when the helicopter is certified for operation with a minimum crew of two pilots. Where a recorded image is used to meet the requirements of **CAT.IDE.H.191**, then the quality of the recorded image should allow reading the following indications during most of the flight:

(1) magnetic or true heading,

(2) time (if presented on the front instrument panel),

(3) pressure altitude,

(4) indicated airspeed,

(5) vertical speed,

(6) slip,

(7) OAT,

(8) attitude (if displayed),

(9) stabilised heading (if displayed), and

(10) main rotor speed.

(c) If the flight recorder records a combination of images and flight data, each flight parameter listed in (a) should be recorded as flight data or by means of images.

(d) The flight parameters listed in (a), which are recorded as flight data, should meet the performance specifications (range, sampling intervals, accuracy limits and resolution in read-out) as defined in the relevant table of EUROCAE Document ED-112 'Minimum Operational Performance Specification for Crash Protected Airborne Recorder Systems', dated March 2003, or EUROCAE Document ED-155 'Minimum Operational Performance Specification for Lightweight Flight Recording Systems', dated July 2009, or any later equivalent standard accepted by the CAA.

(e) The operational performance requirements for the flight recorder should be those laid down in:

(1) EUROCAE Document ED-155 or any later equivalent standard accepted by the CAA for lightweight flight recorders; or

(2) EUROCAE Document ED-112 or any later equivalent standard accepted by the CAA for crash-protected flight recorders.

GM1 CAT.IDE.H.191 Lightweight flight recorder

ADDITIONAL USEFUL INFORMATION

Refer to **GM1 CAT.IDE.A.191**.

GM2 CAT.IDE.H.191 Lightweight flight recorder

INSTALLATION OF CAMERAS

Refer to **GM2 CAT.IDE.A.191**.

GM3 CAT.IDE.H.191 Lightweight flight recorder

RECORDING ACCURACY OF ATTITUDE RATE PARAMETERS

Refer to **GM3 CAT.IDE.A.191**.

GM1 CAT.IDE.H.191(e) Lightweight flight recorder

FUNCTION TO MODIFY IMAGE AND AUDIO RECORDINGS

Refer to **GM1 CAT.IDE.A.191(e).**

AMC1 NCC.GEN.145(b) Handling of flight recorder recordings: preservation, production, protection and use

INSPECTIONS AND CHECKS OF RECORDINGS

~~Whenever a flight recorder is required to be carried:~~

(a) The operator should perform an inspection of the FDR recording and the CVR recording every year unless one or more of the following applies:

(1) If the flight recorder records on magnetic wire or uses frequency modulation technology, the time interval between two inspections of the recording should not exceed ~~three~~ 3 months.

(2) If the flight recorder is solid-state and the flight recorder system is fitted with continuous monitoring for proper operation, the time interval between two inspections of the recording may be up to ~~two~~ 2 years.

(3) In the case of an aircraft equipped with two solid-state flight data and cockpit voice combination recorders, where

(i) the flight recorder systems are fitted with continuous monitoring for proper operation, and

(ii) the flight recorders share the same flight data acquisition, a comprehensive inspection of the recording needs only to be performed for one flight recorder position. The inspection of the recordings should be performed alternately so that each flight recorder position is inspected at time intervals not exceeding ~~four~~ 4 years.

(4) Where all ~~of~~ the following conditions are met, the inspection of FDR recording is not needed:

(i) the aircraft flight data is ~~are~~ collected in the framework of a flight data monitoring (FDM) programme;

(ii) the data acquisition of mandatory flight parameters is the same for the FDR and for the recorder used for the FDM programme;

(iii) an inspection similar to the inspection of the FDR recording and covering all mandatory flight parameters is conducted on the FDM data at time intervals not exceeding ~~two~~ 2 years; and

(iv) the FDR is solid-state and the FDR system is fitted with continuous monitoring for proper operation.

(b) The operator should perform every ~~five~~ 5 years an inspection of the data link recording.

(c) The operator should perform, at time intervals not exceeding 2 years, an inspection of the recording of flight recorders other than an FDR, which are installed on an aircraft in order to ensure compliance with **CAT.IDE.A.191** or **CAT.IDE.H.191**;

(d ~~c~~) When installed, the aural or visual means for preflight checking of the flight recorders for proper operation should be used ~~every day~~ on each day when the aircraft is operated. When no such means is available for a flight recorder, the operator should perform an operational check of this flight recorder at intervals not exceeding 150 flight hours or 7 ~~seven~~ calendar days of operation, whichever is considered more suitable by the operator.

(e ~~d~~) The operator should check every ~~five~~ 5 years, or in accordance with the recommendations of the sensor manufacturer, that the parameters dedicated to the FDR and not monitored by other means are being recorded within the calibration tolerances and that there is no discrepancy in the engineering conversion routines for these parameters.

GM1 NCC.GEN.145(b) Handling of flight recorder recordings: preservation, production, protection and use

INSPECTION OF THE FLIGHT RECORDERS' RECORDINGS FOR ENSURING SERVICEABILITY

(a) The inspection of the recorded flight parameters ~~FDR recording~~ usually consists of the following:

(1) Making a copy of the complete recording file.

(2) Converting the recording to parameters expressed in engineering units in accordance with the documentation required to be held.

(3) Examining a whole flight in engineering units to evaluate the validity of all mandatory parameters – this could reveal defects or noise in the measuring and processing chains and indicate necessary maintenance actions. The following should be considered:

(i) when applicable, each parameter should be expressed in engineering units and checked for different values of its operational range – for this purpose, some parameters may need to be inspected at different flight phases; and

(ii) (only applicable to an FDR) if the parameter is delivered by a digital data bus and the same data are utilised for the operation of the aircraft, then a reasonableness check may be sufficient; otherwise a correlation check may need to be performed:

(A) a reasonableness check is understood in this context as a subjective, qualitative evaluation, requiring technical judgement, of the recordings from a complete flight; and

(B) a correlation check is understood in this context as the process of comparing data recorded by the flight data recorder against the corresponding data derived from flight instruments, indicators or the expected values obtained during specified portion(s) of a flight profile or during ground checks that are conducted for that purpose.

(4) Retaining the most recent copy of the complete recording file and the corresponding recording inspection report that includes references to the documentation required to be held.

(b) When performing the ~~CVR recording~~ inspection of an audio recording from a flight recorder, precautions need to be taken to comply with **NCC.GEN.145(f)(1a)**. The inspection of the audio ~~CVR~~ recording usually consists of:

(1) checking that the ~~CVR~~ flight recorder operates correctly for the nominal duration of the recording;

(2) examining, where practicable, samples of in-flight audio recording ~~of the CVR~~ from the flight recorder for evidence that the signal is acceptable on each channel and in all phases of flight; and

(3) preparing and retaining an inspection report.

(c) The inspection of the DLR recording usually consists of:

(1) Checking the consistency of the data link recording with other recordings for example, during a designated flight, the flight crew speaks out a few data link messages sent and received. After the flight, the data link recording and the CVR recording are compared for consistency.

(2) Retaining the most recent copy of the complete recording and the corresponding inspection report.

(d) When inspecting images recorded by a flight recorder, precautions need to be taken to comply with **NCC.GEN.145(f)(3a)**. The inspection of such images usually consists of the following:

(1) checking that the flight recorder operates correctly for the nominal duration of the recording;

(2) examining samples of images recorded in different flight phases for evidence that the images of each camera are of acceptable quality; and

(3) preparing and retaining an inspection report.

GM3 NCC.GEN.145(b) Handling of flight recorder recordings: preservation, production, protection and use

CVR AUDIO QUALITY

~~Examples of CVR audio quality issues and possible causes thereof may be found in~~

~~the document of the French Bureau d'Enquêtes et d'Analyses, titled 'Study on detection of audio anomalies on CVR recordings' and dated September 2015~~.

Additional guidance material for performing the CVR recording inspection may be found in the document of the French Bureau d'Enquêtes et d'Analyses, titled 'Guidance on CVR recording inspection' and dated October 2018 or later.

AMC1 NCC.GEN.145(f)(1) Handling of flight recorder recordings: preservation, production, protection and use

USE OF AUDIO ~~CVR~~ RECORDINGS FOR MAINTAINING OR IMPROVING SAFETY

(a) The procedure related to the handling of audio recordings from flight recorders and of their transcripts ~~cockpit voice recorder (CVR)~~ should be ~~written in a document which should be~~ documented and signed by all parties (aircraft operator, crew members, maintenance personnel if applicable). In accordance with UK Regulation (EU) 2016/679 this procedure should as a minimum, define:

(1) the method to obtain the consent of all crew members and maintenance personnel concerned;

(2) an access and security policy that restricts access to audio recordings from flight recorders and their transcripts ~~CVR recordings and identified CVR transcripts~~ to specifically authorised persons identified by their position;

(3) a retention policy and accountability, including the measures to be taken to ensure the security of audio recordings from flight recorders and their transcripts~~the CVR recordings and CVR transcripts~~ and their protection from misuse. The retention policy should specify the period of time after which such audio ~~CVR~~ recordings and identified ~~CVR~~ transcripts are destroyed; ~~and~~

(4) a description of the uses made of audio recordings from flight recorders and their transcripts ~~the CVR recordings and of their transcripts.~~;

(5) the participation of flight crew member representatives in the assessment of audio recordings from flight recorders and their transcripts;

(6) the conditions under which advisory briefing or remedial training should take place; this should always be carried out in a constructive and non-punitive manner; and

(7) the conditions under which actions other than advisory briefing or remedial training may be taken for reasons of gross negligence or significant continuing safety concern.

(b) Each time an audio recording file from a flight recorder ~~a CVR recording file~~ is read out under the conditions defined by **NCC.GEN.145(f)(1)**:

(1) parts of the ~~CVR~~ audio recording file that contain information with a privacy content should be deleted to the extent possible, and it should not be permitted that the detail of information with a privacy content is transcribed; and

(2) the operator should retain, and when requested, provide to the CAA:

(i) information on the use made (or the intended use) of the ~~CVR~~ audio recording file; and

(ii) evidence that the persons concerned consented to the use made (or the intended use) ofthe ~~CVR~~ audio recording file.

(c) The person who fulfils the role of a safety manager should also be responsible for the protection and use of the ~~CVR recordings and the CVR transcripts~~ audio recordings from flight recorders and their transcripts, as well as for the assessment of issues and their transmission to the manager(s) responsible for the process concerned.

(d) In case a third party is involved in the use of audio recordings from flight recorders ~~CVR recordings~~, contractual agreements with this third party should~~, when applicable,~~ cover the aspects enumerated in (a) and (b).

GM1 NCC.GEN.145(f)(1) Handling of flight recorder recordings: preservation, production, protection and use

USE OF ~~CVR~~ AUDIO RECORDINGS FOR MAINTAINING OR IMPROVING SAFETY

~~(a) The CVR is primarily a tool for the investigation of accidents and serious incidents by investigating authorities. Misuse of CVR recordings is a breach of the right to privacy and it works against an effective safety culture inside the operator.~~

~~(b) It is noteworthy that the flight data recorder (FDR) may be used for a flight data monitoring (FDM) programme; however, in that case the principles of confidentiality and access restriction of the FDM programme apply to the FDR recordings. Because the CVR is recording the voices of the crew and verbal communications with a privacy content, the CVR recordings must be protected and handled with even more care than FDM data.~~

~~(c) Therefore, the use of a CVR recording, when for purposes other than CVR serviceability or those laid down by Regulation (EU) No 996/2010, should be subject to the free prior consent of the persons concerned, and framed by a procedure that is endorsed by all parties and that protects the privacy ofcrew members and (if applicable) maintenance staff.~~

(a) The audio recordings from flight recorders are primarily a tool for the investigation of accidents and serious incidents by investigating authorities. Misuse of audio recordings and their transcripts are a breach of the right to privacy and it works against an effective safety culture inside the operator.

(b) It is noteworthy that the flight data recorder (FDR) may be used for a flight data monitoring (FDM) programme; however, in that case the principles of confidentiality and access restriction of the FDM programme apply to the FDR recordings. Because the audio recordings are the voices of the crew and verbal communications with a privacy content, the audio recordings must be protected and handled with even more care than FDM data.

(c) Therefore, the use of an audio recording, when for purposes other than serviceability or those laid down by UK Regulation (EU) No 996/2010, should be subject to the free prior consent of the persons concerned, and framed by a procedure that is endorsed by all parties and that protects the privacy of crew members and (if applicable) maintenance staff.

AMC1 NCC.GEN.145(f)(1a) Handling of flight recorder recordings: preservation, production, protection and use

~~CVR RECORDING~~ INSPECTION OF AUDIO RECORDINGS FOR ENSURING SERVICEABILITY

(a) When an inspection of the audio recordings from a flight recorder ~~the CVR recording~~ is performed for ensuring audio quality and intelligibility of recorded communications:

(1) the privacy of the audio ~~CVR~~ recordings should be ensured (e.g. by locating the replay equipment in a separated area and/or using headsets);

(2) access to ~~CVR~~ the replay equipment should be restricted to specifically authorised persons identified by their position;

(3) provision should be made for the secure storage of the recording medium, the audio ~~CVR~~ recording files and copies thereof;

(4) the audio ~~CVR~~ recording files and copies thereof should be destroyed not earlier than 2 months and not later than 1 ~~one~~ year after completion of the ~~CVR recording~~ inspection of the audio recordings, except that audio samples with no privacy content may be retained for enhancing ~~this CVR recording~~ the inspection (e.g. for comparing audio quality);

(5) only the accountable manager of the operator and, when identified to comply with **ORO.GEN.200**, the person fulfilling the role of safety manager should be entitled to request a copy of the audio ~~CVR~~ recording files.

(b) The conditions enumerated in (a) should also be complied with if the inspection of the audio ~~CVR~~ recordings is subcontracted to a third party. The contractual agreements with the third party should explicitly cover these aspects.

AMC1 NCC.GEN.145(f)(3) Handling of flight recorder recordings: preservation, production, protection and use

USE OF IMAGES FROM THE FLIGHT CREW COMPARTMENT FOR MAINTAINING OR IMPROVING SAFETY

(a) The procedure related to the handling of images of the flight crew compartment that are recorded by a flight recorder should be documented and signed by all parties involved (aircraft operator, crew member representatives nominated either by the union or the crew themselves, maintenance personnel representatives if applicable). In accordance with UK Regulation (EU) 2016/679, this procedure should as a minimum, define the following aspects:

(1) the method to obtain the consent of all crew members and maintenance personnel concerned;

(2) an access and security policy that restricts access to the image recordings to specifically authorised persons identified by their position;

(3) a retention policy and accountability, including the measures to ensure the security of the image recordings and their protection from misuse;

(4) a description of the uses made of the image recordings;

(5) the participation of flight crew member representatives in the assessment of the image recordings;

(6) the conditions under which advisory briefing or remedial training should take place; this should always be carried out in a constructive and non-punitive manner; and

(7) the conditions under which actions other than advisory briefing or remedial training may be taken for reasons of gross negligence or significant continuing safety concern.

(b) Each time a recording file from a flight recorder and containing images of the flight crew compartment is read out for purposes other than ensuring the serviceability of that flight recorder:

(1) images that contain information with a privacy content should be deleted to the extent possible, and it should not be permitted that the detail of information with a privacy content is transcribed;

(2) the operator should retain, and when requested, provide the CAA with:

(i) information on the use made (or the intended use) of the recording file; and

(ii) evidence that the crew members concerned consented to the use made (or the intended use) of the flight crew compartment images.

(c) The person fulfilling the role of safety manager should be responsible for the protection and use of images of the flight crew compartment that are recorded by a flight recorder, as well as for the assessment of issues and their transmission to the manager(s) responsible for the process concerned.

(d) In case a third party is involved in the use of images of the flight crew compartment that are recorded by a flight recorder, contractual agreements with this third party should cover the aspects enumerated in (a) and (b).

AMC1 NCC.GEN.145(f)(3a) Handling of flight recorder recordings: preservation, production, protection and use

INSPECTION OF IMAGES OF THE FLIGHT CREW COMPARTMENT FOR ENSURING SERVICEABILITY

(a) When images of the flight crew compartment recorded by a flight recorder are inspected for ensuring the serviceability of the flight recorder, and any body part of a crew member is likely to be visible on these images, then:

(1) the privacy of the image recordings should be ensured (e.g. by locating the replay equipment in a separated area);

(2) access to the replay equipment should be restricted to specifically authorised persons identified by their position;

(3) provisions should be made for the secure storage of the recording medium, the image recording files and copies thereof;

(4) the image recording files and copies thereof should be destroyed not earlier than 2 months and not later than 1 year after completion of the inspection of the image

recordings. Images that do not contain any body part of a person may be retained for enhancing this inspection (e.g. for comparing image quality); and

(5) only the accountable manager of the operator and, when identified to comply with **ORO.GEN.200**, the safety manager should be entitled to request a copy of the image recording files.

(b) The conditions enumerated in (a) should also be complied with if the inspection of the image recording is subcontracted to a third party. The contractual agreements with the third party should explicitly cover these aspects.

GM1 NCC.GEN.145(f) Handling of flight recorder recordings: preservation, production, protection and use

FLIGHT CREW COMPARTMENT

If there are no compartments to physically segregate the flight crew from the passengers during the flight, the 'flight crew compartment' in point (f) of **NCC.GEN.145** should be understood as the area including:

(a) the flight crew seats;

(b) aircraft and engine controls;

(c) aircraft instruments;

(d) windshield and windows used by the flight crew to get an external view while seated at their duty station; and

(e) circuit breakers accessible by the flight crew while seated at their duty station.

GM1 NCC.OP.185 Ice and other contaminants – ground procedures

TERMINOLOGY

Terms used in the context of de-icing/anti-icing have the meaning defined in the following subparagraphs.

~~(a) 'Anti-icing fluid' includes, but is not limited to, the following:~~

~~(1) Type I fluid if heated to min 60 °C at the nozzle;~~

~~(2) mixture of water and Type I fluid if heated to min 60 °C at the nozzle;~~

~~(3) Type II fluid;~~

~~(4) mixture of water and Type II fluid;~~

~~(5) Type III fluid;~~

~~(6) mixture of water and Type III fluid;~~

~~(7) Type IV fluid;~~

~~(8) mixture of water and Type IV fluid.~~

~~On uncontaminated aircraft surfaces Type II, III and IV anti-icing fluids are normally applied unheated.~~

~~(b) 'Clear ice': a coating of ice, generally clear and smooth, but with some air pockets. It forms on exposed objects, the temperatures of which are at, below or slightly above the freezing temperature, by the freezing of super-cooled drizzle, droplets or raindrops.~~

~~(c) 'Conditions conducive to aircraft icing on the ground' (e.g. freezing fog, freezing precipitation, frost, rain or high humidity (on cold soaked wings), snow or mixed rain and snow).~~

~~(d) 'Contamination', in this context, is understood as being all forms of frozen or semi-frozen moisture, such as frost, snow, slush or ice.~~

~~(e) 'Contamination check': a check of aircraft for contamination to establish the need for de-icing.~~

~~(f) 'De-icing fluid': such fluid includes, but is not limited to, the following:~~

~~(1) heated water;~~

~~(2) Type I fluid;~~

~~(3) mixture of water and Type I fluid;~~

~~(4) Type II fluid;~~

~~(5) mixture of water and Type II fluid;~~

~~(6) Type III fluid;~~

~~(7) mixture of water and Type III fluid;~~

~~(8) Type IV fluid;~~
~~(9) mixture of water and Type IV fluid.~~

~~De-icing fluid is normally applied heated to ensure maximum efficiency.~~

~~(g) 'De-icing/anti-icing': this is the combination of de-icing and anti-icing performed in either one or two steps.~~

~~(h) 'Ground ice detection system (GIDS)': system used during aircraft ground operations to inform the personnel involved in the operation and/or the flight crew about the presence of frost, ice, snow or slush on the aircraft surfaces.~~

~~(i) 'Lowest operational use temperature (LOUT)': the lowest temperature at which a fluid has been tested and certified as acceptable in accordance with the appropriate aerodynamic acceptance test whilst still maintaining a freezing point buffer of not less than:~~

~~(1) 10 °C for a Type I de-icing/anti-icing fluid; or~~

~~(2) 7 °C for Type II, III or IV de-icing/anti-icing fluids.~~

~~(j) 'Post-treatment check': an external check of the aircraft after de-icing and/or anti-icing treatment accomplished from suitably elevated observation points (e.g. from the de-icing/anti- icing equipment itself or other elevated equipment) to ensure that the aircraft is free from any frost, ice, snow or slush.~~

~~(k) 'Pre-take-off check': an assessment normally performed by the flight crew, to validate the applied hold-over time (HoT).~~

~~(l) 'Pre-take-off contamination check': a check of the treated surfaces for contamination, performed when the HoT has been exceeded or if any doubt exists regarding the~~

~~continued effectiveness of the applied anti-icing treatment. It is normally accomplished externally, just before commencement of the take-off run.~~

~~ANTI-ICING CODES~~

~~(m) The following are examples of anti-icing codes:~~

~~(1) 'Type I' at (start time) — to be used if anti-icing treatment has been performed with a Type I fluid;~~

~~(2) 'Type II/100' at (start time) — to be used if anti-icing treatment has been performed with undiluted Type II fluid;~~

~~(3) 'Type II/75' at (start time) — to be used if anti-icing treatment has been performed with a mixture of 75 % Type II fluid and 25 % water; and~~

~~(4) 'Type IV/50' at (start time) — to be used if anti-icing treatment has been performed with a mixture of 50 % Type IV fluid and 50 % water.~~

~~(n) When a two-step de-icing/anti-icing operation has been carried out, the anti-icing code should be determined by the second step fluid. Fluid brand names may be included, if desired.~~

(a) anti-icing', in the case of ground procedures, means a procedure that provides protection against the formation of frost or ice and accumulation of snow on treated surfaces of the aircraft for a limited period of time (hold-over time);

(b) 'Anti-icing fluid' includes, but is not limited to, the following:

(1) Typically, Type II, III or IV fluid (neat or diluted), normally applied unheated (*);

(2) Type I fluid/water mixture heated to minimum 60°C at the nozzle.

(*) When de-icing and anti-icing in a one-step process, Type II and Type IV fluids are typically applied diluted and heated.

(c) 'Clear ice': a coating of ice, generally clear and smooth, but with some air pockets. It forms on exposed objects, the temperatures of which are at, below or slightly above the freezing temperature, by the freezing of super-cooled drizzle, droplets or raindrops. Clear ice is very difficult to be detected visually.

(d) 'Cold soaked surface frost (CSSF)': frost developed on cold soaked aircraft surfaces by sublimation of air humidity. This effect can take place at ambient temperatures above 0 °C. Cold soaked aircraft surfaces are more common on aircraft that have recently landed. External surfaces of fuel tanks (e.g. wing skins) are typical areas of CSSF formation (known in this case as cold soaked fuel frost (CSFF)), due to the thermal inertia of very cold fuel that remains on the tanks after landing.

(e) 'Conditions conducive to aircraft icing on the ground': freezing fog, freezing precipitation, frost, rain or high humidity (on cold soaked wings), hail, ice pellets, snow or mixed rain and snow.

(f) 'Contamination': all forms of frozen or semi-frozen deposits on an aircraft, such as frost, snow, slush or ice.

(g) 'Contamination check': a check of the aircraft for contamination to establish the need for de-icing.

(h) 'de-icing', in the case of ground procedures, means a procedure by which frost, ice, snow or slush is removed from an aircraft in order to provide uncontaminated surfaces;

(i) 'De-icing fluid': such fluid includes, but is not limited to, the following:

(1) Heated water;

(2) Preferably, Type I fluid (neat or diluted (typically));

(3) Type II, III or IV fluid (neat or diluted).

The de-icing fluid is normally applied heated to ensure maximum efficiency and its freezing point should be at the outside air temperature (OAT) or below.

(j) ‘De-icing/anti-icing’: this is the combination of de-icing and anti-icing performed in either one or two steps.

(k) ‘Ground ice detection system (GIDS)’: a system used during aircraft ground operations to inform the personnel involved in the operation and/or the flight crew about the presence of frost, ice, snow or slush on the aircraft surfaces.

(l) ‘Holdover time (HOT)’: the period of time during which an anti-icing fluid provides protection against frozen contamination to the treated aircraft surfaces. It depends among other variables, on the type and intensity of the precipitation, OAT, wind, the particular fluid (or fluid Type) and aircraft design and aircraft configuration during the treatment.

(m) ‘Liquid water equivalent (LWE) system’: an automated weather measurement system that determines the LWE precipitation rate in conditions of frozen or freezing precipitation. The system provides flight crew with continuously updated information on the fluid protection capability under varying weather conditions.

(n) ‘Lowest operational use temperature (LOUT)’: the lowest temperature at which a fluid has been tested and certified as acceptable in accordance with the appropriate aerodynamic acceptance test whilst still maintaining a freezing point buffer of not less than:

(1) 10°C for a Type I fluid; or

(2) 7°C for Type II, III or IV fluids.

(o) ‘Post-treatment check’, ‘Post- de-icing check’ or ‘Post- de-icing/anti-icing check’: an external check of the aircraft after de-icing and/or anti-icing treatment accomplished by qualified staff and from suitably elevated observation points (e.g. from the de-icing/anti-icing equipment itself or other elevated equipment) to ensure that the aircraft is free from frost, ice, snow, or slush.

(p) ‘Pre-take-off check’: The flight crew should continuously monitor the weather conditions after the de-icing/anti-icing treatment to assess whether the applied holdover time is still appropriate. Within the aircraft’s HOT and prior to take-off, the flight crew should check the aircraft’s wings or representative aircraft surfaces for frozen contaminants.

(q) ‘Pre-take-off contamination check’: a check of the treated surfaces for contamination, performed when the HOT has been exceeded or if any doubt exists regarding the continued effectiveness of the applied anti-icing treatment. It is normally accomplished externally, just before commencement of the take-off run.

ANTI-ICING CODES

(r) Upon completion of the anti-icing treatment, a qualified staff provides the anti-icing code to the flight crew as follows: ‘the fluid Type/the fluid name (except for Type I)/concentration (except for Type I)/local time at start of anti-icing/date (optional)/the statement ‘post- de-icing/anti-icing check completed’ (if check completed). Example:

‘TYPE II / MANUFACTURER, BRAND X / 75% / 1335 / 15FEB20 / POST- DE-ICING/ANTI-ICING CHECK COMPLETED’.

(s) When a two-step de-icing/anti-icing operation has been carried out, the anti-icing code should be determined by the second step fluid.

GM2 NCC.OP.185 Ice and other contaminants – ground procedures

DE-ICING/ANTI-ICING — PROCEDURES

(a) De-icing and/or anti-icing procedures should take into account manufacturer's recommendations, including those that are type-specific, and should cover:

(1) contamination checks, including detection of clear ice and under-wing frost; limits on the thickness/area of contamination published in the AFM or other manufacturers' documentation should be followed;

(2) procedures to be followed if de-icing and/or anti-icing procedures are interrupted or unsuccessful;

(3) Pre-treatment, the aircraft should be configured in accordance with the OEM's requirements

(4~~3~~) post-treatment checks, followed by aircraft reconfiguration;

(5~~4~~) pre-take-off checks;

(6~~5~~) pre-take-off contamination checks;

(7~~6~~) the recording of any incidents relating to de-icing and/or anti-icing; and

(8~~7~~) the responsibilities of all personnel involved in de-icing and/or anti-icing.

(b) The operator's procedures should ensure the following:

(1) When aircraft surfaces are contaminated by ice, frost, slush or snow, they are de-iced prior to take-off, according to the prevailing conditions. Removal of contaminants may be performed with mechanical tools, fluids (including hot water), infrared heat or forced air, taking account of aircraft type-specific provisions.

(2) Account is taken of the wing skin temperature versus ~~outside air temperature (~~OAT~~)~~, as this may affect:

(i) the need to carry out aircraft de-icing and/or anti-icing; and/or

(ii) the performance of the de-icing/anti-icing fluids.

(3) When freezing precipitation occurs or there is a risk of freezing precipitation occurring that would contaminate the surfaces at the time of take-off, aircraft surfaces should be anti-iced. Anti-icing fluids (neat or diluted) should not be applied at OAT below their LOUT. ~~If both de-icing and anti-icing are required, the procedure may be performed in a one- or two-step process, depending upon weather conditions, available equipment, available fluids and the desired hold-over time (HoT).~~ Anti-icing fluids (neat or diluted) should not be applied at OAT below their LOUT. If both de-icing and anti-icing are required, the procedure may be performed in a one- or two-step process, depending upon weather conditions, available equipment, available fluids and the desired HOT.. One-step de-icing/anti-icing means that de-icing and anti-icing are carried out at the same time, using a mixture of de-icing/anti-icing fluid and water. Two-step de-icing/anti-icing means that de-icing and anti-icing are carried out in two separate steps. The aircraft is first de-iced using heated water only or a heated mixture of de-icing/anti-icing fluid and water. After completion of the de-icing operation, a layer of a mixture of de-icing/anti-icing fluid and water, or of de-icing /anti-icing fluid only, is sprayed over the aircraft surfaces. The second step will be taken before the first step fluid freezes (typically within 3 minutes but severe conditions may shorten this) and, if necessary, area by area.

(4) When an aircraft is anti-iced and a longer ~~HoT~~ HOT is needed/desired, the use of a less diluted ~~Type II or Type IV~~ thickened fluid should be considered.

(5) All restrictions relative to OAT and fluid application (including, but not necessarily limited to, temperature and pressure) published by the fluid manufacturer and/or aircraft manufacturer, are followed and procedures, limitations and recommendations to prevent the formation of fluid residues are followed.

(6) During conditions conducive to aircraft icing on the ground or after de-icing and/or anti-icing, an aircraft is not dispatched for departure unless it has been given a contamination check or a post-treatment check by a trained and qualified person. This check should cover all treated surfaces of the aircraft and be performed from points offering sufficient visibility to these parts. To ensure that there is no clear ice on suspect areas, it may also be necessary to make a physical check (e.g. tactile).

(7) The required entry is made in the technical log.

(8) The commander continually monitors the environmental situation after the performed treatment. Prior to take-off, he/she performs a pre-take-off check, which is an assessment of whether the applied HOT is still appropriate. This pre-take-off check includes, but is not limited to, factors such as precipitation, wind and OAT.

(9) If any doubt exists as to whether a deposit may adversely affect the aircraft's performance and/or controllability characteristics, the commander should arrange for a re-treatment or a pre-take-off contamination check to be performed in order to verify that the aircraft's surfaces are free of contamination. Special methods and/or equipment may be necessary to perform this check, especially at nighttime or in extremely adverse weather conditions. If this check cannot be performed just before take-off, re-treatment should be applied.

(10) When retreatment is necessary, any residue of the previous treatment should be removed, and a completely new de-icing/anti-icing treatment should be applied.

(11) When a ground ice detection system (GIDS) is used to perform an aircraft surfaces check prior to and/or after a treatment, the use of GIDS by suitably trained personnel should be part of the procedure.

(c) Special operational considerations

(1) When using thickened de-icing/anti-icing fluids, the operator should consider a two-step de-icing/anti-icing procedure, the first step preferably with hot water and/or un-thickened fluids.

(2) The use of de-icing/anti-icing fluids should be in accordance with the aircraft manufacturer's documentation. This is particularly important for thickened fluids to assure sufficient flow-off during take-off. Avoid applying excessive thickened fluid on the horizontal tail of aircraft with unpowered elevator controls.

(3) The operator should comply with any type-specific operational requirement(s), such as an aircraft mass decrease and/or a take-off speed increase associated with a fluid application.

(4) The operator should take into account any flight handling procedures (stick force, rotation speed and rate, take-off speed, aircraft attitude, etc.) laid down by the aircraft manufacturer when associated with a fluid application.

(5) All restrictions relative to OAT and fluid application (including, but not necessarily limited to, temperature and pressure) published by the fluid manufacturer and/or aircraft manufacturer, are followed. and procedures, limitations and recommendations to prevent the formation of fluid residues are followed.

(6) During conditions conducive to aircraft icing on the ground or after de-icing and/or anti-icing, an aircraft is not dispatched for departure unless it has been given a contamination check or a post-treatment check by a trained and qualified person. This check should cover all treated surfaces of the aircraft and be performed from

points offering sufficient ~~accessibility~~ visibility to these parts. To ensure that there is no clear ice on suspect areas, it may be necessary to make a physical check (e.g. tactile).

(7) The required entry is made in the technical log.

(8) The commander continually monitors the environmental situation after the performed treatment. Prior to take-off, he/she performs a pre-take-off check, which is an assessment of whether the applied ~~HoT~~ HOT is still appropriate. This pre-take-off check includes, but is not limited to, factors such as precipitation, wind and OAT.

(9) If any doubt exists as to whether a deposit may adversely affect the aircraft's performance and/or controllability characteristics, the commander should arrange for a re-treatment or a pre-take-off contamination check to be performed in order to verify that the aircraft's surfaces are free of contamination. Special methods and/or equipment may be necessary to perform this check, especially at night time or in extremely adverse weather conditions. If this check cannot be performed just before take-off, re-treatment should be applied.

(10) When re-treatment is necessary, any residue of the previous treatment should be removed, and a completely new de-icing/anti-icing treatment should be applied.

(11) When a ground ice detection system (GIDS) is used to perform an aircraft surfaces check prior to and/or after a treatment, the use of GIDS by suitably trained personnel should be part of the procedure.

(c) Special operational considerations

(1) When using thickened de-icing/anti-icing fluids, the operator should consider a two-step de-icing/anti-icing procedure, the first step preferably with hot water and/or un-thickened fluids.

(2) The use of de-icing/anti-icing fluids should be in accordance with the aircraft manufacturer's documentation. This is particularly important for thickened fluids to assure sufficient flow-off during take-off. Avoid applying excessive thickened fluid on the horizontal tail of aircraft with unpowered elevator controls.

(3) The operator should comply with any type-specific operational provision(s), such as an aircraft mass decrease and/or a take-off speed increase associated with a fluid application.

(4) The operator should take into account any flight handling procedures (stick force, rotation speed and rate, take-off speed, aircraft attitude etc.) laid down by the aircraft manufacturer when associated with a fluid application.

(5) The limitations or handling procedures resulting from (c)(3) and/or (c)(4) above should be part of the flight crew pre take-off briefing.

(d) Communications

(1) Before aircraft treatment. When the aircraft is to be treated with the flight crew on board, the flight and personnel involved in the operation should confirm the fluid to be used, the extent of treatment required and any aircraft type-specific procedure(s) to be used. Any other information needed to apply the ~~HoT~~ HOT tables should be exchanged.

(2) Anti-icing code. The operator's procedures should include an anti-icing code, which indicates the treatment the aircraft has received. This code provides the flight crew with the minimum details necessary to estimate a ~~HoT~~ HOT and confirms that the aircraft is free of contamination.

(3) After treatment. Before reconfiguring or moving the aircraft, the flight crew should receive a confirmation from the personnel involved in the operation that all de-icing

and/or anti-icing operations are complete and that all personnel and equipment are clear of the aircraft.

(e) Holdover protection & LWE systems

The operator should publish in the OM, when required, the ~~HoTs~~ HOTs in the form of a table or a diagram, to account for the various types of ground icing conditions and the different types and concentrations of fluids used. However, the times of protection shown in these tables are to be used as guidelines only and are normally used in conjunction with the pre-take-off check.

An operator may choose to operate using LWE systems instead of HOT tables whenever the required means for using these systems are in place.

(f) Training

The operator's initial and recurrent de-icing and/or anti-icing training programmes (including communication training) for flight crew and for other ~~those of its~~ personnel involved ~~in the operation who are involved~~ in de-icing and/or anti-icing operations should include additional training if any of the following are ~~is~~ introduced:

(1) a new method, procedure and/or technique;

(2) a new type of fluid and/or equipment; or

(3) a new type of aircraft.

(g) Contracting

When the operator contracts de-icing/anti-icing functions, the operator should ensure that the contractor complies with the operator's training/qualification procedures, together with any specific procedures in respect of:

~~(1) de-icing and/or anti-icing methods and procedures;~~
~~(2) fluids to be used, including precautions for storage and preparation for use~~
~~(3) specific aircraft provisions (e.g. no-spray areas, propeller/engine de-icing, APU operation etc.); and~~
~~(4) checking and communications procedures.~~

(1) roles and responsibilities;

(2) de-icing and/or anti-icing methods and procedures;

(3) fluids to be used, including precautions for storage, preparation for use and chemical incompatibilities;

(4) specific aircraft provisions (e.g. no-spray areas, propeller/engine de-icing, APU operation, etc.);

(5) different checks to be conducted; and

(6) procedures for communications with flight crew and any other third party involved.

(h) Special maintenance considerations

(1) General

The operator should take proper account of the possible side-effects of fluid use. Such effects may include, but are not necessarily limited to, dried and/or re-hydrated residues, corrosion and the removal of lubricants.

(2) Special considerations regarding residues of dried fluids

The operator should establish procedures to prevent or detect and remove residues of dried fluid. If necessary, the operator should establish appropriate inspection intervals based on the recommendations of the airframe manufacturers and/or the operator's own experience:

(i) Dried fluid residues

Dried fluid residues could occur when surfaces have been treated and the aircraft has not subsequently been flown and has not been subject to precipitation. The fluid may then have dried on the surfaces.

(ii) Re-hydrated fluid residues

Repetitive application of thickened de-icing/anti-icing fluids may lead to the subsequent formation/build-up of a dried residue in aerodynamically quiet areas, such as cavities and gaps. This residue may re-hydrate if exposed to high humidity conditions, precipitation, washing, etc., and increase to many times its original size/volume. This residue will freeze if exposed to conditions at or below 0 °C. This may cause moving parts, such as elevators, ailerons, and flap actuating mechanisms to stiffen or jam in-flight. Re-hydrated residues may also form on exterior surfaces, which can reduce lift, increase drag and stall speed. Re-hydrated residues may also collect inside control surface structures and cause clogging of drain holes or imbalances to flight controls. Residues may also collect in hidden areas, such as around flight control hinges, pulleys, grommets, on cables and in gaps.

(iii) Operators are strongly recommended to obtain information about the fluid dry-out and re-hydration characteristics from the fluid manufacturers and to select products with optimised characteristics.

(iv) Additional information should be obtained from fluid manufacturers for handling, storage, application and testing of their products.

GM3 NCC.OP.185 Ice and other contaminants – ground procedures

DE-ICING/ANTI-ICING — BACKGROUND INFORMATION

Further guidance material on this issue is given in the ICAO *Manual of Aircraft Ground De-icing/Anti-icing Operations* (Doc 9640). ~~(hereinafter referred to as the ICAO *Manual of Aircraft Ground De-icing/Anti-icing Operations*)~~.

(a) General

(1) Any deposit of frost, ice, snow or slush on the external surfaces of an aircraft may drastically affect its flying qualities because of reduced aerodynamic lift, increased drag, modified stability and control characteristics. Furthermore, freezing deposits may cause moving parts, such as elevators, ailerons, flap actuating mechanism etc., to jam and create a potentially hazardous condition. Propeller/engine/auxiliary power unit (APU)/systems performance may deteriorate due to the presence of frozen contaminants on blades, intakes and components. Also, engine operation may be seriously affected by the ingestion of snow or ice, thereby causing engine stall or compressor damage. In addition, ice/frost may form on certain external surfaces (e.g. wing upper and lower surfaces, etc.) due to the effects of cold fuel/structures, even in ambient temperatures well above 0 °C.

(2) Procedures established by the operator for de-icing and/or anti-icing are intended to ensure that the aircraft is clear of contamination so that degradation of aerodynamic characteristics or mechanical interference will not occur and, following anti-icing, to maintain the airframe in that condition during the appropriate ~~HoT~~ HOT.

(3) Under certain meteorological conditions, de-icing and/or anti-icing procedures may be ineffective in providing sufficient protection for continued operations. Examples of these conditions are freezing rain, ice pellets and hail~~, heavy~~ or snow exceeding certain intensities, high wind velocity, and rapidly ~~fast~~ dropping OAT. No ~~HoT~~ HOT guidelines exist for these conditions.

(4) Material for establishing operational procedures can be found, for example, in:

(i) ICAO Annex 3 ‘Meteorological Service for International Air Navigation’;

(ii) ICAO ‘Manual of Aircraft Ground De-icing/Anti-icing Operations’;

(iii) ~~ISO 11075 Aircraft - De-icing/anti-icing fluids - ISO type I;~~ SAE AS6285 ‘Aircraft Ground Deicing/Anti-Icing Processes’;

(iv) SAE AS6286 ‘Aircraft Ground Deicing/Anti-Icing Training and Qualification Program’;

(iv) ~~ISO 11076 Aircraft - De-icing/anti-icing methods with fluids~~; SAE AS6332 ‘Aircraft Ground Deicing/Anti-icing Quality Management’;

(v) ~~ISO 11077 Aerospace - Self propelled de-icing/anti-icing vehicles - Functional requirements;~~ SAE ARP6257 ‘Aircraft Ground De/Anti-Icing Communication Phraseology for Flight and Ground Crews’;

(vi) ~~ISO 11078 Aircraft - De-icing/anti-icing fluids -- ISO types II, III and IV~~; FAA Holdover Time Guidelines

(vii) ~~AEA ‘Recommendations for de-icing/anti-icing of aircraft on the ground’~~ FAA 8900.xxx series Notice ‘Revised FAA-Approved Deicing Program Updates, Winter 20xx-20yy’.

~~(ix) EUROCAE ED-104A Minimum Operational Performance Specification for Ground Ice Detection Systems;~~

~~(x) SAE AS5681 Minimum Operational Performance Specification for Remote On-Ground Ice Detection Systems;~~

~~(xi) SAE ARP4737 Aircraft - De-icing/anti-icing methods;~~

~~(xii) SAE AMS1424 De-icing/anti-Icing Fluid, Aircraft, SAE Type I;~~

~~(xiii) SAE AMS1428 Fluid, Aircraft De-icing/anti-Icing, Non-Newtonian, (Pseudoplastic), SAE Types II, III, and IV;~~

~~(xiv) SAE ARP1971 Aircraft De-icing Vehicle - Self-Propelled, Large and Small Capacity;~~

~~(xv) SAE ARP5149 Training Programme Guidelines for De-icing/anti-icing of Aircraft on Ground; and~~

~~(xvi) SAE ARP5646 Quality Program Guidelines for De-icing/anti-icing of Aircraft on the Ground.~~

(b) Fluids

(1) Type I fluid: Due to its properties, Type I fluid forms a thin, liquid-wetting film on surfaces to which it is applied which, under certain weather conditions, gives a very limited ~~HoT~~ HOT. ~~With this type of fluid, increasing the concentration of fluid in the fluid/water mix does not provide any extension in HoT.~~ For anti-icing purposes the fluid/water mixture should have a freezing point of at least 10 °C below OAT; increasing the concentration of fluid in the fluid/water mix does not provide any extension in HOT

(2) Type II and Type IV fluids contain thickeners which enable the fluid to form a thicker liquid-wetting film on surfaces to which it is applied. Generally, this fluid provides a

longer ~~HoT~~ HOT than Type I fluids in similar conditions. ~~With this type of fluid, the HoT can be extended by increasing the ratio of fluid in the fluid/water mix.~~

(3) Type III fluid is a thickened fluid especially intended for use on aircraft with low rotation speeds.

(4) Fluids used for de-icing and/or anti-icing should be acceptable to the operator and the aircraft manufacturer. These fluids normally conform to specifications such as SAE AMS1424, ~~SAE AMS1428 or equivalent~~. (Type I) or SAE AMS1428 (Types II, III and IV). Use of non-conforming fluids is not recommended due to their characteristics being unknown. The anti-icing and aerodynamic properties of thickened fluids may be seriously degraded by, for example, inappropriate storage, treatment, application, application equipment, age and in case they are applied on top of non-chemically compatible de-icing fluids.

(c) Hold-over protection

(1) Hold-over protection is achieved by a layer of anti-icing fluid remaining on and protecting aircraft surfaces for a period of time. With an one-step de-icing/anti-icing procedure, the ~~HoT~~ HOT begins at the commencement of de-icing/anti-icing. With a two-step procedure, the ~~HoT~~ HOT begins at the commencement of the second (anti-icing) step. The hold-over protection runs out:

(i) at the commencement of the take-off roll (due to aerodynamic shedding of fluid); or

(ii) when frozen deposits start to form or accumulate on treated aircraft surfaces, thereby indicating the loss of effectiveness of the fluid.

(2) The duration of hold-over protection may vary depending on the influence of factors other than those specified in the ~~HoT~~ HOT tables. Guidance should be provided by the operator to take account of such factors, which may include:

(i) atmospheric conditions, e.g. exact type and rate of precipitation, wind direction and velocity, relative humidity and solar radiation; and

(ii) the aircraft and its surroundings, such as aircraft component inclination angle, contour and surface roughness, surface temperature, operation in close proximity to other aircraft (jet or propeller blast) and ground equipment and structures.

(3) ~~HoTs~~ HOTs are not meant to imply that flight is safe in the prevailing conditions if the specified HOT has not been exceeded. Certain meteorological conditions, such as freezing drizzle or freezing rain, may be beyond the certification envelope of the aircraft.

AMC1 NCC.OP.225 Approach and landing conditions — aeroplanes

LANDING DISTANCE ASSESSMENT ~~/ FATO SUITABILITY~~

(a) The in-flight ~~determination of the~~ landing distance~~/FATO suitability~~ should be based on the latest available ~~meteorological~~ weather report ~~or~~ and runway condition report (RCR).

(b) The assessment should be initially carried out when the weather report and the RCR are obtained, usually around top of descent. If the planned duration of the flight does not allow the flight crew to carry out the assessment in non-critical phases of flight, the assessment should be carried out before departure.

(c) When meteorological conditions may lead to a degradation of the runway surface condition, the assessment should include consideration of how much deterioration in runway surface friction characteristics may be tolerated, so that a quick decision can be made prior to landing.

(d) The flight crew should monitor the evolution of the actual conditions during the approach, to ensure that they do not degrade below the condition that was previously determined to be the minimum acceptable.

(e) The in-flight determination of the landing distance should be done is such way that either:

(1) the landing distance available (LDA) on the intended runway is at least 115 % of the landing distance at the estimated time of landing, determined in accordance with the performance information for the assessment of the landing distance at time of arrival (LDTA); or

(2) if performance information for the assessment of the LDTA is not available, the LDA on the intended runway at the estimated time of landing is at least the landing distance determined at the time of dispatch.

(f) If performance information for the assessment of the LDTA is available, it should be based on approved data contained in the AFM, or on other data that is either determined in accordance with the applicable certification standards for aeroplanes or determined by the CAA.

(g) Whenever the runway braking action encountered during the landing roll is not as good as reported by the aerodrome operator in the RCR, the pilot-in-command should notify the air traffic services (ATS) by means of a special air-report (AIREP) as soon as practicable.

GM1 NCC.OP.225 Approach and landing conditions — aeroplanes

LANDING DISTANCE

The assessment of the LDTA begins with the acquisition of the latest available weather information and the RCR. The information provided in the RCR is divided in two sections:

(a) The ‘aircraft performance’ section which contains information that is directly relevant in a performance computation.

(b) The ‘situational awareness’ section which contains information that the flight crew should be aware of for a safe operation, but which does not have a direct impact on the performance assessment.

The ‘aircraft performance’ section of the RCR includes a runway condition code (RWYCC), the contaminant type, depth and coverage for each third of the runway.

The determination of the RWYCC is based on the use of the runway condition assessment matrix (RCAM); however, the presentation of the information in the RCAM is appropriate for use by aerodrome personnel trained and competent in assessing the runway condition in a way that is relevant to aircraft performance. While full implementation of the RCAM standard would eventually no longer require the flight crew to derive from various information available to them the appropriate runway condition to be used for the landing performance assessment at the time of arrival, it is desirable that pilots maintain an understanding of the performance effect of various components considered in the assessment.

It is the task of the aerodrome personnel to assess the appropriate RWYCC in order to allow the flight crew to assess any potential change of the runway in use. When no RWYCC is available in winter conditions, the RCAM provides the flight crew with a combination of the relevant information (runway surface conditions: state and/or contaminant or pilot report of braking action (AIREP)) in order to determine the RWYCC.

Table 1 below is an excerpt of the RCAM and permits to carry out the primary assessment based on the reported contaminant type and depth, as well as on the OAT.

Table 1: Association between the runway surface condition and the RWYCC based on the reported contaminant type and depth and OAT

Runway surface condition	Surface condition descriptor	Depth	Notes	RWYCC
Dry		n/a		6
Wet	Damp (any visible dampness)	3 mm or less	Including wet and contaminated runways below 25 % coverage in each runway third	5
	Wet			
Slippery wet				3
Contaminated	Compacted snow	Any	At or below OAT – 15°C [3]	4
			Above OAT –15°C [3]	3
	Dry snow	3 mm or less		5
		More than 3 mm up to 100 mm	Including when any depth occurs on top of compacted snow	3
		Any	On top of ice	0[2]
	Frost[1]	Any		5
	Ice	Any	In cold and dry conditions	1
	Slush	3 mm or less		5
		More than 3 mm up to 15 mm		2
	Standing water	3 mm or less		5
		More than 3 mm up to 15 mm		2
		Any	On top of ice	0[2]
	Wet ice	Any		0[2]
	Wet snow	3 mm or less		5
		More than 3 mm up to 30 mm	Including when any depth occurs on top of compacted snow	3
		Any	On top of ice	0[2]

Note 1: Under certain conditions, frost may cause the surface to become very slippery.

Note 2: Operations in conditions where less-than-poor braking action prevails are prohibited.

Note 3: The runway surface temperature should preferably be used where available.

A primary assessment may have to be downgraded by the aerodrome operator based on an AIREP of lower braking action than the one typically associated with the type and depth of contaminant on the runway or any other observation.

Upgrading a RWYCC 5, 4, 3 or 2 determined by the aerodrome operator from the observed contaminant type is not allowed.

A RWYCC 1 or 0 maybe be upgraded by the aerodrome operator to a maximum of RWYCC 3. The reason for the upgrade will be specified in the 'situational awareness' section of the RCR.

When the aerodrome operator is approved for operations on specially prepared winter runways, in accordance with Annex V (Part-ADR.OPS) to UK Regulation (EU) No 139/2014, the RWYCC of a runway that is contaminated with compacted snow or ice, may be upgraded to RWYCC 4 depending upon a specific treatment of the runway. In such cases, the reason for the upgrade will be specified in the 'situational awareness' section of the RCR. When the aerodrome operator is approved for specially prepared winter runways, in accordance with

Annex IV (Part-ADR.OPS) to UK Regulation (EU) No 139/2014, a runway that is contaminated with compacted snow or ice and has been treated according to specific procedures, will normally be reported as a maximum of RWYCC 4 SPECIALLY PREPARED WINTER RUNWAY. If the aerodrome operator is in doubt about the quality of the surface, it will be reported with a lower RWYCC, but the runway descriptor will still be SPECIALLY PREPARED WINTER RUNWAY. The term DOWNGRADED will be used in the 'situational awareness' section of the RCR. A SPECIALLY PREPARED WINTER RUNWAY has no loose contaminant; hence no contaminant drag on acceleration, and stopping performance corresponding to the reported RWYCC.

Performance information for the assessment of the LDTA correlates the aircraft performance with the RWYCC contained in the RCR, hence the calculation will be based on the RWYCC of the intended runway of landing.

GM2 NCC.OP.225 Approach and landing conditions — aeroplanes

RUNWAY CONDITIONS

A detailed description of the relevant elements for consideration regarding the portion of the runway that will be used for landing is provided at **GM2 CAT.OP.MPA.303**.

GM3 NCC.OP.225 Approach and landing conditions — aeroplanes

RCR, RWYCC and RCAM

A detailed description of the RCR format and content, the RWYCC and the RCAM may be found in Annex V (Part-ADR.OPS) to UK Regulation (EU) No 139/2014. Further guidance may be found in the following documents:

(a) ICAO Doc 9981 'PANS Aerodromes';

(b) ICAO Doc 4444 'PANS ATM';

(c) ICAO Doc 10064 'Aeroplane Performance Manual'; and

(d) ICAO Circular 355 'Assessment, Measurement and Reporting of Runway Surface Conditions'.

GM4 NCC.OP.225 Approach and landing conditions — aeroplanes

PERFORMANCE INFORMATION FOR THE ASSESSMENT OF LDTA

Guidance on performance information for the assessment of the LDTA may be found in:

(a) AMC1 CAT.OP.MPA.303(e) of the AMC & GM to Annex IV (Part CAT) to UK Regulation (EU) No 965/2012; and

(b) ICAO Doc 10064 'Aeroplane Performance Manual'.

GM5 NCC.OP.225 Approach and landing conditions — aeroplanes

REPORTING ON RUNWAY BRAKING ACTION

The role of the flight crew in the runway surface condition reporting process does not end once a safe landing has been achieved. While the aerodrome operator is responsible for generating the RCR, flight crew are encouraged to provide accurate braking action reports.

The flight crew braking action reports provide feedback to the aerodrome operator regarding the accuracy of the RCR resulting from the observed runway surface conditions.

ATC passes these braking action reports to the aerodrome operator, which in turn uses them in conjunction with the RCAM to determine if it is necessary to downgrade or upgrade the Runway Condition Code (RWYCC).

During busy times, runway inspections and maintenance may be less frequent and need to be sequenced with arrivals. Therefore, aerodrome operators may depend on braking action reports to confirm that the runway surface condition is not deteriorating below the assigned RCR.

Since both the ATC and the aerodrome operator rely on accurate braking action reports, flight crew should use standardised terminology in accordance with ICAO Doc 4444 'PANS ATM'.

The following Table 1 shows the correlation between the terminology to be used in the AIREP to report the braking action and the RWYCC.

Table 1: Association between AIREP and RWYCC

AIREP (braking action)	Description	RWYCC
N/A		6
GOOD	Braking deceleration is normal for the wheel braking effort applied AND directional control is normal.	5
GOOD TO MEDIUM	Braking deceleration OR directional control is between good and medium.	4
MEDIUM	Braking deceleration is noticeably reduced for the wheel braking effort applied OR directional control is noticeably reduced.	3
MEDIUM TO POOR	Braking deceleration OR directional control is between medium and poor.	2
POOR	Braking deceleration is significantly reduced for the wheel braking effort applied OR directional control is significantly reduced.	1
LESS THAN POOR	Braking deceleration is minimal to non-existent for the wheel braking effort applied OR directional control is uncertain.	0

An AIREP should be transmitted to the ATC, in accordance with one of the following specifications, as applicable:

(a) Good braking action is reported as 'BRAKING ACTION GOOD'.

(b) Good to medium braking action is reported as 'BRAKING ACTION GOOD TO MEDIUM'.

(c) Medium braking action is reported as 'BRAKING ACTION MEDIUM'.

(d) Medium to poor braking action is reported as "BRAKING ACTION MEDIUM TO POOR"

(e) Poor braking action is reported as 'BRAKING ACTION POOR'.

(f) Less than poor braking action is reported as 'BRAKING ACTION LESS THAN POOR'.

In some cases, the differences between two consecutive levels of the six braking action categories between 'Good' and 'Less than Poor' may be too subtle for the flight crew to detect.

It is therefore acceptable for the flight crew to report on a more coarse scale of ‘Good’, ‘Medium’ and ‘Poor’.

Whenever requested by ATC, or if the braking action encountered during the landing roll is not as previously reported by the aerodrome operator in the RCR, pilots should provide a braking action report. This is especially important and safety relevant where the experienced braking action is worse than the braking action associated with any RWYCC code currently in effect for that portion of the runway concerned.

When the experienced braking action is better than that reported by the aerodrome operator, it is important to report this information, which may trigger further actions for the aerodrome operator in order to upgrade the RCR.

If an aircraft-generated braking action report is available, it should be transmitted, identifying its origin accordingly. If the flight crew have a reason to modify the aircraft-generated braking action report based on their judgement, the commander should be able to amend such report.

A braking action AIREP of ‘Less Than Poor’ leads to a runway closure until the aerodrome operator can improve the runway condition.

An air safety report should be submitted whenever flight safety has been endangered due to low braking action.

GM6 NCC.OP.225 Approach and landing conditions — aeroplanes

FLIGHT CREW TRAINING

Flight crew should be trained on the use of the RCR, on the use of performance data for the assessment of the LDTA, if available, and on reporting braking action using the AIREP format.

Guidance on the development of the content of the training may be found in:

(a) AMC1 CAT.OP.MPA.303 & CAT.OP.MPA.311 of the AMC & GM to Annex IV (Part CAT) to UK Regulation (EU) No 965/2012, as applicable to the intended operations;

(b) ICAO Doc 10064 ‘Aeroplane Performance Manual’; and

(c) ICAO Circular 355 ‘Assessment, Measurement and Reporting of Runway Surface Conditions’.

AMC1 NCC.OP.226 Approach and landing conditions — helicopters

FATO SUITABILITY

The in-flight determination of the final approach and take-off area (FATO) suitability should be based on the latest available meteorological report.

GM1 NCC.POL.105(e) Mass and balance, loading

TYPE OF FLIGHTS

(a) For the purpose of Table 3 of **NCC.POL.105(e):**

(1) domestic flight means a flight with origin and destination within the borders of one State.

(2) flights within the European region means flights, other than domestic flights, whose origin and destination are within the area specified in item (b).

(3) Intercontinental flight means flights beyond the European region with origin and destination in different continents.

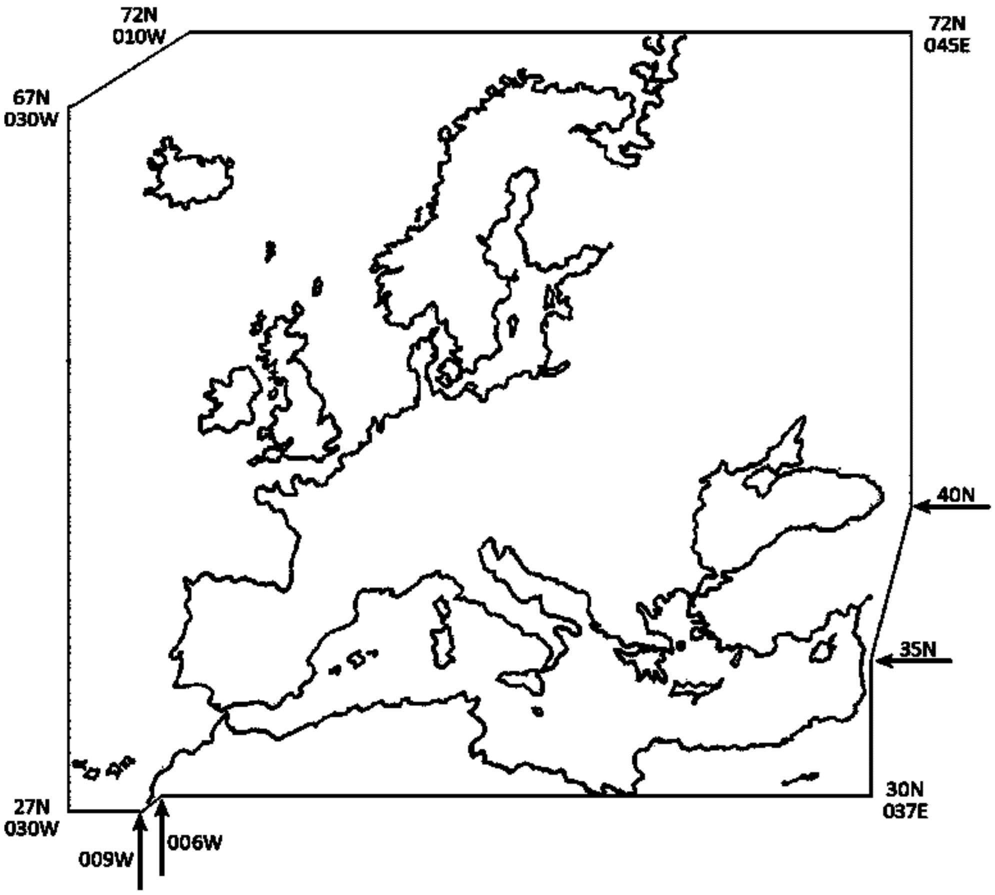
(b) Flights within the European region are flights conducted within the following area:

N7200	E04500
N4000	E04500
N3500	E03700
N3000	E03700
N3000	W00600
N2700	W00900
N2700	W03000
N6700	W03000
N7200	W01000
N7200	E04500

as depicted in Figure 1: European region.

Figure 1:

The European region



GM1 NCC.POL.125 Take-off – aeroplanes

RUNWAY SURFACE CONDITION

Operation on runways contaminated with water, slush, snow or ice implies uncertainties with regard to runway friction and contaminant drag and therefore to the achievable performance and control of the aeroplane during take-off or landing, since the actual conditions may not completely match the assumptions on which the performance information is based. In the case of a contaminated runway, the first option for the pilot-in-command is to wait until the runway is cleared. If this is impracticable, ~~he/she~~ he or she may consider a take-off or landing, provided that he or she has applied the applicable performance adjustments, and any further safety measures ~~he/she~~ he or she considers justified under the prevailing conditions. The excess runway length available including the criticality of the overrun area should also be considered.

The determination of take-off performance data for wet and contaminated runways should be based on the reported runway surface condition in terms of contaminant and depth.

GM1 NCC.POL.135 Landing — aeroplanes

WET AND CONTAMINATED RUNWAY DATA

The determination of landing performance data should be based on information provided in the operations manual (OM) on the reported RWYCC. The RWYCC is determined by the aerodrome operator using the RCAM and associated procedures defined in ICAO Doc 9981 'PANS Aerodromes'. The RWYCC is reported through an RCR in the SNOWTAM format in accordance with ICAO Annex 15.

AMC1 NCC.IDE.A.105 Minimum equipment for flight

MANAGEMENT OF THE STATUS OF CERTAIN INSTRUMENTS, EQUIPMENT OR FUNCTIONS

The operator should control and retain the status of the instruments, equipment or functions required for the intended operation, that are not controlled for the purpose of continuing airworthiness management.

GM1 NCC.IDE.A.105 Minimum equipment for flight

MANAGEMENT OF THE STATUS OF CERTAIN INSTRUMENTS, EQUIPMENT OR FUNCTIONS

(a) The operator should define responsibilities and procedures to retain and control the status of instruments, equipment or functions required for the intended operation, that are not controlled for the purpose of continuing airworthiness management.

(b) Examples of such instruments, equipment or functions may be, but are not limited to, equipment related to navigation approvals as FM immunity or certain software versions.

AMC2 NCC.IDE.A.165 Flight data recorder

OPERATIONAL PERFORMANCE REQUIREMENTS FOR AEROPLANES FIRST ISSUED WITH AN INDIVIDUAL CofA ON OR AFTER 1 JANUARY 2023

(a) The operational performance requirements for flight data recorders (FDRs) should be those laid down in EUROCAE Document 112A (Minimum Operational Performance Specification for Crash Protected Airborne Recorder Systems) dated September 2013, or any later equivalent standard produced by EUROCAE.

(b) The FDR should, with reference to a timescale, record:

  (1) the list of parameters in Table 1 below;

  (2) the additional parameters listed in Table 2 below, when the information data source for the parameter is used by aeroplane systems or is available on the instrument panel for use by the flight crew to operate the aeroplane; and

  (3) any dedicated parameters related to novel or unique design or operational characteristics of the aeroplane as determined by the CAA.

(c) The parameters to be recorded should meet the performance specifications (range, sampling intervals, accuracy limits and resolution in read-out) as defined in the relevant tables of EUROCAE Document 112A, or any later equivalent standard produced by EUROCAE.

Table 1: FDR — All aeroplanes

No*	Parameter
1a 1b 1c	Time; or Relative time count Global navigation satellite system (GNSS) time synchronisation
2	Pressure altitude (including altitude values displayed on each flight crew member's primary flight display, unless the aeroplane is type certified before 1 January 2023 and recording the values displayed at the captain position or the first officer position would require extensive modification)
3	Indicated airspeed or calibrated airspeed (including values of indicated airspeed or calibrated airspeed displayed on each flight crew member's primary flight display, unless the aeroplane is type certified before 1 January 2023 and recording the values displayed at the captain position or the first officer position would require extensive modification)
4	Heading (primary flight crew reference) — when true or magnetic heading can be selected, the primary heading reference, a discrete indicating selection should be recorded.
5	Normal acceleration
6	Pitch attitude — pitch attitude values displayed on each flight crew member's primary flight display should be recorded, unless the aeroplane is type certified before 1 January 2023 and recording the values displayed at the captain position or the first officer position would require extensive modification.
7	Roll attitude — roll attitude values displayed on each flight crew member's primary flight display should be recorded, unless the aeroplane is type certified before 1 January 2023 and recording the values displayed at the captain position or the first officer position would require extensive modification.
8	Manual radio transmission keying and CVR/FDR synchronisation reference
9 9a 9b	Engine thrust/power: Parameters required to determine propulsive thrust/power on each engine, in both normal and reverse thrust Flight crew compartment thrust/power lever position (for aeroplanes with non-mechanically linked engine controls in the flight crew compartment)
14	Total or outside air temperature
16	Longitudinal acceleration (body axis)
17	Lateral acceleration
18 18a 18b 18c	Primary flight control surface and/or primary flight control pilot input (For aeroplanes with control systems in which the movement of a control surface will back drive the pilot's control, 'or' applies. For aeroplanes with control systems in which the movement of a control surface will not back drive the pilot's control, 'and' applies. For multiple or split surfaces, a suitable combination of inputs is acceptable in lieu of recording each surface separately. For aeroplanes that have a flight control break-away capability that allows either pilot to operate the controls independently, record both inputs): Pitch axis Roll axis Yaw axis
19	Pitch trim surface position
23	Marker beacon passage
24	Warnings — in addition to the master warning, each 'red' warning that cannot be determined from other parameters or from the CVR and each smoke warning from other compartments should be recorded.
25	Each navigation receiver frequency selection
27	Air–ground status. Air–ground status and a sensor of each landing gear if installed

* The number in the left-hand column reflects the serial number depicted in EUROCAE 112A.

Table 2: FDR — Aeroplanes for which the data source for the parameter is either used by the aeroplane systems or is available on the instrument panel for use by the flight crew to operate the aeroplane

No*	Parameter
10 10a 10b	Flaps: Trailing edge flap position Flight crew compartment control selection
11 11a 11b	Slats: Leading edge flap (slat) position Flight crew compartment control selection
12	Thrust reverse status
13 13a 13b 13c 13d	Ground spoiler and speed brake: Ground spoiler position Ground spoiler selection Speed brake position Speed brake selection
15	Autopilot, autothrottle and automatic flight control system (AFCS): mode and engagement status (showing which systems are engaged and which primary modes are controlling the flight path and speed of the aircraft)
20	Radio altitude. For auto-land/category III operations, each radio altimeter should be recorded.
21 21a 21b 21c	Vertical deviation — the approach aid in use should be recorded. For auto-land/category III operations, each system should be recorded: ILS/GPS/GLS glide path MLS elevation Integrated approach navigation (IAN) /Integrated Area Navigation, vertical deviation
22 22a 22b 22c	Horizontal deviation — the approach aid in use should be recorded. For auto-land/category III operations, each system should be recorded: ILS/GPS/GLS localiser MLS azimuth GNSS approach path/IRNAV lateral deviation
26 26a 26b	Distance measuring equipment (DME) 1 and 2 distances: Distance to runway threshold (GLS) Distance to missed approach point (IRNAV/IAN)
28 28a 28b 28c	Ground proximity warning system (GPWS)/terrain awareness warning system (TAWS)/ground collision avoidance system (GCAS) status — a suitable combination of discretes unless recorder capacity is limited in which case a single discrete for all modes is acceptable: Selection of terrain display mode, including pop-up display status Terrain alerts, including cautions and warnings and advisories On/off switch position
29	Angle of attack
30 30a 30b	Low pressure warning (each system): Hydraulic pressure Pneumatic pressure
31	Ground speed
32 32a 32b	Landing gear: Landing gear position Gear selector position
33 33a 33b 33c 33d 33e 33f	Navigation data: Drift angle Wind speed Wind direction Latitude Longitude GNSS augmentation in use
34	Brakes:

No*	Parameter
34a 34b	Left and right brake pressure Left and right brake pedal position
35 35a 35b 35c 35d 35e 35f 35g 35h 35i	Additional engine parameters (if not already recorded in parameter 9 of Table 1, and if the aeroplane is equipped with a suitable data source): Engine pressure ratio (EPR) N1 Indicated vibration level N2 Exhaust gas temperature (EGT) Fuel flow Fuel cut-off lever position N3 Engine fuel metering valve position (or equivalent parameter from the system that directly controls the flow of fuel into the engine) — for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification.
36 36a 36b 36c 36d 36e	Traffic alert and collision avoidance system (TCAS)/airborne collision avoidance system (ACAS) — a suitable combination of discretes should be recorded to determine the status of the system: Combined control Vertical control Up advisory Down advisory Sensitivity level
37	Wind shear warning
38 38a 38b	Selected barometric setting — to be recorded for the aeroplane where the parameter is displayed electronically: Pilot selected barometric setting Co-pilot selected barometric setting
39	Selected altitude (all pilot selectable modes of operation) — to be recorded for the aeroplane where the parameter is displayed electronically
40	Selected speed (all pilot selectable modes of operation) — to be recorded for the aeroplane where the parameter is displayed electronically
41	Selected Mach (all pilot selectable modes of operation) — to be recorded for the aeroplane where the parameter is displayed electronically
42	Selected vertical speed (all pilot selectable modes of operation) — to be recorded for the aeroplane where the parameter is displayed electronically
43	Selected heading (all pilot selectable modes of operation) — to be recorded for the aeroplane where the parameter is displayed electronically
44 44a 44b 44c	Selected flight path (all pilot selectable modes of operation) — to be recorded for the aeroplane where the parameter is displayed electronically: Course/desired track (DSTRK) Path angle Coordinates of final approach path (IRNAV/IAN)
45	Selected decision height — to be recorded for the aeroplane where the parameter is displayed electronically
46 46a 46b	Electronic flight instrument system (EFIS) display format, showing the display system status: Pilot Co-pilot
47	Multi-function/engine/alerts display format, showing the display system status
48	Alternating current (AC) electrical bus status — each bus
49	Direct current (DC) electrical bus status — each bus
50	Engine bleed valve(s) position
51	Auxiliary power unit (APU) bleed valve(s) position
52	Computer failure — all critical flight and engine control systems

No*	Parameter
53	Engine thrust command
54	Engine thrust target
55	Computed centre of gravity (CG)
56	Fuel quantity in CG trim tank
57	Head-up display in use
58	Paravisual display on
59	Operational stall protection, stick shaker and pusher activation
60 60a 60b 60c 60d 60e 60f	Primary navigation system reference: GNSS Inertial navigational system (INS) VHF omnidirectional radio range (VOR)/distance measuring equipment (DME) MLS Loran C ILS
61	Ice detection
62	Engine warning — each engine vibration
63	Engine warning — each engine over temperature
64	Engine warning — each engine oil pressure low
65	Engine warning — each engine overspeed
66	Yaw trim surface position
67	Roll trim surface position
68	Yaw or sideslip angle
69	De-icing and/or anti-icing systems selection
70	Hydraulic pressure — each system
71	Loss of cabin pressure
72	Trim control input position in the flight crew compartment, pitch — when mechanical means for control inputs are not available, displayed trim position or trim command should be recorded.
73	Trim control input position in the flight crew compartment, roll — when mechanical means for control inputs are not available, displayed trim position or trim command should be recorded.
74	Trim control input position in the flight crew compartment, yaw — when mechanical means for control inputs are not available, displayed trim position or trim command should be recorded.
75 75a 75b 75c	All flight control input forces (for fly-by-wire flight control systems, where control surface position is a function of the displacement of the control input device only, it is not necessary to record this parameter): Control wheel input forces Control column input forces Rudder pedal input forces
76	Event marker
77	Date
78	Actual navigation performance (ANP) or estimate of position error (EPE) or estimate of position uncertainty (EPU)
79	Cabin pressure altitude — for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification.
80	Aeroplane computed weight — for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification.
81 81a 81b	Flight director command: Left flight director pitch command — for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification. Left flight director roll command — for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification.

No*	Parameter
81c 81d	Right flight director pitch command — for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification. Right flight director roll command — for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification.
82	Vertical speed — for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification.

* The number in the left-hand column reflects the serial number depicted in EUROCAE Document 112A.

AMC1 NCC.IDE.A.245 & NCC.IDE.A.250 Radio communication equipment & Navigation equipment

PERFORMANCE-BASED COMMUNICATION AND SURVEILLANCE (PBCS) OPERATIONS

For operations in airspaces where required communication performance (RCP) and required surveillance performance (RSP) for PBCS have been prescribed, the operator should:

(a) ensure that the communication equipment and surveillance equipment meet the prescribed RCP and RSP specifications respectively, as shown by an AFM statement or equivalent.

(b) ensure that operational constraints are reflected in the MEL;

(c) establish and include in the OM:

(1) normal, abnormal and contingency procedures;

(2) the flight crew qualification and proficiency constraints; and

(3) a training programme for relevant personnel consistent with the intended operations;

(d) ensure continued airworthiness of the communication equipment and surveillance equipment in accordance with the appropriate RCP and RSP specifications respectively;

(e) ensure that the contracted communication service provider (CSP) for the airspace being flown complies with the required RCP and RSP specifications as well as with monitoring, recording and notification requirements; and

(f) participate to monitoring programmes established in the airspace being flown in order to:

(1) submit the relevant reports of observed communication and surveillance performance respectively; and

(2) establish a process for immediate corrective action in case non-compliance with the appropriate RCP or RSP specifications is detected.

GM1 NCC.IDE.A.245 & NCC.IDE.A.250 Radio communication equipment & Navigation equipment

PBCS OPERATIONS — GENERAL

Detailed guidance material on PBCS operations may be found in the following documents:

(a) ICAO Doc 9869 'Performance-based Communication and Surveillance (PBCS) Manual'

(b) ICAO Doc 10037 'Global Operational Data Link (GOLD) Manual'

PBCS OPERATIONS — AIRCRAFT ELIGIBILITY

(a) The aircraft eligibility for compliance with the required RCP/RSP specifications should be demonstrated by the aircraft manufacturer or equipment supplier and be specific to each individual aircraft or the combination of the aircraft type and the equipment. The demonstrated compliance with specific RCP/RSP specifications may be documented in one of the following documents:

(1) the type certificate (TC);

(2) the supplemental type certificate (STC);

(3) the aeroplane flight manual (AFM) or AFM Supplement; or

(4) a compliance statement from the manufacturer or the holder of the design approval of the data link installation, approved by the State of Design.

(b) In addition to the indication of compliance with specific RCP/RSP specifications, the aircraft manufacturer or equipment supplier should document any associated operating limitations, information and procedures in the AFM or other appropriate documents.

PBCS OPERATIONS — MEL ENTRIES

(a) The operator should amend the MEL, in accordance with the items identified by the aircraft manufacturer or equipment supplier in the master minimum equipment list (MMEL) or MMEL supplement, in relation to PBCS capability, to address the impact of losing an associated system/sub-system on data link operational capability.

(b) As an example, equipment required in current FANS 1/A-capable aircraft, potentially affecting RCP and RSP capabilities, may be the following:

(1) VHF, SATCOM, or HFDL1 radios, as applicable;

(2) ACARS management unit (MU)/communications management unit (CMU);

(3) flight management computer (FMC) integration; and

(4) printer, if procedures require its use.

PBCS OPERATIONS — OPERATING PROCEDURES

The operator should establish operating procedures for the flight crew and other relevant personnel, such as but not limited to, flight dispatchers and maintenance personnel. These procedures should cover the usage of PBCS-relevant systems and include as a minimum:

(a) pre-flight planning requirements including MEL consideration and flight plan filing;

(b) actions to be taken in the data link operation, to include specific RCP/RSP required cases;

(c) actions to be taken for the loss of data link capability while in and prior to entering the airspace requiring specific RCP/RSP specifications. Examples may be found in ICAO Doc 10037;

(d) problem reporting procedures to the local/regional PBCS monitoring body or central reporting body as applicable; and

(e) compliance with specific regional requirements and procedures, if applicable.

PBCS OPERATIONS — QUALIFICATION AND TRAINING

(a) The operator should ensure that flight crew and other relevant personnel such as flight dispatchers and maintenance personnel are proficient with PBCS operations. A separate training programme is not required if data link communication is integrated in the current training programme. However, the operator should ensure that the existing training programme incorporates a basic PBCS concept and requirements for flight crew and other personnel that have direct impact on overall data link performance required for the provisions of air traffic services such as reduced separation.

(b) The elements covered during the training should be as a minimum:

(1) Flight crew

(i) Data link communication system theory relevant to operational use;

(ii) AFM limitations;

(iii) Normal pilot response to data link communication messages;

(iv) Message elements in the message set used in each environment;

(v) RCP/RSP specifications and their performance requirements;

(vi) Implementation of performance-based reduced separation with associated RCP/RSP specifications or other possible performance requirements associated with their routes;

(vii) Other ATM operations involving data link communication services;

(viii) Normal, non-normal and contingency procedures; and

(ix) Data link communication failure/problem and reporting.

Note (1) If flight crew has already been trained on data link operations, additional training only on PBCS is required, addressing a basic concept and requirements that have direct impact on overall data link performance required for provisions of air traffic services (e.g. reduced separation).

Note (2) Training may be provided through training material and other means that simulate the functionality.

(2) Dispatchers/flight operations officers

(i) Proper use of data link and PBCS flight plan designators;

(ii) Air traffic service provider's separation criteria and procedures relevant to RCP/RSP specifications;

(iii) MEL remarks or exceptions based on data link communication;

(iv) Procedures for transitioning to voice communication and other contingency procedures related to the operation in the event of abnormal behaviour of the data link communication;

(v) Coordination with the ATS unit related to, or following a special data link communication exceptional event (e.g. log-on or connection failures); and

(vi) Contingency procedures to transition to a different separation standard when data link communication fails.

(3) Engineering and maintenance personnel

(i) Data link communication equipment including its installation, maintenance and modification;

(ii) MEL relief and procedures for return to service authorisations; and

(iii) Correction of reported non-performance of data link system.

PBCS OPERATIONS — CONTINUED AIRWORTHINESS

(a) The operator should ensure that aircraft systems are properly maintained to continue to meet the applicable RCP/RSP specifications.

(b) The operator should ensure that the following elements are documented and managed appropriately:

(1) configuration and equipment list detailing the pertinent hardware and software components for the aircraft/fleet(s) applicable to the specific RCP/RSP operation;

(2) configuration control for subnetwork, communication media and routing policies; and

(3) description of systems including display and alerting functions (including message sets).

PBCS OPERATIONS — CSP COMPLIANCE

(a) The operator should ensure that their contracted CSPs notify the ATS units of any failure condition that may have an impact on PBCS operations. Notification should be made to all relevant ATS units regardless of whether the CSP has a contract with them.

(b) The operator may demonstrate the compliance of their contracted CSP through service level agreements (SLAs)/contractual arrangements for data link services or through a joint agreement among PBCS stakeholders such as a Memorandum of understanding (MOU) or a PBCS Charter.

PBCS OPERATIONS — PBCS CHARTER

A PBCS charter has been developed by PBCS stakeholders and is available as an alternative to SLAs in order to validate the agreement between the operator and the CSP for compliance with RCP/RSP required for PBCS operations. The charter is hosted on the website www.FANS-CRA.com where operators and CSPs can subscribe.

PBCS OPERATIONS — PARTICIPATION IN MONITORING PROGRAMMES

(a) The operator should establish a process to participate in local or regional PBCS monitoring programmes and provide the following information, including any subsequent changes, to monitoring bodies:

(1) operator name;

(2) operator contact details; and

(3) other coordination information as applicable, including appropriate information means for the CSP/SSP service fail notification.

(b) The process should also address the actions to be taken with respect to problem reporting and resolution of deficiencies, such as:

(1) reporting problems identified by the flight crew or other personnel to the PBCS monitoring bodies associated with the route of flight on which the problem occurred

(2) disclosing operational data in a timely manner to the appropriate PBCS monitoring bodies when requested for the purposes of investigating a reported problem

(3) investigating and resolving the cause of the deficiencies reported by the PBCS monitoring bodies.

AMC1 NCC.IDE.H.105 Minimum equipment for flight

MANAGEMENT OF THE STATUS OF CERTAIN INSTRUMENTS, EQUIPMENT OR FUNCTIONS

The operator should control and retain the status of the instruments, equipment or functions required for the intended operation, that are not controlled for the purpose of continuing airworthiness management.

GM1 NCC.IDE.H.105 Minimum equipment for flight

MANAGEMENT OF THE STATUS OF CERTAIN INSTRUMENTS, EQUIPMENT OR FUNCTIONS

(a) The operator should define responsibilities and procedures to retain and control the status of instruments, equipment or functions required for the intended operation, that are not controlled for the purpose of continuing airworthiness management.

(b) Examples of such instruments, equipment or functions may be, but are not limited to, equipment related to navigation approvals as FM immunity or certain software versions.

AMC1 NCO.OP.225 Approach and landing conditions — aeroplanes ~~and helicopters~~

LANDING DISTANCE ASSESSMENT ~~/ FATO SUITABILITY~~

(a) The in-flight ~~determination of the~~ landing distance~~/FATO suitability~~ should be based on the latest available ~~meteorological~~ weather report ~~or~~ and runway condition report (RCR).

(b) The assessment should be initially carried out when weather report and RCR, if available, are obtained, usually around top of descent. If the planned duration of the flight does not allow the flight crew to carry out the assessment in non-critical phases of flight, the assessment should be carried out before departure.

(c) When meteorological conditions may lead to a degradation of the runway surface condition, the assessment should include consideration of how much deterioration in runway surface friction characteristics may be tolerated, so that a quick decision can be made prior to landing.

(d) Whenever the RCR is in use and the runway braking action encountered during the landing roll is not as good as reported by the aerodrome operator in the RCR, the pilot-in-command should notify the air traffic services (ATS) by means of a special air-report (AIREP) as soon as practicable.

GM1 NCO.OP.205 Approach and landing conditions — aeroplanes

RUNWAY CONDITION REPORT (RCR)

When the aerodrome reports the runway conditions by means of an RCR, the information contained therein includes a runway condition code (RWYCC). The determination of the RWYCC is based on the use of the runway condition assessment matrix (RCAM). The RCAM correlates the RWYCC with the contaminants present on the runway and the braking action.

A detailed description of the RCR format and content, the RWYCC and the RCAM may be found in Annex V (Part-ADR.OPS) to Regulation (EU) No 139/2014, in UK Regulation (EU) 2017/373 and in UK Regulation (EU) No 923/2012 (SERA). Further guidance may be found in the following documents:

(a) ICAO Doc 9981 ‘PANS Aerodromes’;

(b) ICAO Doc 4444 ‘PANS ATM’;

(c) ICAO Doc 10064 ‘Aeroplane Performance Manual’; and

(d) ICAO Circular 355 'Assessment, Measurement and Reporting of Runway Surface Conditions'.

AMC1 NCO.OP.206 Approach and landing conditions — helicopters

FATO SUITABILITY

The in-flight determination of the FATO suitability should be based on the latest available meteorological report.

AMC1 NCO.IDE.A.105 Minimum equipment for flight

MANAGEMENT OF THE STATUS OF CERTAIN INSTRUMENTS, EQUIPMENT OR FUNCTIONS

The operator should control and retain the status of the instruments, equipment or functions required for the intended operation, that are not controlled for the purpose of continuing airworthiness management.

GM1 NCO.IDE.A.105 Minimum equipment for flight

MANAGEMENT OF THE STATUS OF CERTAIN INSTRUMENTS, EQUIPMENT OR FUNCTIONS

(a) The operator should define responsibilities and procedures to retain and control the status of instruments, equipment or functions required for the intended operation, that are not controlled for the purpose of continuing airworthiness management.

(b) Examples of such instruments, equipment or functions may be, but are not limited to, equipment related to navigation approvals as FM immunity or certain software versions.

AMC1 NCO.IDE.H.105 Minimum equipment for flight

MANAGEMENT OF THE STATUS OF CERTAIN INSTRUMENTS, EQUIPMENT OR FUNCTIONS

The operator should control and retain the status of the instruments, equipment or functions required for the intended operation, that are not controlled for the purpose of continuing airworthiness management.

GM1 NCO.IDE.H.105 Minimum equipment for flight

MANAGEMENT OF THE STATUS OF CERTAIN INSTRUMENTS, EQUIPMENT OR FUNCTIONS

(a) The operator should define responsibilities and procedures to retain and control the status of instruments, equipment or functions required for the intended operation, that are not controlled for the purpose of continuing airworthiness management.

(b) Examples of such instruments, equipment or functions may be, but are not limited to, equipment related to navigation approvals as FM immunity or certain software versions.

AMC1 SPO.GEN.145(b) Handling of flight recorder recordings: preservation, production, protection and use

INSPECTIONS AND CHECKS OF RECORDINGS

~~Whenever a flight recorder is required to be carried:~~

(a) The operator should perform an inspection of the FDR recording and the CVR recording every year unless one or more of the following applies:

(1) If the flight recorder records on magnetic wire or uses frequency modulation technology, the time interval between two inspections of the recording should not exceed ~~three~~ 3 months.

(2) If the flight recorder is solid-state and the flight recorder system is fitted with continuous monitoring for proper operation, the time interval between two inspections of the recording may be up to ~~two~~ 2 years.

(3) In the case of an aircraft equipped with two solid-state flight data and cockpit voice combination recorders, where

(i) the flight recorder systems are fitted with continuous monitoring for proper operation, and

(ii) the flight recorders share the same flight data acquisition, a comprehensive inspection of the recording needs only to be performed for one flight recorder position. The inspection of the recordings should be performed alternately so that each flight recorder position is inspected at time intervals not exceeding ~~four~~ 4 years.

(4) Where all ~~of~~ the following conditions are met, the inspection of FDR recording is not needed:

(i) the aircraft flight data is ~~are~~ collected in the framework of a flight data monitoring (FDM) programme;

(ii) the data acquisition of mandatory flight parameters is the same for the FDR and for the recorder used for the FDM programme;

(iii) an inspection similar to the inspection of the FDR recording and covering all mandatory flight parameters is conducted on the FDM data at time intervals not exceeding ~~two~~ 2 years; and

(iv) the FDR is solid-state and the FDR system is fitted with continuous monitoring for proper operation.

(b) The operator should perform every ~~five~~ 5 years an inspection of the data link recording.

(c) The operator should perform, at time intervals not exceeding 2 years, an inspection of the recording of flight recorders other than an FDR, which are installed on an aircraft in order to ensure compliance with **CAT.IDE.A.191** or **CAT.IDE.H.191**;

(d ~~c~~) When installed, the aural or visual means for preflight checking of the flight recorders for proper operation should be used ~~every day~~ on each day when the aircraft is operated. When no such means is available for a flight recorder, the operator should perform an operational check of this flight recorder at intervals not exceeding 150 flight hours or 7 ~~seven~~ calendar days of operation, whichever is considered more suitable by the operator.

(e ~~d~~) The operator should check every ~~five~~ 5 years, or in accordance with the recommendations of the sensor manufacturer, that the parameters dedicated to the FDR and not monitored by other means are being recorded within the calibration tolerances and that there is no discrepancy in the engineering conversion routines for these parameters.

GM1 SPO.GEN.145(b) Handling of flight recorder recordings: preservation, production, protection and use

INSPECTION OF THE FLIGHT RECORDERS' RECORDINGS FOR ENSURING SERVICEABILITY

(a) The inspection of the recorded flight parameters ~~FDR recording~~ usually consists of the following:

(1) Making a copy of the complete recording file.

(2) Converting the recording to parameters expressed in engineering units in accordance with the documentation required to be held.

(3) Examining a whole flight in engineering units to evaluate the validity of all mandatory parameters – this could reveal defects or noise in the measuring and processing chains and indicate necessary maintenance actions. The following should be considered:

(i) when applicable, each parameter should be expressed in engineering units and checked for different values of its operational range – for this purpose, some parameters may need to be inspected at different flight phases; and

(ii) (only applicable to an FDR) if the parameter is delivered by a digital data bus and the same data are utilised for the operation of the aircraft, then a reasonableness check may be sufficient; otherwise a correlation check may need to be performed:

(A) a reasonableness check is understood in this context as a subjective, qualitative evaluation, requiring technical judgement, of the recordings from a complete flight; and

(B) a correlation check is understood in this context as the process of comparing data recorded by the flight data recorder against the corresponding data derived from flight instruments, indicators or the expected values obtained during specified portion(s) of a flight profile or during ground checks that are conducted for that purpose.

(4) Retaining the most recent copy of the complete recording file and the corresponding recording inspection report that includes references to the documentation required to be held.

(b) When performing the ~~CVR recording~~ inspection of an audio recording from a flight recorder, precautions need to be taken to comply with **SPO.GEN.145(f)(1a)**. The inspection of the audio ~~CVR~~ recording usually consists of:

(1) checking that the ~~CVR~~ flight recorder operates correctly for the nominal duration of the recording;

(2) examining, where practicable, samples of in-flight audio recording ~~of the CVR~~ from the flight recorder for evidence that the signal is acceptable on each channel and in all phases of flight; and

(3) preparing and retaining an inspection report.

(c) The inspection of the DLR recording usually consists of:

(1) Checking the consistency of the data link recording with other recordings for example, during a designated flight, the flight crew speaks out a few data link messages sent and received. After the flight, the data link recording and the CVR recording are compared for consistency.

(2) Retaining the most recent copy of the complete recording and the corresponding inspection report.

(d) When inspecting images recorded by a flight recorder, precautions need to be taken to comply with **SPO.GEN.145(f)(3a)**. The inspection of such images usually consists of the following:

(1) checking that the flight recorder operates correctly for the nominal duration of the recording;

(2) examining samples of images recorded in different flight phases for evidence that the images of each camera are of acceptable quality; and

(3) preparing and retaining an inspection report.

GM3 SPO.GEN.145(b) Handling of flight recorder recordings: preservation, production, protection and use

CVR AUDIO QUALITY

~~Examples of CVR audio quality issues and possible causes thereof may be found in the document of the French Bureau d'Enquêtes et d'Analyses, titled 'Study on detection of audio anomalies on CVR recordings' and dated September 2015~~.

Additional guidance material for performing the CVR recording inspection may be found in the document of the French Bureau d'Enquêtes et d'Analyses, titled 'Guidance on CVR recording inspection' and dated October 2018 or later.

AMC1 SPO.GEN.145(f)(1) Handling of flight recorder recordings: preservation, production, protection and use

USE OF AUDIO ~~CVR~~ RECORDINGS FOR MAINTAINING OR IMPROVING SAFETY

(a) The procedure related to the handling of audio recordings from flight recorders and of their transcripts ~~cockpit voice recorder (CVR)~~ should be

~~written in a document which should be~~ documented and signed by all parties (aircraft operator, crew members, maintenance personnel if applicable). In accordance with UK Regulation (EU) 2016/679 this procedure should as a minimum, define:

(1) the method to obtain the consent of all crew members and maintenance personnel concerned;

(2) an access and security policy that restricts access to audio recordings from flight recorders and their transcripts ~~CVR recordings and identified CVR transcripts~~ to specifically authorised persons identified by their position;

(3) a retention policy and accountability, including the measures to be taken to ensure the security of audio recordings from flight recorders and their transcripts~~the CVR recordings and CVR transcripts~~ and their protection from misuse. The retention policy should specify the period of time after which such audio ~~CVR~~ recordings and identified ~~CVR~~ transcripts are destroyed; ~~and~~

(4) a description of the uses made of audio recordings from flight recorders and their transcripts ~~the CVR recordings and of their transcripts.~~;

(5) the participation of flight crew member representatives in the assessment of audio recordings from flight recorders and their transcripts;

(6) the conditions under which advisory briefing or remedial training should take place; this should always be carried out in a constructive and non-punitive manner; and

(7) the conditions under which actions other than advisory briefing or remedial training may be taken for reasons of gross negligence or significant continuing safety concern.

(b) Each time an audio recording file from a flight recorder ~~a CVR recording file~~ is read out under the conditions defined by **NCC.GEN.145(f)(1**):

(1) parts of the ~~CVR~~ audio recording file that contain information with a privacy content should be deleted to the extent possible, and it should not be permitted that the detail of information with a privacy content is transcribed; and

(2) the operator should retain, and when requested, provide to the CAA:

(i) information on the use made (or the intended use) of the ~~CVR~~ audio recording file; and

(ii) evidence that the persons concerned consented to the use made (or the intended use) of the ~~CVR~~ audio recording file.

(c) The person who fulfils the role of a safety manager should also be responsible for the protection and use of the ~~CVR recordings and the CVR transcripts~~ audio recordings from flight recorders and their transcripts, as well as for the assessment of issues and their transmission to the manager(s) responsible for the process concerned.

(d) In case a third party is involved in the use of audio recordings from flight recorders ~~CVR recordings~~, contractual agreements with this third party should~~, when applicable,~~ cover the aspects enumerated in (a) and (b).

AMC1~~2~~ SPO.GEN.145(f)(1a) Handling of flight recorder recordings: preservation, production, protection and use

~~CVR RECORDING~~ INSPECTION OF AUDIO RECORDINGS FOR ENSURING SERVICEABILITY

(a) When an inspection of the audio recordings from a flight recorder ~~the CVR recording~~ is performed for ensuring audio quality and intelligibility of recorded communications:

(1) the privacy of the audio ~~CVR~~ recordings should be ensured (e.g. by locating the replay equipment in a separated area and/or using headsets);

(2) access to ~~CVR~~ the replay equipment should be restricted to specifically authorised persons identified by their position;

(3) provision should be made for the secure storage of the recording medium, the audio ~~CVR~~ recording files and copies thereof;

(4) the audio ~~CVR~~ recording files and copies thereof should be destroyed not earlier than 2 months and not later than 1 ~~one~~ year after completion of the ~~CVR recording~~ inspection of the audio recordings, except that audio samples with no privacy content may be retained for enhancing ~~this CVR recording~~ the inspection (e.g. for comparing audio quality);

(5) only the accountable manager of the operator and, when identified to comply with **ORO.GEN.200**, the person fulfilling the role of safety manager should be entitled to request a copy of the audio ~~CVR~~ recording files.

(b) The conditions enumerated in (a) should also be complied with if the inspection of the audio ~~CVR~~ recordings is subcontracted to a third party. The contractual agreements with the third party should explicitly cover these aspects.

GM1 SPO.GEN.145(f) Handling of flight recorder recordings: preservation, production, protection and use

USE OF ~~CVR~~ AUDIO RECORDINGS FOR MAINTAINING OR IMPROVING SAFETY

~~(d) The CVR is primarily a tool for the investigation of accidents and serious incidents by investigating authorities. Misuse of CVR recordings is a breach of the right to privacy and it works against an effective safety culture inside the operator.~~

~~(e) It is noteworthy that the flight data recorder (FDR) may be used for a flight data monitoring (FDM) programme; however, in that case the principles of confidentiality and access restriction of the FDM programme apply to the FDR recordings. Because the CVR is recording the voices of the crew and verbal communications with a privacy content, the CVR recordings must be protected and handled with even more care than FDM data.~~

~~(f) Therefore, the use of a CVR recording, when for purposes other than CVR serviceability or those laid down by Regulation (EU) No 996/2010, should be subject to the free prior consent of the persons concerned, and framed by a procedure that is endorsed by all parties and that protects the privacy of crew members and (if applicable) maintenance staff.~~

(d) The audio recordings from flight recorders are primarily a tool for the investigation of accidents and serious incidents by investigating authorities. Misuse of audio recordings and their transcripts are a breach of the right to privacy and it works against an effective safety culture inside the operator.

(e) It is noteworthy that the flight data recorder (FDR) may be used for a flight data monitoring (FDM) programme; however, in that case the principles of confidentiality and access restriction of the FDM programme apply to the FDR recordings. Because the audio recordings are the voices of the crew and verbal communications with a privacy content, the audio recordings must be protected and handled with even more care than FDM data.

(f) Therefore, the use of an audio recording, when for purposes other than serviceability or those laid down by UK Regulation (EU) No 996/2010, should be subject to the free prior consent of the persons concerned, and framed by a procedure that is endorsed by all parties and that protects the privacy of crew members and (if applicable) maintenance staff.

AMC1 SPO.GEN.145(f)(3) Handling of flight recorder recordings: preservation, production, protection and use

USE OF IMAGES FROM THE FLIGHT CREW COMPARTMENT FOR MAINTAINING OR IMPROVING SAFETY

(a) The procedure related to the handling of images of the flight crew compartment that are recorded by a flight recorder should be documented and signed by all parties involved (aircraft operator, crew member representatives nominated either by the union or the crew themselves, maintenance personnel representatives if applicable). In accordance with UK Regulation (EU) 2016/679, this procedure should as a minimum, define the following aspects:

(1) the method to obtain the consent of all crew members and maintenance personnel concerned;

(2) an access and security policy that restricts access to the image recordings to specifically authorised persons identified by their position;

(3) a retention policy and accountability, including the measures to ensure the security of the image recordings and their protection from misuse;

(4) a description of the uses made of the image recordings;

(5) the participation of flight crew member representatives in the assessment of the image recordings;

(6) the conditions under which advisory briefing or remedial training should take place; this should always be carried out in a constructive and non-punitive manner; and

(7) the conditions under which actions other than advisory briefing or remedial training may be taken for reasons of gross negligence or significant continuing safety concern.

(b) Each time a recording file from a flight recorder and containing images of the flight crew compartment is read out for purposes other than ensuring the serviceability of that flight recorder:

(1) images that contain information with a privacy content should be deleted to the extent possible, and it should not be permitted that the detail of information with a privacy content is transcribed;

(2) the operator should retain, and when requested, provide the CAA with:

(i) information on the use made (or the intended use) of the recording file; and

(ii) evidence that the crew members concerned consented to the use made (or the intended use) of the flight crew compartment images.

(c) The person fulfilling the role of safety manager should be responsible for the protection and use of images of the flight crew compartment that are recorded by a flight recorder, as well as for the assessment of issues and their transmission to the manager(s) responsible for the process concerned.

(d) In case a third party is involved in the use of images of the flight crew compartment that are recorded by a flight recorder, contractual agreements with this third party should cover the aspects enumerated in (a) and (b).

AMC1 SPO.SPO.145(f)(3a) Handling of flight recorder recordings: preservation, production, protection and use

INSPECTION OF IMAGES OF THE FLIGHT CREW COMPARTMENT FOR ENSURING SERVICEABILITY

(a) When images of the flight crew compartment recorded by a flight recorder are inspected for ensuring the serviceability of the flight recorder, and any body part of a crew member is likely to be visible on these images, then:

(1) the privacy of the image recordings should be ensured (e.g. by locating the replay equipment in a separated area);

(2) access to the replay equipment should be restricted to specifically authorised persons identified by their position;

(3) provisions should be made for the secure storage of the recording medium, the image recording files and copies thereof;

(4) the image recording files and copies thereof should be destroyed not earlier than 2 months and not later than 1 year after completion of the inspection of the image recordings. Images that do not contain any body part of a person may be retained for enhancing this inspection (e.g. for comparing image quality); and

(5) only the accountable manager of the operator and, when identified to comply with **ORO.GEN.200**, the safety manager should be entitled to request a copy of the image recording files.

(b) The conditions enumerated in (a) should also be complied with if the inspection of the image recording is subcontracted to a third party. The contractual agreements with the third party should explicitly cover these aspects.

GM1 SPO.GEN.145(f) Handling of flight recorder recordings: preservation, production, protection and use

FLIGHT CREW COMPARTMENT

If there are no compartments to physically segregate the flight crew from the passengers during the flight, the 'flight crew compartment' in point (f) of **SPO.GEN.145** should be understood as the area including:

(a) the flight crew seats;

(b) aircraft and engine controls;

(c) aircraft instruments;

(d) windshield and windows used by the flight crew to get an external view while seated at their duty station; and

(e) circuit breakers accessible by the flight crew while seated at their duty station.

GM1 SPO.OP.175 Ice and other contaminants – ground procedures

TERMINOLOGY

Terms used in the context of de-icing/anti-icing have the meaning defined in the following subparagraphs.

~~(a) 'Anti-icing fluid' includes, but is not limited to, the following:~~

~~(1) Type I fluid if heated to min 60 °C at the nozzle;~~

~~(2) mixture of water and Type I fluid if heated to min 60 °C at the nozzle;~~

~~(3) Type II fluid;~~

~~(4) mixture of water and Type II fluid;~~

~~(5) Type III fluid;~~

~~(6) mixture of water and Type III fluid;~~

~~(7) Type IV fluid;~~

~~(8) mixture of water and Type IV fluid.~~

~~On uncontaminated aircraft surfaces Type II, III and IV anti-icing fluids are normally applied unheated.~~

~~(b) 'Clear ice': a coating of ice, generally clear and smooth, but with some air pockets. It forms on exposed objects, the temperatures of which are at, below or slightly above the freezing temperature, by the freezing of super-cooled drizzle, droplets or raindrops.~~

~~(c) 'Conditions conducive to aircraft icing on the ground' (e.g. freezing fog, freezing precipitation, frost, rain or high humidity (on cold soaked wings), snow or mixed rain and snow).~~

~~(d) 'Contamination', in this context, is understood as being all forms of frozen or semi-frozen moisture, such as frost, snow, slush or ice.~~

~~(e) 'Contamination check': a check of aircraft for contamination to establish the need for de-icing.~~

~~(f) 'De-icing fluid': such fluid includes, but is not limited to, the following:~~

~~(1) heated water;~~

~~(2) Type I fluid;~~

~~(3) mixture of water and Type I fluid;~~

~~(4) Type II fluid;~~

~~(5) mixture of water and Type II fluid;~~

~~(6) Type III fluid;~~

~~(7) mixture of water and Type III fluid;~~

~~(8) Type IV fluid;~~
~~(9) mixture of water and Type IV fluid.~~

~~De-icing fluid is normally applied heated to ensure maximum efficiency.~~

~~(g) 'De-icing/anti-icing': this is the combination of de-icing and anti-icing performed in either one or two steps.~~

~~(h) 'Ground ice detection system (GIDS)': system used during aircraft ground operations to inform the personnel involved in the operation and/or the flight crew about the presence of frost, ice, snow or slush on the aircraft surfaces.~~

~~(i) 'Lowest operational use temperature (LOUT)': the lowest temperature at which a fluid has been tested and certified as acceptable in accordance with the appropriate aerodynamic acceptance test whilst still maintaining a freezing point buffer of not less than:~~

~~(1) 10 °C for a Type I de-icing/anti-icing fluid; or~~

~~(2) 7 °C for Type II, III or IV de-icing/anti-icing fluids.~~

~~(j) 'Post-treatment check': an external check of the aircraft after de-icing and/or anti-icing treatment accomplished from suitably elevated observation points (e.g. from the de-icing/anti- icing equipment itself or other elevated equipment) to ensure that the aircraft is free from any frost, ice, snow or slush.~~

~~(k) 'Pre-take-off check': an assessment normally performed by the flight crew, to validate the applied hold-over time (HoT).~~

~~(l) 'Pre-take-off contamination check': a check of the treated surfaces for contamination, performed when the HoT has been exceeded or if any doubt exists regarding the continued effectiveness of the applied anti-icing treatment. It is normally accomplished externally, just before commencement of the take-off run.~~

~~ANTI-ICING CODES~~

~~(m) The following are examples of anti-icing codes:~~

~~(1) 'Type I' at (start time) — to be used if anti-icing treatment has been performed with a Type I fluid;~~

~~(2) 'Type II/100' at (start time) — to be used if anti-icing treatment has been performed with undiluted Type II fluid;~~

~~(3) 'Type II/75' at (start time) — to be used if anti-icing treatment has been performed with a mixture of 75 % Type II fluid and 25 % water; and~~

~~(4) 'Type IV/50' at (start time) — to be used if anti-icing treatment has been performed with a mixture of 50 % Type IV fluid and 50 % water.~~

~~(n) When a two-step de-icing/anti-icing operation has been carried out, the anti-icing code should be determined by the second step fluid. Fluid brand names may be included, if desired.~~

(a) anti-icing', in the case of ground procedures, means a procedure that provides protection against the formation of frost or ice and accumulation of snow on treated surfaces of the aircraft for a limited period of time (hold-over time);

(b) 'Anti-icing fluid' includes, but is not limited to, the following:

(1) Typically, Type II, III or IV fluid (neat or diluted), normally applied unheated (*);

(2) Type I fluid/water mixture heated to minimum 60°C at the nozzle.

(*) When de-icing and anti-icing in a one-step process, Type II and Type IV fluids are typically applied diluted and heated.

(c) 'Clear ice': a coating of ice, generally clear and smooth, but with some air pockets. It forms on exposed objects, the temperatures of which are at, below or slightly above the freezing temperature, by the freezing of super-cooled drizzle, droplets or raindrops. Clear ice is very difficult to be detected visually.

(d) 'Cold soaked surface frost (CSSF)': frost developed on cold soaked aircraft surfaces by sublimation of air humidity. This effect can take place at ambient temperatures above 0 °C. Cold soaked aircraft surfaces are more common on aircraft that have recently landed. External surfaces of fuel tanks (e.g. wing skins) are typical areas of CSSF formation (known in this case as cold soaked fuel frost (CSFF)), due to the thermal inertia of very cold fuel that remains on the tanks after landing.

(e) 'Conditions conducive to aircraft icing on the ground': freezing fog, freezing precipitation, frost, rain or high humidity (on cold soaked wings), hail, ice pellets, snow or mixed rain and snow.

(f) 'Contamination': all forms of frozen or semi-frozen deposits on an aircraft, such as frost, snow, slush or ice.

(g) 'Contamination check': a check of the aircraft for contamination to establish the need for de-icing.

(h) 'de-icing', in the case of ground procedures, means a procedure by which frost, ice, snow or slush is removed from an aircraft in order to provide uncontaminated surfaces;

(i) 'De-icing fluid': such fluid includes, but is not limited to, the following:

(1) Heated water;

(2) Preferably, Type I fluid (neat or diluted (typically));

(3) Type II, III or IV fluid (neat or diluted).

The de-icing fluid is normally applied heated to ensure maximum efficiency and its freezing point should be at the outside air temperature (OAT) or below.

(j) 'De-icing/anti-icing': this is the combination of de-icing and anti-icing performed in either one or two steps.

(k) 'Ground ice detection system (GIDS)': a system used during aircraft ground operations to inform the personnel involved in the operation and/or the flight crew about the presence of frost, ice, snow or slush on the aircraft surfaces.

(l) 'Holdover time (HOT)': the period of time during which an anti-icing fluid provides protection against frozen contamination to the treated aircraft surfaces. It depends among other variables, on the type and intensity of the precipitation, OAT, wind, the particular fluid (or fluid Type) and aircraft design and aircraft configuration during the treatment.

(m) ‘Liquid water equivalent (LWE) system’: an automated weather measurement system that determines the LWE precipitation rate in conditions of frozen or freezing precipitation. The system provides flight crew with continuously updated information on the fluid protection capability under varying weather conditions.

(n) ‘Lowest operational use temperature (LOUT)’: the lowest temperature at which a fluid has been tested and certified as acceptable in accordance with the appropriate aerodynamic acceptance test whilst still maintaining a freezing point buffer of not less than:

(1) 10°C for a Type I fluid; or

(2) 7°C for Type II, III or IV fluids.

(o) ‘Post-treatment check’, ‘Post- de-icing check’ or ‘Post- de-icing/anti-icing check’: an external check of the aircraft after de-icing and/or anti-icing treatment accomplished by qualified staff and from suitably elevated observation points (e.g. from the de-icing/anti-icing equipment itself or other elevated equipment) to ensure that the aircraft is free from frost, ice, snow, or slush.

(p) ‘Pre-take-off check’: The flight crew should continuously monitor the weather conditions after the de-icing/anti-icing treatment to assess whether the applied holdover time is still appropriate. Within the aircraft’s HOT and prior to take-off, the flight crew should check the aircraft’s wings or representative aircraft surfaces for frozen contaminants.

(q) ‘Pre-take-off contamination check’: a check of the treated surfaces for contamination, performed when the HOT has been exceeded or if any doubt exists regarding the continued effectiveness of the applied anti-icing treatment. It is normally accomplished externally, just before commencement of the take-off run.

ANTI-ICING CODES

(r) Upon completion of the anti-icing treatment, a qualified staff provides the anti-icing code to the flight crew as follows: ‘the fluid Type/the fluid name (except for Type I)/concentration (except for Type I)/local time at start of anti-icing/date (optional)/the statement ‘post- de-icing/anti-icing check completed’ (if check completed). Example:

‘TYPE II / MANUFACTURER, BRAND X / 75% / 1335 / 15FEB20 / POST- DE-ICING/ANTI-ICING CHECK COMPLETED’.

(s) When a two-step de-icing/anti-icing operation has been carried out, the anti-icing code should be determined by the second step fluid.

GM2 SPO.OP.175 Ice and other contaminants – ground procedures

DE-ICING/ANTI-ICING — PROCEDURES

(a) De-icing and/or anti-icing procedures should take into account manufacturer’s recommendations, including those that are type-specific, and should cover:

(1) contamination checks, including detection of clear ice and under-wing frost; limits on the thickness/area of contamination published in the AFM or other manufacturers’ documentation should be followed;

(2) procedures to be followed if de-icing and/or anti-icing procedures are interrupted or unsuccessful;

(3) Pre-treatment, the aircraft should be configured in accordance with the OEM’s requirements

(4~~3~~) post-treatment checks, followed by aircraft reconfiguration;

(5~~4~~) pre-take-off checks;

(6~~5~~) pre-take-off contamination checks;

(7~~6~~) the recording of any incidents relating to de-icing and/or anti-icing; and

(8~~7)~~ the responsibilities of all personnel involved in de-icing and/or anti-icing.

(b) The operator's procedures should ensure the following:

(1) When aircraft surfaces are contaminated by ice, frost, slush or snow, they are de-iced prior to take-off, according to the prevailing conditions. Removal of contaminants may be performed with mechanical tools, fluids (including hot water), infrared heat or forced air, taking account of aircraft type-specific provisions.

(2) Account is taken of the wing skin temperature versus ~~outside air temperature (~~OAT~~)~~, as this may affect:

(i) the need to carry out aircraft de-icing and/or anti-icing; and/or

(ii) the performance of the de-icing/anti-icing fluids.

(3) When freezing precipitation occurs or there is a risk of freezing precipitation occurring that would contaminate the surfaces at the time of take-off, aircraft surfaces should be anti-iced. Anti-icing fluids (neat or diluted) should not be applied at OAT below their LOUT. ~~If both de-icing and anti-icing are required, the procedure may be performed in a one- or two-step process, depending upon weather conditions, available equipment, available fluids and the desired hold-over time (HoT).~~ Anti-icing fluids (neat or diluted) should not be applied at OAT below their LOUT. If both de-icing and anti-icing are required, the procedure may be performed in a one- or two-step process, depending upon weather conditions, available equipment, available fluids and the desired HOT.. One-step de-icing/anti-icing means that de-icing and anti-icing are carried out at the same time, using a mixture of de-icing/anti-icing fluid and water. Two-step de-icing/anti-icing means that de-icing and anti-icing are carried out in two separate steps. The aircraft is first de-iced using heated water only or a heated mixture of de-icing/anti-icing fluid and water. After completion of the de-icing operation, a layer of a mixture of de-icing/anti-icing fluid and water, or of de-icing /anti-icing fluid only, is sprayed over the aircraft surfaces. The second step will be taken before the first step fluid freezes (typically within 3 minutes but severe conditions may shorten this) and, if necessary, area by area.

(4) When an aircraft is anti-iced and a longer ~~HoT~~ HOT is needed/desired, the use of a less diluted ~~Type II or Type IV~~ thickened fluid should be considered.

(5) All restrictions relative to OAT and fluid application (including, but not necessarily limited to, temperature and pressure) published by the fluid manufacturer and/or aircraft manufacturer, are followed and procedures, limitations and recommendations to prevent the formation of fluid residues are followed.

(6) During conditions conducive to aircraft icing on the ground or after de-icing and/or anti-icing, an aircraft is not dispatched for departure unless it has been given a contamination check or a post-treatment check by a trained and qualified person. This check should cover all treated surfaces of the aircraft and be performed from points offering sufficient visibility to these parts. To ensure that there is no clear ice on suspect areas, it may also be necessary to make a physical check (e.g. tactile).

(7) The required entry is made in the technical log.

(8) The commander continually monitors the environmental situation after the performed treatment. Prior to take-off, he/she performs a pre-take-off check, which

is an assessment of whether the applied HOT is still appropriate. This pre-take-off check includes, but is not limited to, factors such as precipitation, wind and OAT.

(9) If any doubt exists as to whether a deposit may adversely affect the aircraft's performance and/or controllability characteristics, the commander should arrange for a re-treatment or a pre-take-off contamination check to be performed in order to verify that the aircraft's surfaces are free of contamination. Special methods and/or equipment may be necessary to perform this check, especially at nighttime or in extremely adverse weather conditions. If this check cannot be performed just before take-off, re-treatment should be applied.

(10) When retreatment is necessary, any residue of the previous treatment should be removed, and a completely new de-icing/anti-icing treatment should be applied.

(11) When a ground ice detection system (GIDS) is used to perform an aircraft surfaces check prior to and/or after a treatment, the use of GIDS by suitably trained personnel should be part of the procedure.

(c) Special operational considerations

(1) When using thickened de-icing/anti-icing fluids, the operator should consider a two-step de-icing/anti-icing procedure, the first step preferably with hot water and/or un-thickened fluids.

(2) The use of de-icing/anti-icing fluids should be in accordance with the aircraft manufacturer's documentation. This is particularly important for thickened fluids to assure sufficient flow-off during take-off. Avoid applying excessive thickened fluid on the horizontal tail of aircraft with unpowered elevator controls.

(3) The operator should comply with any type-specific operational requirement(s), such as an aircraft mass decrease and/or a take-off speed increase associated with a fluid application.

(4) The operator should take into account any flight handling procedures (stick force, rotation speed and rate, take-off speed, aircraft attitude, etc.) laid down by the aircraft manufacturer when associated with a fluid application.

(5) All restrictions relative to OAT and fluid application (including, but not necessarily limited to, temperature and pressure) published by the fluid manufacturer and/or aircraft manufacturer, are followed. and procedures, limitations and recommendations to prevent the formation of fluid residues are followed.

(6) During conditions conducive to aircraft icing on the ground or after de-icing and/or anti-icing, an aircraft is not dispatched for departure unless it has been given a contamination check or a post-treatment check by a trained and qualified person. This check should cover all treated surfaces of the aircraft and be performed from points offering sufficient ~~accessibility~~ visibility to these parts. To ensure that there is no clear ice on suspect areas, it may be necessary to make a physical check (e.g. tactile).

(7) The required entry is made in the technical log.

(8) The commander continually monitors the environmental situation after the performed treatment. Prior to take-off, he/she performs a pre-take-off check, which is an assessment of whether the applied ~~HoT~~ HOT is still appropriate. This pre-take-off check includes, but is not limited to, factors such as precipitation, wind and OAT.

(9) If any doubt exists as to whether a deposit may adversely affect the aircraft's performance and/or controllability characteristics, the commander should arrange for a re-treatment or a pre-take-off contamination check to be performed in order to verify that the aircraft's surfaces are free of contamination. Special methods and/or equipment may be necessary to perform this check, especially at night time or in

extremely adverse weather conditions. If this check cannot be performed just before take-off, re-treatment should be applied.

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(11) When a ground ice detection system (GIDS) is used to perform an aircraft surfaces check prior to and/or after a treatment, the use of GIDS by suitably trained personnel should be part of the procedure.

(c) Special operational considerations

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(3) The operator should comply with any type-specific operational provision(s), such as an aircraft mass decrease and/or a take-off speed increase associated with a fluid application.

(4) The operator should take into account any flight handling procedures (stick force, rotation speed and rate, take-off speed, aircraft attitude etc.) laid down by the aircraft manufacturer when associated with a fluid application.

(5) The limitations or handling procedures resulting from (c)(3) and/or (c)(4) above should be part of the flight crew pre take-off briefing.

(d) Communications

(1) Before aircraft treatment. When the aircraft is to be treated with the flight crew on board, the flight and personnel involved in the operation should confirm the fluid to be used, the extent of treatment required and any aircraft type-specific procedure(s) to be used. Any other information needed to apply the ~~HoT~~ HOT tables should be exchanged.

(2) Anti-icing code. The operator's procedures should include an anti-icing code, which indicates the treatment the aircraft has received. This code provides the flight crew with the minimum details necessary to estimate a ~~HoT~~ HOT and confirms that the aircraft is free of contamination.

(3) After treatment. Before reconfiguring or moving the aircraft, the flight crew should receive a confirmation from the personnel involved in the operation that all de-icing and/or anti-icing operations are complete and that all personnel and equipment are clear of the aircraft.

(e) Holdover protection & LWE systems

The operator should publish in the OM, when required, the ~~HoTs~~ HOTs in the form of a table or a diagram, to account for the various types of ground icing conditions and the different types and concentrations of fluids used. However, the times of protection shown in these tables are to be used as guidelines only and are normally used in conjunction with the pre-take-off check.

An operator may choose to operate using LWE systems instead of HOT tables whenever the required means for using these systems are in place.

(f) Training

The operator's initial and recurrent de-icing and/or anti-icing training programmes (including communication training) for flight crew and for other ~~those of its~~ personnel involved ~~in the operation who are involved~~ in de-icing and/or anti-icing operations should include additional training if any of the following are ~~is~~ introduced:

(1) a new method, procedure and/or technique;

(2) a new type of fluid and/or equipment; or

(3) a new type of aircraft.

(g) Contracting

When the operator contracts de-icing/anti-icing functions, the operator should ensure that the contractor complies with the operator's training/qualification procedures, together with any specific procedures in respect of:

~~(5) de-icing and/or anti-icing methods and procedures;~~
~~(6) fluids to be used, including precautions for storage and preparation for use~~
~~(7) specific aircraft provisions (e.g. no-spray areas, propeller/engine de-icing, APU operation etc.); and~~
~~(8) checking and communications procedures.~~

(1) roles and responsibilities;

(2) de-icing and/or anti-icing methods and procedures;

(3) fluids to be used, including precautions for storage, preparation for use and chemical incompatibilities;

(4) specific aircraft provisions (e.g. no-spray areas, propeller/engine de-icing, APU operation, etc.);

(5) different checks to be conducted; and

(6) procedures for communications with flight crew and any other third party involved.

(h) Special maintenance considerations

(1) General

The operator should take proper account of the possible side-effects of fluid use. Such effects may include, but are not necessarily limited to, dried and/or re-hydrated residues, corrosion and the removal of lubricants.

(2) Special considerations regarding residues of dried fluids

The operator should establish procedures to prevent or detect and remove residues of dried fluid. If necessary, the operator should establish appropriate inspection intervals based on the recommendations of the airframe manufacturers and/or the operator's own experience:

(i) Dried fluid residues

Dried fluid residues could occur when surfaces have been treated and the aircraft has not subsequently been flown and has not been subject to precipitation. The fluid may then have dried on the surfaces.

(ii) Re-hydrated fluid residues

Repetitive application of thickened de-icing/anti-icing fluids may lead to the subsequent formation/build-up of a dried residue in aerodynamically quiet areas, such as cavities and gaps. This residue may re-hydrate if exposed to high humidity conditions, precipitation, washing, etc., and increase to many times its original size/volume. This residue will freeze if exposed to conditions at or below 0 °C. This may cause moving parts, such as elevators, ailerons, and flap actuating mechanisms to stiffen or jam in-flight. Re-hydrated residues may also form on exterior surfaces, which can reduce lift, increase drag and stall speed. Re-hydrated residues may also collect inside control surface structures and cause clogging of drain holes or imbalances to flight controls. Residues may also collect in hidden areas, such as around flight control hinges, pulleys, grommets, on cables and in gaps.

(iii) Operators are strongly recommended to obtain information about the fluid dry-out and re-hydration characteristics from the fluid manufacturers and to select products with optimised characteristics.

(iv) Additional information should be obtained from fluid manufacturers for handling, storage, application and testing of their products.

GM3 SPO.OP.175 Ice and other contaminants – ground procedures

DE-ICING/ANTI-ICING — BACKGROUND INFORMATION

Further guidance material on this issue is given in the ICAO *Manual of Aircraft Ground De-icing/Anti-icing Operations* (Doc 9640). ~~(hereinafter referred to as the ICAO *Manual of Aircraft Ground De-icing/Anti-icing Operations*)~~.

(a) General

(1) Any deposit of frost, ice, snow or slush on the external surfaces of an aircraft may drastically affect its flying qualities because of reduced aerodynamic lift, increased drag, modified stability and control characteristics. Furthermore, freezing deposits may cause moving parts, such as elevators, ailerons, flap actuating mechanism etc., to jam and create a potentially hazardous condition. Propeller/engine/auxiliary power unit (APU)/systems performance may deteriorate due to the presence of frozen contaminants on blades, intakes and components. Also, engine operation may be seriously affected by the ingestion of snow or ice, thereby causing engine stall or compressor damage. In addition, ice/frost may form on certain external surfaces (e.g. wing upper and lower surfaces, etc.) due to the effects of cold fuel/structures, even in ambient temperatures well above 0 °C.

(2) Procedures established by the operator for de-icing and/or anti-icing are intended to ensure that the aircraft is clear of contamination so that degradation of aerodynamic characteristics or mechanical interference will not occur and, following anti-icing, to maintain the airframe in that condition during the appropriate ~~HoT~~ HOT.

(3) Under certain meteorological conditions, de-icing and/or anti-icing procedures may be ineffective in providing sufficient protection for continued operations. Examples of these conditions are freezing rain, ice pellets and hail~~, heavy~~ or snow exceeding certain intensities, high wind velocity, and rapidly ~~fast~~ dropping OAT. No ~~HoT~~ HOT guidelines exist for these conditions.

(4) Material for establishing operational procedures can be found, for example, in:

(i) ICAO Annex 3 ‘Meteorological Service for International Air Navigation’;

(ii) ICAO ‘Manual of Aircraft Ground De-icing/Anti-icing Operations’;

(iii) ~~ISO 11075 Aircraft - De-icing/anti-icing fluids - ISO type I;~~ SAE AS6285 ‘Aircraft Ground Deicing/Anti-Icing Processes’;

(iv) SAE AS6286 ‘Aircraft Ground Deicing/Anti-Icing Training and Qualification Program’;

(iv) ~~ISO 11076 Aircraft - De-icing/anti-icing methods with fluids~~; SAE AS6332 'Aircraft Ground Deicing/Anti-icing Quality Management';

(v) ~~ISO 11077 Aerospace - Self propelled de-icing/anti-icing vehicles - Functional requirements;~~ SAE ARP6257 'Aircraft Ground De/Anti-Icing Communication Phraseology for Flight and Ground Crews';

(vi) ~~ISO 11078 Aircraft - De-icing/anti-icing fluids -- ISO types II, III and IV~~; FAA Holdover Time Guidelines

(vii) ~~AEA 'Recommendations for de-icing/anti-icing of aircraft on the ground'~~ FAA 8900.xxx series Notice 'Revised FAA-Approved Deicing Program Updates, Winter 20xx-20yy'.

~~(ix) EUROCAE ED-104A Minimum Operational Performance Specification for Ground Ice Detection Systems;~~

~~(x) SAE AS5681 Minimum Operational Performance Specification for Remote On-Ground Ice Detection Systems;~~

~~(xi) SAE ARP4737 Aircraft - De-icing/anti-icing methods;~~

~~(xii) SAE AMS1424 De-icing/anti-Icing Fluid, Aircraft, SAE Type I;~~

~~(xiii) SAE AMS1428 Fluid, Aircraft De-icing/anti-Icing, Non-Newtonian, (Pseudoplastic), SAE Types II, III, and IV;~~

~~(xiv) SAE ARP1971 Aircraft De-icing Vehicle - Self-Propelled, Large and Small Capacity;~~

~~(xv) SAE ARP5149 Training Programme Guidelines for De-icing/anti-icing of Aircraft on Ground; and~~

~~(xvi) SAE ARP5646 Quality Program Guidelines for De-icing/anti-icing of Aircraft on the Ground.~~

(b) Fluids

(1) Type I fluid: Due to its properties, Type I fluid forms a thin, liquid-wetting film on surfaces to which it is applied which, under certain weather conditions, gives a very limited ~~HoT~~ HOT. ~~With this type of fluid, increasing the concentration of fluid in the fluid/water mix does not provide any extension in HoT.~~ For anti-icing purposes the fluid/water mixture should have a freezing point of at least 10 °C below OAT; increasing the concentration of fluid in the fluid/water mix does not provide any extension in HOT

(2) Type II and Type IV fluids contain thickeners which enable the fluid to form a thicker liquid-wetting film on surfaces to which it is applied. Generally, this fluid provides a longer ~~HoT~~ HOT than Type I fluids in similar conditions. ~~With this type of fluid, the HoT can be extended by increasing the ratio of fluid in the fluid/water mix.~~

(3) Type III fluid is a thickened fluid especially intended for use on aircraft with low rotation speeds.

(4) Fluids used for de-icing and/or anti-icing should be acceptable to the operator and the aircraft manufacturer. These fluids normally conform to specifications such as SAE AMS1424, ~~SAE AMS1428 or equivalent~~. (Type I) or SAE AMS1428 (Types II, III and IV). Use of non-conforming fluids is not recommended due to their characteristics being unknown. The anti-icing and aerodynamic properties of thickened fluids may be seriously degraded by, for example, inappropriate storage, treatment, application, application equipment, age and in case they are applied on top of non-chemically compatible de-icing fluids.

(c) Hold-over protection

(1) Hold-over protection is achieved by a layer of anti-icing fluid remaining on and protecting aircraft surfaces for a period of time. With an one-step de-icing/anti-icing procedure, the ~~HoT~~ HOT begins at the commencement of de-icing/anti-icing. With a two-step procedure, the ~~HoT~~ HOT begins at the commencement of the second (anti-icing) step. The hold-over protection runs out:

(i) at the commencement of the take-off roll (due to aerodynamic shedding of fluid); or

(ii) when frozen deposits start to form or accumulate on treated aircraft surfaces, thereby indicating the loss of effectiveness of the fluid.

(2) The duration of hold-over protection may vary depending on the influence of factors other than those specified in the ~~HoT~~ HOT tables. Guidance should be provided by the operator to take account of such factors, which may include:

(i) atmospheric conditions, e.g. exact type and rate of precipitation, wind direction and velocity, relative humidity and solar radiation; and

(ii) the aircraft and its surroundings, such as aircraft component inclination angle, contour and surface roughness, surface temperature, operation in close proximity to other aircraft (jet or propeller blast) and ground equipment and structures.

(3) ~~HoTs~~ HOTs are not meant to imply that flight is safe in the prevailing conditions if the specified HOT has not been exceeded. Certain meteorological conditions, such as freezing drizzle or freezing rain, may be beyond the certification envelope of the aircraft.

AMC1 SPO.OP.210 Approach and landing conditions — aeroplanes ~~and helicopters~~

LANDING DISTANCE ASSESSMENT-COMPLEX AEROPLANES ~~/ FATO SUITABILITY~~

(a) The in-flight ~~determination of the~~ landing distance~~/FATO suitability~~ should be based on the latest available ~~meteorological~~ weather report ~~or~~ and runway condition report (RCR).

(b) The assessment should be initially carried out when the weather report and the RCR are obtained, usually around top of descent. If the planned duration of the flight does not allow the flight crew to carry out the assessment in non-critical phases of flight, the assessment should be carried out before departure.

(c) When meteorological conditions may lead to a degradation of the runway surface condition, the assessment should include consideration of how much deterioration in runway surface friction characteristics may be tolerated, so that a quick decision can be made prior to landing.

(d) The flight crew should monitor the evolution of the actual conditions during the approach, to ensure that they do not degrade below the condition that was previously determined to be the minimum acceptable.

(e) The in-flight determination of the landing distance should be done is such a way that either:

(1) the landing distance available (LDA) on the intended runway is at least 115 % of the landing distance at the estimated time of landing, determined in accordance with the performance information for the assessment of the landing distance at time of arrival (LDTA); or

(2) if performance information for the assessment of the LDTA is not available, the LDA on the intended runway at the estimated time of landing is at least the landing distance determined in accordance with **SPO.POL.140**.

(f) If performance information for the assessment of the LDTA is available, it should be based on approved data contained in the AFM, or on other data that is either determined in accordance with the applicable certification standards for aeroplanes or determined by the CAA.

(g) Whenever the runway braking action encountered during the landing roll is not as good as reported by the aerodrome operator in the RCR, the pilot-in-command should notify the air traffic services (ATS) by means of a special air-report (AIREP) as soon as practicable.

LANDING DISTANCE ASSESSMENT— OTHER-THAN-COMPLEX AEROPLANES

(a) The in-flight landing distance assessment should be based on the latest available weather report and, if available, RCR.

(b) The assessment should be initially carried out when weather report and RCR are obtained, usually around top of descent. If the planned duration of the flight does not allow the flight crew to carry out the assessment in non-critical phases of flight, the assessment should be carried out before departure.

(c) When meteorological conditions may lead to a degradation of the runway surface condition, the assessment should include consideration of how much deterioration in runway surface friction characteristics may be tolerated, so that a quick decision can be made prior to landing.

(d) Whenever the runway braking action encountered during the landing roll is not as good as reported by the aerodrome operator in the RCR, the pilot-in-command should notify ATS by means of an AIREP as soon as practicable.

GM1 SPO.OP.210 Approach and landing conditions — aeroplanes

LANDING DISTANCE – COMPLEX AEROPLANES

The assessment of the LDTA begins with the acquisition of the latest available weather information and the RCR. The information provided in the RCR is divided in two sections:

(a) The ‘aircraft performance’ section which contains information that is directly relevant in a performance computation.

(b) The ‘situational awareness’ section which contains information that the flight crew should be aware of for a safe operation, but which does not have a direct impact on the performance assessment.

The ‘aircraft performance’ section of the RCR includes a runway condition code (RWYCC), the contaminant type, depth and coverage for each third of the runway.

The determination of the RWYCC is based on the use of the runway condition assessment matrix (RCAM); however, the presentation of the information in the RCAM is appropriate for use by aerodrome personnel trained and competent in assessing the runway condition in a way that is relevant to aircraft performance. While full implementation of the RCAM standard would eventually no longer require the flight crew to derive from various information available to them the appropriate runway condition to be used for the landing performance assessment at the time of arrival, it is desirable that pilots maintain an understanding of the performance effect of various components considered in the assessment.

It is the task of the aerodrome personnel to assess the appropriate RWYCC in order to allow the flight crew to assess any potential change of the runway in use. When no RWYCC is available in winter conditions, the RCAM provides the flight crew with a combination of the relevant information (runway surface conditions: state and/or contaminant or pilot report of braking action (AIREP)) in order to determine the RWYCC.

Table 1 below is an excerpt of the RCAM and permits to carry out the primary assessment based on the reported contaminant type and depth, as well as on the OAT.

Table 1: Association between the runway surface condition and the RWYCC based on the reported contaminant type and depth and OAT

Runway surface condition	Surface condition descriptor	Depth	Notes	RWYCC
Dry		n/a		6
Wet	Damp (any visible dampness)	3 mm or less	Including wet and contaminated runways below 25 % coverage in each runway third	5
	Wet			
Slippery wet				3
Contaminated	Compacted snow	Any	At or below OAT – 15°C [3]	4
			Above OAT –15°C [3]	3
	Dry snow	3 mm or less		5
		More than 3 mm up to 100 mm	Including when any depth occurs on top of compacted snow	3
		Any	On top of ice	0[2]
	Frost[1]	Any		5
	Ice	Any	In cold and dry conditions	1
	Slush	3 mm or less		5
		More than 3 mm up to 15 mm		2
	Standing water	3 mm or less		5
		More than 3 mm up to 15 mm		2
		Any	On top of ice	0[2]
	Wet ice	Any		0[2]
	Wet snow	3 mm or less		5
		More than 3 mm up to 30 mm	Including when any depth occurs on top of compacted snow	3
		Any	On top of ice	0[2]

Note 1: Under certain conditions, frost may cause the surface to become very slippery.

Note 2: Operations in conditions where less-than-poor braking action prevails are prohibited.

Note 3: The runway surface temperature should preferably be used where available.

A primary assessment may have to be downgraded by the aerodrome operator based on an AIREP of lower braking action than the one typically associated with the type and depth of contaminant on the runway or any other observation.

Upgrading a RWYCC 5, 4, 3 or 2 determined by the aerodrome operator from the observed contaminant type is not allowed.

A RWYCC 1 or 0 maybe be upgraded by the aerodrome operator to a maximum of RWYCC 3. The reason for the upgrade will be specified in the ‘situational awareness’ section of the RCR.

When the aerodrome operator is approved for operations on specially prepared winter runways, in accordance with Annex V (Part-ADR.OPS) to UK Regulation (EU) No 139/2014, the RWYCC of a runway that is contaminated with compacted snow or ice, may be upgraded to RWYCC 4 depending upon a specific treatment of the runway. In such cases, the reason for the upgrade will be specified in the 'situational awareness' section of the RCR. When the aerodrome operator is approved for specially prepared winter runways, in accordance with Annex IV (Part-ADR.OPS) to UK Regulation (EU) No 139/2014, a runway that is contaminated with compacted snow or ice and has been treated according to specific procedures, will normally be reported as a maximum of RWYCC 4 SPECIALLY PREPARED WINTER RUNWAY. If the aerodrome operator is in doubt about the quality of the surface, it will be reported with a lower RWYCC, but the runway descriptor will still be SPECIALLY PREPARED WINTER RUNWAY. The term DOWNGRADED will be used in the 'situational awareness' section of the RCR. A SPECIALLY PREPARED WINTER RUNWAY has no loose contaminant; hence no contaminant drag on acceleration, and stopping performance corresponding to the reported RWYCC.

Performance information for the assessment of the LDTA correlates the aircraft performance with the RWYCC contained in the RCR, hence the calculation will be based on the RWYCC of the intended runway of landing.

GM2 SPO.OP.210 Approach and landing conditions — aeroplanes

RUNWAY CONDITIONS

A detailed description of the relevant elements for consideration regarding the portion of the runway that will be used for landing is provided at **GM2 CAT.OP.MPA.303**.

GM3 SPO.OP.210 Approach and landing conditions — aeroplanes

RCR, RWYCC and RCAM – COMPLEX AEROPLANES

A detailed description of the RCR format and content, the RWYCC and the RCAM may be found in Annex V (Part-ADR.OPS) to UK Regulation (EU) No 139/2014. Further guidance may be found in the following documents:

(a) ICAO Doc 9981 'PANS Aerodromes';

(b) ICAO Doc 4444 'PANS ATM';

(c) ICAO Doc 10064 'Aeroplane Performance Manual'; and

(d) ICAO Circular 355 'Assessment, Measurement and Reporting of Runway Surface Conditions'.

RUNWAY CONDITION REPORT (RCR) — OTHER-THAN-COMPLEX AEROPLANES

When the aerodrome reports the runway conditions by means of an RCR, the information thereby contained, includes a RWYCC. The determination of the RWYCC is based on the use of the RCAM. The RCAM correlates the RWYCC with the contaminant present on the runway and the braking action.

A detailed description of the RCR format and content, the RWYCC and the RCAM may be found in Annex V (Part-ADR.OPS) to UK Regulation (EU) No 139/2014. Further guidance may be found in the following documents:

(a) ICAO Doc 9981 ‘PANS Aerodromes’;

(b) ICAO Doc 4444 ‘PANS ATM’;

(c) ICAO Doc 10064 ‘Aeroplane Performance Manual’; and

(d) ICAO Circular 355 ‘Assessment, Measurement and Reporting of Runway Surface Conditions’.

GM4 SPO.OP.210 Approach and landing conditions — aeroplanes

COMPLEX AEROPLANESPERFORMANCE INFORMATION FOR THE ASSESSMENT OF LDTA

Guidance on performance information for the assessment of the LDTA may be found in:

(a) AMC1 CAT.OP.MPA.303(e) of the AMC & GM to Annex IV (Part CAT) to UK Regulation (EU) No 965/2012; and

(b) ICAO Doc 10064 ‘Aeroplane Performance Manual’.

GM5 SPO.OP.210 Approach and landing conditions — aeroplanes

REPORTING ON RUNWAY BRAKING ACTION

The role of the flight crew in the runway surface condition reporting process does not end once a safe landing has been achieved. While the aerodrome operator is responsible for generating the RCR, flight crew are encouraged to provide accurate braking action reports.

The flight crew braking action reports provide feedback to the aerodrome operator regarding the accuracy of the RCR resulting from the observed runway surface conditions.

ATC passes these braking action reports to the aerodrome operator, which in turn uses them in conjunction with the RCAM to determine if it is necessary to downgrade or upgrade the Runway Condition Code (RWYCC).

During busy times, runway inspections and maintenance may be less frequent and need to be sequenced with arrivals. Therefore, aerodrome operators may depend on braking action reports to confirm that the runway surface condition is not deteriorating below the assigned RCR.

Since both the ATC and the aerodrome operator rely on accurate braking action reports, flight crew should use standardised terminology in accordance with ICAO Doc 4444 ‘PANS ATM’.

The following Table 1 shows the correlation between the terminology to be used in the AIREP to report the braking action and the RWYCC.

Table 1: Association between AIREP and RWYCC

AIREP (braking action)	Description	RWYCC
N/A		6
GOOD	Braking deceleration is normal for the wheel braking effort applied AND directional control is normal.	5
GOOD TO MEDIUM	Braking deceleration OR directional control is between good and medium.	4
MEDIUM	Braking deceleration is noticeably reduced for the wheel braking effort applied OR directional control is noticeably reduced.	3
MEDIUM TO POOR	Braking deceleration OR directional control is between medium and poor.	2
POOR	Braking deceleration is significantly reduced for the wheel braking effort applied OR directional control is significantly reduced.	1
LESS THAN POOR	Braking deceleration is minimal to non-existent for the wheel braking effort applied OR directional control is uncertain.	0

An AIREP should be transmitted to the ATC, in accordance with one of the following specifications, as applicable:

(a) Good braking action is reported as ‘BRAKING ACTION GOOD’.

(b) Good to medium braking action is reported as ‘BRAKING ACTION GOOD TO MEDIUM’.

(c) Medium braking action is reported as ‘BRAKING ACTION MEDIUM’.

(d) Medium to poor braking action is reported as “BRAKING ACTION MEDIUM TO POOR”

(e) Poor braking action is reported as ‘BRAKING ACTION POOR’.

(f) Less than poor braking action is reported as ‘BRAKING ACTION LESS THAN POOR’.

In some cases, the differences between two consecutive levels of the six braking action categories between ‘Good’ and ‘Less than Poor’ may be too subtle for the flight crew to detect. It is therefore acceptable for the flight crew to report on a more coarse scale of ‘Good’, ‘Medium’ and ‘Poor’.

Whenever requested by ATC, or if the braking action encountered during the landing roll is not as previously reported by the aerodrome operator in the RCR, pilots should provide a braking action report. This is especially important and safety relevant where the experienced braking action is worse than the braking action associated with any RWYCC code currently in effect for that portion of the runway concerned.

When the experienced braking action is better than that reported by the aerodrome operator, it is important to report this information, which may trigger further actions for the aerodrome operator in order to upgrade the RCR.

If an aircraft-generated braking action report is available, it should be transmitted, identifying its origin accordingly. If the flight crew have a reason to modify the aircraft-generated braking action report based on their judgement, the commander should be able to amend such report.

A braking action AIREP of ‘Less Than Poor’ leads to a runway closure until the aerodrome operator can improve the runway condition.

An air safety report should be submitted whenever flight safety has been endangered due to low braking action.

GM6 SPO.OP.210 Approach and landing conditions — aeroplanes

FLIGHT CREW TRAINING

Flight crew should be trained on the use of the RCR, on the use of performance data for the assessment of the LDTA, if available, and on reporting braking action using the AIREP format.

Guidance on the development of the content of the training may be found in:

(a) **AMC1 CAT.OP.MPA.303** & **CAT.OP.MPA.311** of the AMC & GM to Annex IV (Part CAT) to UK Regulation (EU) No 965/2012, as applicable to the intended operations;

(b) ICAO Doc 10064 'Aeroplane Performance Manual'; and

(c) ICAO Circular 355 'Assessment, Measurement and Reporting of Runway Surface Conditions'.

FLIGHT CREW TRAINING — OTHER-THAN-COMPLEX AEROPLANES

When the aerodrome reports the runway conditions by means of a RCR, flight crew should be trained on the use of the RCR for the assessment of the landing distance, and on reporting braking action using the AIREP format. Guidance to develop the content of the training may be found in:

(a) ICAO Doc 10064 'Aeroplane Performance Manual'; and

(b) ICAO Circular 355 'Assessment, Measurement and Reporting of Runway Surface Conditions'.

AMC1 SPO.OP.211 Approach and landing conditions — helicopters

FATO SUITABILITY

The in-flight determination of the final approach and take-off area (FATO) suitability should be based on the latest available meteorological report.

GM1 SPO.POL.125 Take-off – complex motor-powered aeroplanes

RUNWAY SURFACE CONDITION

Operation on runways contaminated with water, slush, snow or ice implies uncertainties with regard to runway friction and contaminant drag and therefore to the achievable performance and control of the aeroplane during take-off or landing, since the actual conditions may not completely match the assumptions on which the performance information is based. In the case of a contaminated runway, the first option for the pilot-in-command is to wait until the runway is cleared. If this is impracticable, ~~he/she~~ he or she may consider a take-off or landing, provided that he or she has applied the applicable performance adjustments, and any further safety measures ~~he/she~~ he or she considers justified under the prevailing conditions. The excess runway length available including the criticality of the overrun area should also be considered.

The determination of take-off performance data for wet and contaminated runways should be based on the reported runway surface condition in terms of contaminant and depth.

GM1 SPO.POL.140 Landing — complex motor-powered aeroplanes

WET AND CONTAMINATED RUNWAY DATA

The determination of landing performance data should be based on information provided in the operations manual (OM) on the reported RWYCC. The RWYCC is determined by the aerodrome operator using the RCAM and associated procedures defined in ICAO Doc 9981 'PANS Aerodromes'. The RWYCC is reported through an RCR in the SNOWTAM format in accordance with ICAO Annex 15.

AMC1 SPO.IDE.A.105 Minimum equipment for flight

MANAGEMENT OF THE STATUS OF CERTAIN INSTRUMENTS, EQUIPMENT OR FUNCTIONS

The operator should control and retain the status of the instruments, equipment or functions required for the intended operation, that are not controlled for the purpose of continuing airworthiness management.

GM1 SPO.IDE.A.105 Minimum equipment for flight

MANAGEMENT OF THE STATUS OF CERTAIN INSTRUMENTS, EQUIPMENT OR FUNCTIONS

(a) The operator should define responsibilities and procedures to retain and control the status of instruments, equipment or functions required for the intended operation, that are not controlled for the purpose of continuing airworthiness management.

(b) Examples of such instruments, equipment or functions may be, but are not limited to, equipment related to navigation approvals such as FM immunity or certain software versions.

AMC2 SPO.IDE.A.145 Flight data recorder

OPERATIONAL PERFORMANCE REQUIREMENTS FOR AEROPLANES FIRST ISSUED WITH AN INDIVIDUAL CofA ON OR AFTER 1 JANUARY 2023

(a) The operational performance requirements for flight data recorders (FDRs) should be those laid down in EUROCAE Document 112A (Minimum Operational Performance Specification for Crash Protected Airborne Recorder Systems) dated September 2013, or any later equivalent standard produced by EUROCAE.

(b) The FDR should, with reference to a timescale, record:

(1) the list of parameters in Table 1 below;

(2) the additional parameters listed in Table 2 below, when the information data source for the parameter is used by aeroplane systems or is available on the instrument panel for use by the flight crew to operate the aeroplane; and

(3) any dedicated parameters related to novel or unique design or operational characteristics of the aeroplane as determined by the CAA.

(c) The parameters to be recorded should meet the performance specifications (range, sampling intervals, accuracy limits and resolution in read-out) as defined in the relevant tables of EUROCAE Document 112A, or any later equivalent standard produced by EUROCAE.

Table 1: FDR — All aeroplanes

No*	Parameter
1a 1b 1c	Time; or Relative time count Global navigation satellite system (GNSS) time synchronisation
2	Pressure altitude (including altitude values displayed on each flight crew member's primary flight display, unless the aeroplane is type certified before 1 January 2023 and recording the values displayed at the captain position or the first officer position would require extensive modification)
3	Indicated airspeed or calibrated airspeed (including values of indicated airspeed or calibrated airspeed displayed on each flight crew member's primary flight display, unless the aeroplane is type certified before 1 January 2023 and recording the values displayed at the captain position or the first officer position would require extensive modification)
4	Heading (primary flight crew reference) — when true or magnetic heading can be selected, the primary heading reference, a discrete indicating selection should be recorded.
5	Normal acceleration
6	Pitch attitude — pitch attitude values displayed on each flight crew member's primary flight display should be recorded, unless the aeroplane is type certified before 1 January 2023 and recording the values displayed at the captain position or the first officer position would require extensive modification.
7	Roll attitude — roll attitude values displayed on each flight crew member's primary flight display should be recorded, unless the aeroplane is type certified before 1 January 2023 and recording the values displayed at the captain position or the first officer position would require extensive modification.
8	Manual radio transmission keying and CVR/FDR synchronisation reference
9 9a 9b	Engine thrust/power: Parameters required to determine propulsive thrust/power on each engine, in both normal and reverse thrust Flight crew compartment thrust/power lever position (for aeroplanes with non-mechanically linked engine controls in the flight crew compartment)
14	Total or outside air temperature
16	Longitudinal acceleration (body axis)
17	Lateral acceleration
18 18a 18b 18c	Primary flight control surface and/or primary flight control pilot input (For aeroplanes with control systems in which the movement of a control surface will back drive the pilot's control, 'or' applies. For aeroplanes with control systems in which the movement of a control surface will not back drive the pilot's control, 'and' applies. For multiple or split surfaces, a suitable combination of inputs is acceptable in lieu of recording each surface separately. For aeroplanes that have a flight control break-away capability that allows either pilot to operate the controls independently, record both inputs): Pitch axis Roll axis Yaw axis
19	Pitch trim surface position
23	Marker beacon passage
24	Warnings — in addition to the master warning, each 'red' warning that cannot be determined from other parameters or from the CVR and each smoke warning from other compartments should be recorded.
25	Each navigation receiver frequency selection
27	Air–ground status. Air–ground status and a sensor of each landing gear if installed

* The number in the left-hand column reflects the serial number depicted in EUROCAE 112A.

Table 2: FDR — Aeroplanes for which the data source for the parameter is either used by the aeroplane systems or is available on the instrument panel for use by the flight crew to operate the aeroplane

No*	Parameter
10 10a 10b	Flaps: Trailing edge flap position Flight crew compartment control selection
11 11a 11b	Slats: Leading edge flap (slat) position Flight crew compartment control selection
12	Thrust reverse status
13 13a 13b 13c 13d	Ground spoiler and speed brake: Ground spoiler position Ground spoiler selection Speed brake position Speed brake selection
15	Autopilot, autothrottle and automatic flight control system (AFCS): mode and engagement status (showing which systems are engaged and which primary modes are controlling the flight path and speed of the aircraft)
20	Radio altitude. For auto-land/category III operations, each radio altimeter should be recorded.
21 21a 21b 21c	Vertical deviation — the approach aid in use should be recorded. For auto-land/category III operations, each system should be recorded: ILS/GPS/GLS glide path MLS elevation Integrated approach navigation (IAN) /Integrated Area Navigation, vertical deviation
22 22a 22b 22c	Horizontal deviation — the approach aid in use should be recorded. For auto-land/category III operations, each system should be recorded: ILS/GPS/GLS localiser MLS azimuth GNSS approach path/IRNAV lateral deviation
26 26a 26b	Distance measuring equipment (DME) 1 and 2 distances: Distance to runway threshold (GLS) Distance to missed approach point (IRNAV/IAN)
28 28a 28b 28c	Ground proximity warning system (GPWS)/terrain awareness warning system (TAWS)/ground collision avoidance system (GCAS) status — a suitable combination of discretes unless recorder capacity is limited in which case a single discrete for all modes is acceptable: Selection of terrain display mode, including pop-up display status Terrain alerts, including cautions and warnings and advisories On/off switch position
29	Angle of attack
30 30a 30b	Low pressure warning (each system): Hydraulic pressure Pneumatic pressure
31	Ground speed
32 32a 32b	Landing gear: Landing gear position Gear selector position
33 33a 33b 33c 33d 33e 33f	Navigation data: Drift angle Wind speed Wind direction Latitude Longitude GNSS augmentation in use
34	Brakes:

No*	Parameter
34a 34b	Left and right brake pressure Left and right brake pedal position
35 35a 35b 35c 35d 35e 35f 35g 35h 35i	Additional engine parameters (if not already recorded in parameter 9 of Table 1, and if the aeroplane is equipped with a suitable data source): Engine pressure ratio (EPR) N1 Indicated vibration level N2 Exhaust gas temperature (EGT) Fuel flow Fuel cut-off lever position N3 Engine fuel metering valve position (or equivalent parameter from the system that directly controls the flow of fuel into the engine) — for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification.
36 36a 36b 36c 36d 36e	Traffic alert and collision avoidance system (TCAS)/airborne collision avoidance system (ACAS) — a suitable combination of discretes should be recorded to determine the status of the system: Combined control Vertical control Up advisory Down advisory Sensitivity level
37	Wind shear warning
38 38a 38b	Selected barometric setting — to be recorded for the aeroplane where the parameter is displayed electronically: Pilot selected barometric setting Co-pilot selected barometric setting
39	Selected altitude (all pilot selectable modes of operation) — to be recorded for the aeroplane where the parameter is displayed electronically
40	Selected speed (all pilot selectable modes of operation) — to be recorded for the aeroplane where the parameter is displayed electronically
41	Selected Mach (all pilot selectable modes of operation) — to be recorded for the aeroplane where the parameter is displayed electronically
42	Selected vertical speed (all pilot selectable modes of operation) — to be recorded for the aeroplane where the parameter is displayed electronically
43	Selected heading (all pilot selectable modes of operation) — to be recorded for the aeroplane where the parameter is displayed electronically
44 44a 44b 44c	Selected flight path (all pilot selectable modes of operation) — to be recorded for the aeroplane where the parameter is displayed electronically: Course/desired track (DSTRK) Path angle Coordinates of final approach path (IRNAV/IAN)
45	Selected decision height — to be recorded for the aeroplane where the parameter is displayed electronically
46 46a 46b	Electronic flight instrument system (EFIS) display format, showing the display system status: Pilot Co-pilot
47	Multi-function/engine/alerts display format, showing the display system status
48	Alternating current (AC) electrical bus status — each bus
49	Direct current (DC) electrical bus status — each bus
50	Engine bleed valve(s) position
51	Auxiliary power unit (APU) bleed valve(s) position
52	Computer failure — all critical flight and engine control systems

No*	Parameter
53	Engine thrust command
54	Engine thrust target
55	Computed centre of gravity (CG)
56	Fuel quantity in CG trim tank
57	Head-up display in use
58	Paravisual display on
59	Operational stall protection, stick shaker and pusher activation
60 60a 60b 60c 60d 60e 60f	Primary navigation system reference: GNSS Inertial navigational system (INS) VHF omnidirectional radio range (VOR)/distance measuring equipment (DME) MLS Loran C ILS
61	Ice detection
62	Engine warning — each engine vibration
63	Engine warning — each engine over temperature
64	Engine warning — each engine oil pressure low
65	Engine warning — each engine overspeed
66	Yaw trim surface position
67	Roll trim surface position
68	Yaw or sideslip angle
69	De-icing and/or anti-icing systems selection
70	Hydraulic pressure — each system
71	Loss of cabin pressure
72	Trim control input position in the flight crew compartment, pitch — when mechanical means for control inputs are not available, displayed trim position or trim command should be recorded.
73	Trim control input position in the flight crew compartment, roll — when mechanical means for control inputs are not available, displayed trim position or trim command should be recorded.
74	Trim control input position in the flight crew compartment, yaw — when mechanical means for control inputs are not available, displayed trim position or trim command should be recorded.
75 75a 75b 75c	All flight control input forces (for fly-by-wire flight control systems, where control surface position is a function of the displacement of the control input device only, it is not necessary to record this parameter): Control wheel input forces Control column input forces Rudder pedal input forces
76	Event marker
77	Date
78	Actual navigation performance (ANP) or estimate of position error (EPE) or estimate of position uncertainty (EPU)
79	Cabin pressure altitude — for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification.
80	Aeroplane computed weight — for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification.
81 81a 81b	Flight director command: Left flight director pitch command — for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification. Left flight director roll command — for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification.

No*	Parameter
81c 81d	Right flight director pitch command — for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification. Right flight director roll command — for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification.
82	Vertical speed — for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification.

* The number in the left-hand column reflects the serial number depicted in EUROCAE Document 112A.

AMC1 SPO.IDE.A.146 Lightweight flight recorder

OPERATIONAL PERFORMANCE REQUIREMENTS

(a) If the flight recorder records flight data, it should record at least the following parameters:

(1) relative time count,

(2) pitch attitude or pitch rate,

(3) roll attitude or roll rate,

(4) heading (magnetic or true) or yaw rate,

(5) latitude,

(6) longitude,

(7) positioning system: estimated error (if available),

(8) pressure altitude or altitude from a positioning system,

(9) time,

(10) ground speed,

(11) positioning system: track (if available),

(12) normal acceleration,

(13) longitudinal acceleration,

(14) lateral acceleration.

(b) If the flight recorder records images, it should capture views of the main instrument displays at the pilot station, or at both pilot stations when the aeroplane is certified for operation with a minimum crew of two pilots. The recorded image quality should allow reading the following indications during most of the flight:

(1) magnetic heading,

(2) time,

(3) pressure altitude,

(4) indicated airspeed,

(5) vertical speed,

(6) turn and slip,

(7) attitude,

(8) Mach number (if displayed),

(9) stabilised heading, and

(10) tachometer indication or equivalent indication of propulsive thrust or power.

(c) If the flight recorder records a combination of images and flight data, each flight parameter listed in (a) should be recorded as flight data or by means of images.

(d) The flight parameters listed in (a), which are recorded as flight data, should meet the performance specifications (range, sampling intervals, accuracy limits and resolution in read-out) as defined in the relevant table of EUROCAE Document ED-112 'Minimum Operational Performance Specification for Crash Protected Airborne Recorder Systems', dated March 2003, or EUROCAE Document ED-155 'Minimum Operational Performance Specification for Lightweight Flight Recording Systems', dated July 2009, or any later equivalent standard accepted by the CAA.

(e) The operational performance requirements for the flight recorder should be those laid down in:

(1) EUROCAE Document ED-155 or any later equivalent standard accepted by the CAA for lightweight flight recorders; or

(2) EUROCAE Document ED-112 or any later equivalent standard accepted by the CAA for crash-protected flight recorders.

GM1 SPO.IDE.A.146 Lightweight flight recorder

ADDITIONAL USEFUL INFORMATION

(a) Experience has shown the usefulness, of analysing incidents and for training purposes, of recording additional information. In particular, audio of the flight crew compartment and information on the handling of the aircraft (such as position of flight controls, position of engine controls, fuel and oil indications, aircraft configuration selection), and an external view are very useful for such purposes. To capture such information, simple equipment such as an integrated microphone and integrated camera may be sufficient.

(b) If the flight recorder includes optional capabilities such as described in (a), their recording duration is recommended to be at least 2 hours.

(c) If the flight recorder is capable of acquiring flight parameters from some aircraft systems, it is advised to give priority to the flight parameters listed in Annex II-B to EUROCAE Document ED-155 or the flight parameters listed in Annex II-A to EUROCAE Document ED-112. Indeed, these flight parameters were selected based on their relevance in many safety investigations.

GM2 SPO.IDE.A.146 Lightweight flight recorder

INSTALLATION OF CAMERAS

When cameras are installed for the purpose of **SPO.IDE.A.146**, it is recommended that they are installed so that they do not capture images of head and shoulders of the flight crew members whilst seated in their normal operating position.

GM3 SPO.IDE.A.146 Lightweight flight recorder

RECORDING ACCURACY OF ATTITUDE RATE PARAMETERS

In the case of attitude rate parameters (pitch rate parameter, yaw rate parameter, roll rate parameter), the accuracy limit specified in EUROCAE Document ED-155, dated July 2009, was found to be unclear. Therefore, the following additional guidance is provided:

(a) If the attitude rate parameter is provided by an approved system of the aeroplane, accuracy greater than as provided by this system is not expected for this attitude rate parameter.

(b) If the attitude rate parameter is provided by a dedicated gyroscope, it is advisable that the gyroscope meets the following performance:

(1) errors caused by linear accelerations less than ±3°/sec (equivalent to ±1% of 300°/sec recording range) for all combinations of parameter values and linear acceleration values in the respective ranges [-300°/sec; +300°/sec] and [-3g; +6g];

(2) errors caused by temperature less than ±5°/sec for all combinations of parameter values and temperature values in the respective ranges [-300°/sec; +300°/sec] and [-40°C; +85°C];

(3) angular random walk of the gyroscope equal to or less than 2°/sqrt(hour); and

(4) bias stability of the gyroscope significantly less than 360°/hour (for instance, 50°/hour).

GM1 SPO.IDE.A.146(e) Lightweight flight recorder

FUNCTION TO MODIFY IMAGE AND AUDIO RECORDINGS

The purpose of the function modifying the image and audio recordings is to allow the flight crew to protect their privacy by making such recordings inaccessible using normal techniques. The activation of this function is subject to the commander's approval (refer to **SPO.GEN.107**). However, the equipment manufacturer or a safety investigation authority might still be able to retrieve these recordings using special techniques.

AMC1 SPO.IDE.A.215 & SPO.IDE.A.220 Radio communication equipment & Navigation equipment

PERFORMANCE-BASED COMMUNICATION AND SURVEILLANCE (PBCS) OPERATIONS

For operations in airspaces where required communication performance (RCP) and required surveillance performance (RSP) for PBCS have been prescribed, the operator should:

(a) ensure that the communication equipment and surveillance equipment meet the prescribed RCP and RSP specifications respectively, as shown by an AFM statement or equivalent.

(b) ensure that operational constraints are reflected in the MEL;

(c) establish and include in the OM:

(1) normal, abnormal and contingency procedures;

(2) the flight crew qualification and proficiency constraints; and

(3) a training programme for relevant personnel consistent with the intended operations;

(d) ensure continued airworthiness of the communication equipment and surveillance equipment in accordance with the appropriate RCP and RSP specifications respectively;

(e) ensure that the contracted communication service provider (CSP) for the airspace being flown complies with the required RCP and RSP specifications as well as with monitoring, recording and notification requirements; and

(f) participate to monitoring programmes established in the airspace being flown in order to:

 (1) submit the relevant reports of observed communication and surveillance performance respectively; and

 (2) establish a process for immediate corrective action in case non-compliance with the appropriate RCP or RSP specifications is detected.

GM1 SPO.IDE.A.215 & SPO.IDE.A.220 Radio communication equipment & Navigation equipment

PBCS OPERATIONS — GENERAL

Detailed guidance material on PBCS operations may be found in the following documents:

(a) ICAO Doc 9869 ‘Performance-based Communication and Surveillance (PBCS) Manual’

(b) ICAO Doc 10037 ‘Global Operational Data Link (GOLD) Manual’

PBCS OPERATIONS — AIRCRAFT ELIGIBILITY

(a) The aircraft eligibility for compliance with the required RCP/RSP specifications should be demonstrated by the aircraft manufacturer or equipment supplier and be specific to each individual aircraft or the combination of the aircraft type and the equipment. The demonstrated compliance with specific RCP/RSP specifications may be documented in one of the following documents:

 (1) the type certificate (TC);

 (2) the supplemental type certificate (STC);

 (3) the aeroplane flight manual (AFM) or AFM Supplement; or

 (4) a compliance statement from the manufacturer or the holder of the design approval of the data link installation, approved by the State of Design.

(b) In addition to the indication of compliance with specific RCP/RSP specifications, the aircraft manufacturer or equipment supplier should document any associated operating limitations, information and procedures in the AFM or other appropriate documents.

PBCS OPERATIONS — MEL ENTRIES

(a) The operator should amend the MEL, in accordance with the items identified by the aircraft manufacturer or equipment supplier in the master minimum equipment list (MMEL) or MMEL supplement, in relation to PBCS capability, to address the impact of losing an associated system/sub-system on data link operational capability.

(b) As an example, equipment required in current FANS 1/A-capable aircraft, potentially affecting RCP and RSP capabilities, may be the following:

 (1) VHF, SATCOM, or HFDL1 radios, as applicable;

 (2) ACARS management unit (MU)/communications management unit (CMU);

 (3) flight management computer (FMC) integration; and

 (4) printer, if procedures require its use.

PBCS OPERATIONS — OPERATING PROCEDURES

The operator should establish operating procedures for the flight crew and other relevant personnel, such as but not limited to, flight dispatchers and maintenance personnel. These procedures should cover the usage of PBCS-relevant systems and include as a minimum:

(a) pre-flight planning requirements including MEL consideration and flight plan filing;

(b) actions to be taken in the data link operation, to include specific RCP/RSP required cases;

(c) actions to be taken for the loss of data link capability while in and prior to entering the airspace requiring specific RCP/RSP specifications. Examples may be found in ICAO Doc 10037;

(d) problem reporting procedures to the local/regional PBCS monitoring body or central reporting body as applicable; and

(e) compliance with specific regional requirements and procedures, if applicable.

PBCS OPERATIONS — QUALIFICATION AND TRAINING

(a) The operator should ensure that flight crew and other relevant personnel such as flight dispatchers and maintenance personnel are proficient with PBCS operations. A separate training programme is not required if data link communication is integrated in the current training programme. However, the operator should ensure that the existing training programme incorporates a basic PBCS concept and requirements for flight crew and other personnel that have direct impact on overall data link performance required for the provisions of air traffic services such as reduced separation.

(b) The elements covered during the training should be as a minimum:

(1) Flight crew

(i) Data link communication system theory relevant to operational use;

(ii) AFM limitations;

(iii) Normal pilot response to data link communication messages;

(iv) Message elements in the message set used in each environment;

(v) RCP/RSP specifications and their performance requirements;

(vi) Implementation of performance-based reduced separation with associated RCP/RSP specifications or other possible performance requirements associated with their routes;

(vii) Other ATM operations involving data link communication services;

(viii) Normal, non-normal and contingency procedures; and

(ix) Data link communication failure/problem and reporting.

Note (1) If flight crew has already been trained on data link operations, additional training only on PBCS is required, addressing a basic concept and requirements that have direct impact on overall data link performance required for provisions of air traffic services (e.g. reduced separation).

Note (2) Training may be provided through training material and other means that simulate the functionality.

(2) Dispatchers/flight operations officers

(i) Proper use of data link and PBCS flight plan designators;

(ii) Air traffic service provider’s separation criteria and procedures relevant to RCP/RSP specifications;

(iii) MEL remarks or exceptions based on data link communication;

(iv) Procedures for transitioning to voice communication and other contingency procedures related to the operation in the event of abnormal behaviour of the data link communication;

(v) Coordination with the ATS unit related to, or following a special data link communication exceptional event (e.g. log-on or connection failures); and

(vi) Contingency procedures to transition to a different separation standard when data link communication fails.

(3) Engineering and maintenance personnel

(i) Data link communication equipment including its installation, maintenance and modification;

(ii) MEL relief and procedures for return to service authorisations; and

(iii) Correction of reported non-performance of data link system.

PBCS OPERATIONS — CONTINUED AIRWORTHINESS

(a) The operator should ensure that aircraft systems are properly maintained to continue to meet the applicable RCP/RSP specifications.

(b) The operator should ensure that the following elements are documented and managed appropriately:

(1) configuration and equipment list detailing the pertinent hardware and software components for the aircraft/fleet(s) applicable to the specific RCP/RSP operation;

(2) configuration control for subnetwork, communication media and routing policies; and

(3) description of systems including display and alerting functions (including message sets).

PBCS OPERATIONS — CSP COMPLIANCE

(a) The operator should ensure that their contracted CSPs notify the ATS units of any failure condition that may have an impact on PBCS operations. Notification should be made to all relevant ATS units regardless of whether the CSP has a contract with them.

(b) The operator may demonstrate the compliance of their contracted CSP through service level agreements (SLAs)/contractual arrangements for data link services or through a joint agreement among PBCS stakeholders such as a Memorandum of understanding (MOU) or a PBCS Charter.

PBCS OPERATIONS — PBCS CHARTER

A PBCS charter has been developed by PBCS stakeholders and is available as an alternative to SLAs in order to validate the agreement between the operator and the CSP for compliance with RCP/RSP required for PBCS operations. The charter is hosted on the website www.FANS-CRA.com where operators and CSPs can subscribe.

PBCS OPERATIONS — PARTICIPATION IN MONITORING PROGRAMMES

(a) The operator should establish a process to participate in local or regional PBCS monitoring programmes and provide the following information, including any subsequent changes, to monitoring bodies:

(1) operator name;

(2) operator contact details; and

(3) other coordination information as applicable, including appropriate information means for the CSP/SSP service fail notification.

(b) The process should also address the actions to be taken with respect to problem reporting and resolution of deficiencies, such as:

(1) reporting problems identified by the flight crew or other personnel to the PBCS monitoring bodies associated with the route of flight on which the problem occurred

(2) disclosing operational data in a timely manner to the appropriate PBCS monitoring bodies when requested for the purposes of investigating a reported problem

(3) investigating and resolving the cause of the deficiencies reported by the PBCS monitoring bodies.

AMC1 SPO.IDE.H.105 Minimum equipment for flight

MANAGEMENT OF THE STATUS OF CERTAIN INSTRUMENTS, EQUIPMENT OR FUNCTIONS

The operator should control and retain the status of the instruments, equipment or functions required for the intended operation, that are not controlled for the purpose of continuing airworthiness management.

GM1 SPO.IDE.H.105 Minimum equipment for flight

MANAGEMENT OF THE STATUS OF CERTAIN INSTRUMENTS, EQUIPMENT OR FUNCTIONS

(a) The operator should define responsibilities and procedures to retain and control the status of instruments, equipment or functions required for the intended operation, that are not controlled for the purpose of continuing airworthiness management.

(b) Examples of such instruments, equipment or functions may be, but are not limited to, equipment related to navigation approvals as FM immunity or certain software versions.

AMC1 SPO.IDE.H.146 Lightweight flight recorder

OPERATIONAL PERFORMANCE REQUIREMENTS

(a) If the flight recorder records flight data, it should record at least the following parameters:

(1) relative time count,

(2) pitch attitude or pitch rate,

(3) roll attitude or roll rate,

(4) heading (magnetic or true) or yaw rate,

(5) latitude,

(6) longitude,

(7) positioning system: estimated error (if available),

(8) pressure altitude or altitude from a positioning system,

(9) time,

(10) ground speed,

(11) positioning system: track (if available),

(12) normal acceleration,

(13) longitudinal acceleration,

(14) lateral acceleration.

(b) If the flight recorder records images, it should capture views of the main instrument displays at the pilot station, or at both pilot stations when the aeroplane is certified for operation with a minimum crew of two pilots. The recorded image quality should allow reading the following indications during most of the flight:

(1) magnetic heading,

(2) time,

(3) pressure altitude,

(4) indicated airspeed,

(5) vertical speed,

(6) turn and slip,

(7) attitude,

(8) Mach number (if displayed),

(9) stabilised heading, and

(10) tachometer indication or equivalent indication of propulsive thrust or power.

(c) If the flight recorder records a combination of images and flight data, each flight parameter listed in (a) should be recorded as flight data or by means of images.

(d) The flight parameters listed in (a), which are recorded as flight data, should meet the performance specifications (range, sampling intervals, accuracy limits and resolution in read-out) as defined in the relevant table of EUROCAE Document ED-112 'Minimum Operational Performance Specification for Crash Protected Airborne Recorder Systems', dated March 2003, or EUROCAE Document ED-155 'Minimum Operational Performance Specification for Lightweight Flight Recording Systems', dated July 2009, or any later equivalent standard accepted by the CAA.

(e) The operational performance requirements for the flight recorder should be those laid down in:

(1) EUROCAE Document ED-155 or any later equivalent standard accepted by the CAA for lightweight flight recorders; or

(2) EUROCAE Document ED-112 or any later equivalent standard accepted by the CAA for crash-protected flight recorders.

GM1 SPO.IDE.H.146 Lightweight flight recorder

ADDITIONAL USEFUL INFORMATION

Refer to **GM1 CAT.IDE.A.146**.

GM2 SPO.IDE.H.146 Lightweight flight recorder

INSTALLATION OF CAMERAS

Refer to **GM2 SPO.IDE.A.146**.

GM3 SPO.IDE.H.146 Lightweight flight recorder

RECORDING ACCURACY OF ATTITUDE RATE PARAMETERS

Refer to **GM3 SPO.IDE.A.146**.

GM1 SPO.IDE.H.146(e) Lightweight flight recorder

FUNCTION TO MODIFY IMAGE AND AUDIO RECORDINGS

Refer to **GM1 SPO.IDE.A.146(e).**