สำนักงานการบินพลเรือนแห่งประเทศไทย
The Civil Aviation Authority of Thailand

Acceptable Means of Compliance and Guidance Material to TCAR OPS Part Commercial Air Transport

(AMC/GM to TCAR OPS Part - CAT)

AMC/GM to TCAR OPS Part - CAT

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Approved By

Suttipong Kongpool
Director General
The Civil Aviation Authority of Thailand

THAILAND CIVIL AVIATION REGULATION (TCAR)

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RECORD OF REVISIONS

Issue No.	Revision No.	Date (DD/MMM/YYYY)	Subject	Insert By (Department/ Division)
01	00	8 DEC 2023	Initial Issue	OPS
02	00	20 DEC 2024	New Issue	OPS

REVISION HIGHLIGHTS

Area of Change	Change Detail(s)
New Issue	New Issue

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LIST OF EFFECTIVE PAGES

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INTRODUCTION AND APPLICABILITY

In this publication the word 'should' is used to indicate that the Organisation, Owner or Operator has a degree of latitude in adhering to the requirement, particularly where the nature of the operation - or proposed operation - affects their ability to achieve the necessary degree of compliance with the requirement; provided that an acceptable level of safety is achieved.

If the Organisation's/owner's/operator's response is deemed to be inadequate by the Director General, a specific requirement or restriction may be applied as a condition of the appropriate instrument to be issued under Thailand Civil Aviation Regulations. This publication includes associated means of compliance and interpretative material wherever possible and, unless specifically stated otherwise, clarification will be based on this material or other relevant the CAAT documentation.

These AMCs and GM are based on EASA Executive Director Decisions (ED) up to 2018/012/R, 2019/005/R, 2019/019/R, 2019/025/R, 2021/002/R, 2021/005/R, 2021/008/R, 2022/005/R, 2022/012/R, and 2022/014/R.

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TABLE OF CONTENT

SUBPART A: GENERAL REQUIREMENTS

SECTION 1 - Motor-powered aircraft

AMC1 CAT.GEN.MPA.100(b) Crew responsibilities

COPIES OF REPORTS

Where a written report is required, a copy of the report should be communicated to the commander concerned unless the terms of the operator's reporting schemes prevent this.

AMC1 CAT.GEN.MPA.100(c)(1) Crew responsibilities

ALCOHOL CONSUMPTION

The operator should issue instructions concerning the consumption of alcohol by crew members. The instructions should be not less restrictive than the following:

(a) no alcohol should be consumed less than 8 hours prior to the specified reporting time for a flight duty period or the commencement of standby;

(b) the blood alcohol level should not exceed the lower of the Kingdom of Thailand national requirements or 0.2 per thousand at the start of a flight duty period;

(c) no alcohol should be consumed during the flight duty period or whilst on standby.

GM1 CAT.GEN.MPA.100(c)(2) Crew responsibilities

ELAPSED TIME BEFORE RETURNING TO FLYING DUTY

24 hours is a suitable minimum length of time to allow after normal blood donation or normal recreational (sport) diving before returning to flying duties. This should be considered by operators when determining a reasonable time period for the guidance of crew members.

APPLICABLE MEDICAL REGULATION

Information on the effects of medication, drugs, other treatments and alcohol can be found in the CAAT Medical Regulations.

GM1 CAT.GEN.MPA.105(a)(10) Responsibilities of the commander

IDENTIFICATION OF THE SEVERITY OF AN OCCURRENCE BY THE COMMANDER

The definitions of an accident and a serious incident as well as examples thereof can be found in Section 61 of the Air Navigation Act B.E. 2497 and Kingdom of Thailand Civil Aviation Regulations, including occurrence reporting Regulation(s).

GM1 CAT.GEN.MPA.105(e) Responsibilities of the commander

The procedures for making special-air-reports regarding runway braking action are contained in the Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM, Doc 4444), Chapter 4 and Appendix 1, Instructions for air-reporting by voice communcication.

AMC1 CAT.GEN.MPA.115(a) Personnel or crew members other than cabin crew in the passenger compartment

MEASURES TO PREVENT CONFUSION BY PASSENGERS

If personnel or crew members other than operating cabin crew members carry out duties in a passenger compartment, the operator should ensure that they do not perform tasks or wear a uniform in such a way that might identify them as members of the operating cabin crew.

GM1 CAT.GEN.MPA.115 Personnel or crew members other than cabin crew in the passenger compartment

POSITIONING CABIN CREW MEMBERS

To prevent confusion by passengers and undue expectations in case of emergency, positioning cabin crew members should not wear, or should at least make invisible to passengers, parts of the operator's cabin crew uniform, such as main jacket or crew signs or badges, that might identify them as members of the operating cabin crew.

AMC1 CAT.GEN.MPA.124 Taxiing of aircraft

PROCEDURES FOR TAXIING

Procedures for taxiing should include at least the following:

(a) application of the sterile flight crew compartment procedures;

(b) use of standard radio-telephony (RTF) phraseology;

(c) use of lights;

(d) measures to enhance the situational awareness of the minimum required flight crew members. The following list of typical items should be adapted by the operator to take into account its operational environment:

  (1) each flight crew member should have the necessary aerodrome layout charts available;

  (2) the pilot taxiing the aircraft should announce in advance his/her intentions to the pilot monitoring;

  (3) all taxi clearances should be heard and should be understood by each flight crew member;

  (4) all taxi clearances should be cross-checked against the aerodrome chart and aerodrome surface markings, signs, and lights;

  (5) an aircraft taxiing on the manoeuvring area should stop and hold at all lighted stop bars, and may proceed further when an explicit clearance to enter or cross the runway has been issued by the aerodrome control tower, and when the stop bar lights are switched off;

  (6) if the pilot taxiing the aircraft is unsure of his/her position, he/she should stop the aircraft and contact air traffic control;

  (7) the pilot monitoring should monitor the taxi progress and adherence to the clearances, and should assist the pilot taxiing;

  (8) any action which may disturb the flight crew from the taxi activity should be avoided or done with the parking brake set (e.g. announcements by public address);

(e) subparagraphs (d)(2) and (d)(7) are not applicable to single-pilot operations.

GM1 CAT.GEN.MPA.125 Taxiing of aeroplanes

SKILLS AND KNOWLEDGE

The following skills and knowledge may be assessed to check if a person can be authorised by the operator to taxi an aeroplane:

(a) positioning of the aeroplane to ensure safety when starting engine;

(b) getting ATIS reports and taxi clearance, where applicable;

(c) interpretation of airfield markings/lights/signals/indicators;

(d) interpretation of marshalling signals, where applicable;

(e) identification of suitable parking area;

(f) maintaining lookout and right-of-way rules and complying with air traffic control (ATC) or marshalling instructions, when applicable;

(g) avoidance of adverse effect of propeller slipstream or jet wash on other aeroplanes, aerodrome facilities and personnel;

(h) inspection of taxi path when surface conditions are obscured;

(i) communication with others when controlling an aeroplane on the ground;

(j) interpretation of operational instructions;

(k) reporting of any problem that may occur while taxiing an aeroplane; and

(l) adapting the taxi speed in accordance with prevailing aerodrome, traffic, surface and weather conditions.

GM2 CAT.GEN MPA.125 Taxiing of aeroplanes

SAFETY-CRITICAL ACTIVITY

(a) Taxiing should be treated as a safety-critical activity due to the risks related to the movement of the aeroplane and the potential for a catastrophic event on the ground.

(b) Taxiing is a high-workload phase of flight that requires the full attention of the flight crew.

GM1 CAT.GEN.MPA.130 Rotor engagement - helicopters

INTENT OF THE RULE

(a) The following two situations where it is allowed to turn the rotor under power should be distinguished:

  (1) for the purpose of flight, this is described in the Kingdom of Thailand Civil Aviation Regulation;

  (2) for maintenance purposes.

(b) Rotor engagement for the purpose of flight: the pilot should not leave the control when the rotors are turning. For example, the pilot is not allowed to get out of the aircraft in order to welcome passengers and adjust their seat belts with the rotors turning.

(c) Rotor engagement for the purpose of maintenance: the regulation, does not prevent ground runs being conducted by qualified personnel other than pilots for maintenance purposes.

The following conditions should be applied:

(1) the operator should ensure that the qualification of personnel, other than pilots, who are authorised to conduct maintenance runs is described in the appropriate manual;

(2) the operator shall provide appropriately specific training and procedures to be followed for all personnel, other than qualified pilot(s), who are likely to carry out the turning of a rotor under power for purposes other than flight;

(3) ground runs should not include taxiing the helicopter;

(4) there should be no passengers on board; and

(5) maintenance runs should not include collective increase or autopilot engagement (due to the risk of ground resonance).

AMC1 CAT.GEN.MPA.135(a)(3) – Admission to the flight crew compartment

INSTRUCTIONS FOR SINGLE-PILOT OPERATIONS UNDER VFR BY DAY

Where an aircraft is used in a single-pilot operation under visual flight rules (VFR) by day, but has more than one pilot station, the instructions of the operator may permit passengers to be carried in the unoccupied pilot seat(s), provided that the commander is satisfied that:

(a) it will not cause distraction or interference with the operation of the flight; and

(b) the passenger occupying a pilot seat is familiar with the relevant restrictions and safety procedures.

AMC1 CAT.GEN.MPA.140 Portable electronic devices

TECHNICAL PREREQUISITES FOR THE USE OF PEDS

(a) Scope

This AMC describes the technical prerequisites under which any kind of portable electronic device (PED) may be used on board the aircraft without adversely affecting the performance of the aircraft's systems and equipment.

(b) Prerequisites concerning the aircraft configuration

(1) Before an operator may permit the use of any kind of PED on-board, it should ensure that PEDs have no impact on the safe operation of the aircraft. The operator should demonstrate that PEDs do not interfere with on-board electronic systems and equipment, especially with the aircraft's navigation and communication systems.

(2) The assessment of PED tolerance may be tailored to the different aircraft zones for which the use of PEDs is considered, i.e. may address separately:

(i) the passenger compartment;

(ii) the flight crew compartment; and

(iii) areas not accessible during the flight.

(c) Scenarios for permitting the use of PEDs

(1) Possible scenarios, under which the operator may permit the use of PEDs, should be as documented in Table 1. The scenarios in Table 1 are listed in a descending order with the least permitting scenario at the bottom.

(2) Restrictions arising from the corresponding aircraft certification, as documented in the aircraft flight manual (AFM) or equivalent document(s), should stay in force. They may be linked to different aircraft zones, or to particular transmitting technologies covered.

(3) For Scenarios Nos. 3 to 8 in Table 1 the use of C-PEDs and cargo tracking devices may be further expanded, when the EMI assessment has demonstrated that there is no impact on safety as follows:

(i) for C-PEDs by using the method described in (d)(2); and

(ii) for cargo tracking devices by using the method described in (d)(3).

Table 1 – Scenarios for permitting the use of PEDs by the operator

No.	Technical condition	Non-intentional transmitters	T-PEDs
1	The aircraft is certified as T-PED tolerant, i.e. it has been demonstrated during the aircraft certification process that front door and back door coupling have no impact on the safe operation of the aircraft	All phases of flight	All phases of flight
2	A complete electromagnetic interference (EMI) assessment for all technologies, using the method described in (d)(1), has been performed and has demonstrated the T-PED tolerance	All phases of flight	All phases of flight
3	The aircraft is certified for the use of T-PEDs using particular technologies (e.g. WLAN or mobile phone)	All phases of flight	All phases of flight, restricted to those particular technologies
4	The EMI assessment, using the method described in (d)(1), has demonstrated that: the front door coupling has no impact on safety; and the back door coupling has no impact on safety when using particular technologies (e.g. WLAN or mobile phone)	All phases of flight	All phases of flight, restricted to those particular technologies
5	The EMI assessment, using the method described in (d)(1)(i), has demonstrated that the front door coupling has no impact on safety caused by non-intentional transmitters	All phases of flight	Not permitted

No.	Technical condition	Non-intentional transmitters	T-PEDs
6	The EMI assessment, using the method described in **(**d**)(**1**)(**ii**)**, has demonstrated that the back door coupling has no impact on safety when using particular technologies **(**e.g. WLAN or mobile phone**)**	All phases of flight **-** except low visibility approach operation	All phases of flight- except low visibility approach operation, restricted to those particular technologies
7	An EMI assessment has not been performed	All phases of flight - except low visibility approach operation	Not permitted
8	Notwithstanding Scenarios Nos. 3 to 7	(a) before taxi-out; (b) during taxi-in after the end of landing roll; and (c) the commander may permit the use during prolonged departure delays, provided that sufficient time is available to check the passenger compartment before the flight proceeds	

(d) Demonstration of electromagnetic compatibility

(1) EMI assessment at aircraft level

The means to demonstrate that the radio frequency (RF) emissions (intentional or non-intentional) are tolerated by aircraft systems should be as follows:

(i) to address front door coupling susceptibility for any kind of PEDs:

(A) EUROCAE, 'Guidance for the use of Portable Electronic Devices (PED'S) on Board Aircraft', ED-130A/ RTCA DO-363 'Guidance for the development of Portable Electronic Devices (PED) Tolerance for Civil Aicraft', Section 5; or

(B) EUROCAE, 'Aircraft Design and Certification for Portable Electronic Device (PED) Tolerance', ED-239/RTCA DO-307A, Section 4;

The use of RTCA, 'Guidance on Allowing Transmitting Portable Electronic Devices (T PEDs) on Aircraft', DO-294C (or later revisions), Appendix 5C; or RTCA DO-307 'Aircraft Design and Certification for Portable Electronic Device (PED) Tolerance', (including Change 1 or later revisions), Section 4 may be acceptable.

(ii) to address back door coupling susceptibility for T-PEDs:

(A) EUROCAE, 'Guidance for the use of portable electronic devices (PEDs) on board aircraft', ED-130/RTCA DO-363, Section 6; or

(B) EUROCAE. 'Aircraft Design and Certification for portable electronic device tolerance (PED) Tolerance, ED-239/RTCA DO-307A, Section 3; or

(C) The use of EUROCAE, 'Guidance for the use of Portable Electronic Devices (PEDs) on Board Aircraft', ED-130, Annex 6; or RTCA DO-294C (or later revisions), Appendix 6D; or RTCA DO-307 (including Change 1 or later revisions), Section 3 may be acceptable.

(2) Alternative EMI assessment of C-PEDs

(i) For front door coupling:

(A) C-PEDs should comply with the levels as defined by:

EUROCAE/RTCA, 'Environmental conditions and test procedures for airborne equipment', ED-14D/DO-160D (or later revisions), Section 21, Category M, for operation in the passenger compartment and the flight crew compartment; and

EUROCAE ED-14E/RTCA DO-160D (or later revisions), Section 21, Category M, for operation in areas not accessible during the flight.

(B) If the C-PEDs are electronic flight bags used in the flight crew compartment and if the DO-160 testing described in (A) identifies adequate margins for interference or has not been performed, it is necessaryto test the C-PED in each aircraft model in which it will be operated. The C-PED should be tested in operation on the aircraft to show that no interference with aircraft equipment occurs. Credit may be given to other aircraft that are similarly equipped (meaning in particular that they contain the same avionics equipment) of the same make and model as the one tested.

(ii) To address back door coupling susceptibility for C-PEDs with transmitting capabilities, the EMI assessment described in (1)(ii) should be performed.

(3) Alternative EMI assessment of cargo tracking devices

In case a transmitting function is automatically deactivated in a cargo tracking device (being a T-PED), the unit should be qualified for safe operation on board the aircraft. One of the following methods should be considered acceptable as evidence for safe operation:

(i) A type-specific safety assessment, including failure mode and effects analysis, has been performed at aircraft level. The main purpose of the assessment should be to determine the worst hazards and to demonstrate an adequate design assurance level of the relevant hardware and software components of the cargo tracking device.

(ii) The high intensity radiated field (HIRF) certification of the aircraft has been performed, i.e. the aircraft type has been certified after 1987 and meets the appropriate special condition. In such a case, the operator should observe the following:

(A) The tracking device:

(a) features an automated and prolonged radio suspension in flight using multiple modes of redundancy; and

(b) has been verified in the aircraft environment to ensure deactivation of the transmitting function in flight.

(B) The emissions from the tracking device comply with the levels as defined by EUROCAE ED-14E/RTCA DO-160E (or later revisions), Section 21, Category H.

(C) The operator should ensure that the following documents are provided by the tracking device manufacturer:

(a) a declaration from the manufacturer identifying the device and confiring that the device and its deactivation function comply with the requirements (A) and (B) above;

(b) a declaration to show that the robust design and production controls are in place during the manufacturing of the tracking device.

(c) a declaration of conformity and technical documentation showing compliance with European Norms (EN), regulating the transmitter characteristics ofthe tracking device or its transmission module; and

(d) the EMI assessment report documenting compliance with point (B) above.

(iii) The tracking device interference levels during transmission are below those considered acceptable for the specific aircraft environment.

(e) Operational conditions of C-PEDs and cargo tracking devices

The operator should ensure that C-PEDs and cargo tracking devices are maintained in good and safe condition, having in mind that:

(1) damage may modify their emissions characteristics; and

(2) damage to the battery may create a fire hazard.

(3) Batteries in C-PEDs and cargo tracking devices

(f) Lithium-type batteries in C-PEDs and cargo tracking devices should meet:

(1) United Nations (UN) Transportation Regulations, 'Recommendations on the transport of dangerous goods - manual of tests and criteria', UN ST/SG/AC.10/11; and

(2) one of the following standards:

(i) Underwriters Laboratory, 'Lithium batteries', UL 1642;

(ii) Underwriters Laboratory, 'Household and commercial batteries', UL 2054;

(iii) Underwriters Laboratory, 'Information technology equipment – safety', UL 60950-1;

(iv) International Electrotechnical Commission (IEC), 'Secondary cells and batteries containing alkaline or other non-acid electrolytes - safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications', IEC 62133;

(v) RTCA, 'Minimum operational performance standards for rechargeable lithium battery systems', DO-311. RTCA DO-311 may be used to address concerns regarding overcharging, over-discharging, and the flammability of cell components. The standard is intended to test permanently installed equipment; however, these tests are applicable and sufficient to test electronic flight bags rechargeable lithium-type batteries; or

(vi) European Technical Standard Order (ETSO), 'Non-rechargeable lithium cells and batteries', ETSO C142a.

AMC2 CAT.GEN.MPA.140 Portable electronic devices

PROCEDURES FOR THE USE OF PEDS

(a) Scope

This AMC describes the procedures under which any kind of portable electronic device (PED) may be used on board the aircraft without adversely affecting the performance of the aircraft's systems and equipment. This AMC addresses the operation of PEDs in the different aircraft zones passenger compartment, flight compartment, and areas inaccessible during the flight.

(b) Prerequisites

Before permitting the use of any kind of PEDs the operator should ensure compliance with (c) of AMC1 CAT.GEN.MPA.140.

(c) Hazard identification and risk assessment

The operator should identify the safety hazards and manage the associated risks following the management system implemented in accordance with ORO.GEN.200. The risk assessment should include hazards associated with:

(1) PEDs in different aircraft zones;

(2) PED use during various phases of flight;

(3) PED use during turbulence;

(4) improperly stowed PEDs;

(5) impeded or slowed evacuations;

(6) passenger non-compliance, e.g. not deactivating transmitting functions, not switching off PEDs or not stowing PEDs properly;

(7) disruptive passengers; and

(8) battery fire.

(d) Use of PEDs in the passenger compartment

(1) Procedures and training

If an operator permits passengers to use PEDs on board its aircraft, procedures should be in place to control their use. These procedures should include provisions for passenger briefing, passenger handling and for the stowage of PEDs. The operator should ensure that all crew members and ground personnel are trained to enforce possible restrictions concerning the use of PEDs, in line with these procedures.

(2) Provisions for use

(i) The use of PEDs in the passenger compartment may be granted under the responsibility of the operator, i.e. the operator decides which PED may be used during which phases of the flight.

(ii) Notwithstanding (b), medical equipment necessary to support physiological functions may be used at all times and does not need to be switched-off.

(3) Stowage, passenger information and passenger briefing of PEDs

(i) In accordance with CAT.OP.MPA.160 the operator should establish procedures concerning the stowage of PEDs. The operator should:

(A) identify the phases of flight in which PEDs are to be stowed; and

(B) determine suitable stowage locations, taking into account the PEDs' size and weight.

(ii) The operator should provide general information on the use of PEDs to the passengers before the flight. This information should specify at least:

(A) which PEDs can be used during which phases of the flight;

(B) when and where PEDs are to be stowed; and

(C) that the instructions of the crew are to be followed at all times

(iii) In accordance with CAT.OP.MPA.170, the use of PEDs should be part of the passenger briefings. The operator should remind passengers to pay attention and to avoid distractions duirng such briefings.

(4) In-seat electrical power supplies

Where in-seat electrical power supplies are available for passenger use, the following should apply:

(i) information giving safety instructions should be provided to the passengers;

(ii) PEDs should be disconnected from any in-seat electrical power supply during taxiing, take-off, approach, landing, and during abnormal or emergency conditions; and

(iii) flight crew, cabin crew and technical crew should be aware of the proper means to switch-off in-seat power supplies used for PEDs.

(5) Operator's safety measures during boarding and any phase of flight

(i) Appropriate coordination between flight crew, cabin crew and technical crew should be established to deal with interference or other safety problems associated with PEDs.

(ii) Suspect equipment should be switched off.

(iii) Particular attention should be given to passenger misuse of equipment.

(iv) Thermal runaways of batteries, in particular lithium batteries, and potential resulting fire, should be handled properly.

(v) The commander may, for any reason and during any phase of flight, require deactivation and stowage of PEDs.

(vi) When the operator restricts the use of PEDs, consideration should be given to handle special requests to operate a T-PED during any phase of the flight for specific reasons (e.g. for security measures).

(6) Reporting

Occurrences of suspected or confirmed interference should be reported to the CAAT. Where possible, to assist follow-up and technical investigation, reports should describe the suspected device, identify the brand name and model number, its location in the aircraft at the time of the occurrence, interference symptoms, the device user's contact details and the results of actions taken by the crew.

(e) Use of PEDs in the flight crew compartment

In the flight crew compartment the operator may permit the use of PEDs, e.g. to assist the flight crew in their duties, when procedures are in place to ensure the following:

(1) The conditions for the use of PEDs in-flight are specified in the operations manual.

(2) The PEDs do not pose a loose item risk or other hazard.

(3) These provisions should not preclude use of a T-PED (specifically a mobile phone) by the flight crew to deal with an emergency. However, reliance should not be predicated on a T- PED for this purpose.

(f) PEDs not accessible during the flight

PEDs should be switched off, when not accessible for deactivation during flight. This should apply especially to PEDs contained in baggage or transported as part of the cargo. The operator may permit deviation for PEDs for which safe operation has been demonstrated in accordance with AMC1 CAT.GEN.MPA.140. Other precautions, such as transporting in shielded metal boxes, may also be used to mitigate associated risks.

GM1 CAT.GEN.MPA.140 Portable electronic devices

DEFINITIONS

(a) categories of PEDs

PEDs include the following two categories:

(1) Non-intentional transmitters can non-intentionally radiate RF transmissions, sometimes referred to as spurious emissions. This category includes, but is not limited to, calculators, cameras, radio receivers, audio and video players, electronic games and toys; when these devices are not equipped with a transmitting function.

(2) Intentional transmitters radiate RF transmissions on specific frequencies as part of their intended function. In addition, they may radiate non-intentional transmissions like any PED. The term ‘transmitting PED’ (T-PED) is used to identify the transmitting capability of the PED. Intentional transmitters are transmitting devices such as RF-based remote control equipment, which may include some toys, two-way radios (sometimes referred to as ‘private mobile radio’), mobile phones of any type, satellite phones, computers with mobile phone data connection, wireless local area network (WLAN) or Bluetooth capability. After deactivation of the transmitting capability, e.g. by activating the so-called ‘flight mode’ or ‘flight safety mode’, the T-PED remains a PED having non-intentional emissions.

(b) Cargo tracking device

A cargo tracking device is a PED attached to or included in airfreight (e.g. in or on containers, pallets, parcels or baggage). Cargo tracking devices can be assigned to the category of non-intentional transmitters or T-PEDs. If the device is a T-PED, it complies with the European Norms (EN) for transmissions, or standards acceptable to the CAAT.

(c) Definition of the switched-off status

Many PEDs are not completely disconnected from the internal power source when switched off. The switching function may leave some remaining functionality e.g. data storage, timer, clock, etc. These devices can be considered switched off when in the deactivated status. The same applies to devices having no transmitting capability and are operated by coin cells without further deactivation capability, e.g. wrist watches.

(d) Electromagnetic interference (EMI)

The two classes of EMI to be addressed can be described as follows:

(1) Front door coupling is the possible disturbance to an aircraft system as received by the antenna of the system and mainly in the frequency band used by the system. Any PED internal oscillation has the potential to radiate low level signals in the aviation frequency bands. Through this disturbance especially the instrument landing system (ILS) and the VHF omni range (VOR) navigation system may indicate erroneous information.

(2) Back door coupling is the possible disturbance of aircraft systems by electromagnetic fields generated by transmitters at a level which could exceed on short distance (i.e. within the aircraft) the electromagnetic field level used for the aircraft system certification. This disturbance may then lead to system malfunction.

GM2 CAT.GEN.MPA.140 Portable electronic devices

CREW REST COMPARTMENT, NAVIGATION, TEST ENTITIES AND FIRE CAUSED BY PEDS

(a) When the aircraft is equipped with a crew rest compartment, it is considered being part of the passenger compartment.

(b) Front door coupling may influence the VOR navigation system. Therefore, the flight crew monitors other navigation sensors to detect potential disturbances by PEDs, especially during low visibility departure operation based on VOR guidance.

(c) Specific equipment, knowledge and experience are required, when the industry standards for evaluating technical prerequisites for the use of PEDs are applied. In order to ensure conformity with the industry standards, the operator is encouraged to cooperate with an appropriately qualified and experienced entity, as necessary. For this entity an aviation background is not required, but is considered to be beneficial.

(d) Guidance to follow in case of fire caused by PEDs is provided by the International Civil Aviation Organisation, 'Emergency response guidance for aircraft incidents involving dangerous goods', ICAO Doc 9481-AN/928.

GM3 CAT.GEN.MPA.140 Portable electronic devices

CARGO TRACKING DEVICES EVALUATION

(a) Safety assessment

Further guidance on performing a safety assessment can be found in:

(1) EASA, 'Certification specifications and acceptable means of compliance for large aeroplanes', CS-25, Book 2, AMC-Subpart F, AMC 25.1309;

(2) EUROCAE/SAE, 'Guidelines for development of civil aircraft and systems', ED-79/ARP 4754 (or later revisions); and

(3) SAE, 'Guidelines and methods for conducting the safety assessment process on civil airborne systems and equipment', ARP 4761 (or later revisions).

(b) HIRF certification

The type certificate data sheet (TCDS), available on the EASA website for each aircraft model having EASA certification, lists whether the HIRF certification has been performed through a special condition. The operator may contact the type certification holder to gain the necessary information.

(c) Multiple modes of redundancy

Multiple modes of redundancy means that the device is designed with a minimum of two independent means to turn it off completely, turn off the cellular or mobile functions, or a combination of both when airborne. These independent methods should use different sources to identify that the aircraft is in flight, for example, a cargo-tracking device may be designed to sense rapid altitude changes and acceleration to determine when to turn off cellular transmissions. Redundant sources of the same information, such as the two vertical accelerometers, should not be considered independent.

GM1 CAT.GEN.MPA.141 Use of electronic flight bags (EFBs)

DEFINITIONS

For the purpose of EFB use, the following definitions apply:

(a) Aircraft administrative communications (AAC):

AAC are defined by ICAO as non-safety communications that are used by aeronautical operating agencies and are related to the business aspects of operating their flights and transport services. These communications are used for a variety of purposes, such as flight and ground transportation, bookings, deployment of crew, and aircraft or any other logistical purposes that maintain or enhance the efficiency of overall flight operations. AAC data links receive/transmit information that includes, but is not limited to, the support of EFB applications.

(b) Aeronautical operational control (AOC):

AOC communications are defined by ICAO as communications required for the exercise of authority over the initiation, continuation, diversion or termination of flight for safety, regularity, and efficiency reasons.

GM2 CAT.GEN.MPA.141 Use of electronic flight bags (EFBs)

BACKGROUND INFORMATION

Further related information on EFB hardware and EFB applications can be found in the following documents:

(a) EASA AMC 20-25, Airworthiness considerations for EFBs;

(b) EASA CS-25, Book 2, AMC Subpart F, AMC 25.1309, System Design and Analysis;

(c) EUROCAE ED-14D/DO-160D (or later revisions) Environmental Conditions and Test Procedures for Airborne Equipment;

(d) EASA ETSO-C165A, Electronic Map Systems for Graphical Depiction of Aircraft Position;

(e) FAA AC 120-76(C), Authorization for an Electronic Flight Bag Programme;

(f) FAA AC 120-78, Electronic Signatures, Electronic Recordkeeping, and Electronic Manuals;

(g) ICAO Doc 10020, Manual of Electronic Flight Bags (EFBs).

AMC1 CAT.GEN.MPA.141(a) Use of electronic flight bags (EFBs)

HARDWARE

Before using a portable EFB, the following considerations should be assessed by the operator:

(a) General

A portable EFB is a portable electronic device (PED) and may host type A and/or type B EFB applications. In addition, it may host miscellaneous software applications. Portable EFBs are controlled PEDs (C-PEDs).

A portable EFB should be capable of operation autonomously inside and outside the aircraft.

The mass, dimensions, shape, and position of the portable EFB should not compromise flight safety.

The power supply of a portable EFB may be provided by aircraft sources through an adequate power source.

If mounted or stowed, a portable EFB should be easily removable from its mounting device/viewable stowage device or attached to it, without the use of tools by the flight crew. Any locking devices used to prevent theft should be unlocked during flight.

A portable EFB may be part of a system that contains EFB-installed resources which are part of the certified aircraft configuration. The intended functions of the EFB-installed components may be to mount the EFB onto the aircraft and/or connect it to other systems.

Portable EFBs may be used in all phases of the flight if secured to a certified mount or securely attached to a viewable stowage device in a manner that allows its use.

Portable EFBs that do not meet the above characteristics should be stowed during critical phases of the flight.

However, this does not preclude a flight crew from using a portable EFB during restricted portions of the critical phases of flight to complete a task related to the safety of the flight on the condition that the device is continuously handheld and used only during a short period of time. When the task is completed, the device should be stowed again.

Any EFB component that is either not accessible in the flight crew compartment by the flight crew members or not removable by the flight crew members should be installed as ‘certified equipment’ covered by a type certificate (TC), a change to a TC or a supplemental (S)TC.

(b) Characteristics and placement of the EFB display

For a portable EFB, the considerations on the location of the display proposed below should apply to the proposed location of the display when the EFB is in use.

The EFB display and any other elements of the EFB system should be placed in such a way that they do not unduly impair the flight crew’s external view during any of the phases of the flight. Equally, they should not impair the view of or access to any flight-crew-compartment control or instrument.

The location of the display unit and the other EFB system elements should be assessed for their possible impact on egress requirements.

When the EFB is in use (intended to be viewed or controlled), its display should be within 90 degrees on either side of each flight crew member’s line of sight.

Glare and reflection on the EFB display should not interfere with the normal duties of the flight crew.

(c) Power source

If the aircraft is equipped with electrical power outlet(s) in the flight crew compartment, the operator should ensure that their certified characteristics are compatible with the intended use of the EFB system. The powering or charging of the EFB system should be compatible with the electrical characteristics of the power supplied by the outlets in terms of power consumption, voltage, frequency, etc., not to impair the EFB system or other aircraft systems.

(d) EFB data connectivity Portable

EFBs may have data connectivity to aircraft systems, either wired or wireless, provided that the connections (hardware and software for data connection provisions) and adequate interface protection devices are incorporated into the aircraft type design.

A portable EFB may receive any data from aircraft systems, but data transmission from EFBs should be limited to aircraft systems that have been certified for this intended purpose (refer to AMC 20-25 for more details).

(e) External connecting cables (to avionics and/or power sources)

When external cables are used to connect a portable EFB to the aircraft systems and/or to a power source, the following should apply:

cables should not hang loosely in a way that compromises task performance and safety; flight crew members should be able to easily secure the cables out of the way during operations (e.g. by using cable tether straps); and

cables should be of sufficient length so that they do not obstruct the use of any movable device (e.g. flight controls, switches, seats, windows) in the flight crew compartment.

(f) Electromagnetic interference (EMI) demonstrations

See paragraph (b), (c) and (d) of AMC1 CAT.GEN.MPA.140.

The EMI demonstration should cover any cable connected to the EFB as well as non-certified power chargers.

(g) Batteries

See paragraph (f) of AMC1 CAT.GEN.MPA.140.

(h) Viewable stowage

The evaluation of the viewable stowage should be performed for a given location in the flight deck. This location should be documented and this information should be part of the EFB policy.

The viewable stowage should not be positioned in such a way that it creates significant obstruction to the flight crew members' view or hinders physical access to aircraft controls and/or displays and/or aircraft safety equipment, flight crew ingress or egress. The viewable stowage as positioned should allow the flight crew to retain a sufficiently extensive, clear, and undistorted view, to enable them to safely perform any manoeuvres within the operating limitations of the aircraft, including taxiing, take-off, approach, and landing. The design of the viewable stowage should allow the user easy access to any item of the EFB system, even if stowed, and notably to the EFB controls and a clear view of the EFB display while in use. The following design practices should be considered:

(1) The viewable stowage and associated mechanisms should not impede the flight crew members in the performance of any task (whether normal, abnormal, or emergency) associated with operating any aircraft system;

(2) When the viewable stowage is used to secure an EFB display, it should be able to be easily locked in position. If necessary, the selection of positions should be adjustable enough to accommodate a range of flight crew member preferences. In addition, the range of available movement should accommodate the expected range of users' physical abilities (i.e. anthropometric constraints). Locking mechanisms should be of a low-wear type that will minimise slippage even after extended periods of normal use;

(3) The viewable stowage should be designed and installed so that it will sustain all foreseeable conditions relative to the flight environment (e.g. severe turbulence, hard landings) while retaining its structural integrity and without becoming detached. The use of restraints of the device should be considered where appropriate;

(4) A provision should be available to secure or lock the device in a position out of the way of flight crew operations when not in use. When stowed, the device and its securing mechanism should not intrude into the flight crew compartment space to the extent that they cause either visual or physical obstruction of flight controls/displays and/or ingress/egress routes;

(5) Possible mechanical interference issues of the viewable stowage, either on the side panel (side stick controller), or on the control yoke, in terms of full and free movement under all operating conditions and non-interference with buckles, etc., should be prevented;

(6) Adequate means should be provided (e.g. hardware or software) to shut down the portable EFB when its controls are not accessible by the flight crew members when strapped in the normal seated position; and

(7) The viewable stowage device should be easily removable from the aircraft without the use of tools.

Some types of means for securing viewable stowage may have characteristics that degrade noticeably with ageing or due to various environmental factors. In that case, the documentation should include procedures (e.g. crew procedures, checks, or maintenance actions) to ensure that the stowage characteristics remain within acceptable limits for the proposed operations. Securing means based on vacuums (e.g. suction cups) have holding capacities that decrease with pressure. It should be demonstrated that they will still perform their intended function at operating cabin altitudes or in the event of a rapid decompression.

In addition, it should be demonstrated that if the EFB moves or is separated from its stowage, or if the viewable stowage is unsecured from the aircraft (as a result of turbulence, manoeuvring, or other action), it will not jam flight controls, damage flight deck equipment, or injure flight crew members.

The risks associated with an EFB fire should be minimised by the design and location of the viewable stowage. GM1 CAT.GEN.MPA.141(a) Use of electronic flight bags.

GM1 CAT.GEN.MPA.141(a) Use of electronic flight bags (EFBs)

VIEWABLE STOWAGE

(a) Viewable stowage devices have been involved in several reported incidents worldwide. The following issues should be considered by the operator when assessing the compliance of a viewable stowage device:

(1) The EFB or EFB stowage interfering with controls (e.g. side sticks, tillers, PTT switches, etc.);

(2) Stowage or EFB cables interfering with the opening of windows;

(3) Stowage or EFB cables interfering with the access to oxygen masks;

(4) The EFB falling during take-off, cruise, or landing, interfering with flight controls, disengaging the autopilot, or hurting the flight crew; and

(5) Suction cups detaching following a loss of pressurisation, adding to the crew's workload.

(b) Guidance on the safety, reliability and usability of different viewable stowage solutions and on the related operating conditions can be found in a study published by the FAA.

With regard to the specific example of suction cups, the following means of mitigation are recommended:

(1) The suction cups and the surface to which they will be attached should be properly cleaned with isopropyl alcohol or aircraft window cleaner prior to attachment of the suction cups;

(2) Attachment surfaces should be substantially smooth and flat;

(3) Periodic cleaning and reattachment should be performed, as appropriate, for the conditions of the environment in which they are used (dusty, etc.);

(4) Suction cups should not be left attached to the aircraft windscreen for long periods of time;

(5) Suction cups should be replaced every 6 months at a minimum, and, more often in extreme environments.

AMC1 CAT.GEN.MPA.141(b) Use of electronic flight bags (EFBs)

APPLICATION CLASSIFICATION

An EFB software application is an application that is not part of the configuration of the certified aircraft and is installed on an EFB system to support flight operations. The classification of the applications, based on their respective safety effects, is intended to provide clear divisions between such applications and, therefore, between the assessment processes applied to each. For the purpose of the following process, 'malfunction or misuse' means any failure, malfunction of the application, or design-related human errors that can reasonably be expected in service.

(a) Determination of an application type:

AMC2 CAT.GEN.MPA.141(b) and AMC3 CAT.GEN.MPA.141(b) should be used to justify a classification, provided that the application does not feature design or functional novelties that introduce new forms of crew interaction or unusual procedures.

An application may also be recognised as a type A or type B EFB application through an appropriate approval (e.g. ETSO authorisation) granted by the authority.

If an application is not listed in AMC2 or AMC3 to CAT.GEN.MPA.141(b), presents a high degree of novelty, or is not by an approval acceptable to the CAAT (e.g. EASA ETSO authorisation or FAA equivalent), the classification should be established using the definitions and criteria provided hereafter.

As a first step, it should be verified that the application does not belong to the following list of applications that are not eligible for classification as either type A or type B EFB applications.

Applications that:

(1) display information which is tactically used by the flight crew members to check, control or deduce the aircraft position or trajectory, either to follow the intended navigation route or to avoid adverse weather, obstacles or traffic during the flight;

(2) display information which may be directly used by the flight crew members to assess the real-time status of aircraft critical and essential systems, as a replacement for existing installed avionics, and/or to manage aircraft critical and essential systems following a failure;

(3) send data to air traffic services;

are not eligible to be classified as either type A or type B EFB applications.

Then, the next steps in this process should be to:

(1) identify any failure conditions resulting from potential losses of function or malfunction (with either detected or undetected erroneous outputs), taking into consideration any relevant factors (e.g. aircraft/system failures, operational or environmental conditions) and any established mitigation (e.g. flight crew procedures, flight crew training) that would intensify or alleviate the effects; and

(2) classify the application as follows, based on the assessment of the safety effect of each failure condition:

(i) if there is no failure condition that may have a safety effect, the application should be classified as a type A EFB application;

(ii) if one or several failure conditions with a safety effect that is limited to minor are identified, the application should be classified as type B;

(iii) if more severe failure conditions are identified, the application should not be eligible for classification as an EFB application.

Software applications with failure conditions that are classified as more severe than minor are ineligible as type A or type B EFB applications.

Notes:

– The severity of the failure conditions linked to displaying a function that already exists in the certified type design, or that is already authorised through an ETSO, and used with same concept of operation (considering the intended function but also operational means of mitigation), should be considered in the assessment of the severity of the failure condition of an application and cannot be less than the severity already assessed for this function.

– The data resulting from this process may be reused by the operators in the context of the EFB risk assessment process.

(b) Miscellaneous software applications

Miscellaneous software applications are applications that support function(s) that are not directly related to operations conducted by the flight crew on the aircraft. Miscellaneous software applications are not considered to be EFB applications for the purposes of this AMC.

Examples of miscellaneous software applications are web browsers (not used for operational purposes), email clients, picture management applications, or even applications used by ground crews (e.g. for maintenance purposes).

AMC2 CAT.GEN.MPA.141(b) Use of electronic flight bags (EFBs)

TYPICAL TYPE A EFB APPLICATIONS

The following EFB application should be considered type A EFB applications:

(a) browsers that display:

(1) the certificates and other documents which are required to be carried by the applicable operational regulations, including digitally created documents such as:

(i) the certificate of registration;

(ii) the certificate of airworthiness (CofA);

(iii) the noise certificate, and its English translation if applicable;

(iv) the air operator certificate (AOC);

(v) the operations specifications relevant to the aircraft type, issued with the AOC;

(vi) the third-party liability insurance certificate(s); and

(vii) the aircraft continuing airworthiness records, including the technical log (flight crew view thereof);

(2) some manuals and additional information and forms which are required to be carried by the applicable operational regulations such as:

(i) notifications of special categories of passenger (SCPs) and special loads; and

(ii) passenger and cargo manifests, if applicable; and

(3) other information within the operator's aircraft library such as:

(i) airport diversion policy guidance, including a list of special designated airports and/or approved airports with emergency medical service (EMS) support facilities;

(ii) maintenance manuals;

(iii) emergency response guidance for aircraft incidents involving dangerous goods (see ICAO Doc 9481-AN/928);

(iv) aircraft parts manuals;

(v) service bulletins/published airworthiness directives, etc.;

(vi) current fuel prices at various airports;

(vii) trip scheduling and bid lists;

(viii) passenger information requests;

(ix) examiner and flight instructor records; and

(x) flight crew currency requirements;

(b) interactive applications for crew rest calculations in the framework of flight time limitations;

(c) interactive forms to comply with the reporting requirements of the authority and the operator;

(d) applicationsthat make use of aircraft administrative communications (AAC) to collect, process and then disseminate data that has no effect on the safe operation of an aircraft.

AMC3 CAT.GEN.MPA.141(b) Use of electronic flight bags (EFBs)

TYPICAL TYPE B EFB APPLICATIONS

The following EFB applications should be considered type B EFB applications, provided that they do not feature design or functional novelties that introduce new forms of crew interaction or unusual procedures:

(a) Document browsers that display the manuals and additional information and forms required to be carried by regulations and that are necessary for the safe operation of the aircraft, such as:

  (1) the operations manual (including the minimum equipment list (MEL) and configuration deviation list (CDL));

  (2) the aircraft flight manual, or equivalent document;

  (3) the operational flight plan;

  (4) meteorological information with graphical interpretation;

  (5) air traffic services (ATS) flight plan;

  (6) notices to airmen (NOTAMs) and aeronautical information service (AIS) briefing documentation.

(b) Electronic aeronautical chart applications including en-route, area, approach, and airport surface maps.

(c) Airport moving map display (AMMD) applications.

(d) Applications that make use of the aeronautical operational control (AOC) communications to collect, process and then disseminate operational data.

(e) Aircraft performance calculation applications that use algorithmic data or that perform calculations using software algorithms to provide aircraft performance data such as:

  (1) take-off, en-route, approach and landing, missed approach and other phases of flight, performance calculations providing limiting masses, distances, times and/or speeds, etc.;

  (2) power settings, including reduced take-off thrust settings, etc.

(f) Mass and balance calculation applications used to establish the mass and centre of gravity of the aircraft and to determine that the load and its distribution are such that the mass and balance limits of the aircraft are not exceeded.

(g) Applications providing in-flight weather information.

GM1 CAT.GEN.MPA.141(b) Use of electronic flight bags (EFBs)

TACTICAL USE

The tactical use of an EFB application is considered to be related to short-term decision-making, while strategic use is related to long-term decision-making support.

GM2 CAT.GEN.MPA.141(b) Use of electronic flight bags (EFBs)

HUMAN–MACHINE INTERFACE (HMI) FOR TYPE A EFB APPLICATIONS

An HMI assessment is not required for a type A EFB application. However, type A EFB applications should be designed in accordance with the human factor principles in order to minimise their impacts on crew workload.

AMC1 CAT.MPA.145 Information on emergency and survival equipment carried

ITEMS FOR COMMUNICATION TO THE RESCUE COORDINATION CENTRE

The information, compiled in a list, should include, as applicable, the number, colour and type of life rafts and pyrotechnics, details of emergency medical supplies, e.g. first-aid kits, emergency medical kits, water supplies and the type and frequencies of emergency portable radio equipment.

GM1 CAT.GEN.MPA.155 Carriage of weapons of war and munitions of war

WEAPONS OF WAR AND MUNITIONS OF WAR

(a) In accordance with the National Civil Aviation Security Programme (NCASP) of the Kingdom of Thailand, weapons of war may be carried on board an aircraft, in a place that is not inaccessible, if the required security conditions in accordance with national laws have been fulfilled and authorisation has been given by the States involved.

(b) There is no internationally agreed definition of weapons of war and munitions of war. Some States may have defined them for their particular purposes or for national need.

(c) It is the responsibility of the operator to check, with the State(s) concerned, whether or not a particular weapon or munition is regarded as a weapon of war or munitions of war. In this context, States that may be concerned with granting approvals for the carriage of weapons of war or munitions of war are those of origin, transit, overflight and destination of the consignment and the State of the operator.

(d) Where weapons of war or munitions of war are also dangerous goods by definition (e.g. torpedoes, bombs, etc.), CAT.GEN.MPA.200 Transport of dangerous goods also applies.

GM1 CAT.GEN.MPA.160 Carriage of sporting weapons and ammunition

SPORTING WEAPONS

(a) In accordance with the the National Civil Aviation Security Programme (NCASP) of the Kingdom of Thailand, sporting weapons may be carried on board an aircraft, in a place that is not inaccessible, if the required security conditions in accordance with national laws have been fulfilled and authorisation has been given by the States involved.

(b) There is no internationally agreed definition of sporting weapons. In general, it may be any weapon that is not a weapon of war or munitions of war. Sporting weapons include hunting knives, bows and other similar articles. An antique weapon, which at one time may have been a weapon of war or munitions of war, such as a musket, may now be regarded as a sporting weapon.

(c) A firearm is any gun, rifle or pistol that fires a projectile.

(d) The following firearms are generally regarded as being sporting weapons:

  (1) those designed for shooting game, birds and other animals;

  (2) those used for target shooting, clay-pigeon shooting and competition shooting, providing the weapons are not those on standard issue to military forces; and

(3) airguns, dart guns, starting pistols, etc.

(e) A firearm, which is not a weapon of war or munitions of war, should be treated as a sporting weapon for the purposes of its carriage on an aircraft.

AMC1 CAT.GEN.MPA.161 Carriage of sporting weapons and ammunition — alleviations

SPORTING WEAPONS — HELICOPTERS

Procedures for the carriage of sporting weapons may need to be considered if the helicopter does not have a separate compartment in which the weapons can be stowed. These procedures should take into account the nature of the flight, its origin and destination, and the possibility of unlawful interference. As far as possible, the weapons should be stowed so they are not immediately accessible to the passengers, locked boxes, in checked baggage that is stowed under other baggage or under fixed netting.

AMC1 CAT.GEN.MPA.170(b) Psychoactive substances

POLICY ON THE PREVENTION OF MISUSE OF PSYCHOACTIVE SUBSTANCES

(a) The operator's policy on prevention of misuse of psychoactive substances should ensure that flight and cabin crew, as well as other safety-sensitive personnel, are dealt with in a consistent, just and fair manner as regards the prevention and detection of misuse of psychoactive substances.

(b) The operator's training policy on misuse of psychoactive substances should include training and/or educational material on:

(1) the effects of psychoactive substances on individuals and on flight safety;

(2) established procedures within the organisation to prevent misuse of psychoactive substances;

(3) individual responsibilities with regard to applicable legislation and policies on psychoactive substances; and

(4) assistance provided by the support programme in accordance with CAT.GEN.MPA.215.

AMC2 CAT.GEN.MPA.170(b) Psychoactive substances

POLICY TO PREVENT MISUSE OF PSYCHOACTIVE SUBSTANCE

The operator's policy should ensure testing for psychoactive substances at least in the following cases:

(a) upon employment by the operator; and

(b) with due cause in the following cases:

(1) following a reasonable suspicion, and following an assessment by appropriately trained personnel; and

(2) after a serious incident or accident within the meaning of Kingdom of Thailand Occurrence Reporting Regulation, provided that testing is possible due to the location of the serious incident or accident.

GM1 CAT.GEN.MPA.170(b) Psychoactive substances

POLICY TO PREVENT MISUSE OF PSYCHOACTIVE SUBSTANCES

Guidance for the development and implementation of the policy on prevention of misuse of psychoactive substances is contained in ICAO Doc 9654 'Manual on Prevention of Problematic Use of Substances in the Aviation Workplace'.

TRAINING AND EDUCATION PROGRAMMES

Guidance for the development and implementation of training and education programmes is contained in ICAO Doc 9654 'Manual on Prevention of Problematic Use of Substances in the Aviation Workplace'.

GM2 CAT.GEN.MPA.170(b) Psychoactive substances

OPERATOR RANDOM TESTING PROGRAMME

Nothing should prevent an operator from implementing a random testing programme in accordance with national requirements on testing of individuals, in order to mitigate the risk that misuse of psychoactive substances remains undetected and endangers the safety of the aircraft or its occupants.

GM3 CAT.GEN.MPA.170(b) Psychoactive substances

MEANING OF 'PERSONNEL UNER THE DIRECT CONTROL OF THE OPERATOR'

(a) Personnel under the direct control of the operator means personnel that is directly employed bythe operator. This excludes personnel of contractors or subcontractors of the operator unless they act as flight or cabin crew.

(b) The operator may require the contracted service provider to carry out testing of personnel as part of the contract between the operator and the contracted service provider.

GM4 CAT.GEN.MPA.170(b) Psychoactive substances

POLICY TO PREVENT MISUSE OF PSYCHOACTIVE SUBSTANCES

After referral and assessment by the medical assessor of the licencing authority, the operator may consider unannounced testing as part of a periodic medical follow-up after rehabilitation and return to work.

AMC1 CAT.GEN.MPA.170(c) Psychoactive substances

OBJECTIVE, TRANSPARENT AND NON-DISCRIMINATORY TESTING PROGRAMME

The operator's objective, transparent and non-discriminatory testing procedure should specify:

(a) means to ensure confidentiality and protection of data;

(b) the responsibilities of the person carrying out a test, which should be in accordance with national legislation;

(c) the timing and suitable locations for testing;

(d) that the body responsible for testing should be an independent, accredited body using standard guidelines on psychoactive substance testing in line with national legislation;

(e) the testing process, and in particular:

   (1) the psychoactive substances to be tested for;

   (2) the applicable national legislation and use of recognised quality standards applied to the testing methodology;

   (3) initial screening and confirmation methods used; and

(4) handling of test results, which should be conducted by impartial and trained personnel, in order to ensure adherence to the procedure, to determine the true positives and to prevent false positives;

(f) applicable limits applying to psychoactive substance tests;

(g) the process to be followed in case of a confirmed positive test result; and

(h) the internal appeal process.

AMC1 CAT.GEN.MPA.175(b) Endangering Safety

PSYCHOLOGICAL ASSESSMENT

(a) The psychological assessment should be:

(1) appropriate to the particularity, the complexity and the challenges of the operational environment that the flight crew is likely to be exposed to, as defined by a job analysis identifying the safety-critical dimensions related to the flight crew's function and role within the operator and should include at least the following assessment criteria:

(i) cognitivabilities;

(ii) personalittraits;

(iii) operational and professional competencies; and

(iv) social competences in accordance with crew resource management principles;

(2) validated and either directly performed or overseen by a psychologist with acquired knowledge in aviation relevant to the flight crew's operating environment and with expertise in psychological assessment, and where possible, the psychological selection of aviation personnel; and

(3) undertaken at least within the past 24 months before commencing line flying, unless the operator can demonstrate that the psychological assessment undertaken more than 24 months ago is still adequate for the risk mitigation as required by ORO.GEN.200(a)(3). Such a demonstration should be based on the tests previously performed, an updated risk assessment based on data gathered from previous operational experience and continuous human performance monitoring since the last psychological assessment.

(b) As regards the psychological assessment, the following should be documented:

(1) the procedures followed

(2) the personnel involved;

(3) the assessment criteria, and instruments used in the assessment; and

(4) the validity period.

GM1 CAT.GEN.MPA.175(b) Endangering Safety

GUIDANCE ON CONDUCTING A PSYCHOLOGICAL ASSESSMENT

(a) A psychological assessment performed by one operator may subsequently be accepted by a different operator, provided that the latter is satisfied that the assessment has been performed in accordance with AMC1 CAT.GEN.MPA.175(b).

(b) A psychological assessment conducted by or on behalf of an operator should not be considered or conducted as a clinical psychological evaluation.

(c) When establishing the policy on psychological assessment of flight crews, the operator may refer to recognised industry standards and best practices in the field of pilot selection, aptitude testing and psychological assessment such as:

(1) IATA 'Guidance Material and Best Practices for Pilot Aptitude Testing'; and

(2) national or European standards of ethical codes of conduct when conducting a psychological assessment, such as by national or European associations for (aviation) psychology.

AMC1 CAT.GEN.MPA.175(c) Endangering Safety

(a) An operator may replace the psychological assessment with an internal assessment of the psychological attributes and suitability of the flight crew, if the operator is considered to be a non- complex operator, i.e. when it has a workforce of 20 full-time equivalents (FTEs) or less, that are involved in an activity subject to the Air Navigation Act B.E.2497 and its Kingdom of Thailand Civil Aviation Regulations.

(b) The internal assessment for non-complex operators should as far as possible apply the same principles as the psychological assessment before commencing line flying for complex operators.

AMC1 CAT.GEN.MPA.180 Documents, manuals and information to be carried

GENERAL

The documents, manuals and information may be available in a form other than on printed paper. Accessibility, usability and reliability should be assured.

GM1 CAT.GEN.MPA.180(a)(1) Documents, manuals and information to be carried

AIRCRAFT FLIGHT MANUAL OR EQUIVALENT DOCUMENT(S)

'Aircraft flight manual, or equivalent document(s)' means in the context of this rule the flight manual for the aircraft, or other documents containing information required for the operation of the aircraft within the terms of its certificate of airworthiness unless these data are available in the parts of the operations manual carried on board.

GM1 CAT.GEN.MPA.180(a)(5)(6) Documents, manuals and information to be carried

CERTIFIED TRUE COPIES

(a) Certified true copies may be provided:

(1) directly by the CAAT; or

(2) by persons holding privileges for certification of official documents in accordance with the applicable Member State's legislation, e.g. public notaries, authorised officials in public services.

(3) Translations of the air operator certificate (AOC) including operations specifications do not need to be certified.

GM1 CAT.GEN.MPA.180(a)(9) Documents, manuals and information to be carried

JOURNEY LOG OR EQUIVALENT

'Journey log, or equivalent' means that the required information may be recorded in documentation other than a log book, such as the operational flight plan or the aircraft technical log.

AMC1 CAT.GEN.MPA.180(a)(13) Documents, manuals and information to be carried

PROCEDURES AND VISUAL SIGNALS FOR USE BY INTERCEPTING AND INTERCEPTED AIRCRAFT

The procedures and the visual signals information for use by intercepting and intercepted aircraft should reflect those contained in International Civil Aviation Organization (ICAO) Annex 2. This may be part of the operations manual.

GM1 CAT.GEN.MPA.180(a)(14) Documents, manuals and information to be carried

SEARCH AND RESCUE INFORMATION

This information is usually found in the State's aeronautical information publication.

AMC1 CAT.GEN.MPA.180(a)(18) Documents, manuals and information to be carried

APPROPRIATE METEOROLOGICAL INFORMATION

The appropriate meteorological information should be relevant to the planned operation and comprise the following:

(a) the meteorological information as follows:

(1) forecasts of upper-wind and upper-air temperature;

(2) SIGWX phenomena;

(3) METAR or, when issued, SPECI for the aerodromes of departure and intended landing, and for take-off, en-route and destination alternate aerodromes;

(4) TAF or amended TAF for the aerodromes of departure and intended landing, and for takeoff, en-route and destination alternate aerodromes;

(5) SIGMET, and, when issued, AIRMET and appropriate special air-reports relevant to the whole route;

(6) volcanic ash and tropical cyclone advisory information relevant to the whole route.

However, when agreed between the aerodrome meteorological office and the operators concerned, flight documentation for flights of two hours' duration or less, after a short stop or turnaround, may be limited to the information operationally needed, but in all cases the flight documentation shall at least comprise the meteorological information listed in points (3), (4), (5) and (6);

and

(b) supplemental meteorological information:

(1) information other than that specified in point (a), which should be based on data fromcertified meteorological service providers; or

(2) information from other reliable sources of meteorological information that should beevaluated by the operator.

GM1 CAT.GEN.MPA.180(a)(18) Documents, manuals and information to be carried

DATA FROM CERTIFIED METEOROLOGICAL SERVICE PROVIDERS

In the context of point (b)(1) of AMC1 CAT.GEN.MPA.180(a)(18), the operator may consider that any meteorological information that is provided by the organisation within the scope of the meteorological information included in the flight documentation defined in point (a) of point AMC1 CAT.GEN.MPA.180(a)(18) should originate only from authoritative sources or certified providers, and should not be transformed or tampered, except for the purpose of presenting the data in the correct format. The organisation's process should provide assurance that the integrity of such service is preserved in the data to be used by both flight crews and operators, regardless of their form.

GM2 CAT.GEN.MPA.180(a)(18) Documents, manuals and information to be carried

INFORMATION FROM OTHER RELIABLE SOURCES OF METEOROLOGICAL INFORMATION

In the context of point (b)(2) of AMC1 CAT.GEN.MPA.180(a)(18), reliable sources of meteorological information are organisations that are able to provide an appropriate level of data assurance in terms of accuracy and integrity. The operator may consider in the evaluation that the organisation has a quality assurance system in place that covers source selection, acquisition/import, processing, validity period check, and distribution phase of data.

GM3 CAT.GEN.MPA.180(a)(18) Documents, manuals and information to be carried

SUPPLEMENTAL METEOROLOGICAL INFORMATION AND SUPPLEMENTARY INFORMATION

Supplemental meteorological information: when operating under specific provisions and without the meteorological information from a certified service provider, the operator should use 'supplemental meteorological information', such as digital imagery. Related information can be found in point (e)(4) of AMC1 CAT.OP.MPA.192.

Supplementary information: it is included in point (a) of AMC1 CAT.GEN.MPA.180(a)(18) and refers to meteorological information to be reported in specific cases such as freezing precipitation, blowing snow, thunderstorm, etc.

GM1 CAT.GEN.MPA.180(a)(23) Documents, manuals and information to be carried

DOCUMENTS THAT MAY BE PERTINENT TO THE FLIGHT

Any other documents that may be pertinent to the flight or required by the States concerned with the flight, may include, for example, forms to comply with reporting requirements.

STATES CONCERNED WITH THE FLIGHT

The States concerned are those of origin, transit, overflight and destination of the flight.

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

PRESERVATION OF RECORDED DATA FOR INVESTIGATION

(a) The operator should establish procedures to ensure that flight recorder recordings are preserved for the investigating authority.

(b) These procedures should include:

   (1) instructions for flight crew members to deactivate the flight recorders immediately after completion of the flight and inform relevant personnel that the recording of the flight recorders should be preserved. These instructions should be readily available on board; and

   (2) instructions to prevent inadvertent reactivation, test, repair or reinstallation of the flight recorders by operator personnel or during maintenance or ground handling activities performed by third parties.

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

REMOVAL OF RECORDERS IN CASE OF AN INVESTIGATION

The need for removal of the recorders from the aircraft is determined by the investigating authority with due regard to the seriousness of an occurrence and the circumstances, including the impact on the operation.

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

INSPECTIONS AND CHECKS OF RECORDINGS

(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 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 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 4 years.

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

(i) the aircraft flight data is collected in the frame 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 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 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) When installed, the aural or visual means for preflight checking of the flight recorders for proper operation should be used 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 calendar days of operation, whichever is considered more suitable by the operator.

(e) The operator should check every 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, protections and use

INSPECTION OF THE FLIGHT RECORDERS' RECORDINGS FOR ENSURING SERVICEABILITY

(a) The inspection of recorded flight parameters 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.

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 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 audio recording usually consists of:

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

(2) examining samples of in-flight audio recording 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 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.

GM2 CAT.GEN.MPA.195(b) Handling of flight recorder recordings: preservation, production, protections and use

MONITORING AND CHECKING THE PROPER OPERATION OF FLIGHT RECORDERS — EXPLANATION OF TERMS

For the understanding of the terms used in AMC1 CAT.GEN.MPA.195(b):

(a) ‘operational check of the flight recorder’ means a check of the flight recorder for proper operation. It is not a check of the quality of the recording and, therefore, it is not equivalent to an inspection of the recording. This check can be carried out by the flight crew or through a maintenance task.

(b) ‘aural or visual means for preflight checking the flight recorders for proper operation’ means an aural or visual means for the flight crew to check before the flight the results of an automatically or manually initiated test of the flight recorders for proper operation. Such a means provides for an operational check that can be performed by the flight crew.

(c) ‘flight recorder system’ means the flight recorder, its dedicated sensors and transducers, as well as its dedicated acquisition and processing equipment.

(d) ‘continuous monitoring for proper operation’ means for a flight recorder system, a combination of system monitors and/or built-in test functions which operates continuously in order to detect the following:

(1) loss of electrical power supply to the flight recorder system;

(2) failure of the equipment performing acquisition and processing;

(3) failure of the recording medium and/or drive mechanism; and

(4) failure of the recorder to store the data in the recording medium as shown by checks of the recorded data including, as reasonably practicable for the storage medium concerned, correct correspondence with the input data.

However, detections by the continuous monitoring for proper operation do not need to be automatically reported to the flight crew compartment.

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

CVR AUDIO QUALITY

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

USE OF AUDIO RECORDINGS FOR MAINTAINING OR IMPROVING SAFETY

(a) The procedure related to the handling of audio recordings from flight recorders and of their transcripts should be documented and signed by all parties (aircraft operator, crew member representatives nominated either by the union or the crew themselves, maintenance personnel representatives if applicable). 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 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 the audio recordings from flight recorders and their transcripts and their protection from misuse. The retention policy should specify the period of time after which such audio recordings and identified transcripts are destroyed;

(4) a description of the uses made of audio recordings from flight recorders and 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 is read out under the conditions defined by CAT.GEN.MPA.195(f)(1):

(1) parts of the 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 CAAT:

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

(ii) evidence that the persons concerned consented to the use made (or the intended use) of the 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 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, contractual agreements with this third party should cover the aspects enumerated in (a) and (b).

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

INSPECTION OF AUDIO RECORDINGS FOR ENSURING SERVICEABILITY

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

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

(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 audio recording files and copies thereof;

(4) the audio 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 audio recordings, except that audio samples with no privacy content may be retained for enhancing this 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 safety manager should be entitled to request a copy of the audio recording files.

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

GM1 CAT.GEN.MPA.195(f)(2) Handling of flight recorder recordings: preservation, production, protections and use

USE OF FDR DATA FOR AN FDM PROGRAMME

The use of FDR data in the framework of an FDM programme may be acceptable if it fulfils the conditions set by sub-paragraph (f)(2) of CAT.GEN.MPA.195.

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, maintenance personnel representatives if applicable). This procedure should, as a minimum, define the following aspects:

(1) the method to obtain the consent of all crew members

(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 CAAT 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.GEN.MPA.200(e) Transport of dangerous goods

DANGEROUS GOODS ACCIDENT AND INCIDENT REPORTING

(a) Any type of dangerous goods accident or incident, or the finding of undeclared or misdeclared dangerous goods should be reported, irrespective of whether the dangerous goods are contained in cargo, mail, passengers' baggage or crew baggage. For the purposes of the reporting of undeclared and misdeclared dangerous goods found in cargo, the Technical Instructions considers this to include items of operators' stores that are classified as dangerous goods.

(b) The first report should be dispatched within 72 hours of the event. It may be sent by any means, including e-mail, telephone or fax. This report should include the details that are known at that time, under the headings identified in (c). If necessary, a subsequent report should be made as soon as possible giving all the details that were not known at the time the first report was sent. If a report has been made verbally, written confirmation should be sent as soon as possible.

(c) The first and any subsequent report should be as precise as possible and should contain the following data, where relevant:

(1) date of the incident or accident or the finding of undeclared or misdeclared dangerous goods;

(2) location, the flight number and flight date;

(3) description of the goods and the reference number of the air waybill, pouch, baggage tag, ticket, etc.;

(4) proper shipping name (including the technical name, if appropriate) and UN/ID number, when known;

(5) class or division and any subsidiary risk;

(6) type of packaging, and the packaging specification marking on it;

(7) quantity;

(8) name and address of the shipper, passenger, etc.;

(9) any other relevant details;

(10) suspected cause of the incident or accident;

(11) action taken;

(12) any other reporting action taken; and

(13) name, title, address and telephone number of the person making the report.

(d) Copies of relevant documents and any photographs taken should be attached to the report.

(e) A dangerous goods accident or incident may also constitute an aircraft accident, serious incident or incident. Reports should be made for both types of occurrences when the criteria for each are met.

(f) The following dangerous goods reporting form should be used, but other forms, including electronic transfer of data, may be used provided that at least the minimum information of this AMC is supplied:

DANGEROUS GOODS OCCURRENCE REPORT **DGOR No:**

<table>
<tr><td colspan="2">1. Operator:</td><td colspan="2">2. Date of Occurrence:</td><td colspan="2">3. Local time of occurrence:</td></tr>
<tr><td colspan="3">4. Flight date:</td><td colspan="3">5. Flight No:</td></tr>
<tr><td colspan="3">6. Departure aerodrome:</td><td colspan="3">7. Destination aerodrome:</td></tr>
<tr><td colspan="3">8. Aircraft type:</td><td colspan="3">9. Aircraft registration:</td></tr>
<tr><td colspan="3">10. Location of occurrence:</td><td colspan="3">11. Origin of the goods:</td></tr>
<tr><td colspan="6">12. Description of the occurrence, including details of injury, damage, etc. (if necessary, continue on the reverse of this form):</td></tr>
<tr><td colspan="5">13. Proper shipping name (including the technical name):</td><td>14. UN/ID No (when known):</td></tr>
<tr><td>15.Class/Division (when known):</td><td colspan="2">16. Subsidiary risk(s):</td><td colspan="2">17. Packing group:</td><td>18 Category (Class 7 only):</td></tr>
<tr><td>19. Type of packaging:</td><td colspan="2">20.Packaging specification marking:</td><td colspan="2">21. No of packages:</td><td>22. Quantity (or transport index, if applicable):</td></tr>
<tr><td colspan="6">23. Reference No of Airway Bill:</td></tr>
<tr><td colspan="6">24. Reference No of courier pouch, baggage tag, or passenger ticket:</td></tr>
<tr><td colspan="6">25. Name and address of shipper, agent, passenger, etc.:</td></tr>
<tr><td colspan="6">26. Other relevant information (including suspected cause, any action taken):</td></tr>
</table>

27. Name and title of person making report:	28. Telephone No:
29. Company:	30. Reporters ref:
31. Address:	32. Signature:
	33. Date:
Description of the occurrence (continuation)	

Notes for completion of the form:

1. A dangerous goods accident is as defined in TCAR OPS Part DEF
2. This form should also be used to report any occasion when undeclared or misdeclared dangerous goods are discovered in cargo, mail or unaccompanied baggage or when accompanied baggage contains dangerous goods which passengers or crew are not permitted to take on aircraft.
3. The initial report should be dispatched unless exceptional circumstances prevent this. This occurrence report form, duly completed, should be sent as soon as possible, even if all the information is not available.
4. Copies of all relevant documents and any photographs taken should be attached to this report.
5. Any further information, or any information not included in the initial report, should be sent as soon as possible to the authorities identified in CAT.GEN.MPA.200(e).
6. Providing it is safe to do so, all dangerous goods, packaging, documents, etc., relating to the occurrence should be retained until after the initial report has been sent to the authorities identified in CAT.GEN.MPA.200(e) and they have indicated whether or not these should continue to be retained.

GM1 CAT.GEN.MPA.200 Transport of dangerous goods

GENERAL

(a) The requirement to transport dangerous goods by air in accordance with the Technical Instructions is irrespective of whether:

(1) the flight is wholly or partly within or wholly outside the territory of a State; or

(2) an approval to carry dangerous goods in accordance with TCAR OPS Part SPA, Subpart G is held.

(b) The Technical Instructions provide that in certain circumstances dangerous goods, which are normally forbidden on an aircraft, may be carried. These circumstances include cases of extreme urgency or when other forms of transport are inappropriate or when full compliance with the prescribed requirements is contrary to the public interest. In these circumstances, all the States concerned may grant exemptions from the provisions of the Technical Instructions provided that an overall level of safety which is at least equivalent to that provided by the Technical Instructions is achieved. Although exemptions are most likely to be granted for the carriage of dangerous goods that are not permitted in normal circumstances, they may also be granted in other circumstances, such as when the packaging to be used is not provided for by the appropriate packing method or the quantity in the packaging is greater than that permitted. The Technical Instructions also make provision for some dangerous goods to be carried when an approval has been granted only by the State of origin and the State of the operator.

(c) When an exemption is required, the States concerned are those of origin, transit, overflight and destination of the consignment and that of the operator. For the State of overflight, if none of the criteria for granting an exemption are relevant, an exemption may be granted based solely on whether it is believed that an equivalent level of safety in air transport has been achieved.

(d) The Technical Instructions provide that exemptions and approvals are granted by the 'appropriate national authority', which is intended to be the authority responsible for the particular aspect against which the exemption or approval is being sought. The Instructions do not specify who should seek exemptions and, depending on the legislation of the particular State, this may mean the operator, the shipper or an agent. If an exemption or approval has been granted to other than the operator, the operator should ensure a copy has been obtained before the relevant flight. The operator should ensure all relevant conditions on an exemption or approval are met.

(e) The exemption or approval referred to in (b) to (d) is in addition to the approval required by TCAR OPS Part SPA, Subpart G.

AMC1 CAT.GEN.MPA.205 Aircraft tracking system – Aeroplanes

EQUIPMENT, PERFORMANCE AND PROCEDURES WHEN AIRCRAFT TRACKING IS REQUIRED

(a) Automatic tracking of aeroplane position

The aircraft tracking system should rely on equipment capable of automatically detecting and transmitting a position report to the aircraft operator, except if (d)(2) applies.

(b) Position reporting period

The tracking of an individual flight should provide a position report at time intervals which do not exceed 15 minutes.

(c) Content of position reports

Each position report should contain at least the latitude, the longitude and the time of position determination and whenever available, an indication of the aeroplane altitude, except that for each flight:-

(1) One of the position reports may contain only time-stamped data indicating that the aeroplane has left the gate;

(2) One of the position reports may contain only time-stamped data indicating that the aeroplane has become airborne;

(3) One of the position reports may contain only time-stamped data indicating that the aeroplane has landed; and

(4) One of the position reports may contain only time-stamped data indicating that the aeroplane has reached the gate.

(d) Source of position data

The data contained in a position report may come from:

(1) ATC surveillance systems, if the ATC surveillance data source is capable of providing this data with a delay equal to or less than 10 minutes;

(2) the flight crew, if the planned flight duration is less than two position reporting periods;

(3) aeroplane systems. In that case:

(i) the source of time, latitude and longitude data should be the navigation system of the aeroplane or an approved GNSS receiver;

(ii) the source of altitude data should be:

(A) the same source as for time, latitude and longitude data, or

(B) an approved source of pressure altitude; and

(iii) the delivery time of position reports from the aeroplane to the operational control over the flight should, to the extent possible, not exceed 10 minutes; or

(4) any data source when the position report is of a type designated by (c)(1), (c)(2), (c)(3) or (c)(4). In that case, the delivery time of position reports from the data source to the operational control over the flight should, to the extent possible, not exceed 10 minutes.

(e) Temporary lack of aircraft tracking data

Aircraft tracking data may be incomplete due to a temporary or unexpected issue prior to or during the flight. However, the operator should:

(1) identify any loss of aircraft tracking data which is not due to a temporary issue, and

(2) address any systematic lack of aircraft tracking data affecting a given aeroplane or a given route in a timely manner.

(f) Operational control over the flights

When abnormal flight behaviour is suspected, this should be checked and acted upon without delay.

(g) Recording of aircraft tracking data during normal operation

When the tracking of a flight is required, all related aircraft tracking data should be recorded on the ground, including position data from ATC surveillance systems when they are used. The aircraft tracking data of a given flight should be retained until confirmation that the flight is completed and no accident or serious incident occurred.

(h) Preserving aircraft tracking data after an accident or a serious incident

Following an accident or a serious incident, the operator should retain the aircraft tracking data of the involved flight for at least 30 days. In addition, the operator should be capable of providing a copy of this data without delay and in an electronic format that is human-readable using a common text file editor.

(i) Procedures

The operator should establish procedures describing its aircraft tracking system, including the identification of abnormal flight behaviour and the notification of the competent ATS unit (ATS unit responsible for providing the alerting service in the airspace where the aircraft is believed to be), when appropriate. These procedures should be integrated with the emergency response plan of the operator.

AMC2 CAT.GEN.MPA.205 Aircraft tracking system — Aeroplanes

ROUTES INCLUDED IN AIRSPACE COVERED BY ATS SURVEILLANCE

(a) Trajectory points located at a distance of less than 50 NM from the departure airfield and trajectory points located at a distance of less than 50 NM from the destination airfield may be considered as not part of the 'planned route'.

(b) Trajectory points located at a distance of less than 50 NM from any diversion airfield may be considered as not part of the 'planned diversion routes'.

(c) An ATS surveillance service may be considered 'supported by ATC surveillance systems locating the aircraft at time intervals with adequate duration' if those ATC surveillance systems are capable of locating aircraft at time intervals not exceeding 15 minutes when operated normally.

(d) When applicable, the operator should check that the conditions required for using the exception defined by CAT.GEN.MPA.205(b) are fulfilled before operating into new airspace blocks.

(e) When applicable, the operator should check at time intervals not exceeding 180 calendar days that the conditions required for using the exception defined by CAT.GEN.MPA.205(b) are maintained.

AMC3 CAT.GEN.MPA.205 Aircraft tracking system — Helicopters

Operators should use the appropriate AMC & GM reference material to CAT.GEN.MPA.205 that can be applied to Helicopter operations. AMC1 and GM1 SPA.HOFO.150 are also applicable cross references.

GM1 CAT.GEN.MPA.205 Aircraft tracking system — Aeroplanes

EXPLANATION OF TERMS

For the understanding of the terms used in CAT.GEN.MPA.205:

(a) 'capability to provide a position additional to the secondary surveillance radar transponder' means airborne equipment other than the SSR transponder, which is operative and which can be used to automatically transmit time-stamped position data without change to the approved airborne systems; and

(b) 'abnormal flight behaviour': see GM1 to TCAR OPS Part DEF.

GM2 CAT.GEN.MPA.205 Aircraft tracking system — Aeroplanes

DETERMINING WHETHER A FLIGHT NEEDS TO BE TRACKED

Table 1 provides a summary of the cases applicable to an aeroplane which is within the scope of CAT.GEN.MPA.205(a).

Table 1: Cases applicable to the flight of an aeroplane subject to the aircraft tracking requirement

Condition 1: The planned route and the planned diversion routes are included in airspace blocks where ATS surveillance service is normally provided.	Condition 2: The ATS surveillance service provided in all airspace blocks determined by Condition 1 is supported by ATC surveillance systems locating the aircraft at time intervals with adequate duration.	Condition 3: The operator has provided all air navigation service providers competent for the airspace blocks determined by Condition 1 with the necessary contact information.	Case considered: Aeroplane that is within the scope of CAT.GEN.MPA.205(a).
Conditions 1, 2 and 3 are met altogether.			The flight does not need to be tracked (refer to CAT.GEN.MPA.205(b)). Note: The operator should check at regular time intervals that Conditions 1, 2 and 3 are still met (refer to AMC2 CAT.GEN.MPA.205).
Either Condition 1, Condition 2 or Condition 3 is not met.			The flight shall be tracked (refer to CAT.GEN.MPA.205(b)). Note: Lack of aircraft tracking data due to a temporary or unexpected issue may be acceptable (refer to AMC1 CAT.GEN.MPA.205). Examples of issues (list is indicative and not exhaustive): airborne equipment found inoperative, transmission link disturbed by environmental factors; issue with the ground-based infrastructure or the space-based infrastructure.

GM3 CAT.GEN.MPA.205 Aircraft tracking system — Aeroplanes

METHOD FOR ASSESSING WHETHER A FLIGHT NEEDS TO BE TRACKED

The following gives an example of a method to assess whether flights performed along a given route need to be tracked.

(a) Determine the planned route and the planned diversion routes and consider only points of these routes located at a distance of greater than or equal to 50 NM from the departure airfield, the destination airfield and the diversion airfields. If there is no such point, then the flight does not need to be tracked, otherwise go to (b).

(b) Identify all airspace blocks crossed by the result of (a) and go to (c).

(c) If every airspace block meets all of the following conditions, then the flight does not need to be tracked:

  (1) ATS surveillance service is provided in the airspace block;

  (2) This ATS surveillance service relies on ATC surveillance systems which are normally capable of detecting aircraft in the airspace block at time intervals not exceeding 15 minutes; and

  (3) The air navigation service provider competent for the airspace block has information sufficient to contact the on-duty staff at the operator;

GM4 CAT.GEN.MPA.205 Aircraft tracking system — Aeroplanes

POSSIBLE SOURCES AND MINIMUM CONTENT OF A POSITION REPORT

Table 1 presents a summary of the possible sources and the minimum content of a position report according to AMC1 CAT.GEN.MPA.205.

Table 1: Possible sources and minimum content of a position report

<table>
<tr><th>Planned flight duration</th><th>Possible sources of a position report</th><th>Minimum content of a position report</th></tr>
<tr><td>Flight duration < 2×reporting period</td><td>Airborne equipment (automatic transmission);
Flight crew; or
ATC surveillance systems.</td><td rowspan="2">Latitude, longitude and time (and whenever available altitude), except for the position reports designated by point (c)(1), (c)(2), (c)(3) and (c)(4) of AMC1 CAT.GEN.MPA.205.</td></tr>
<tr><td>Flight duration 2×reporting period</td><td>• Airborne equipment (automatic transmission);
• ATC surveillance systems;
• Flight crew if the flight is not required to be tracked; or
• Any source for position reports designated by point (c)(1), (c)(2), (c)(3) and (c)(4) of AMC1 CAT.GEN.MPA.205.</td></tr>
</table>

GM5 CAT.GEN.MPA.205 Aircraft tracking system — Aeroplanes

AIRCRAFT TRACKING — CHOICE OF THE POSITION REPORTING PERIOD

(a) Unless the aircraft tracking system includes functionalities enhancing the detection of deviations from normal operation (e.g. airborne systems capable of automatically transmitting more information under some conditions, possibility for the operational control to adjust the position reporting period of an ongoing flight, etc.), the choice of the position reporting period has a significant influence on the effectiveness of the aircraft tracking system.

(1) Indeed, assuming that an operator has set itself the objective of detecting, within a given time T, deviations from normal operation, and that the operator relies for this purpose only on position reports, then the position reporting period needs to be less than T.

(2) Furthermore, when no other information than position reports is available to locate a missing aircraft, then the search zone is a circle with a radius corresponding to the distance likely to have been covered since the last detection. The corresponding search area grows as the square of the time, until the position of the aircraft is detected again or the fuel on board is exhausted. Taking the example of an aeroplane cruising at Mach 0.8 (i.e. covering a distance of about 8 NM per minute), after 15 minutes the search area is 155 000 square kilometres.

(3) In the publication of the Australian Transportation Safety Bureau titled 'The Operational Search for MH370' (dated October 2017), it is recommended that 'Aircraft operators, aircraft manufacturers, and aircraft equipment manufacturers investigate ways to provide high-rate and/or automatically triggered global position tracking in existing and future fleets'.

(b) It is advised to take the above into account when setting up the aircraft tracking system.

GM6 CAT.GEN.MPA.205 Aircraft tracking system — Aeroplanes

PROVIDING CONTACT INFORMATION TO COMPETENT AIR NAVIGATION SERVICE PROVIDERS

A solution for the operator to make the necessary contact information available to all competent air navigation service providers (ANSPs) could be to register to the global OPS Control Directory of ICAO. Another possible way is to provide in the ATS flight plan ('Other information') information sufficient to contact the on-duty staff of the aircraft operator.

GM7 CAT.GEN.MPA.205 Aircraft tracking system — Aeroplanes

GUIDANCE

Additional guidance for the establishment of an aircraft tracking system is found in ICAO Circular 347 – Aircraft Tracking Implementation Guidelines, dated 2017.

AMC1 CAT.GEN.MPA.210 Location of an aircraft in distress — Aeroplanes

PERFORMANCE OF THE AIRBORNE SYSTEM, TRANSMISSION SERVICE, AND OPERATIONAL PROCEDURES

(a) Performance of the airborne system

The airborne system used to comply with point CAT.GEN.MPA.210 ('airborne system') should:

(1) be approved in accordance with the applicable airworthiness requirements; and

(2) comply with the Certification Specifications for Airborne Communications, Navigation and Surveillance (CS-ACNS) issued by EASA, or equivalent material acceptable to the CAAT.

(b) Transmission service

If the airborne system relies on other equipment than ELTs for transmitting the information needed to comply with point CAT.GEN.MPA.210, the provider of the transmission service should be a surveillance service provider that is certified in accordance with the ATM/ANS Regulation.

(c) Flight crew procedures

The operator should establish flight crew procedures for using the airborne system, including manual activation and manual deactivation of that system. These procedures should ensure that the flight crew manually activate the airborne system only if a search and rescue (SAR) response is needed or anticipated, and that they inform the relevant ATS unit in a timely manner when they manually deactivate or disable the airborne system to stop data transmission.

(d) Operator's procedures

The operator should establish procedures:

(1) for assessing whether an aircraft is likely to be in a state of emergency and

(2) for informing the competent ATS unit (ATS unit responsible for providing the alerting service in the airspace where the aircraft is believed to be):

(i) when a state of emergency is identified, and

(ii) when a state of emergency no longer exists.

(e) Limiting the effects of false alerts To reduce the frequency and effects of false alerts that are caused by the airborne system, the operator should:

(1) establish procedures for disabling any of the required functions of the airborne system;

(2) consider the airborne system inoperative if, during a flight, there were several occurrences of undesirable automatic activation of the airborne system; and

(3) analyse occurrences of undesirable (manual and automatic) activation of the airborne system to determine their probable cause; the records of such analyses should be retained for at least 12 months and provided to the CAAT on request.

GM1 CAT.GEN.MPA.210 Location of an aircraft in distress — Aeroplanes

OBJECTIVES AND IMPLEMENTATION

(a) The purpose of point CAT.GEN.MPA.210 is to have a high probability of timely and accurately locating the accident site after an accident during which the aircraft is severely damaged, irrespective of the accident location and survivability (hence, the terms 'automatic', 'robust', and 'accurately' are used in CAT.GEN.MPA.210). The scope of point CAT.GEN.MPA.210 includes non-survivable accidents. Means compliant with point CAT.GEN.MPA.210 are expected to:

(1) quickly inform the SAR authority concerned that an accident occurred or is about to occur and provide them with information that can easily be used for locating the accident site; and

(2) help the safety investigation authority concerned to locate the accident site and the aircraft wreckage so that they can collect evidence in a reasonable time frame.

Therefore, if an aircraft in the scope of CAT.IDE.A.280 complies with CAT.GEN.MPA.210, this aircraft is not required to be equipped with an automatic emergency locator transmitter (ELT). Similarly, if an aircraft in the scope of CAT.IDE.A.285 complies with CAT.GEN.MPA.210, this aircraft is not required to be equipped with a 8.8-kHz underwater locating device (ULD).

(b) The airborne system used to comply with point CAT.GEN.MPA.210 could rely, for example, on an emergency locator transmitter of a distress tracking type (ELT(DT)), on an automatic deployable flight recorder (ADFR), or on the transmission of position reports at short time intervals (high-rate tracking (HRT)).

(c) Subpart A of the Certification Specifications for Airborne Communications, Navigation and Surveillance (CS-ACNS) contains general conditions applicable to the airborne system. Subpart E of CS-ACNS contains specific conditions for meeting the purpose of point CAT.GEN.MPA.210.

(d) If other transmitting equipment than an ELT is used by the airborne system for complying with CAT.GEN.MPA.210, AMC1 CNS.OR.100 to Part CNS of the ATM/ANS Regulation contains conditions applicable to the provider of the transmission service that is used by that equipment.

(e) While AMC1 CNS.OR.100 only addresses the transmission of information to the SAR authorities, the capability to also transmit that information to the operator is advisable.

GM2 CAT.GEN.MPA.210 Location of an aircraft in distress — Aeroplanes

EXPLANATION OF TERMS

The terms used in point CAT.GEN.MPA.210 and AMC1 CAT.GEN.MPA.210 are explained below for better understanding:

— 'accident during which the aeroplane is severely damaged' refers to an accident during which the aeroplane sustains damage or structural failure that adversely affects its structural strength, performance, or flight characteristics, and would normally require a major repair or replacement of the affected component, except for:

— an engine failure or damage to the engine, when the damage is limited to a single engine (including its cowlings or accessories);

— damage limited to propellers, wing tips, antennas, probes, vanes, tyres, brakes, wheels, fairings, panels, landing gear doors, windscreens, the aeroplane skin (such as small dents or puncture holes);

— minor damage to the landing gear; and

— damage resulting from hail or bird strike (including holes in the radome);

— 'accurately determine the location of the point of end of flight' means locating the point of end of flight with a position accuracy that is sufficient for safety investigation purposes, and when the accident conditions are survivable, also for SAR purposes;

— 'activation of the airborne system' means the transition of the airborne system from another state to the activated state;

— 'airborne system' means the organised set of airborne applications and airborne equipment that comply with CAT.GEN.MPA.210;

— 'automatic means' refers to means that do not require any human action to perform their intended function;

— 'automatic activation of the airborne system' means activation of the airborne system that is automatically triggered by airborne equipment;

— 'deactivation of the airborne system' means the transition of that system from the activated state to another state;

— 'point of end of flight' means, depending on the nature of the accident, the point where the aircraft crashed into land or water, or landed on land or water, or was destroyed;

— 'required functions of the airborne system' refers to the 'functions of the system', which are defined in the CS-ACNS that are applicable to locating an aircraft in distress;

— 'robust means' refers to means designed to work properly under the circumstances of survivable accidents, and under the circumstances of most non-survivable accidents;

— 'the airborne system is activated' means that the airborne system transmits signals to enable the determination of the location of the point of end of flight without sending mobile SAR facilities to the area of the transmitter; and

— 'transmission service' refers to the service that makes the information sent by the airborne system available to the relevant stakeholders.

AMC1 CAT.GEN.MPA.215 Support Programme

PRINCIPLES GOVERNING A SUPPORT PROGRAMME

The access to a support programme should:

(a) enable self-declaration or referral in case of a decrease in a flight crew's medical fitness with an emphasis on prevention and early support; and

(b) if appropriate, allow the flight crew to receive temporary relief from flight duties and be referred to professional advice.

AMC2 CAT.GEN.MPA.215 Support Programme

CONFIDENTIALITY AND PROTECTION OF DATA

(a) The personal data of flight crew who have been referred to a support programme should be handled in a confidential, non-stigmatising, and safe environment.

(b) A culture of mutual trust and cooperation should be maintained so that the flight crew is less likely to hide a condition and more likely to report and seek help.

(c) Disclosure of data to the operator may only be granted in an anonymised manner such as in the form of aggregated statistical data and only for purposes of safety management so as not to compromise the voluntary participation in a support programme, thereby compromising flight safety.

(d) Notwithstanding the above, an agreement with related procedures should be in place between the operator and the support programme on how to proceed in case of a serious safety concern.

AMC3 CAT.GEN.MPA.215 Support Programme

ELEMENTS OF A SUPPORT PROGRAMME

(a) A support programme should contain as a minimum the following elements:

   (1) procedures including education of flight crew regarding self-awareness and facilitation of self-referral;

   (2) assistance provided by professionals, including mental and psychological health professionals with relevant knowledge of the aviation environment;

   (3) involvement of trained peers, where trained peers are available;

   (4) monitoring of the efficiency and effectiveness of theprogramme;

   (5) monitoring and support of the process of returning to work;

   (6) management of risks resulting from fear of loss of licence; and

(7) a referral system to an aero-medical examiner in defined cases raising serious safety concerns.

(b) A support programme should be linked to the management system of the operator, provided that data is used for purposes of safety management and is anonymised and aggregated to ensure confidentiality.

AMC4 CAT.GEN.MPA.215 Support Programme

TRAINING AND AWARENESS

(a) The operator should promote access to the support programme for all flight crew.

(b) Professionals, including mental and psychological health professionals, as well as trained peers, where trained peers are available, that are involved in the support programme, should receive initial and recurrent training related to their role and function within the support programme.

GM1 CAT.GEN.MPA.215 Support Programme

SUPPORT PROGRAMM

(a) A support programme is a proactive programme applying the principles of 'just culture' as defined in Kingdom of Thialand Occurrence Reporting Regulation, whereby the senior management of the operator, mental health professionals, trained peers, and in many cases representative organisations of crew members work together to enable self-declaration, referral, advice, counselling and/or treatment, where necessary, in case of a decrease in medical fitness.

(b) The support programme should be easily accessible for flight crew, and should provide adequate means of support at the earliest stages.

GM2 CAT.GEN.MPA.215 Support Programme

FACILITATION OF TRUST IN THE SUPPORT PROGRAMME

Essential trust between management and crew is the foundation for a successful support programme. This trust can be facilitated by:

(a) establishing a platform for multi-stakeholder participation and partnership in the governance process of the support programme by involving flight crew representatives from one or mor operators and representatives of the relevant operator. In some cases, a multi-stakeholder platform may also include representatives of the CAAT;

(b) participation of the representatives of those personnel covered by the support programme in the design, implementation and operation of the support programme;

(c) a formal agreement between management and crew, identifying the procedures for the use of data, its protection and confidentiality;

(d) clear and unambiguous provisions on data protection;

(e) senior management's demonstrated commitment to promote a proactive safety culture;

(f) a non-punitive operator policy that also covers the support programme;

(g) support programme management by staff either established within the operator or by a separate independent organisation;

(h) involvement of persons with appropriate expertise when advising crews (for example, pilot peers with similar cultural backgrounds and professional staff with appropriate training in e.g. psychology, etc.);

(i) a structured system to protect the confidentiality of personal data; and

(j) an efficient communication system that promotes the benefits of the support programme, such as its positive impacts, temporary relief from duties without fear of dismissal, management of risks resulting from fear of loss of licence.

GM3 CAT.GEN.MPA.215 Support Programme

TRAINING AND AWARENESS

(a) When promoting the benefits of the support programme, the operator should stress at least the following elements of the programme:

  (1) positive impacts of a support programme;

  (2) awareness of job stressors and life stressors — mental fitness and mental health;

  (3) coping strategies;

  (4) potential effects of psychoactive substances and their use or misuse;

  (5) medication use (prescribed and over-the-counter medication) to ensure the safe exercise of the privileges of the licence whilst taking medication;

  (6) early recognition of mental unfitness;

  (7) principles and availability of a support programme; and

  (8) data protection and confidentiality principles.

(b) Mental health professionals involved in the support programme should be trained on:

  (1) psychological first aid;

  (2) applicable legal requirements regarding data protection; and

  (3) cases where information should be disclosed due to an immediate and evident safety threat and in the interest of public safety.

(c) Peers involved in the support programme should receive practically orientated basic training in psychological first aid and regular refresher trainings.

GM4 CAT.GEN.MPA.215 Support Programme

ELEMENTS CONTRIBUTING TO A SUPPORT PROGRAMME

When implementing a support programme, the operator should pay attention to the following:

(a) establishment and verification of operational and data protection procedures;

(b) selection and training of dedicated and experienced staff and peers;

(c) offer of motivating alternative positions to flight crew in case a return to in-flight duties is not possible; and

(d) limitation of the financial consequences of a loss of licence, for example through extending loss of licence coverage.

GM5 CAT.GEN.MPA.215 Support Programme

POSSIBILITY TO CONTRACT THE ESTABLISHMENT OF A SUPPORT PROGRAMME TO A THIRD PARTY

The operator may contract the establishment of a support programme to a third party. For a smaller-sized operator, the synergies created by a third-party support programme can be beneficial and in some cases may provide the only feasible option to ensure access to a support programme or to ensure availability of trained peers.

GM6 CAT.GEN.MPA.215 Support Programme

OBLIGATION TO SEEK AERO-MEDICAL ADVICE IN CASE ODF A DECREASE IN MEDICAL FITNESS

Joining a support programme does not remove the flight crew's obligation to seek aero-medical advice in case of a decrease in medical fitness in accordance with the CAAT Medical Regulations.

GM7 CAT.GEN.MPA.215 Support Programme

SCOPE OF THE SUPPORT PROGRAMME

Nothing should prevent an operator from extending the scope of the support programme to include, apart from flight crew, other safety-sensitive categories personnel, e.g. cabin crew or maintenance, as well.

GM8 CAT.GEN.MPA.215 Support Programme

MEANING OF THE TERM PEER

(a) In the context of a support programme, a 'peer' is a trained person who shares common professional qualifications and experience, and has encountered similar situations, problems or conditions with the person seeking assistance from a support programme. This may or may not be a person working in the same organisation as the person seeking assistance from the support programme.

(b) A peer's involvement in a support programme can be beneficial due to similar professional backgrounds between the peer and the person seeking support. However, a mental health professional should support the peer when required, e.g. in cases where intervention is required to prevent endangering safety.

GM1 CAT.GEN.MPA.220 Cosmic Radiation — Aeroplanes

Guidance on the maintenance of cumulative radiation records is given in ICAO Circular 126

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SUBPART B: OPERATING PROCEDURES

SECTION 1 - Motor-powered aircraft

GM1 CAT.OP.MPA.100(a)(2) Use of air traffic services

IN-FLIGHT OPERATIONAL INSTRUCTIONS

When coordination with an appropriate air traffic service (ATS) unit has not been possible, in-flight operational instructions do not relieve a commander of the responsibility for obtaining an appropriate clearance from an ATS unit, if applicable, before making a change in flight plan.

GM1 CAT.OP.MPA.101(b) Altimeter check and settings

ALTIMETER SETTING PROCEDURES

The following paragraphs of ICAO Doc 8168 (PANS-OPS), Volume III provide recommended guidance on how to develop the altimeter setting procedure:

(a) 3.2 ‘Pre-flight operational test’;

(b) 3.3 ‘Take-off and climb’;

(c) 3.5 ‘Approach and landing’.

AMC1 CAT.OP.MPA.105 Use of aerodromes/Heliports and operating sites

DEFINING OPERATING SITES — HELICOPTERS

When defining operating sites (including infrequent or temporary sites) for the type(s) of helicopter(s) and operation(s) concerned, the operator should take account of the following:

(a) An adequate site is a site that the operator considers to be satisfactory, taking account of the applicable performance requirements and site characteristics (guidance on standards and criteria are contained in ICAO Annex 14 Volume 2 and in the ICAO *Heliport Manual* (Doc 9261-AN/903)).

(b) The operator should have in place a procedure for the survey of sites by a competent person. Such a procedure should take account of possible changes to the site characteristics which may have taken place since last surveyed.

(c) Sites that are pre-surveyed should be specifically specified in the operations manual. The operations manual should contain diagrams or/and ground and aerial photographs, and depiction (pictorial) and description of:

(1) the overall dimensions of the site;

(2) location and height of relevant obstacles to approach and take-off profiles, and in the manoeuvring area;

(3) approach and take-off flight paths;

(4) surface condition (blowing dust/snow/sand);

(5) helicopter types authorised with reference to performance requirements;

(6) provision of control of third parties on the ground (if applicable);

(7) procedure for activating site with land owner or controlling authority;

(8) other useful information, for example, appropriate ATS agency and frequency; and

(9) lighting (if applicable).

(d) For sites that are not pre-surveyed, the operator should have in place a procedure that enables the pilot to make, from the air, a judgment on the suitability of a site. (c)(1) to (c)(6) should be considered.

(e) Operations to non-pre-surveyed sites by night (except in accordance with SPA.HEMS.125 (b)(4)) should not be permitted.

AMC1 CAT.OP.MPA.107 Adequate aerodrome

RESCUE AND FIREFIGHTING SERVICES (RFFS)

When considering the adequacy of an aerodrome's rescue and fire fighting services (EFFS), the operator should:

(a) As part of its management system, assess the level of RFFS protection available at the aerodrome intended to be specified in the operational flight plan in order to ensure that an acceptable level of protection is available for the intended operation; and

(b) Include relevant information related to the RFFS protection that is deemed acceptable by the operator in the operations manual.

GM1 CAT.OP.MPA.107 Adequate aerodrome

VERIFICATION OF WEATHER CONDITIONS

This GM clarifies the difference between 'adequate aerodrome' and 'weather-permissible aerodrome'. The two concepts are complementary:

— 'adequate aerodrome': see definition in TACR OPS Part DEF and point CAT.OP.MPA.107; and

— 'weather-permissible aerodrome' means an adequate aerodrome with additional requirements: see definition in TCAR OPS Part DEF. Weather conditions are not required to be considered at an adequate aerodrome.

AMC1 CAT.OP.MPA.110 Aerodrome operating minima

TAKE-OFF OPERATIONS — AEROPLANES

(a) Take-off minima

Take-off minima should be expressed as visibility or runway visual range (RVR) limits, taking into account all relevant factors for each runway planned to be used and aircraft characteristics and equipment. Where there is a specific need to see and avoid obstacles on departure and/or for a forced landing, additional conditions, e.g. ceiling, should be specified.

(b) Visual reference

(1) The take-off minima should be selected to ensure sufficient guidance to control the aircraft in the event of both a rejected take-off in adverse circumstances and a continued take-off after failure of the critical engine.

(2) For night operations, the prescribed runway lights should be in operation.

(c) Required RVR or VIS — aeroplanes

(1) For multi-engined aeroplanes, with performance such that, in the event of a critical engine failure at any point during take-off, the aeroplane can either stop or continue the take-off to a height of 1 500 ft above the aerodrome while clearing obstacles by the required margins, the take-off minima specified by the operator should be expressed as RVR or VIS values not lower than those specified in Table 1.

(2) For multi-engined aeroplanes without the performance to comply with the conditions in (c)(1), in the event of a critical engine failure, there may be a need to re-land immediately and to see and avoid obstacles in the take-off area. Such aeroplanes may be operated to the following take-off minima provided that they are able to comply with the applicable obstacle clearance criteria, assuming engine failure at the height specified. The take-off minima specified by the operator should be based upon the height from which the one-engine-inoperative (OEI) net take-off flight path can be constructed. The RVR minima used should not be lower than either of the values specified in Table 1 or Table 2.

(3) For single-engined turbine aeroplane operations approved in accordance with Subpart L (SET-IMC) of TCAR OPS Part SPA, the take-off minima specified by the operator should be expressed as RVR values not lower than those specified in Table 1.

Unless the operator is making use of a risk period, whenever the surface in front of the runway does not allow for a safe forced landing, the RVR values should not be lower than 800 m. In this case, the proportion of the flight to be considered starts at the lift-off position and ends when the aeroplane is able to turn back and land on the runway in the opposite direction or glide to the next landing site in case of power loss.

Table 1 Take-off — aeroplanes (without LVTO approval) RVR or VIS

Minimum RVR* or VIS*	**Facilities**
500 m (day)	Nil**
400 m (day)	Centre line markings or Runway edge lights or Runway centre line lights
400 m (night)	Runway end lights*** and Runway edge lights or runway centreline lights

*:The reported RVR or VIS value representative of the initial part of the take-off run can be replaced by pilot assessment.

**:The pilot is able to continuously identify the take-off surface and maintain directional control.

***: Runway end lights may be substituted by colour-coded runway edge lights or colour-coded runway centre line lights.

Table 2 Take-off — aeroplanes (without LVTO approval)

Assumed engine failure height above the runway versus RVR or VIS

Assumed engine failure height above the take- off runway (ft)	**RVR or VIS (m) ****
<50	400
51 – 100	400
101 – 150	400
151 – 200	500
201 – 300	1 000
>300 *or if no positive take-off flight path can be constructed	1 500

**: The reported RVR or VIS value representative of the initial part of the take-off run can be replaced by pilot assessment.

AMC2 CAT.OP.MPA.110 Aerodrome operating minima

TAKE-OFF OPERATIONS — HELICOPTERS

(a) General

(1) Take-off minima should be expressed as VIS or RVR limits, taking into account all relevant factors for each aerodrome planned to be used and aircraft characteristics and equipment. Where there is a specific need to see and avoid obstacles on departure,or for a forced landing, additional conditions, e.g. ceiling, should be specified.

(2) The commander should not commence take-off unless the meteorological conditions at the aerodrome of departure are equal to or better than the applicable minima for landing at that aerodrome unless a weather-permissible take-off alternate aerodrome is available.

(3) When the reported VIS is below that required for take-off and RVR is not reported, a take-off should only be commenced if the commander can determine that the visibility or RVR along the take-off runway/area is equal to or better than the required minimum.

(4) When no reported VIS or RVR is available, a take-off should only be commenced if the commander can determine that the visibility along the take-off runway/area is equal to or better than the required minimum.

(b) Visual reference

(1) The take-off minima should be selected to ensure sufficient guidance to control the aircraft in the event of both a rejected take-off in adverse circumstances and a continued take-off after failure of the critical engine.

(2) For night operations, ground lights should be available to illuminate the take-off runway/final approach and take-off area (FATO) and any obstacles.

(3) For point-in-space (PinS) departures to an initial departure fix (IDF), the take-off minima should be selected to ensure sufficient guidance to see and avoid obstacles and return to

the heliport if the flight cannot be continued visually to the IDF. This should require a VIS of 800 m. The ceiling should be 250 ft.

(c) Required RVR or VIS:

(1) For performance class 1 operations, the operator should specify an RVR or a VIS as take-off minima in accordance with Table 3.

(2) For performance class 2 operations onshore, the commander should operate to take-off minima of 800 m RVR or VIS and remain clear of cloud during the take-off manoeuvre until reaching performance class 1 capabilities.

(3) For performance class 2 operations offshore, the commander should operate to minima not less than those for performance class 1 and remain clear of cloud during the take-off manoeuvre until reaching performance class 1 capabilities.

Table 3 Take-off — helicopters (without LVTO approval) RVR or VIS

Onshore aerodromes with instrument flight rules (IFR) departure procedures	**RVR or VIS (m)****
No light and no markings (day only)	400 or the rejected take-off distance, whichever is the greater
No markings (night)	800
Runway edge/FATO light and centre line marking	400
Runway edge/FATO light, centre line marking and relevant RVR information	400
Offshore helideck *	
Two-pilot operations	400
Single-pilot operations	500

*: The take-off flight path to be free of obstacles.

** On PinS departures to IDF, VIS should not be less than 800 m and the ceiling should not be less than 250 ft.

AMC3 CAT.OP.MPA.110 Aerodrome operating minima

DETERMINATION OF DH/MDH FOR INSTRUMENT APPROACH OPERATIONS — AEROPLANES

(a) The decision height (DH) to be used for a 3D approach operation or a 2D approach operation flown using the continuous descent final approach (CDFA) technique should not be lower than the highest of:

(1) the obstacle clearance height (OCH) for the category of aircraft;

(2) the published approach procedure DH or minimum descent height (MDH) where applicable;

(3) the system minima specified in Table 4;

(4) the minimum DH permitted for the runway specified in Table 5; or

(5) the minimum DH specified in the aircraft flight manual (AFM) or equivalent document, if stated.

(b) The MDH for 2D approach operation flown not using the CDFA technique should not be lower than the highest of:

(1) the OCH for the category of aircraft;

(2) the published approach procedure MDH where applicable;

(3) the system minima specified in Table 4;

(4) the lowest MDH permitted for the runway specified in Table 5; or

(5) the lowest MDH specified in the AFM, if stated.

Table 4 System minima – Aeroplanes

Facility	Lowest DH/MDH (ft)
ILS/MLS/GLS	200
GNSS/SBAS (LPV)	200*
Precision approach radar (PAR)	200
GNSS/SBAS (LP)	250
GNSS (LNAV)	250
GNSS/Baro VNAV (LNAV/ VNAV)	250
LOC with or without DME	250
SRA (terminating at ½ NM)	250
SRA (terminating at 1 NM)	300
SRA (terminating at 2 NM or more)	350
VOR	300
VOR/DME	250
NDB	350
NDB/DME	300
VDF	350

* For localiser performance with vertical guidance (LPV), a DH of 200 ft may be used only if the published FAS datablock sets a vertical alert limit not exceeding 35 m. Otherwise, the DH should not be lower than 250 ft.

Table 5 Runway type minima — aeroplanes

Runway type		Lowest DH/MDH (ft)
Instrument runway	Precision approach (PA) runway, category I	200
	NPA runway	250
Non-Instrument runway	Non-Instrument runway	Circling minima as shown in Table 15

(c) Where a barometric DA/H or MDA/H is used, this should be adjusted where the ambient temperature is significantly below international standard atmosphere (ISA). GM8 CAT.OP.MPA.110 'Low temperature correction' provides a cold temperature correction table for adjustment of minimum promulgated heights/altitudes.

AMC4 CAT.OP.MPA.110 Aerodrome operating minima

DETERMINATION OF DH/MDH FOR INSTRUMENT APPROACH OPERATIONS — HELICOPTERS

(a) The DH or MDH to be used for a 3D or a 2D approach operation should not be lower than the highest of:

(1) the OCH for the category of aircraft;

(2) the published approach procedure DH or MDH where applicable;

(3) the system minima specified in Table 6;

(4) the minimum DH permitted for the runway/FATO specified in Table 7, if applicable; or

(5) the minimum DH specified in the AFM or equivalent document, if stated.

Table 6 System minima — helicopters

Facility	Lowest DH/MDH (ft)
ILS/MLS/GLS	200
GNSS/SBAS (LPV) *	200
Precision approach radar (PAR)	200
GNSS/SBAS (LP)	250
GNSS (LNAV)	250
GNSS/Baro VNAV (LNAV/VNAV)	250
Helicopter PinS approach	250**
LOC with or without DME	250
SRA (terminating at ½ NM)	250
SRA (terminating at 1 NM)	300
SRA (terminating at 2 NM or more)	350
VOR	300
VOR/DME	250
NDB	350
NDB/DME	300
VDF	350

* For LPV, a DH of 200 ft may be used only if the published FAS datablock sets a vertical alert limit not exceeding 35 m. Otherwise, the DH should not be lower than 250 ft.

** For PinS approaches with instructions to 'proceed VFR' to an undefined or virtual destination, the DH or MDH should be with reference to the ground below the missed approach point (MAPt).

Table 7 Type of runway/FATO versus lowest DH/MDH — helicopters

Type of runway/FATO	Lowest DH/MDH (ft)
Precision approach (PA) runway, category I Non-precision approach (NPA) runway Non-instrument runway	200
Instrument FATO FATO	200 250

Table 7 does not apply to helicopter PinS approaches with instructions to 'proceed VFR'.

AMC5 CAT.OP.MPA.110 Aerodrome operating minima

DETERMINATION OF RVR OR VIS FOR INSTRUMENT APPROACH OPERATIONS — AEROPLANES

(a) The RVR or VIS for straight-in instrument approach operations should be not less than the greatest of:

(1) the minimum RVR or VIS for the type of runway used according to Table 8;

(2) the minimum RVR determined according to the MDH or DH and class of lighting facility according to Table 9; or

(3) the minimum RVR according to the visual and non-visual aids and on-board equipment used according to Table 10.

If the value determined in (1) is a VIS, then the result is a minimum VIS. In all other cases, the result is a minimum RVR.

(b) For Category A and B aeroplanes, if the RVR or VIS determined in accordance with (a) is greater than 1 500 m, then 1 500 m should be used.

(c) If the approach is flown with a level flight segment at or above the MDA/H, then 200 m should be added to the RVR calculated in accordance with (a) and (b) for Category A and B aeroplanes and 400 m for Category C and D aeroplanes.

(d) The visual aids should comprise standard runway day markings, runway edge lights, threshold lights, runway end lights and approach lights as defined in Table 11.

Table 8 Type of runway versus minimum RVR or VIS — aeroplanes

Type of runway	Minimum RVR or VIS (m)
PA runway Category I	RVR 550
NPA runway RVR	750
Non-instrument runway	VIS according to Table 15 (circling minima)

Table 9 RVR versus DH/MDH — aeroplanes

DH or MDH (ft)			Class of lighting facility			
			FALS	IALS	BALS	NALS
			RVR (m)			
200	-	210	550	750	1 000	1 200
211	-	240	550	800	1 000	1 200
241	-	250	550	800	1 000	1 300
251	-	260	600	800	1 100	1 300
261	-	280	600	900	1 100	1 300
281	-	300	650	900	1 200	1 400
301	-	320	700	1 000	1 200	1 400
321	-	340	800	1 100	1 300	1 500
341	-	360	900	1 200	1 400	1 600
361	-	380	1 000	1 300	1 500	1 700
381	-	400	1 100	1 400	1 600	1 800
401	-	420	1 200	1 500	1 700	1 900
421	-	440	1 300	1 600	1 800	2 000
441	-	460	1 400	1 700	1 900	2 100
461	-	480	1 500	1 800	2 000	2 200
481	-	500	1 500	1 800	2 100	2 300
501	-	520	1 600	1 900	2 100	2 400
521	-	540	1 700	2 000	2 200	2 400
541	-	560	1 800	2 100	2 300	2 400
561	-	580	1 900	2 200	2 400	2 400
581	-	600	2 000	2 300	2 400	2 400
601	-	620	2 100	2 400	2 400	2 400
621	-	640	2 200	2 400	2 400	2 400
641	-	660	2 300	2 400	2 400	2 400
661	and above		2 400	2 400	2 400	2 400

Table 10 Visual and non-visual aids and/or on-board equipment versus minimum RVR — aeroplanes

Type of approach	Facilities	Lowest RVR	
		Multi-pilot operations	Single-pilot operations
3D operations Final approach track offset ≤15 ° for category A and B aeroplanes or ≤5 ° for Category C and D aeroplanes	runway touchdown zone lights (RTZL) and runway centre line lights (RCLL)	No limitation	
	without RTZL and/or RCLL but using HUDLS or equivalent system; without RTZL and/or RCLL but using autopilot or flight director to the DH	No limitation	600 m
	No RTZL and/or RCLL, not using HUDLS or equivalent system or autopilot or flight director to the DH	750 m	800 m

3D operations	runway touchdown zone lights (RTZL) and runway centre line lights (RCLL) and Final approach track offset > 15° for Category A and B aeroplanes or Final approach track offset > 5° for Category C and D aeroplanes	800 m	1 000 m
	without RTZL and RCLL but using HUDLS or equivalent system; autopilot or flight director to the DH and Final approach track offset > 15° for Category A and B aeroplanes or Final approach track offset > 5° for Category C and D aeroplanes	800 m	1 000 m
2D operations	Final approach track offset ≤15° for category A and B aeroplanes or ≤5° for Category C and D aeroplanes	750 m	800 m
	Final approach track offset > 15° for Category A and B aeroplanes	1 000 m	1 000 m
	Final approach track offset >5° for Category C and D aeroplanes	1 200 m	1 200 m

Table 11 Approach lighting systems — aeroplanes

Class of lighting facility	Length, configuration and intensity of approach lights
FALS	CAT I lighting system (HIALS ≥720 m) distance coded centre line, barrette centre line
IALS	Simple approach lighting system (HIALS 420–719 m) single source, barrette
BALS	Any other approach lighting system (HIALS, MALS or ALS 210–419 m)
NALS	Any other approach lighting system (HIALS, MALS or ALS <210 m) or no approach lights

(e) For night operations or for any operation where credit for visual aids is required, the lights should be on and serviceable except as provided for in Table 17.

(f) Where any visual or non-visual aid specified for the approach and assumed to be available in the determination of operating minima is unavailable, revised operating minima will need to be determined.

AMC6 CAT.OP.MPA.110 Aerodrome operating minima

DETERMINATION OF RVR or VIS FOR INSTRUMENT APPROACH OPERATIONS — HELICOPTERS

The RVR/VIS minima for Type A instrument approach and Type B CAT I instrument approach operations should be determined as follows:

(a) For IFR operations, the RVR or VIS should not be less than the greatest of:

(1) the minimum RVR or VIS for the type of runway/FATO used according to Table 12;

(2) the minimum RVR determined according to the MDH or DH and class of lighting facility according to Table 13; or

(3) for PinS operations with instructions to 'proceed visually', the distance between the MAPt of the PinS and the FATO or its approach light system.

If the value determined in (1) is a VIS, then the result is a minimum VIS. In all other cases, the result is a minimum RVR.

(b) For PinS operations with instructions to 'proceed VFR', the VIS should be compatible with visual flight rules.

(c) For Type A instrument approaches where the MAPt is within ½ NM of the landing threshold, the approach minima specified for FALS may be used regardless of the length of the approach lights available. However, FATO/runway edge lights, threshold lights, end lights and FATO/runway markings are still required.

(d) An RVR of less than 800 m should not be used except when using a suitable autopilot coupled to an ILS, an MLS, a GLS or LPV, in which case normal minima apply.

(e) For night operations, ground lights should be available to illuminate the FATO/runway and any obstacles.

(f) The visual aids should comprise standard runway day markings, runway edge lights, threshold lights and runway end lights and approach lights as specified in Table 14.

(g) For night operations or for any operation where credit for runway and approach lights as defined in Table 14 is required, the lights should be on and serviceable except as defined in Table 17.

Table 12 Type of runway/FATO versus minimum RVR — helicopters

Type of runway/FATO	Minimum RVR or VIS
Precision approach (PA) runway, category I NPA runway Non-instrument runway	RVR 550 m
Instrument FATO FATO	RVR 550 m RVR/VIS 800 m

Table 13 Onshore helicopter instrument approach minima

DH/MDH (ft)	Facilities versus RVR (m)			
	FALS	IALS	BALS	NALS
200	550	600	700	1 000
201–249	550	650	750	1 000
250–299	600*	700*	800	1 000
300 and above	750*	800	900	1 000

* Minima on 2D approach operations should be no lower than 800 m.

Table 14 Approach lighting systems — helicopters

Class of lighting facility	Length, configuration and intensity of approach lights
FALS	CAT I lighting system (HIALS ≥720 m) distance coded centre line, barrette centre line
IALS	Simple approach lighting system (HIALS 420–719 m) single source, barrette
BALS	Any other approach lighting system (HIALS, MALS or ALS 210–419 m)

NALS	Any other approach lighting system (HIALS, MALS or ALS <210 m) or no approach lights

AMC7 CAT.OP.MPA.110 Aerodrome operating minima

CIRCLING OPERATIONS — AEROPLANES

(a) Circling minima

The following standards should apply for establishing circling minima for operations with aeroplanes:

(1) the MDH for circling operation should not be lower than the highest of:

(i) the published circling OCH for the aeroplane category;

(ii) the minimum circling height derived from Table 15; or

(iii) the DH/MDH of the preceding instrument approach procedure (IAP);

(2) the MDA for circling should be calculated by adding the published aerodrome elevation to the MDH, as determined by (a)(1); and

(3) the minimum VIS for circling should be the highest of:

(i) the circling VIS for the aeroplane category, if published; or

(ii) the minimum VIS derived from Table 15.

Table 15 Circling — aeroplanes

MDH and minimum VIS vs aeroplane category

	Aeroplane category			
	A	B	C	D
MDH (ft)	400	500	600	700
Minimum VIS (m)	1 500	1 600	2 400	3 600

(b) Conduct of flight — general:

(1) the MDH and OCH included in the procedure are referenced to aerodrome elevation;

(2) the MDA is referenced to mean sea level;

(3) for these procedures, the applicable visibility is the VIS; and

(4) operators should provide tabular guidance of the relationship between height above threshold and the in-flight visibility required to obtain and sustain visual contact during the circling manoeuvre.

(c) Instrument approach followed by visual manoeuvring (circling) without prescribed tracks

(1) When the aeroplane is on the initial instrument approach, before visual reference is established, but not below MDA/H, the aeroplane should follow the corresponding IAP until the appropriate instrument MAPt is reached.

(2) At the beginning of the level flight phase at or above the MDA/H, the instrument approach track should be maintained until the pilot:

(i) estimates that, in all probability, visual contact with the runway of intended landing or the runway environment will be maintained during the entire circling procedure;

(ii) estimates that the aeroplane is within the circling area before commencing circling; and

(iii) is able to determine the aeroplane's position in relation to the runway of intended landing with the aid of the appropriate visual references.

(3) If the pilot cannot comply with the conditions in (c)(2) at the MAPt then a missed approach should be executed in accordance with the IAP.

(4) After the aeroplane has left the track of the initial instrument approach, the flight phase outbound from the runway should be limited to an appropriate distance, which is required to align the aeroplane onto the final approach. Such manoeuvres should be conducted to enable the aeroplane to:

(i) attain a controlled and stable descent path to the intended landing runway; and

(ii) remain within the circling area and in such way that visual contact with the runway of intended landing or runway environment is maintained at all times.

(5) Flight manoeuvres should be carried out at an altitude/height that is not less than the circling MDA/H.

(6) Descent below MDA/H should not be initiated until the threshold of the runway to be used has been appropriately identified. The aeroplane should be in a position to continue with a normal rate of descent and land within the touchdown zone (TDZ).

(d) Instrument approach followed by a visual manoeuvring (circling) with prescribed track

(1) The aeroplane should remain on the initial IAP until one of the following is reached:

(i) the prescribed divergence point to commence circling on the prescribed track; or

(ii) the MAPt.

(2) The aeroplane should be established on the instrument approach track in level flight at or above the MDA/H at or by the circling manoeuvre divergence point.

(3) If the divergence point is reached before the required visual reference is acquired, a missed approach should be initiated not later than the MAPt and completed in accordance with the instrument approach procedure.

(4) When commencing the prescribed circling manoeuvre at the published divergence point, the subsequent manoeuvres should be conducted to comply with the published routing and published heights/altitudes.

(5) Unless otherwise specified, once the aeroplane is established on the prescribed track(s), the published visual reference does not need to be maintained unless:

(i) required by the State of the aerodrome; or

(ii) the circling MAPt (if published) is reached.

(6) If the prescribed circling manoeuvre has a published MAPt and the required visual reference has not been obtained by that point, a missed approach should be executed in accordance with (e)(2) and (e)(3).

(7) Subsequent further descent below MDA/H should only commence when the required visual reference has been obtained.

(8) Unless otherwise specified in the procedure, final descent should not be commenced from MDA/H until the threshold of the intended landing runway has been identified and the aeroplane is in a position to continue with a normal rate of descent to land within the TDZ.

(e) Missed approach

(1) Missed approach during the instrument procedure prior to circling

(i) if the missed approach procedure is required to be flown when the aeroplane is positioned on the instrument approach track defined by radio-navigation aids RNAV, RNP, or ILS, MLS, and before commencing the circling manoeuvre, the published missed approach for the instrument approach should be followed; or

(ii) if the IAP is carried out with the aid of an ILS, MLS or an stabilised approach (SAp), the MAPt associated with an ILS, MLS procedure without glide path (GP-out procedure) or the SAp, where applicable, should be used.

(2) If a prescribed missed approach is published for the circling manoeuvre, this overrides the manoeuvres prescribed below.

(3) If visual reference is lost while circling to land after the aeroplane has departed from the initial instrument approach track, the missed approach specified for that particular instrument approach should be followed. It is expected that the pilot will make an initial climbing turn toward the intended landing runway to a position overhead the aerodrome where the pilot will establish the aeroplane in a climb on the instrument missed approach segment.

(4) The aeroplane should not leave the visual manoeuvring (circling) area, which is obstacle-protected, unless:

(i) established on the appropriate missed approach procedure; or

(ii) at minimum sector altitude (MSA).

(5) All turns should be made in the same direction and the aeroplane should remain within the circling protected area while climbing either:

(i) to the altitude assigned to any published circling missed approach manoeuvre if applicable;

(ii) to the altitude assigned to the missed approach of the initial instrument approach;

(iii) to the MSA; or

(iv) to the minimum holding altitude (MHA) applicable to transition to a holding facility or fix, or continue to climb to an MSA;

or as directed by ATS.

When the missed approach procedure is commenced on the 'downwind' leg of the circling manoeuvre, an 'S' turn may be undertaken to align the aeroplane on the initial instrument approach missed approach path, provided the aeroplane remains within the protected circling area.

The commander should be responsible for ensuring adequate terrain clearance during the above-stipulated manoeuvres, particularly during the execution of a missed approach initiated by ATS.

(6) Because the circling manoeuvre may be accomplished in more than one direction, different patterns will be required to establish the aeroplane on the prescribed missed approach course depending on its position at the time visual reference is lost. In particular, all turns are to be in the prescribed direction if this is restricted, e.g. to the west/east (left or right hand) to remain within the protected circling area.

(7) If a missed approach procedure is published for a particular runway onto which the aeroplane is conducting a circling approach and the aeroplane has commenced a manoeuvre to align with the runway, the missed approach for this direction may be accomplished. The ATS unit should be informed of the intention to fly the published missed approach procedure for that particular runway.

(8) The commander should advise ATS when any missed approach procedure has been commenced, the height/altitude the aeroplane is climbing to and the position the aeroplane is proceeding towards and/or heading the aeroplane is established on.

AMC8 CAT.OP.MPA.110 Aerodrome operating minima

ONSHORE CIRCLING OPERATIONS — HELICOPTERS

For circling, the specified MDH should not be less than 250 ft, and the VIS not less than 800 m.

AMC9 CAT.OP.MPA.110 Aerodrome operating minima

VISUAL APPROACH OPERATIONS

The operator should not use an RVR of less than 800 m for a visual approach operation.

AMC10 CAT.OP.MPA.110 Aerodrome operating minima

CONVERSION OF VISIBILITY TO CMV — AEROPLANES

The following conditions apply to the use of converted meteorological visibility (CMV) instead of RVR:

(a) If the reported RVR is not available, a CMV may be substituted for the RVR, except:

(1) to satisfy the take-off minima; or

(2) for the purpose of continuation of an approach in LVOs.

(b) If the minimum RVR for an approach is more than the maximum value assessed by the aerodrome operator, then CMV should be used.

(c) In order to determine CMV from visibility:

(1) for flight planning purposes, a factor of 1.0 should be used;

(2) for purposes other than flight planning, the conversion factors specified in Table 16 should be used.

Table 16 Conversion of reported VIS to RVR/CMV

Light elements in operation	RVR/CMV = reported VIS x	
	Day	**Night**
HI approach and runway lights	1.5	2.0
Any type of light installation other than above	1.0	1.5
No lights	1.0	not applicable

AMC11 CAT.OP.MPA.110 Aerodrome operating minima

EFFECT ON LANDING MINIMA OF TEMPORARILY FAILED OR DOWNGRADED GROUND EQUIPMENT

(a) General

These instructions are intended for use both before and during flight. Only those facilities mentioned in Table 17 should be acceptable to be used to determine the effect of temporarily failed of downgraded equipment. It is, however, not expected that the commander would consult such instructions after passing 1 000 ft above the aerodrome. If failures of ground aids are announced at such a late stage, the approach could be continued at the commander's discretion. If failures are announced before such a late stage in the approach, their effect on the approach should be considered as described in Table 17, and the approach may have to be abandoned.

(b) Conditions applicable to Table 17:

(1) multiple failures of runway/FATO lights other than those indicated in Table 17 should not be acceptable;

(2) failures of approach and runway/FATO lights are acceptable at the same time, and the most demanding consequence should be applied; and

(3) failures other than ILS, GLS, MLS affect RVR only and not DH.

Table 17 Failed or downgraded equipment — effect on landing minima Operations without LVO approval

<table>
<tr><th rowspan="2">Failed or downgraded equipment</th><th colspan="2">Effect on landing minima</th></tr>
<tr><th>Type B</th><th>Type A</th></tr>
<tr><td>Navaid stand-by transmitter</td><td colspan="2">No effect</td></tr>
<tr><td rowspan="4">Outer marker</td><td rowspan="4">FOR CAT I: Not allowed except if the required height versus glide path can be checked using other means, e.g. DME fix</td><td>APV — not applicable</td></tr>
<tr><td>NPA with final approach fix (FAF): no effect unless used as FAF</td></tr>
<tr><td>If the FAF cannot be identified (e.g. no method available for timing of descent), NPA operations cannot be conducted</td></tr>
<tr><td>FOR CAT I: Not allowed except if the required height versus glide path can be checked using other means, e.g. DME fix</td></tr>
<tr><td>Middle marker (ILS only)</td><td>No effect</td><td>No effect unless used as MAPt</td></tr>
<tr><td>DME</td><td colspan="2">No effect if replaced by RNAV (GNSS) information or the outer marker</td></tr>
<tr><td>RVR Assessment Systems</td><td colspan="2">No effect</td></tr>
<tr><td>Approach lights</td><td colspan="2">Minima as for NALS</td></tr>
<tr><td>Approach lights except the last 210 m</td><td colspan="2">Minima as for BALS</td></tr>
<tr><td>Approach lights except the last 420 m</td><td colspan="2">Minima as for IALS</td></tr>
<tr><td>Standby power for approach lights</td><td colspan="2">No effect</td></tr>
</table>

Failed or downgraded equipment	Effect on landing minima	
	Type B	Type A
Edge lights, threshold lights and runway end lights	Day: no effect; Night: not allowed	
Centre line lights	Aeroplanes: No effect if flight director (F/D), HUDLS or auto-land otherwise RVR 750 m Helicopters: No effect on CAT I and HELI SA CAT I approach	No effect but the minimum RVR should be 750m.
Centre line lights spacing increased to 30 m	No effect	
TDZ lights	Aeroplanes: No effect if F/D, HUDLS or auto-land; otherwise RVR 750 m Helicopters: No effect	No effect
Taxiway lighting system	No effect	

AMC12 CAT.OP.MPA.110 Aerodrome operating minima

VFR OPERATIONS WITH OTHER-THAN-COMPLEX MOTOR-POWERED AIRCRAFT

For the establishment of VFR operation minima, the operator may apply the VFR operating minima specified in ICAO Annex 2/RCAB 94. Where necessary, the operator may specify in the OM additional conditions for the applicability of such minima taking into account such factors as radio coverage, terrain, nature of sites for take-off and landing, flight conditions and ATS capacity.

GM1 CAT.OP.MPA.110 Aerodrome operating minima

ONSHORE AERODROME DEPARTURE PROCEDURES — HELICOPTERS

The cloud base and visibility should be such as to allow the helicopter to be clear of cloud at take-off decision point (TDP), and for the pilot flying to remain in sight of the surface until reaching the minimum speed for flight in instrument meteorological conditions (IMC) given in the AFM.

GM2 CAT.OP.MPA.110 Aerodrome operating minima

APPROACH LIGHTING SYSTEMS — ICAO, FAA

The following table provides a comparison of ICAO and FAA specifications.

Table 19 Approach lighting systems— ICAO and FAA specifications

Class of lighting facility	Length, configuration and intensity of approach lights
FALS	ICAO: CAT I lighting system (HIALS ≥ 720 m) distance coded centre line, Barrette centre line FAA: ALSF1, ALSF2, SSALR, MALSR, high or medium intensity and/or flashing lights, 720 m or more
IALS	ICAO: simple approach lighting system (HIALS 420 – 719 m) single source, Barrette FAA: MALSF, MALS, SALS/SALSF, SSALF, SSALS, high or medium intensity and/or flashing lights, 420 – 719 m
BALS	Any other approach lighting system (HIALS, MALS or ALS 210-419 m) FAA: ODALS, high or medium intensity or flashing lights 210 - 419 m
NALS	Any other approach lighting system (HIALS, MALS or ALS <210 m) or no approach lights

GM3 CAT.OP.MPA.110 Aerodrome operating minima

SBAS OPERATIONS

(a) SBAS LPV operations with a DH of 200 ft depend on an SBAS system approved for operations down to a DH of 200 ft.

(b) The following systems are in operational use or in a planning phase:

 (1) European geostationary navigation overlay service (EGNOS) operational in Europe;

 (2) wide area augmentation system (WAAS) operational in the USA;

 (3) multi-functional satellite augmentation system (MSAS) operational in Japan;

 (4) system of differential correction and monitoring (SDCM) planned by Russia;

 (5) GPS aided geo augmented navigation (GAGAN) system, planned by India; and

 (6) satellite navigation augmentation system (SNAS), planned by China.

GM4 CAT.OP.MPA.110 Aerodrome operating minima

MEANS TO DETERMINE THE REQUIRED RVR BASED ON DH AND LIGHTING FACILITIES

The values in Table 9 are derived from the formula below:

Minimum RVR (m) = [(DH/MDH (ft) x 0.3048)/tanα] — length of approach lights (m)

where α is the calculation angle, being a default value of 3.00° increasing in steps of 0.10° for each line in Table 9 up to 3.77° and then remaining constant. An upper RVR limit of 2 400 m has been applied to the table.

GM5 CAT.OP.MPA.110 Aerodrome operating minima

USE OF DH FOR NPAs FLOWN USING THE CDFA TECHNIQUE

AMC3 CAT.OP.MPA.110 provides that, in certain circumstances, a published MDH may be used as a DH for a 2D operation flown using the CDFA technique.

The safety of the use of MDH as DH in CDFA operations has been verified by at least two independent analyses concluding that the CDFA using MDH as DH without any add-on is safer than the traditional step-down and level-flight NPA operation. A comparison has been made between the safety level of using MDH as DH without an add-on with the well-established safety level resulting from the ILS collision risk model. The NPA used was the most demanding, i.e. most tightly designed NPA, which offers the least additional margins. It should be noted that the design limits of the ILS approach design, e.g. the maximum GP angle of 3.5 degrees, must be observed for the CDFA in order to keep the validity of the comparison.

There is a wealth of operational experience in Europe confirming the above-mentioned analytical assessments. It cannot be expected that each operator is able to conduct similar safety assessments, and this is not necessary. The safety assessments already performed take into account the most demanding circumstances at hand, like the most tightly designed NPA procedures and other 'worst-case scenarios'. The assessments naturally focus on cases where the controlling obstacle is located in the missed approach area.

However, it is necessary for operators to assess whether their cockpit procedures and training are adequate to ensure minimal height loss in case of a go-around manoeuvre. Suitable topics for the safety assessment required by each operator may include:

— understanding of the CDFA concept including the use of the MDA/H as DA/H;

— cockpit procedures that ensure flight on speed, on path and with proper configuration and energy management;

— cockpit procedures that ensure gradual decision-making; and

— identification of cases where an increase of the DA/H may be necessary because of non-standard circumstances, etc.

GM6 CAT.OP.MPA.110 Aerodrome operating minima

INCREMENTS SPECIFIED BY THE CAAT

Additional increments to the published minima may be specified by the CAAT to take into account certain operations, such as downwind approaches,single-pilot operations or approaches flown not using the CDFA technique.

GM7 CAT.OP.MPA.110 Aerodrome operating minima

USE OF COMMERCIALLY AVAILABLE INFORMATION

When an operator uses commercially available information to establish aerodrome operating minima, the operator remains responsible for ensuring that the material used is accurate and suitable for its operation, and that aerodrome operating minima are calculated in accordance with the method specified in Part C of its operations manual and approved by the CAAT.

The procedures in ORO.GEN.205 'Contracted activities' apply in this case.

GM8 CAT.OP.MPA.110 Aerodrome operating minima

LOW TEMPERATURE CORRECTION

(a) An operator may determine the aerodrome temperature below which a correction should be applied to the DA/H.

(b) Table 20 may be used to determine the correction that should be applied.

(c) The calculations in the table are for a sea-level aerodrome; they are therefore conservative when applied at higher-level aerodromes.

(d) Guidance on accurate corrections for specific conditions (if required) is available in PANS-OPS, Volume III (ICAO Doc 8168) Section 2 Chapter 4 First Edition, 2018.

Table 20 Temperature corrections to be applied to barometric DH/MDH

Aerodrome temperature (°C)	Height above the elevation of the altimeter setting source (ft)													
	200	300	400	500	600	700	800	900	1000	1500	2000	3000	4000	5000
0	20	20	30	30	40	40	50	50	60	90	120	170	230	280
-10	20	30	40	50	60	70	80	90	100	150	200	290	390	490
-20	30	50	60	70	90	100	120	130	140	210	280	420	570	710
-30	40	60	80	100	120	140	150	170	190	280	380	570	760	950
-40	50	80	100	120	150	170	190	220	240	360	480	720	970	1210
-50	60	90	120	150	180	210	240	270	300	450	590	890	1190	1500

GM9 CAT.OP.MPA.110 Aerodrome operating minima

AERODROME OPERATING MINIMA — HELICOPTERS

High vertical speeds should be avoided due to unstable aerodynamics and potential transient autorotation state of the main rotor.

Vertical speeds at or below 800 ft/min should be considered to be normal, and vertical speeds above 1 000 ft/min should be considered to be high.

The vertical speed on final approach increases with the descent angle and the ground speed (GS), including tailwinds. Whereas the helicopter should be manoeuvred into the wind during the visual segment of an instrument approach, tailwinds may be encountered during the instrument segments of the approach.

If the vertical speed is above 1 000 ft/min, a go-around should be considered. Greater vertical speeds may be used based on the available data in the rotorcraft flight manual.

Table 21 below gives an indication of the vertical speed based on the descent angles and ground speed.

Table 21 Examples of vertical speeds

Ground speed	Descent angle	Vertical speed
80 kt	5.7° (10 %)	800 ft/min
100 kt	5.7° (10 %)	1 000 ft/min
80 kt	7.5° (13.2 %)	1 050 ft/m
100 kt	7.5° (13.2 %)	1 300 ft/min

Note: A GS of 80 kt may be the result of an indicated airspeed (IAS) of 60 kt and a tailwind component of 20 kt.

GM1 CAT.OP.MPA.110(b)(6) Aerodrome operating minima

VISUAL AND NON-VISUAL AIDS AND INFRASTRUCTURE

'Visual and non-visual aids and infrastructure' refers to all equipment and facilities required for the procedure to be used for the intended instrument approach operation. This includes but is not limited to lights, markings, ground- or space-based radio aids, etc.

AMC1 CAT.OP.MPA.115 Approach flight technique — aeroplanes

CONTINUOUS DESCENT FINAL APPROACH (CDFA)

The following criteria apply to CDFA:

(a) For each NPA procedure to be used, the operator should provide information allowing the flight crew to determine the appropriate descent path. This information is either:

  (1) a descent path depicted on the approach chart including check altitude/heights against range;

  (2) a descent path coded into the aircraft flight management system; or

  (3) a recommended descent rate based on estimated ground speed.

(b) The information provided to the crew should observe human factors principles.

(c) The descent path should be calculated to pass at or above the minimum altitude specified at any step-down fix.

(d) The optimum angle for the descent path is 3° and should not exceed 4,5° except for steep approach operations approved in accordance with this Part.

(e) For multi-pilot operations, the operator should establish procedures that require:

  (1) the pilot monitoring to verbalise deviations from the required descent path;

  (2) the pilot flying to make prompt corrections to deviation from the required descent path; and

  (3) a call-out to be made when the aircraft is approaching the DA/H.

(f) A missed approach should be executed promptly at the DA/H or the MAPt, whichever is first, if the required visual references have not been established.

(g) For approaches other than circling approaches, the lateral part of the missed approach should be flown via the MAPt unless otherwise stated on the approach chart.

AMC2 CAT.OP.MPA.115 Approach flight technique — aeroplanes

APPROACH OPERATIONS USING NPA PROCEDURES FLOWN WITH A FLIGHT TECHNIQUE OTHER THAN THE CDFA

(a) In case the CDFA technique is not used, the approach should be flown to an altitude/height at or above the MDA/H where a level flight segment at or above MDA/H may be flown to the MAPt.

(b) Even when the approach procedure is flown without the CDFA technique, the relevant procedures for ensuring a controlled and stable path to MDA/H should be followed.

(c) In case the CDFA technique is not used when flying an approach, the operator should implement procedures to ensure that early descent to the MDA/H will not result in a subsequent flight below MDA/H without adequate visual reference. These procedures could include:

(1) awareness of radio altimeter information with reference to the approach profile;

(2) terrain awareness warning system (TAWS);

(3) limitation of rate of descent;

(4) limitation of the number of repeated approaches;

(5) safeguards against too early descents with prolonged flight at MDA/H; and

(6) specification of visual requirements for the descent from the MDA/H.

(d) In case the CDFA technique is not used and when the MDA/H is high, it may be appropriate to make an early descent to MDA/H with appropriate safeguards such as the application of a significantly higher RVR or VIS.

(e) The procedures that are flown with level flight at/or above MDA/H should be listed in the OM.

(f) Operators should categorise aerodromes where there are approaches that require level flight at/or above MDA/H as B or C. Such aerodrome categorisation will depend upon the operator’s experience, operational exposure, training programme(s) and flight crew qualification(s).

AMC3 CAT.OP.MPA.115 Approach flight technique — aeroplanes

OPERATIONAL PROCEDURES AND INSTRUCTIONS AND TRAINING

(a) The operator should establish procedures and instructions for flying approaches using the CDFA technique and not using it. These procedures should be included in the operations manualand should include the duties of the flight crew during the conduct of such operations. The operator should ensure that the initial and recurrent flight crew training required by ORO.FC includes the use of the CDFA technique.

(b) Operators holding an approval to use another technique for NPAs on certain runways should establish procedures for the application of such techniques.

AMC1 CAT.OP.MPA.115(a) Approach flight technique — aeroplanes

STABILISED APPROACH OPERATIONS — AEROPLANES

The following criteria should be satisfied for all stabilised approach operations with aeroplanes:

(a) The flight management systems and approach aids should be correctly set, and any required radio aids identified before reaching a predetermined point or altitude/height on the approach.

(b) The aeroplane should be flown according to the following criteria from a predetermined point or altitude/height on the approach:

(1) the angle of bank should be less than 30 degrees; and

(2) the target rate of descent should be that required to maintain the correct vertical path at the planned approach speed.

(c) Variations in the rate of descent should normally not exceed 50 % of the target rate of descent.

(d) An aeroplane should be considered stabilised for landing when the following conditions are met:

(1) the aeroplane is tracking within an acceptable tolerance of the required lateral path;

(2) the aeroplane is tracking within an acceptable tolerance of the required vertical path;

(3) the vertical speed of the aeroplane is within an acceptable tolerance of the required rate of descent;

(4) the airspeed of the aeroplane is within an acceptable tolerance of the intended landing speed;

(5) the aeroplane is in the correct configuration for landing, unless operating procedures require a final configuration change for performance reasons after visual reference is acquired; and

(6) the thrust/power and trim settings are appropriate.

(e) The aeroplane should be stabilised for landing before reaching 500 ft above the landing runway threshold elevation.

(f) For approach operations where the pilot does not have visual reference with the ground, the aeroplane should additionally be stabilised for landing before reaching 1 000 ft above the landing runway threshold elevation except that a later stabilisation in airspeed may be acceptable if higher than normal approach speeds are required for operational reasons specified in the operations manual.

(g) The operator should specify the following in the operations manual:

(1) the acceptable tolerances referred to in (d);

(2) the means to identify the predetermined points referred to in (a) and (b). This should normally be the FAF.

(h) When the operator requests approval for an alternative to the stabilised approach criteria for a particular approach to a particular runway, the operator should demonstrate that the proposed alternative will ensure that an acceptable level of safety is achieved.

GM1 CAT.OP.MPA.115(a) Approach flight techniques — aeroplanes

ACCEPTABLE TOLERANCES FOR STABILISED APPROACH OPERATIONS

(a) The requirement for the aircraft to be tracking within an acceptable tolerance of the required lateral path does not imply that the aircraft has to be aligned with the runway centre line by any particular height.

(b) The target rate of descent for the final approach segment (FAS) of a stabilised approach normally does not exceed 1 000 fpm. Where a rate of descent of more than 1 000 fpm will be required (e.g. due to high ground speed or a steeper-than-normal approach path), this should be briefed in advance.

(c) Operational reasons for specifying a higher-than-normal approach speed below 1 000 ft may include compliance with air traffic control (ATC) speed restrictions.

(d) For operations where a level flight segment is required during the approach (e.g. circling approaches or approaches flown as non-CDFA), the criteria in point (b) of AMC1 CAT.OP.MPA.115(a) should apply from the predetermined point until the start of the level flight segment and again from the point at which the aircraft begins descent from the level flight segment down to a point of 50 ft above the threshold or the point where the flare manoeuvre is initiated, if higher.

GM1 CAT.OP.MPA.115(b) Approach flight technique — aeroplanes

CONTINUOUS DESCENT FINAL APPROACH (CDFA)

(a) Introduction

(1) Controlled flight into terrain (CFIT) is a major hazard in aviation. Most CFIT accidents occur in the FAS of approach operations flown using NPA procedures. The use of stabilised-approach criteria on a continuous descent with a constant, predetermined vertical path is seen as a major improvement in safety during the conduct of such approaches.

(2) The elimination of level flight segments at MDA close to the ground during approaches, and the avoidance of major changes in attitude and power/thrust close to the runway that can destabilise approaches, are seen as ways to reduce operational risks significantly.

(3) The term CDFA has been selected to cover a flight technique for instrument approach operations using NPA procedures.

(4) The advantages of CDFA are as follows:

(i) the technique enhances safe approach operations by the utilisation of standard operating practices;

(ii) the technique is similar to that used when flying an ILS approach, including when executing the missed approach and the associated missed approach procedure manoeuvre;

(iii) the aeroplane attitude may enable better acquisition of visual cues;

(iv) the technique may reduce pilot workload;

(v) the approach profile is fuel-efficient;

(vi) the approach profile affords reduced noise levels;

(vii) the technique affords procedural integration with 3D approach operations; and

(viii) when used and the approach is flown in a stabilised manner, CDFA is the safest approach technique for all instrument approach operations using NPA procedures.

(b) Stabilised approach (SAp).

(1) The control of the descent path is not the only consideration when using the CDFA technique. Control of the aeroplane's configuration and energy is also vital to the safe conduct of an approach.

(2) The control of the flight path, described above as one of the specifications for conducting an SAp, should not be confused with the path specifications for using the CDFA technique. The predetermined path specification for conducting an SAp are established by the operator and published in the operations manual part B.

(3) The appropriate descent path for applying the CDFA technique is established by the following:

(A) the published 'nominal' slope information when the approach has a nominal vertical profile; and

(B) the designated final-approach segment minimum of 3 NM, and maximum, when using timing techniques, of 8 NM.

(4) Straight-in approach operations using CDFA do not have a level segment of flight at MDA/H. This enhances safety by mandating a prompt missed approach procedure manoeuvre at DA/H.

(5) An approach using the CDFA technique is always flown as an SAp, since this is a specification for applying CDFA. However, an SAp does not have to be flown using the CDFA technique, for example, a visual approach.

(c) Circling approach operations using the CDFA technique Circling approach operations using the CDFA technique require a continuous descent from an altitude/height at or above the FAF altitude/height until MDA/H or visual flight manoeuvre altitude/height. This does not preclude level flight at or above the MDA/H. This level flight may be at MDA/H while following the IAP or after visual reference has been established as the aircraft is aligned with the final approach track. The conditions for descent from level flight are described in AMC7 CAT.OP.MPA.110.

AMC1 CAT.OP.MPA.126 Performance-based navigation

PBN OPERATIONS

For operations where a navigation specification for performance-based navigation (PBN) has been prescribed and no specific approval is required in accordance with SPA.PBN.100, the operator should:

(a) establish operating procedures specifying:

(1) normal, abnormal and contingency procedures;

(2) electronic navigation database management; and

(3) relevant entries in the minimum equipment list (MEL);

(b) specify the flight crew qualification and proficiency constraints and ensure that the training programme for relevant personnel is consistent with the intended operation; and

(c) ensure continued airworthiness of the area navigation system.

AMC2 CAT.OP.MPA.126 Performance-based navigation

MONITORING AND VERIFICATION

(a) Preflight and general considerations

(1) At navigation system initialisation, the flight crew should confirm that the navigation database is current and verify that the aircraft position has been entered correctly, if required.

(2) The active flight plan, if applicable, should be checked by comparing the charts or other applicable documents with navigation equipment and displays. This includes confirmation of the departing runway and the waypoint sequence, reasonableness of track angles and distances, any altitude or speed constraints, and, where possible, which waypoints are fly- by and which are fly-over. Where relevant, the RF leg arc radii should be confirmed.

(3) The flight crew should check that the navigation aids critical to the operation of the intended PBN procedure are available.

(4) The flight crew should confirm the navigation aids that should be excluded from the operation, if any.

(5) An arrival, approach or departure procedure should not be used if the validity of the procedure in the navigation database has expired.

(6) The flight crew should verify that the navigation systems required for the intended operation are operational.

(b) Departure

(1) Prior to commencing a take-off on a PBN procedure, the flight crew should check that the indicated aircraft position is consistent with the actual aircraft position at the start of the take-off roll (aeroplanes) or lift-off (helicopters).

(2) Where GNSS is used, the signal should be acquired before the take-off roll (aeroplanes) or lift-off (helicopters) commences.

(3) Unless automatic updating of the actual departure point is provided, the flight crew should ensure initialisation on the runway or FATO by means of a manual runway threshold or intersection update, as applicable. This is to preclude any inappropriate or inadvertent position shift after take-off.

(c) Arrival and approach

(1) The flight crew should verify that the navigation system is operating correctly and the correct arrival procedure and runway (including any applicable transition) are entered and properly depicted.

(2) Any published altitude and speed constraints should be observed.

(3) The flight crew should check approach procedures (including alternate aerodromes if needed) as extracted by the system (e.g. CDU flight plan page) or presented graphically on the moving map, in order to confirm the correct loading and the reasonableness of the procedure content.

(4) Prior to commencing the approach operation (before the IAF), the flight crew should verify the correctness of the loaded procedure by comparison with the appropriate approach charts. This check should include:

(i) the waypoint sequence;

(ii) reasonableness of the tracks and distances of the approach legs and the accuracy of the inbound course; and

(iii) the vertical path angle, if applicable.

(d) Altimetry settings for RNP APCH operations using Baro VNAV

(1) Barometric settings

(i) The flight crew should set and confirm the correct altimeter setting and check that the two altimeters provide altitude values that do not differ more than 100 ft at the most at or before the final approach fix (FAF).

(ii) The flight crew should fly the procedure with:

(A) a current local altimeter setting source available — a remote or regional altimeter setting source should not be used; and

(B) the QNH/QFE, as appropriate, set on the aircraft's altimeters.

(2) Temperature compensation

(i) For RNP APCH operations to LNAV/VNAV minima using Baro VNAV:

(A) the flight crew should not commence the approach when the aerodrome temperature is outside the promulgated aerodrome temperature limits for the procedure unless the area navigation system is equipped with approved temperature compensation for the final approach;

(B) when the temperature is within promulgated limits, the flight crew should not make compensation to the altitude at the FAF;

(C) since only the final approach segment is protected by the promulgated aerodrome temperature limits, the flight crew should consider the effect of temperature on terrain and obstacle clearance in other phases of flight.

(ii) For RNP APCH operations to LNAV minima, the flight crew should consider the effect of temperature on terrain and obstacle clearance in all phases of flight, in particular on any step-down fix.

(e) Sensor and lateral navigation accuracy selection

(1) For multi-sensor systems, the flight crew should verify, prior to approach, that the GNSS sensor is used for position computation.

(2) Flight crew of aircraft with RNP input selection capability should confirm that the indicated RNP value is appropriate for the PBN operation.

AMC3 CAT.OP.MPA.126 Performance-based navigation

MANAGAMENT OF THE NAVIGATION DATABASE

(a) For RNAV 1, RNAV 2, RNP 1, RNP 2, and RNP APCH, the flight crew should neither insert nor modify waypoints by manual entry into a procedure (departure, arrival or approach) that has been retrieved from the database. User-defined data may be entered and used for waypoint altitude/speed constraints on a procedure where said constraints are not included in the navigation database coding.

(b) For RNP 4 operations, the flight crew should not modify waypoints that have been retrieved from the database. User-defined data (e.g. for flex-track routes) may be entered and used.

(c) The lateral and vertical definition of the flight path between the FAF and the missed approach point (MAPt) retrieved from the database should not be revised by the flight crew.

AMC4 CAT.OP.MPA.126 Performance-based navigation

DISPLAYS AND AUTOMATION

(a) For RNAV 1, RNP 1, and RNP APCH operations, the flight crew should use a lateral deviation indicator, and where available, flight director and/or autopilot in lateral navigation mode.

(b) The appropriate displays should be selected so that the following information can be monitored:

(1) the computed desired path;

(2) aircraft position relative to the lateral path (cross-track deviation) for FTE monitoring;

(3) aircraft position relative to the vertical path (for a 3D operation).

(c) The flight crew of an aircraft with a lateral deviation indicator (e.g. CDI) should ensure that lateral deviation indicator scaling (full-scale deflection) is suitable for the navigation accuracy associated with the various segments of the procedure.

(d) The flight crew should maintain procedure centrelines unless authorised to deviate by air traffic control (ATC) or demanded by emergency conditions.

(e) Cross-track error/deviation (the difference between the area-navigation-system-computed path and the aircraft-computed position) should normally be limited to ± ½ time the RNAV/RNP value associated with the procedure. Brief deviations from this standard (e.g. overshoots or undershoots during and immediately after turns) up to a maximum of 1 time the RNAV/RNP value should be allowable.

(f) For a 3D approach operation, the flight crew should use a vertical deviation indicator and, where required by AFM limitations, a flight director or autopilot in vertical navigation mode.

(g) Deviations below the vertical path should not exceed 75 ft at any time, or half-scale deflection where angular deviation is indicated, and not more than 75 ft above the vertical profile, or half-scale deflection where angular deviation is indicated, at or below 1 000 ft above aerodrome level. The flight crew should execute a missed approach if the vertical deviation exceeds this criterion, unless the flight crew has in sight the visual references required to continue the approach.

AMC5 CAT.OP.MPA.126 Performance-based navigation

VECTORING AND POSITIONING

(a) ATC tactical interventions in the terminal area may include radar headings, ‘direct to’ clearances which bypass the initial legs of an approach procedure, interceptions of an initial or intermediate segments of an approach procedure or the insertion of additional waypoints loaded from the database.

(b) In complying with ATC instructions, the flight crew should be aware of the implications for the navigation system.

(c) ‘Direct to’ clearances may be accepted to the IF provided that it is clear to the flight crew that the aircraft will be established on the final approach track at least 2 NM before the FAF.

(d) ‘Direct to’ clearance to the FAF should not be acceptable. Modifying the procedure to intercept the final approach track prior to the FAF should be acceptable for radar-vectored arrivals or otherwise only with ATC approval.

(e) The final approach trajectory should be intercepted no later than the FAF in order for the aircraft to be correctly established on the final approach track before starting the descent (to ensure terrain and obstacle clearance).

(f) ‘Direct to’ clearances to a fix that immediately precede an RF leg should not be permitted.

(g) For parallel offset operations en route in RNP 4 and A-RNP, transitions to and from the offset track should maintain an intercept angle of no more than 45° unless specified otherwise by ATC.

AMC6 CAT.OP.MPA.126 Performance-based navigation

ALERTING AND ABORT

(a) Unless the flight crew has sufficient visual reference to continue the approach operation to a safe landing, an RNP APCH operation should be discontinued if:

(1) navigation system failure is annunciated (e.g. warning flag);

(2) lateral or vertical deviations exceed the tolerances;

(3) loss of the on-board monitoring and alerting system.

(b) Discontinuing the approach operation may not be necessary for a multi-sensor navigation system that includes demonstrated RNP capability without GNSS in accordance with the AFM.

(c) Where vertical guidance is lost while the aircraft is still above 1 000 ft AGL, the flight crew may decide to continue the approach to LNAV minima, when supported by the navigation system.

AMC7 CAT.OP.MPA.126 Performance-based navigation

CONTINGENCY PROCEDURES

(a) The flight crew should make the necessary preparation to revert to a conventional arrival procedure where appropriate. The following conditions should be considered:

(1) failure of the navigation system components including navigation sensors, and a failure effecting flight technical error (e.g. failures of the flight director or autopilot);

(2) multiple system failures affecting aircraft performance;

(3) coasting on inertial sensors beyond a specified time limit; and

(4) RAIM (or equivalent) alert or loss of integrity function.

(b) In the event of loss of PBN capability, the flight crew should invoke contingency procedures and navigate using an alternative means of navigation.

(c) The flight crew should notify ATC of any problem with PBN capability.

(d) In the event of communication failure, the flight crew should continue with the operation in accordance with published lost communication procedures.

GM1 CAT.OP.MPA.126 Performance-based navigation

DESCRIPTION

(a) For both, RNP X and RNAV X designations, the 'X' (where stated) refers to the lateral navigation accuracy (total system error) in NM, which is expected to be achieved at least 95 % of the flight time by the population of aircraft operating within the airspace, route or procedure. For RNP APCH and A-RNP, the lateral navigation accuracy depends on the segment.

(b) PBN may be required on notified routes, for notified procedures and in notified airspace.

RNAV 10

(c) For purposes of consistency with the PBN concept, this Regulation is using the designation 'RNAV 10' because this specification does not include on-board performance monitoring and alerting.

(d) However, it should be noted that many routes still use the designation 'RNP 10' instead of 'RNAV 10'. 'RNP 10' was used as designation before the publication of the fourth edition of ICAO Doc 9613 in 2013. The terms 'RNP 10' and 'RNAV 10' should be considered equivalent.

AMC1 CAT.OP.MPA.130 Noise abatement procedures — aeroplanes

NADP DESIGN

(a) For each aeroplane type, two departure procedures should be defined, in accordance with ICAO Doc 8168 (Procedures for Air Navigation Services, 'PANS-OPS'), Volume I:

(1) noise abatement departure procedure one (NADP 1), designed to meet the close-in noise abatement objective; and

(2) noise abatement departure procedure two (NADP 2), designed to meet the distant noise abatement objective.

(b) For each type of NADP (1 and 2), a single climb profile should be specified for use at all aerodromes, which is associated with a single sequence of actions. The NADP 1 and NADP 2 profiles may be identical.

GM1 CAT.OP.MPA.130 Noise abatement procedures — aeroplanes

TERMINOLOGY

(a) 'Climb profile' means in this context the vertical path of the NADP as it results from the pilot's actions (engine power reduction, acceleration, slats/flaps retraction).

(b) 'Sequence of actions' means the order in which these pilot's actions are done and their timing

GENERAL

(c) The rule addresses only the vertical profile of the departure procedure. Lateral track has to comply with the standard instrument departure (SID).

EXAMPLE

(d) For a given aeroplane type, when establishing the distant NADP, the operator should choose either to reduce power first and then accelerate, or to accelerate first and then wait until slats/flaps are retracted before reducing power. The two methods constitute two different sequences of actions.

(e) For an aeroplane type, each of the two departure climb profiles may be defined by one sequence of actions (one for close-in, one for distant) and two above aerodrome level (AAL) altitudes/heights. These are:

(1) the altitude of the first pilot's action (generally power reduction with or without acceleration). This altitude should not be less than 800 ft AAL; or

(2) the altitude of the end of the noise abatement procedure. This altitude should usually not be more than 3 000 ft AAL.

These two altitudes may be runway specific when the aeroplane flight management system (FMS) has the relevant function which permits the crew to change thrust reduction and/or acceleration altitude/height. If the aeroplane is not FMS-equipped or the FMS is not fitted with the relevant function, two fixed heights should be defined and used for each of the two NADPs.

AMC1 CAT.OP.MPA.135 Routes and areas of operation — general

RNAV 10

(a) Operating procedures and routes should take account of the RNAV 10 time limit declared for the inertial system, if applicable, considering also the effect of weather conditions that could affect flight duration in RNAV 10 airspace.

(b) The operator may extend RNAV 10 inertial navigation time by position updating. The operator should calculate, using statistically-based typical wind scenarios for each planned route, points at which updates can be made, and the points at which further updates will not be possible.

GM1 CAT.OP.MPA.137(b) Routes and areas of operation — helicopters

COASTAL TRANSIT

(a) General

(1) Helicopters operating overwater in performance class 3 have to have certain equipment fitted. This equipment varies with the distance from land that the helicopter is expected to operate. The aim of this GM is to discuss that distance, bring into focus what fit is required and to clarify the operator's responsibility, when a decision is made to conduct coastal transit operations.

(2) In the case of operations north of 45N or south of 45S, the coastal corridor facility may or may not be available in a particular state, as it is related to the State definition of open sea area as described in the definition of hostile environment.

(3) Where the term 'coastal transit' is used, it means the conduct of operations overwater within the coastal corridor in conditions where there is reasonable expectation that:

(i) the flight can be conducted safely in the conditions prevailing;

(ii) following an engine failure, a safe forced landing and successful evacuation can be achieved; and

(iii) survival of the crew and passengers can be assured until rescue is effected.

(4) Coastal corridor is a variable distance from the coastline to a maximum distance corresponding to three minutes' flying at normal cruising speed.

(b) Establishing the width of the coastal corridor

(1) The maximum distance from land of coastal transit, is defined as the boundary of a corridor that extends from the land, to a maximum distance of up to 3 minutes at normal cruising speed (approximately 5 - 6 NM). Land in this context includes sustainable ice (see (i) to (iii) below) and, where the coastal region includes islands, the surrounding waters may be included in the corridor and aggregated with the coast and each other. Coastal transit need not be applied to inland waterways, estuary crossing or river transit.

(i) In some areas, the formation of ice is such that it can be possible to land, or force land, without hazard to the helicopter or occupants. Unless the CAAT considers that operating to, or over, such ice fields is unacceptable, the operator may regard that the definition of the 'land' extends to these areas.

(ii) The interpretation of the following rules may be conditional on (i) above:

— CAT.OP.MPA.137(a)(2);

— CAT.IDE.H.290;

— CAT.IDE.H.295;

— CAT.IDE.H.300; and

— CAT.IDE.H.320.

(iii) In view of the fact that such featureless and flat white surfaces could present a hazard and could lead to white-out conditions, the definition of land does not extend to flights over ice fields in the following rules:

— CAT.IDE.H.125(d); and

— CAT.IDE.H.145.

(2) The width of the corridor is variable from not safe to conduct operations in the conditions prevailing, to the maximum of 3 minutes wide. A number of factors will, on the day, indicate if it can be used — and how wide it can be. These factors will include, but not be restricted to, the following:

(i) meteorological conditions prevailing in the corridor;

(ii) instrument fit of the aircraft;

(iii) certification of the aircraft — particularly with regard to floats;

(iv) sea state;

(v) temperature of the water;

(vi) time to rescue; and

(vii) survival equipment carried.

(3) These can be broadly divided into three functional groups:

(i) those that meet the provisions for safe flying;

(ii) those that meet the provisions for a safe forced landing and evacuation; and

(iii) those that meet the provisions for survival following a forced landing and successful evacuation.

(c) Provision for safe flying

It is generally recognised that when flying out of sight of land in certain meteorological conditions, such as those occurring in high pressure weather patterns (goldfish bowl — no horizon, light winds and low visibility), the absence of a basic panel (and training) can lead to disorientation. In addition, lack of depth perception in these conditions demands the use of a radio altimeter with an audio voice warning as an added safety benefit — particularly when autorotation to the surface of the water may be required.

In these conditions, the helicopter, without the required instruments and radio altimeter, should be confined to a corridor in which the pilot can maintain reference using the visual cues on the land.

(d) Provision for a safe forced landing and evacuation

(1) Weather and sea state both affect the outcome of an autorotation following an engine failure. It is recognised that the measurement of sea state is problematical and when assessing such conditions, good judgement has to be exercised by the operator and the commander.

(2) Where floats have been certificated only for emergency use (and not for ditching), operations should be limited to those sea states that meet the provisions for such use — where a safe evacuation is possible.

(3) Ditching certification requires compliance with a comprehensive number of requirements relating to rotorcraft water entry, flotation and trim, occupant egress and occupant survival. Emergency flotation systems, generally fitted to smaller CS-27

rotorcraft, are approved against a broad specification that the equipment should perform its intended function and not hazard the rotorcraft or its occupants. In practice, the most significant difference between ditching and emergency flotation systems is substantiation of the water entry phase. Ditching rules call for water entry procedures and techniques to be established and promulgated in the AFM. The fuselage/flotation equipment should thereafter be shown to be able to withstand loads under defined water entry conditions which relate to these procedures. For emergency flotation equipment, there is no specification to define the water entry technique and no specific conditions defined for the structural substantiation.

(e) Provisions for survival

(1) Survival of crew members and passengers, following a successful autorotation and evacuation, is dependent on the clothing worn, the equipment carried and worn, the temperature of the sea and the sea state. Search and rescue (SAR) response/capability consistent with the anticipated exposure should be available before the conditions in the corridor can be considered non-hostile.

(2) Coastal transit can be conducted (including north of 45N and south of 45S — when the definition of open sea areas allows) providing the provisions of (c) and (d) are met, and the conditions for a non-hostile coastal corridor are satisfied.

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 BETWEEN 120 AND 180 MINUTES FROM AN ADEQUATE AERODROME

(a) For operations between 120 and 180 minutes the operator should include the relevant information in its operations manual (OM) and its maintenance procedures.

(b) The aeroplane should be certified to EASA CS-25 or any equivalent material acceptable to the CAAT (e.g. FAR-25)

(c) Engine events and corrective action

(1) All engine events and operating hours should be reported by the operator to the airframe and engine type certificate (TC) holders, as well as to the CAAT.

(2) These events should be evaluated by the operator in consultation with the CAAT and with the engine and airframe TC holders. The CAAT may consult EASA or other regulatory authoritie(s) such as the FAA to ensure that worldwide data is 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 or the application of operational restrictions.

(5) Engine events could include engine shutdowns, both on ground and in-flight, excluding normal training events, including flameout, 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 ensure that all corrective actions required by the CAAT are implemented.

(d) Maintenance

(1) The operator's oil-consumption-monitoring programme should be based on engine manufacturer's recommendations, if available, and 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, and 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 crew training programme for this type of operation that includes, in addition to the requirements of Subpart FC (flight Crew) of TCAR OPS Part ORO, particular emphasis on the following:

(1) Fuel management: verifying required fuel on board prior to departure and monitoring fuel on board en-route, including calculation of fuel remaining. Procedures should provide for an independent cross-check of fuel quantity indicators, e.g. fuel flow used to calculate fuel burned compared to indicate fuel remaining. Confirmation 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 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) 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 applicable airworthiness requirements and designed to verify the status of the aeroplane's significant systems, should be 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 described in the OM. The operator should ensure that flight crew members are fully trained and competent to conduct a pre-departure check of the aeroplane. The operator's required training programme 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 MEL takes into account all items specified by the manufacturer relevant to this type of operations.

(h) Dispatch/flight planning rules

The operator should establish dispatch procedures that address the following:

(1) Fuel and oil supply: for releasing an aeroplane on an extended range flight, the operator should ensure that it carries sufficient fuel and oil to meet the applicable operational requirements and any additional fuel that may be determined in accordance with the following:

(i) Critical fuel scenario: in establishing the critical fuel reserves, the applicant is to determine the fuel necessary to fly to the most critical point of the route and execute a diversion to an alternate aerodrome assuming a simultaneous failure of an engine and the cabin air pressurisation system. The operator should carry additional fuel for the worst-case fuel burn condition (one engine vs two engines operating) if this is greater than the additional fuel calculated in accordance with the fuel requirements in CAT.OP.MPA, 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

(B) descend and hold at 1 500 ft for 15 minutes in standard 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 available, take account of ice accumulation on unprotected surfaces if icing conditions are likely to be encountered during a diversion.

(iii) 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) Aircraft technical log review to ensure that proper MEL procedures, deferred items, and required maintenance checks have been completed.

(4) ERA aerodrome(s): the operator should ensure that ERA aerodromes are available for the intended route, within the distance flown in 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 CAAT, confirming that, based on the available meteorological information, the weather conditions at ERA aerodromes are at or above the applicable minima for the applicable period of time , in accordance with CAT.OP.MPA.182.

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

ONE-ENGINE-INOPERATIVE (OEI) CRUISING SPEED

The OEI cruising speed is intended to be used solely for establishing the maximum distance from an adequate aerodrome.

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.).

AMC1 CAT.OP.MPA.145(a) Establishment of minimum flight altitudes

CONSIDERATIONS FOR ESTABLISHING MINIMUM FLIGHT ALTITUDES

(a) The operator should take into account the following factors when establishing minimum flight altitudes:

(1) the accuracy with which the position of the aircraft can be determined;

(2) the probable inaccuracies in the indications of the altimeters used;

(3) the characteristics of the terrain, such as sudden changes in the elevation, along the routes or in the areas where operations are to be conducted;

(4) the probability of encountering unfavourable meteorological conditions, such as severe turbulence and descending air currents; and

(5) possible inaccuracies in aeronautical charts.

(b) The operator should also consider:

(1) corrections for temperature and pressure variations from standard values;

(2) ATC requirements; and

(3) any foreseeable contingencies along the planned route.

AMC1.1 CAT.OP.MPA.145(a) Establishment of minimum flight altitudes

CONSIDERATIONS FOR ESTABLISHING MINIMUM FLIGHT ALTITUDES

This AMC provides another means of complying with the rule for VFR operations of other-than-complex motor-powered aircraft by day, compared to that presented in AMC1 CAT.OP.MPA.145(a). The safety objective should be satisfied if the operator ensures that operations are only conducted along such routes or within such areas for which a safe terrain clearance can be maintained and take account of such factors as temperature, terrain and unfavourable meteorological conditions.

GM1 CAT.OP.MPA.145(a) Establishment of minimum flight altitudes

MINIMUM FLIGHT ALTITUDES

(a) The following are examples of some of the methods available for calculating minimum flight altitudes.

(b) KSS formula:

(1) Minimum obstacle clearance altitude (MOCA)

(i) MOCA is the sum of:

(A) the maximum terrain or obstacle elevation, whichever is higher; plus

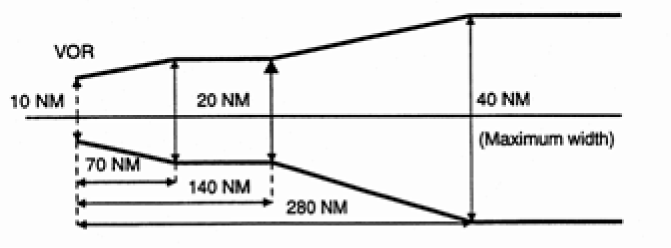
(B) 1 000 ft for elevation up to and including 6 000 ft; or

(C) 2 000 ft for elevation exceeding 6 000 ft rounded up to the next 100 ft.

(ii) The lowest MOCA to be indicated is 2 000 ft.

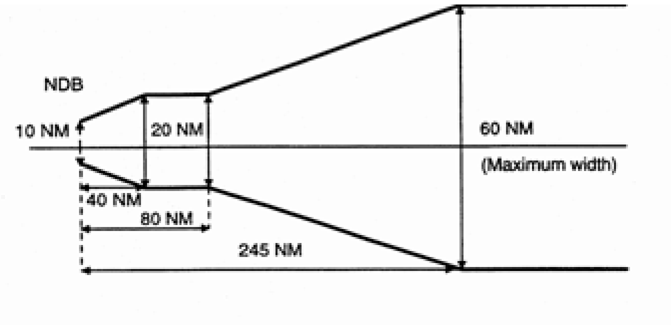
(iii) From a VOR station, the corridor width is defined as a borderline starting 5 NM either side of the VOR, diverging 4° from centreline until a width of 20 NM is reached at 70 NM out, thence paralleling the centreline until 140 NM out, thence again diverging 4° until a maximum width of 40 NM is reached at 280 NM out. Thereafter, the width remains constant (see Figure 1).

Figure 1 Corridor width from a VOR station



(iv) From a non-directional beacon (NDB), similarly, the corridor width is defined as a borderline starting 5 NM either side of the NDB diverging 7° until a width of 20 NM is reached 40 NM out, thence paralleling the centreline until 80 NM out, thence again diverging 7° until a maximum width of 60 NM is reached 245 NM out. Thereafter, the width remains constant (see Figure 2).

Figure 2 Corridor width from an NDB



(v) MOCA does not cover any overlapping of the corridor.

(2) Minimum off-route altitude (MORA). MORA is calculated for an area bounded by each or every second LAT/LONG square on the route facility chart (RFC)/terminal approach chart (TAC) and is based on a terrain clearance as follows:

(i) terrain with elevation up to 6 000 ft (2 000 m) – 1 000 ft above the highest terrain and obstructions;

(ii) terrain with elevation above 6 000 ft (2 000 m) – 2 000 ft above the highest terrain and obstructions.

(c) Jeppesen formula (see Figure 3)

(1) MORA is a minimum flight altitude computed by Jeppesen from current operational navigation charts (ONCs) or world aeronautical charts (WACs). Two types of MORAs are charted which are:

(i) route MORAs e.g. 9800a; and

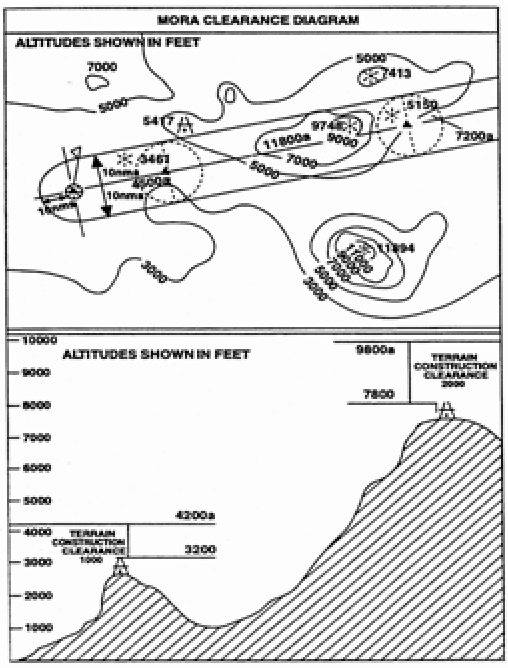
(ii) grid MORAs e.g. 98.

(2) Route MORA values are computed on the basis of an area extending 10 NM to either side of route centreline and including a 10 NM radius beyond the radio fix/reporting point or mileage break defining the route segment.

(3) MORA values clear all terrain and man-made obstacles by 1 000 ft in areas where the highest terrain elevation or obstacles are up to 5 000 ft. A clearance of 2 000 ft is provided above all terrain or obstacles that are 5 001 ft and above.

(4) A grid MORA is an altitude computed by Jeppesen and the values are shown within each grid formed by charted lines of latitude and longitude. Figures are shown in thousands and hundreds of feet (omitting the last two digits so as to avoid chart congestion). Values followed by ± are believed not to exceed the altitudes shown. The same clearance criteria as explained in (c)(3) apply.

Figure 3 Jeppesen formula



(d) ATLAS formula

(1) Minimum en-route altitude (MEA). Calculation of the MEA is based on the elevation of the highest point along the route segment concerned (extending from navigational aid to navigational aid) within a distance on either side of track as specified in Table 1 below:

Table 1 Minimum safe en-route altitude

Segment length	Distance either side of track
Up to 100 NM	10 NM *
More than 100 NM	10 % of segment length up to a maximum of 60 NM **

*: This distance may be reduced to 5 NM within terminal control areas (TMAs) where, due to the number and type of available navigational aids, a high degree of navigational accuracy is warranted.

**: In exceptional cases, where this calculation results in an operationally impracticable value, an additional special MEA may be calculated based on a distance of not less than 10 NM either side of track. Such special MEA will be shown together with an indication of the actual width of protected airspace.

(2) The MEA is calculated by adding an increment to the elevation specified above as appropriate, following Table 2 below. The resulting value is adjusted to the nearest 100 ft.

Table 2 Increment added to the elevation *

Elevation of highest point	Increment
Not above 5 000 ft	1 500 ft
Above 5 000 ft but not above 10 000 ft	2 000 ft
Above 10 000 ft	10 % of elevation plus 1 000 ft

*: For the last route segment ending over the initial approach fix, a reduction to 1 000 ft is permissible within TMAs where, due to the number and type of available navigation aids, a high degree of navigational accuracy is warranted.

(3) Minimum safe grid altitude (MGA). Calculation of the MGA is based on the elevation of the highest point within the respective grid area.

The MGA is calculated by adding an increment to the elevation specified above as appropriate, following Table 3 below. The resulting value is adjusted to the nearest 100 ft.

Table 3 Minimum safe grid altitude

Elevation of highest point	Increment
Not above 5 000 ft	1 500 ft
Above 5 000 ft but not above 10 000 ft	2 000 ft
Above 10 000 ft	10 % of elevation plus 1 000 ft

(e) Lido formula

(1) Minimum terrain clearance altitude (MTCA)

The MTCA represents an altitude providing terrain and obstacle clearance for all airways/ATS routes, all standard terminal arrival route (STAR) segments up to IAF or equivalent end point and for selected standard instrument departures (SIDs).

The MTCA is calculated by Lido and covers terrain and obstacle clearance relevant for air navigation with the following buffers:

(i) Horizontal:

(A) for SID and STAR procedures 5 NM either side of centre line; and

(B) for airways/ATS routes 10 NM either side of centre line.

(ii) Vertical:

(A) 1 000 ft up to 6 000 ft; and

(B) 2 000 ft above 6 000 ft.

MTCAs are always shown in feet. The lowest indicated MTCA is 3 100 ft.

(2) Minimum grid altitude (MGA)

MGA represents the lowest safe altitude which can be flown off-track. The MGA is calculated by rounding up the elevation of the highest obstruction within the respective grid area to the next 100 ft and adding an increment of

(i) 1 000 ft for terrain or obstructions up to 6 000 ft; and

(ii) 2 000 ft for terrain or obstructions above 6 000 ft.

MGA is shown in hundreds of feet. The lowest indicated MGA is 2 000 ft. This value is also provided for terrain and obstacles that would result in an MGA below 2 000 ft. An exception is over water areas where the MGA can be omitted.

AMC1 CAT.OP.MPA.155(b) Carriage of special categories of passengers (SCPs)

PROCEDURES

When establishing the procedures for the carriage of SCPs, the operator should take into account the following factors:

(a) the aircraft type and cabin configuration;

(b) the total number of passengers carried on board;

(c) the number and categories of SCPs, which should not exceed the number of passengers capable of assisting them in case of an emergency; and

(d) any other factor(s) or circumstances possibly impacting on the application of emergency procedures by the operating crew members.

AMC2 CAT.OP.MPA.155(b) Carriage of Special Categories of Passengers (SCPs)

PROCEDURES TO PROVIDE INFORMATION TO SCP

The operator procedures on information provided to the SCP should specify the timing and methods on how and when the information can be provided.

AMC3 CAT.OP.MPA.155(b) Carriage of Special Categories of Passengers (SCPs)

CONDITIONS OF SAFE CARRIAGE FOR UNACCOMPANIED CHILDREN

(a) When carrying an unaccompanied child that is not self-reliant, the operator should assess the safety risks to ensure that the child is assisted in case of an emergency situation.

(b) A child under the age of 12 years, separated from the accompanying adult, who is travelling in another cabin class, should be considered as an unaccompanied child in order to ensure that the child is assisted in case of an emergency situation.

GM1 CAT.OP.MPA.155(b) Carriage of Special Categories of Passengers (SCPs)

PROCEDURES TO PROVIDE INFORMATION TO SCP

Providing information only at the time of booking might not be sufficient to ensure that the SCP is aware of the information at the time of the flight.

GM2 CAT.OP.MPA.155(b) Carriage of Special Categories of Passengers (SCPs

INFORMATION PROVIDED TO SCP

When establishing procedures on the information to be provided to an SCP, the operator should consider informing the SCP that cabin crew can only assist the SCP once the cabin has been evacuated. The following table contains additional information by SCP category:

SCP category	Type of information
Unaccompanied child	Inform the unaccompanied child on the following: (a) which adult will assist with the operation of the seat belt and the fitting of the oxygen mask if the situation requires it; (b) the content of the passenger safety briefing card; and (c) in case of evacuation, to seek the assistance of adult passenger(s) in contacting a crew member. Inform the passenger sitting next to the unaccompanied child to assist with: (a) providing the child with an oxygen mask in case of decompression after fitting one's own mask; (b) securing/releasing the child's seat belt, if necessary; and (c) calling a cabin crew member in all other in-flight situations. When a child and the accompanying adult travel in a different class of cabin, information should be provided to the child and adult that, in the event of an emergency, they should follow the instructions of the cabin crew and not try to reunite inside the cabin as this would slow down the overall evacuation.
Adult travelling with an infant	Information on brace position for adult with lap-held infant. Information on the use of the loop belt, in case of a lap-held infant. Information to fit own oxygen mask before fitting the infant's oxygen mask. Information on how to evacuate when carrying an infant: (a) On land, see EASA SIB 2013-03 on evacuation of infants on aircraft equipped with inflatable slides or hatch-type overwing exits; and (b) In case of ditching, how to fit and when to inflate infant flotation aid (e.g. life jacket, flotation device).
Physically disabled passenger (aided walking)	Inform the SCP to leave mobility aid behind in an emergency evacuation.

SCP category	Type of information
Passenger with disability of upper limbs	Inform the accompanying passenger to: (a) fit the life jacket on the SCP, in case of a ditching evacuation; (b) first put on their own oxygen mask before fitting the SCP's oxygen mask, in case of decompression; and (c) secure/release the SCP's seat belt, if necessary.
Passenger with disability of lower limbs	Inform the SCP: (a) on the location of the nearest suitable exit; and (b) that mobility aids might not be accessible in an emergency evacuation.
Passenger with disability of both upper and lower limbs	Inform accompanying passenger to secure/release the SCP's seat belt . Inform the SCP (a) in case of an evacuation, on the location of the nearest suitable exit; (b) in case of a ditching evacuation, that the accompanying passenger should fit the life jacket on the SCP; and (c) in case of a decompression, that the accompanying passenger should first put on his/her own oxygen mask before fitting the SCP's oxygen mask.
Visually impaired passenger	Depending on the level of impairment, inform the visually impaired passenger on the following: (a) seat and seat belt operation; (b) location of the nearest exit (e.g. number of seat rows to the nearest exit); (c) oxygen mask deployment; (d) location of life jacket; (e) brace position; and (f) location of cabin crew call button. If available, take the aircraft demonstration equipment to the passenger for tactile assistance.
Passenger travelling with a recognised assistance dog in the cabin	Advise how to evacuate guide dog by holding the dog and sliding.
Stretcher occupant	Inform the stretcher occupant and the accompanying passenger that in case of an evacuation: (a) the stretcher occupant should be evacuated when the cabin area surrounding the stretcher is clear; (b) to evacuate the stretcher occupant without the stretcher, if possible; (c) to be seated when sliding, holding the stretcher occupant in front; and in the event of a ditching evacuation, to fit the life jacket on the stretcher occupant.

GM3 CAT.OP.MPA.155(b) Carriage of Special Categories of Passengers (SCPs)

PROCEDURES

A passenger capable of assisting in case of an emergency means a passenger who is not an SCP and has no other role or private responsibility that would prevent him/her from assisting the SCP. For example, an adult travelling alone has no other role or private responsibility, unlike a family travelling together with younger children.

GM4 CAT.OP.MPA.155(b) Carriage of Special Categories of Passengers (SCPs)

BRIEFING PROCEDURE IN A PLANNED EMERGENCY

In a planned emergency, if time permits, passengers identified by the cabin crew as capable of assisting an SCP should be briefed on the assistance they can provide.

AMC1 CAT.OP.MPA.155(c) Carriage of Special Categories of Passengers (SCPs)

SEATING PROCEDURES

When establishing SCP seating procedures, the operator should take into account the following factors:

(a) If the SCP travels with an accompanying passenger, the accompanying passenger should be seated next to the SCP.

(b) If the SCP is unable to negotiate stairs within the cabin unaided, he/she should not be seated on the upper deck of a multi-deck aircraft if the exits are not certified for emergency evacuation on both land and water.

AMC2 CAT.OP.MPA.155(c) Carriage of Special Categories of Passengers (SCPs)

SEATING ALLOCATION OF SCP WITH A DISABILITY AND/OR RESTRAINT AID

(a) A disability and/or restraint aid that requires to be secured around the back of the seat should not be used if there is a person seated behind unless the seating configuration is approved for the use of such devices. This is to avoid the changed dynamic seat reactions with the disability and/or restraint aid, which may lead to head injury of the passenger seated behind.

(b) If the seat design or installation would prevent head contact of the person seated behind, then no further consideration is necessary.

GM1 CAT.OP.MPA.155(c) Carriage of Special categories of Passengers (SCPs)

GROUP SEATING

(a) Taking into account access to exits, groups of non-ambulatory SCPs should be seated throughout the cabin to ensure that each SCP is surrounded by the maximum number of passengers capable of assisting in case of an emergency.

(b) If non-ambulatory SCPs cannot be evenly distributed throughout the cabin, the operator should establish procedures to mitigate the increased safety risk such as seating of passengers capable of assisting in case of an emergency in the vicinity, additional information or training of cabin crew.

(c) A group of passengers whose physical size would possibly prevent them from moving quickly or reaching and passing through an emergency exit, should not occupy the same seat row segment

AMC1 CAT.OP.MPA.160 Stowage of baggage and cargo

STOWAGE PROCEDURES

Procedures established by the operator to ensure that hand baggage and cargo are adequately and securely stowed should take account of the following:

(a) each item carried in a cabin should be stowed only in a location that is capable of restraining it;

(b) weight limitations placarded on or adjacent to stowages should not be exceeded;

(c) under seat stowages should not be used unless the seat is equipped with a restraint bar and the baggage is of such size that it may adequately be restrained by this equipment;

(d) items should not be stowed in lavatories or against bulkheads that are incapable of restraining articles against movement forwards, sideways or upwards and unless the bulkheads carry a placard specifying the greatest mass that may be placed there;

(e) baggage and cargo placed in lockers should not be of such size that they prevent latched doors from being closed securely;

(f) baggage and cargo should not be placed where it can impede access to emergency equipment; and

(g) checks should be made before take-off, before landing and whenever the ‘fasten seat belts’ signs are illuminated or it is otherwise so ordered to ensure that baggage is stowed where it cannot impede evacuation from the aircraft or cause injury by falling (or other movement), as may be appropriate to the phase of flight.

AMC2 CAT.OP.MPA.160 Stowage of baggage and cargo

CARRIAGE OF CARGO IN THE PASSENGER COMPARTMENT

The following should be observed before carrying cargo in the passenger compartment:

(a) for aeroplanes:

  (1) dangerous goods should not be allowed; and

  (2) a mix of passengers and live animals should only be allowed for pets weighing not more than 8 kg and guide dogs;

(b) for aeroplanes and helicopters:

  (1) the mass of cargo should not exceed the structural loading limits of the floor or seats;

  (2) the number/type of restraint devices and their attachment points should be capable of restraining the cargo in accordance with applicable Certification Specifications; and

  (3) the location of the cargo should be such that, in the event of an emergency evacuation, it will not hinder egress nor impair the crew’s view.

AMC1 CAT.OP.MPA.165 Passenger seating

EMERGENCY EXIT SEATING

The operator should make provisions so that:

(a) a passenger occupies a seat at least on each side in a seat row with direct access to an emergency exit (not staffed by a cabin crew member) during taxiing, take-off and landing unless this would be impracticable due to a low number of passengers or might negatively impact the mass and balance limitations.

(b) those passengers who are allocated seats that permit direct access to emergency exits appear to be reasonably fit, strong, and be able and willing to assist the rapid evacuation of the aircraft in an emergency after an appropriate briefing by the crew;

(c) in all cases, passengers who, because of their condition, might hinder other passengers during an evacuation or who might impede the crew in carrying out their duties, should not be allocated seats that permit direct access to emergency exits. If procedures cannot be reasonably implemented at the time of passenger 'check-in', the operator should establish an alternative procedure which ensures that the correct seat allocations will, in due course, be made.

AMC2 CAT.OP.MPA.165 Passenger seating

ACCESS TO EMERGENCY EXITS

The following categories of passengers are among those who should not be allocated to, or directed to, seats that permit direct access to emergency exits:

(a) passengers suffering from obvious physical or mental disability to the extent that they would have difficulty in moving quickly if asked to do so;

(b) passengers who are either substantially blind or substantially deaf to the extent that they might not readily assimilate printed or verbal instructions given;

(c) passengers who because of age or sickness are so frail that they have difficulty in moving quickly;

(d) passengers who are so obese that they would have difficulty in moving quickly or reaching and passing through the adjacent emergency exit;

(e) children (whether accompanied or not) and infants;

(f) deportees, inadmissible passengers or persons in custody; and

(g) passengers with animals.

GM1 CAT.OP.MPA.165 Passenger seating

DIRECT ACCESS

'Direct access' means a seat from which a passenger can proceed directly to the exit without entering an aisle or passing around an obstruction.

GM2 CAT.OP.MPA.165 Passenger seating

EMERGENCY EXIT SEATING

When allocating a seat in a seat row with direct access to an emergency exit, the operator should consider at least the following:

(a) providing the passenger with the applicable emergency exit seating restrictions prior to boarding, or upon assigning a passenger to a seat, e.g. at the stage of booking, or check-in, or at the airport;

(b) utilising, as far as practicable, cabin crew members that are additional to the minimum required cabin crew complement, or positioning crew members, if available on board.

AMC1 CAT.OP.MPA.170 Passenger briefing

PASSENGER BRIEFING

Passenger briefings should contain the following:

(a) Before take-off

(1) Passengers should be briefed on the following items, if applicable:

(i) any cabin secured aspects, e.g. required position of seatbacks, tray tables, footrests, window blinds, etc. as applicable;

(ii) emergency lighting (floor proximity escape path markings, exit signs);

(iii) correct stowage of hand baggage and the importance of leaving hand baggage behind in case of evacuation;

(iv) the use and stowage of portable electronic devices, including in-flight entertainment (IFE) system;

(v) the location and presentation of the safety briefing card, the importance of its contents and the need for passengers to review it prior to take-off; and

(vi) compliance with ordinance signs, pictograms or placards, and crew member instructions; and

(2) Passengers should receive a demonstration of the following:

(i) the use of safety belts or restraint systems, including how to fasten and unfasten the safety belts or restraint systems;

(ii) the location of emergency exits - cabin crew to indicate;

(iii) the location and use of oxygen equipment, if required. Passengers should also be briefed to extinguish all smoking materials when oxygen is being used; and

(iv) the location and use of life-jackets if required.

(3) Passengers occupying seats with direct access to emergency exits not staffed by cabin crew members should receive an additional briefing on the operation and use of the exit.

(b) After take-off

(1) Passengers should be reminded of the following, if applicable:

(i) use of safety belts or restraint systems including the safety benefits of having safety belts fastened when seated irrespective of seat belt sign illumination; and

(ii) caution when opening overhead compartments.

(c) Before landing

(1) Passengers should be reminded of the following, if applicable:

(i) use of safety belts or restraint systems;

(ii) any cabin secured aspects, e.g. required position of seatbacks, tray tables, footrests, window blinds, etc. as applicable;

(iii) correct stowage of hand baggage and the importance of leaving hand baggage behind in case of evacuation;

(iv) the use and stowage of portable electronic devices; and

(v) the location of the safety briefing card, the importance of its contents and its review.

(d) After landing

(1) Passengers should be reminded of the following:

(i) use of safety belts or restraint systems;

(ii) the use and stowage of portable electronic devices; and

(iii) caution when opening overhead compartments.

(e) Emergency during flight:

(1) Passengers should be instructed as appropriate to the circumstances.

(f) Smoking regulations

(1) The operator should determine the frequency of briefings or reminding passengers about the smoking regulations.

AMC1.1 CAT.OP.MPA.170 Passenger briefing

PASSENGER BRIEFING

(a) The operator may replace the briefing/demonstration as set out in AMC1 CAT.OP.MPA.170 with a passenger training programme covering all safety and emergency procedures for a given type of aircraft.

(b) Only passengers who have been trained according to this programme and have flown on the aircraft type within the last 90 days may be carried on board without receiving a briefing/demonstration.

AMC2 CAT.OP.MPA.170 Passenger briefing

SINGLE-PILOT OPERATIONS WITHOUT CABIN CREW

For single-pilot operations without cabin crew, the commander should provide safety briefings to passengers except during critical phases of flight and taxiing.

AMC3 CAT.OP.MPA.170 Passenger briefing

IN-FLIGHT ENTERTAINMENT (IFE) SYSTEMS

When IFE systems are available by means of equipment that can be handled by passengers, including portable electronic devices (PEDs), provided by the operator for the purpose of IFE, appropriate information containing at least the following should be made available to passengers:

(a) instructions on how to safely operate the IFE system for personal use in normal conditions;

(b) restrictions, including stowage of retractable or loose items of equipment (e.g. screens or remote controls) during taxiing, take-off and landing, and in abnormal or emergency conditions; and

(c) the instruction to alert cabin crew members in case of IFE system malfunction, damage or falls into the seat structure.

AMC4 CAT.OP.MPA.170 Passenger briefing

SAFETY BRIEFING CARD

(a) The safety briefing card should be designed, and the information should be provided, in a size easily visible to the passenger. The safety briefing card should be stowed in a location from where it is easily visible and reachable to the seated passenger and from where it cannot easily fall out. Information should be presented in a pictographic form and should be consistent with the placards used in the aircraft. Written information should be kept to the necessary minimum. The safety briefing card should only contain information relevant to safety.

(b) The operator should consider including the following information in its safety briefing card:

(1) cabin secured aspects during taxi, take-off and landing;

(i) correct versus forbidden stowage of hand baggage (e.g. exits, aisles, etc.);

(ii) required position of seatbacks, headrests, tray tables, armrests, footrests, window blinds and IFE systems, etc.;

(2) safety belts and other restraint systems:

(i) when and how to fasten, adjust and unfasten safety belts and/or shoulder harnesses;

(ii) restraint of infants and children;

(iii) additional installed systems, e.g. airbag (if applicable);

(3) drop-down oxygen system:

(i) location;

(ii) activation on the oxygen flow;

(iii) donning and adjusting the mask;

(iv) assisting others after fitting own mask;

(4) flotation devices:

(i) stowage locations (including if different in various cabin sections);

(ii) method of removal, donning and inflation;

(iii) features, e.g. straps, toggles, tubes, signalling light, whistle;

(iv) when and where to inflate a life jacket;

(v) flotation devices for infants;

(5) emergency exits:

(i) number and location;

(ii) method of operation, including alternative operation in case of ditching;

(iii) surrounding conditions prior to opening (e.g. fire, smoke, water level, etc.);

(iv) unusable exit;

(v) alternative egress routes in case of unusable exit(s);

(vi) leaving hand baggage behind;

(vii) awareness of dangers, as applicable (e.g. propellers, exit height, etc.);

(6) escape routes: depiction of routes:

(i) to the exits (inside the aircraft);

(ii) movement on a double-deck aircraft;

(iii) via the wing to the ground or water;

(iv) on the ground or water away from the aircraft;

(7) assisting evacuation means:

(i) location of available equipment (e.g. life raft, installed slide/raft, etc.);

(ii) operation of the available equipment (activation, detachment, manual inflation handle, etc.);

(iii) removal of high-heeled shoes;

(iv) method of evacuation through exits with no assisting evacuation means;

(8) brace position:

(i) appropriate method to the applicable facing direction;

(ii) alternative brace positions as applicable to the seated passengers (e.g. expectant mothers, passengers with lap-held infants, etc.);

(9) restrictions on the use of PED;

(10) smoking restrictions;

(11) floor proximity escape path marking;

(12) any other safety aspects.

GM1 CAT.OP.MPA.170(a) Passenger briefing

BRIEFING OF PASSENGERS OCCUPYING SEATS WITH DIRECT ACCESS TO EMERGENCY EXITS NOT STAFFED BY CABIN CREW MEMBERS

(a) The emergency exit briefing should contain instructions on the operation of the exit, assessment of surrounding conditions for the safe use of the exit, and recognition of emergency commands given by the crew.

(b) Cabin crew should verify that the passenger(s) is (are) able and willing to assist the crew in case of an emergency and that the passenger(s) has (have) understood the instructions.

GM2 CAT.OP.MPA.170 Passenger briefing

SAFETY BRIEFING MATERIAL

(a) Safety briefing material may include but is not limited to an audio-visual presentation, such as a safety video or a safety briefing card. Information in the safety briefing material should be relevant to the aircraft type and the installed equipment and should be consistent with the operator's procedures. Information in the safety briefing material should be presented in a clear and unambiguous manner and in a form easily understandable to passengers.

(b) For those passengers occupying seats with direct access to emergency exits, the operator should consider providing a separate briefing card, which contains a summary of the exit briefing information.

(c) The operator conducting an operation with no cabin crew should consider including expanded information, such as location and use of fire extinguisher, oxygen system if different from the drop-down system, etc.

(d) The safety video should be structured in a pace that allows a continuous ability to follow the information presented. The operator may consider including sign language or subtitles to simultaneously complement the soundtrack.

AMC1 CAT.OP.MPA.175 Flight preparation

FLIGHT PREPARATION FOR PBN OPERATIONS

(a) The flight crew should ensure that RNAV 1, RNAV 2, RNP 1 RNP 2, and RNP APCH routes or procedures to be used for the intended flight, including for any alternate aerodromes, are selectable from the navigation database and are not prohibited by NOTAM.

(b) The flight crew should take account of any NOTAMs or operator briefing material that could adversely affect the aircraft system operation along its flight plan including any alternate aerodromes.

(c) When PBN relies on GNSS systems for which RAIM is required for integrity, its availability should be verified during the pre-flight planning. In the event of a predicted continuous loss of fault detection of more than five minutes, the flight planning should be revised to reflect the lack of full PBN capability for that period.

(d) For RNP 4 operations with only GNSS sensors, a fault detection and exclusion (FDE) check should be performed. The maximum allowable time for which FDE capability is projected to be unavailable on any one event is 25 minutes. If predictions indicate that the maximum allowable FDE outage will be exceeded, the operation should be rescheduled to a time when FDE is available.

(e) For RNAV 10 operations, the flight crew should take account of the RNAV 10 time limit declared for the inertial system, if applicable, considering also the effect of weather conditions that could affect flight duration in RNAV 10 airspace. Where an extension to the time limit is permitted, the flight crew will need to ensure that en route radio facilities are serviceable before departure, and to apply radio updates in accordance with any AFM limitation.

AMC2 CAT.OP.MPA.175 Flight preparation

DATABASE SUITABILITY

(a) The flight crew should check that any navigational database required for PBN operations includes the routes and procedures required for the flight.

DATABASE CURRENCY

(b) The database validity (current AIRAC cycle) should be checked before the flight.

(c) Navigation databases should be current for the duration of the flight. If the AIRAC cycle is due to change during flight, the flight crew should follow procedures established by the operator to ensure the accuracy of navigation data, including the suitability of navigation facilities used to define the routes and procedures for the flight.

(d) An expired database may only be used if the following conditions are satisfied:

  (1) the operator has confirmed that the parts of the database which are intended to be used during the flight and any contingencies that are reasonable to expect are not changed in the current version;

(2) any NOTAMs associated with the navigational data are taken into account;

(3) maps and charts corresponding to those parts of the flight are current and have not been amended since the last cycle;

(4) any MEL limitations are observed; and

(5) the database has expired by no more than 28 days.

AMC1 CAT.OP.MPA.175(a) Flight preparation

OPERATIONAL FLIGHT PLAN — COMPLEX MOTOR-POWERED AIRCRAFT

(a) The operational flight plan used and the entries made during flight should contain the following items:

(1) aircraft registration;

(2) aircraft type and variant;

(3) date of flight;

(4) flight identification;

(5) names of flight crew members;

(6) duty assignment of flight crew members;

(7) place of departure;

(8) time of departure (actual off-block time, take-off time);

(9) place of arrival (planned and actual);

(10) time of arrival (actual landing and on-block time);

(11) type of operation (ETOPS, VFR, ferry flight, etc.);

(12) route and route segments with checkpoints/waypoints, distances, time and tracks;

(13) planned cruising speed and flying times between check-points/waypoints (estimated, revised and actual times overhead);

(14) safe altitudes and minimum levels;

(15) planned altitudes and flight levels;

(16) fuel calculations (records of in-flight fuel checks);

(17) fuel on board when starting engines;

(18) alternate(s) for destination, including the information required in (a)(12) to 15), as well as destination 2 and destination 2 alternate aerodromes in case of a reduced contingency fuel (RCF) procedure;

(19) where applicable, a take-off alternate and fuel ERA aerodrome

(20) initial ATS flight plan clearance and subsequent reclearance;

(21) in-flight replanning calculations; and

(22) meteorological information which:

(i) cover the flight in respect of time, altitude and geographical extent;

(ii) relate to appropriate fixed times or periods of time;

(iii) extend to the aerodrome of intended landing, also covering the meteorological conditions expected between the aerodrome of intended landing and alternate aerodromes designated by the operator;

(iv) is up to date.

(b) Items that are readily available in other documentation or from another acceptable source or are irrelevant to the type of operation may be omitted from the operational flight plan.

(c) The operational flight plan and its use should be described in the operations manual.

(d) All entries on the operational flight plan should be made concurrently and be permanent in nature.

OPERATIONAL FLIGHT PLAN — OTHER-THAN-COMPLEX MOTOR-POWERED AIRCRAFT OPERATIONS AND LOCAL OPERATIONS

(e) An operational flight plan may be established in a simplified form relevant to the type of operation for operations with other-than-complex motor-powered aircraft as well as local operations with any aircraft. Local operations should be defined in the OM.

OPERATIONAL FLIGHT PLAN — HELICOPTERS OPERATED WITH A SINGLE PILOT AND WITHOUT A STABILITY AUGMENTATION SYSTEM OR AN AUTOMATIC FLIGHT CONTROL SYSTEM (AFCS)

(f) No entries should be made in the operational flight plan during the flight.

OPERATIONAL FLIGHT PLAN PRODUCED BY A COMPUTERISED FLIGHT-PLANNING SYSTEM

(g) When the operator uses a computerised flight-planning system to produce an operational flight plan, the functionality of this system should be described in the OM.

(h) If the computerised flight-planning system is used in conjunction with a basic fuel scheme with variations or an individual fuel scheme, the operator should ensure that the quality and the proper functionality of the software are tested after each upgrade. The test should verify that the changes to the software do not affect the final output.

GM1 CAT.OP.MPA.175(b)(5) Flight preparation

CONVERSION TABLES

The documentation should include any conversion tables necessary to support operations where metric heights, altitudes and flight levels are used.

AMC1 CAT.OP.MPA.177 Submission of the ATS flight plan

FLIGHTS WITHOUT AN ATS FLIGHT PLAN

(a) When unable to submit or close the ATS flight plan due to lack of ATS facilities or of any other means of communications to ATS, the operator should establish procedures, instructions, and a list of nominated persons to be responsible for alerting search and rescue (SAR) services.

(b) To ensure that each flight is located at all times, these instructions should:

(1) provide the nominated person with at least the information required to be included in a VFR flight plan, and the location, date, and estimated time for re-establishing communications;

(2) if an aircraft is overdue or missing, ensure that the appropriate ATS or SAR service is notified; and

(3) ensure that the information will be retained at a designated place until the completion of the flight.

AMC1 CAT.OP.MPA.180 Fuel/energy scheme — aeroplanes

INDIVIDUAL FUEL SCHEME

(a) Prior to submitting an individual fuel scheme for approval, the operator should perform all the following actions to establish a baseline safety performance:

(1) measure the baseline safety performance of its operation with the current fuel scheme by:

(i) selecting safety performance indicators (SPIs) and targets that are agreed with the CAAT; and

(ii) collecting statistically relevant data for a period of at least 2 years of continuous operation (note: the number of flights should be sufficient to provide data to support the intended deviation);

(2) identify the hazards associated with the individual fuel scheme and carry out a safety risk assessment of these hazards; and

(3) based on this safety risk assessment, establish a mechanism for risk monitoring and risk control to ensure an equivalent level of safety to that of the current fuel scheme.

(b) In order to ensure the approval of the CAAT and its continuous oversight, the operator should establish an effective continuous reporting system to the CAAT on the safety performance and regulatory compliance of the individual fuel scheme.

(c) When determining the extent of the deviation from the current fuel scheme, the operator should take into account at least the following elements for the relevant area of operation:

(1) the available aerodrome technologies, capabilities, and infrastructure;

(2) the reliability of meteorological and aerodrome information;

(3) the reliability of the aeroplane systems, especially the time-limited ones; and

(4) the type of ATS provided and, where applicable, characteristics and procedures of the air traffic flow management and of the airspace management.

(d) An operator wishing to apply for the approval of an individual fuel scheme should be able to demonstrate that it exercises sufficient organisational control over internal processes and the use of resources. The operator should adapt its management system to ensure that:

(1) processes and procedures are established to support the individual fuel scheme;

(2) involved flight crew and personnel are trained and competent to perform their tasks; and

(3) the implementation and effectiveness of such processes, procedures, and training are monitored.

(e) The operator should have as a minimum the following operational capabilities that support the implementation of an individual fuel scheme:

(1) use a suitable computerised flight-planning system;

(2) ensure that the planning of flights is based upon current aircraft-specific data that is derived from a fuel consumption monitoring system and reliable meteorological data;

(3) have airborne fuel prediction systems;

(4) be able to operate in required navigation performance (RNP) 4 oceanic and remote continental airspace and in area navigation (RNAV) 1 continental en-route airspace, as applicable;

(5) be able to perform APCHs that require an LVO approval and RNP APCHs down to VNAV minima; and

(6) update the available landing options by establishing an operational control system with the following capabilities:

(i) flight monitoring or flight watch;

(ii) collection and continuous monitoring of reliable meteorological, aerodrome, and traffic information;

(iii) two independent airborne communications systems to achieve rapid and reliable exchange of relevant safety information between flight operations personnel and flight crew during the entire flight; and

(iv) monitoring of the status of aircraft systems that affect fuel consumption and of ground and aircraft systems that affect landing capabilities.

(f) After receiving the approval, the operator should:

(1) continually measure and monitor the outcome of each SPI; and

(2) in case of degradation of any SPI:

(i) assess the root cause of the degradation;

(ii) identify remedial actions to restore the baseline safety performance; and

(iii) when the associated safety performance target is not met, inform the authority as soon as practicable.

GM1 CAT.OP.MPA.180 Fuel/energy scheme — aeroplanes

FUEL SCHEMES

An operator can choose between three different fuel schemes. For the development of each fuel scheme, the following AMC are applicable:

(a) Basic fuel scheme: all the AMC that apply to the basic fuel scheme.

(b) Basic fuel scheme with variations: when an operator decides to deviate fully or partly from the basic fuel schemes, the AMC for basic fuel schemes with variations apply to the specific deviation.

(c) Individual fuel scheme: when an operator wishes to apply an individual fuel scheme, the AMC for the individual fuel scheme apply; for the part of the scheme where the operator still follows the basic fuel scheme, the operator should apply the AMC referred to in (a) and (b).

GM2 CAT.OP.MPA.180 Fuel/energy scheme — aeroplanes

INDIVIDUAL FUEL SCHEMES — BASELINE SAFETY PERFORMANCE INDICATORS (SPIs) AND EQUIVALENT LEVEL OF SAFETY

(a) Establishing the baseline safety performance of a current fuel scheme involves collecting historical statistical data for the selected SPIs over a defined period of time, e.g. a minimum of

2 years. The safety performance of the operator's processes is then measured against this baseline safety performance before and after implementation of the individual fuel scheme.

(b) Agreed SPIs should be commensurate with the complexity of the operational context, the extent of the deviations of the individual fuel scheme from the current fuel scheme, and the availability of resources to address those SPIs.

(c) The following is a non-exhaustive list of SPIs that are used to measure the baseline safety performance:

(1) flights with 100 % consumption of the contingency fuel;

(2) flights with a percentage consumption of the contingency fuel (e.g. 85 %), as agreed by the operator and the CAAT;

(3) difference between planned and actual trip fuel;

(4) landings with less than the final reserve fuel (FRF) remaining;

(5) flights landing with less than minutes of fuel remaining (e.g. 45 minutes), as agreed by the operator and the CAAT;

(6) 'MINIMUM FUEL' declarations;

(7) 'MAYDAY MAYDAY MAYDAY FUEL' declarations;

(8) in-flight re-planning to the planned destination due to fuel shortage, including committing to land at the destination by cancelling the planned destination alternate;

(9) diversion to an en route alternate (ERA) aerodrome to protect the FRF;

(10) diversion to the destination alternate aerodrome; and

(11) any other indicator with the potential of demonstrating the suitability or unsuitability of the alternate aerodrome and fuel planning policy.

Note: Although the above-list includes quantitative SPIs, for certain non-data-based monitoring SPIs, alert and target levels may be qualitative in nature.

(d) Equivalent level of safety: SPIs and associated targets that are achieved after the introduction of an individual fuel scheme 'should be equivalent to' or 'exceed' the SPIs and associated targets that were used in the previously approved fuel scheme. To determine if such equivalence is achieved, the operator should carefully compare with one another the safety performance of operational activities before and after the application of the individual fuel scheme. For example, the operator should ensure that the average number of landings with less than the FRF does not increase after the introduction of the individual fuel scheme.

(e) The applicability of the individual fuel scheme may be limited to a specific aircraft fleet or type/variant of aircraft or area of operations. Different policies may be established as long as the procedures clearly specify the boundaries of each policy so that the flight crew is aware of the policy being applied: for example, the operator may wish to deviate from the basic 5 % contingency fuel policy only in certain areas of operations or only for a specific aircraft fleet or type/variant of aircraft. The safety performance of the fuel scheme may be measured according to the relevant area of operation or aircraft fleet or type/variant of aircraft so that any degradation of the safety performance can be isolated and mitigated separately. In that case, the approval for a deviation may be suspended for the affected area of operations and/or type/variant of aircraft until the required safety performance is achieved.

Note: ICAO Doc 9976 *Flight Planning and Fuel Management (FPFM) Manual* (1st Edition, 2015) and the EASA *Fuel Manual* provide further guidance.

GM3 CAT.OP.MPA.180 Fuel/energy scheme — aeroplanes

INDIVIDUAL FUEL SCHEMES — OPERATOR CAPABILITIES — COMMUNICATIONS SYSTEMS

(a) In the context of point (e)(6) of AMC1 CAT.OP.MPA.180, the availability of two independent communications systems at dispatch is particularly relevant for flights over oceanic and remote areas (e.g. when flying over the ocean without VHF coverage, operators need either HF or satellite communications (SATCOM)).

(b) Consideration should also be given to the operational control system associated with the use of the aircraft communications addressing and reporting system (ACARS). Two communications systems (e.g. VHF and SATCOM) should be used to support the ACARS functionality to ensure the required degree of independence unless the operator has established contingency procedures for reverting to voice communication only.

(c) Additional means of communications may be required by other regulations that are not linked to fuel schemes.

Note: For further information, see ICAO Doc 9976 Flight Planning and Fuel Management (FPFM) Manual, Appendix 7 to Chapter 5 A performance-based approach job-aid for an approving authority (1st Edition, 2015).

AMC1 CAT.OP.MPA.181 Fuel/energy scheme — fuel/energy planning and in-flight re-planning policy — aeroplanes

BASIC FUEL SCHEME — PRE-FLIGHT CALCULATION OF USABLE FUEL FOR PERFORMANCE CLASS A AEROPLANES

For the pre-flight calculation of the usable fuel in accordance with point CAT.OP.MPA.181, the operator should:

(a) for taxi fuel, take into account the local conditions at the departure aerodrome and the APU consumption;

(b) for trip fuel, include:

  (1) fuel for take-off and climb from the aerodrome elevation to the initial cruising level/altitude, taking into account the expected departure routing;

  (2) fuel from the top of climb to the top of descent, including any step climb/descent;

  (3) fuel from the top of descent to the point where the approach procedure is initiated, taking into account the expected arrival routing; and

  (4) fuel for making an approach and landing at the destination aerodrome;

(c) for contingency fuel, calculate for unforeseen factors either:

  (1) 5 % of the planned trip fuel or, in the event of in-flight re-planning, 5 % of the trip fuel for the remainder of the flight; or

  (2) an amount to fly for 5 minutes at holding speed at 1 500 ft (450 m) above the destination aerodrome in standard conditions,

  whichever is the higher;

(d) for destination alternate fuel, include:

  (1) when the aircraft is operated with one destination alternate aerodrome:

(i) fuel for a missed approach from the applicable DA/H or MDA/H at the destination aerodrome to the missed-approach altitude, taking into account the complete missed-approach procedure;

(ii) fuel for climb from the missed-approach altitude to the cruising level/altitude, taking into account the expected departure routing;

(iii) fuel for cruising from the top of climb to the top of descent, taking into account the expected routing;

(iv) fuel for descent from the top of descent to the point where the approach is initiated, taking into account the expected arrival routing; and

(v) fuel for making an approach and landing at the destination alternate aerodrome; and

(2) when the aircraft is operated with two destination alternate aerodromes, the amount of fuel that is calculated in accordance with point (d)(1), based on the destination alternate aerodrome that requires the greater amount of fuel;

(e) for FRF, comply with point CAT.OP.MPA.181(c);

(f) for additional fuel, include an amount of fuel that allows the aeroplane to proceed, in the event of an engine failure or loss of pressurisation, from the most critical point along the route to a fuel en route alternate (fuel ERA) aerodrome in the relevant aircraft configuration, hold there for 15 minutes at 1 500 ft (450 m) above the aerodrome elevation in standard conditions, make an approach, and land;

(g) for extra fuel, include anticipated delays or specific operational constraints that can be predicted; and

(h) for discretionary fuel, include a quantity at the sole discretion of the commander.

AMC2 CAT.OP.MPA.181 Fuel/energy scheme — fuel/energy planning and in-flight re-planning policy — aeroplanes

BASIC FUEL SCHEME — PRE-FLIGHT CALCULATION OF USABLE FUEL FOR PERFORMANCE CLASS B and C AEROPLANES

The pre-flight calculation of required usable fuel should include:

(a) taxi fuel, if significant;

(b) trip fuel;

(c) contingency fuel that is not less than 5 % of the planned trip fuel, or in the event of in-flight re-planning, 5 % of the trip fuel for the remainder of the flight;

(d) alternate fuel to reach the destination alternate aerodrome via the destination if a destination alternate aerodrome is required;

(e) FRF to comply with point CAT.OP.MPA.181(c);

(f) extra fuel if there are anticipated delays or specific operational constraints; and

(g) discretionary fuel, if required by the commander.

The operating conditions may include rounded-up figures of fuel for all flights.

AMC3 CAT.OP.MPA.181 Fuel/energy scheme — fuel/energy planning and in-flight re-planning policy — aeroplanes

BASIC FUEL SCHEME — PRE-FLIGHT CALCULATION OF USABLE FUEL FOR AEROPLANE WITH A MAXIMUM TAKE-OFF MASS (MTOM) OF 2 000 KG OR LESS THAT IS NOT CLASSIFIED AS CMPA

For operations, take-off, and landing at the same aerodrome or operating site under VFR by day, operators should specify the minimum FRF in the OM. This FRF should not be less than the amount needed to fly for a period of 45 minutes. The operating conditions may be rounded up to a single figure of fuel for all flights. For the pre-flight calculation of the required usable fuel, a single rounded-up figure for the particular flight is needed, which includes trip fuel, contingency fuel, extra fuel, discretionary fuel, and alternate fuel, to reach a destination alternate aerodrome if such an aerodrome is required.

AMC4 CAT.OP.MPA.181 Fuel/energy scheme — Fuel/energy planning and in-flight re-planning policy — aeroplanes

BASIC FUEL SCHEME — PRE-FLIGHT CALCULATION OF USABLE FUEL

The additional fuel required by the type of operation in the event of an aircraft failure that significantly increases fuel consumption at the most critical point along the route should be calculated according to the engine failure or loss of pressurisation, whichever requires a greater amount of fuel.

GM1 CAT.OP.MPA.181 Fuel/energy scheme — fuel/energy planning and in-flight re-planning policy — aeroplanes

BASIC FUEL SCHEME TAXI FUEL — LOCAL CONDITIONS

(a) Local conditions, as referred to in point (a) of AMC1 CAT.OP.MPA.181, include NOTAMs, meteorological conditions (e.g. winter operations), ATS procedures (e.g. LVP, collaborative decision-making (CDM)), and any anticipated delay(s).

PLANNING OF FLIGHTS

(b) A flight should be planned by using the most accurate information available. If aircraft-specific data that is derived from a fuel consumption monitoring system is available, this data is used in preference to data that is provided by the aircraft manufacturer. Data that is provided by the aircraft manufacturer should be used only in specific cases, e.g. when introducing a new aircraft type into service.

FUEL CONSUMPTION MONITORING SYSTEM

(c) Extensive guidance on a fuel consumption monitoring system is provided in ICAO Doc 9976 *Flight* Planning *and Fuel Management (FPFM) Manual*, Appendix 5 to Chapter 5 *Example of a fuel consumption monitoring (FCM) programme* (1st Edition, 2015). As a basic requirement, the fuel consumption monitoring system (commonly referred to as 'hull-specific fuel bias') is a process of comparing an aeroplane's achieved in-flight performance to an aeroplane's predicted performance. Variations between the achieved performance and the predicted performance result in a variation of the fuel consumption rate, which should be accounted for by the operator during flight planning and in-flight re-planning.

The fuel consumption monitoring system is used to determine an individual aeroplane's performance in comparison with its predicted one. In no case, should data that is collected from one aeroplane be used as a basis for varying another aeroplane's performance figures away from the predicted values.

The data that is collected and used to determine an aeroplane's actual performance should be collected in a manner acceptable to the CAAT. The operator should demonstrate that the data collected during in-service operation of the aeroplane is accurate. Where possible, the data should be collected automatically; however, manual recording of data does not preclude an operator from participating in a fuel consumption monitoring system.

ANTICIPATED MASSES — LAST-MINUTE CHANGES

(d) Where appropriate, the operating procedures should include means to revise the fuel quantity and define limits to zero fuel weight (ZFW) changes, beyond which a new operational flight plan should be calculated.

TRIP FUEL — ARRIVAL ROUTING

(e) POINT MERGE PATTERN When planning for a STAR to point merge, fuel for the direct STAR to the point merge should be included in the trip fuel. The fuel required to account for the probability that part of or the entire point merge route needs to be flown may be included in the contingency fuel unless there is an anticipated delay, in which case, the fuel required for the route should be included in the extra fuel.

(f) POINT TROMBONE PATTERN

When planning for a STAR or transition including a trombone pattern, fuel for the reasonably expected route should be included in the trip fuel. The fuel required to account for the probability that an extended part of or the entire trombone pattern route needs to be flown may be included in the contingency fuel unless there is an anticipated delay, in which case, the fuel required for the trombone pattern route should be included in the extra fuel.

UNFORESEEN FACTORS

(g) According to its definition, contingency fuel is the amount of fuel required to compensate for unforeseen factors.

Unforeseen factors are those that could have an influence on the fuel consumption to the destination aerodrome, such as deviations of an individual aeroplane from the expected fuel consumption data, deviations from forecast meteorological conditions, extended unexpected delays in flight, extended unexpected taxi times, and deviations from planned routings and/or cruising levels.

Unforeseen factors may differ based on the type of fuel scheme adopted by each operator; the higher the capability of the operator, the fewer unforeseen factors there may be.

For example, operators that have a fuel consumption monitoring system should calculate the trip fuel based on the individual fuel consumption. Extended unexpected delays or deviations from forecast meteorological conditions are mitigated by means of statistical data.

DESTINATION ALTERNATE AERODROME

(h) The departure aerodrome may be selected as the destination alternate aerodrome.

FINAL RESERVE FUEL

(i) The operator may determine conservative (rounded-up) FRF values for each type and variant of aeroplane that is used in operations. The intent of this recommendation is:

(1) to provide a reference value for comparing to pre-flight fuel planning computations, and for the purpose of a 'gross error' check; and

(2) to provide flight crews with easily referenced and recallable FRF figures to support in-flight fuel monitoring and decision-making activities.

ANTICIPATED DELAYS

(j) In the context of fuel schemes, an anticipated delay is defined as one that can be predicted based on the information that is provided by the State of the aerodrome and/or ATS provider before the flight commences. For example, restrictions due to scheduled maintenance work on a runway are likely to cause a delay to the normal flow of inbound traffic. That delay may be promulgated either through NOTAMs or via the aeronautical information publication (AIP), including a specific time and/or date.

Another example is an ATS procedure that requires an operator to fly longer routes, e.g. due to curfew during night-time.

DISCRETIONARY FUEL

(k) Discretionary fuel is defined as 'fuel at the sole discretion of the commander' (PIC). The commander's discretion over the amount of fuel to be carried is independent and cannot be encouraged or discouraged.

IN-FLIGHT RE-PLANNING

(l) In the context of fuel policy, in-flight re-planning means voluntarily changing the destination aerodrome, any alternate aerodrome, or the remainder of the route after the flight commences, even when the flight can be completed as originally planned. In-flight re-planning has a broader sense than being obliged to change the intended course of action due to safety issues (remaining fuel, failures, bad weather conditions, etc.). In-flight re-planning allows the operator to modify the filed flight plan after flight commencement for commercial or other reasons. However, the modified flight plan should fulfil all requirements of a new flight plan. The use of en route alternate (ERA) aerodromes to save fuel should comply with the in-flight re-planning requirements.

In-flight re-planning should not apply when the aircraft no longer continues via the flight plan route to the intended destination for reasons that could not be anticipated. In such cases, the in-flight fuel management policy dictates the commander's course of action.

AMC5 CAT.OP.MPA.181 Fuel/energy scheme — fuel/energy planning and in-flight re-planning policy — aeroplanes

BASIC FUEL SCHEME WITH VARIATIONS — TAXI FUEL

To calculate taxi fuel for a basic fuel scheme with variations, the operator may use statistical taxi fuel.

AMC6 CAT.OP.MPA.181 Fuel/energy scheme — fuel/energy planning and in-flight re-planning policy — aeroplanes

BASIC FUEL SCHEME WITH VARIATIONS — CONTINGENCY FUEL

(a) Contingency fuel variations are methods of reducing the basic amount of contingency fuel based on established mitigating measures.

(b) If the operator establishes and maintains a fuel consumption monitoring system for individual aeroplanes, and uses valid data for fuel calculation based on such a system, the operator may use any of the requirements in point (c) or (d) of this AMC to calculate the contingency fuel.

(c) The contingency fuel should be the fuel described in points (c)(1) or (c)(2) of this AMC, whichever is higher:

(1) an amount of fuel that should be either:

(i) not less than 3 % of the planned trip fuel, or in the event of in-flight re-planning, 3 % of the trip fuel for the remainder of the flight provided that a fuel en route alternate (fuel ERA) aerodrome is available; or

(ii) an amount of fuel sufficient for 20-minute flying time based upon the planned trip fuel consumption; or

(iii) an amount of fuel based on a statistical fuel method that ensures an appropriate statistical coverage of the deviation from the planned to the actual trip fuel; prior to implementing a statistical fuel method, a continuous 2-year operation is required during which statistical contingency fuel (SCF) data is recorded

— note: to use SCF on a particular city pair/aeroplane combination, sufficient data is required to be statistically significant; the operator should use this method to monitor the fuel consumption on each city pair/aeroplane combination, and to carry out a statistical analysis to calculate the required contingency fuel for that city pair/aeroplane combination;

or

(2) an amount of fuel to fly for 5 minutes at holding speed at 1 500 ft (450 m) above the destination aerodrome in standard conditions.

(d) RCF procedure: if the operator's fuel policy includes pre-flight planning to a destination 1 aerodrome (commercial destination with an RCF procedure using a decision point along the route) and a destination 2 aerodrome (optional refuelling destination), the amount in the pre-flight calculation of the required usable fuel should be greater than the sum in points (d)(1) or (d)(2):

(1) the sum of:

(i) taxi fuel;

(ii) trip fuel to the destination 1 aerodrome via the decision point;

(iii) contingency fuel equal to not less than 5 % of the fuel that is estimated to be consumed from the decision point to the destination 1 aerodrome;

(iv) the amount of fuel specified in AMC2 CAT.OP.MPA.182: destination 1 alternate fuel or no alternate fuel if the remaining flying time from the decision point to destination 1 aerodrome is less than 6 hours;

(v) FRF;

(vi) additional fuel;

(vii) extra fuel if there are anticipated delays or specific operational constraints; and

(viii) discretionary fuel, if required by the commander; or

(2) the sum of:

(i) taxi fuel;

(ii) trip fuel to the destination 2 aerodrome via the decision point;

(iii) contingency fuel equal to not less than the amount that is calculated in accordancewith point (c) of this AMC, from the departure aerodrome to the destination 2aerodrome;

(iv) alternate fuel if a destination 2 alternate aerodrome is required;

(v) FRF;

(vi) additional fuel;

(vii) extra fuel if there are anticipated delays or specific operational constraints; and

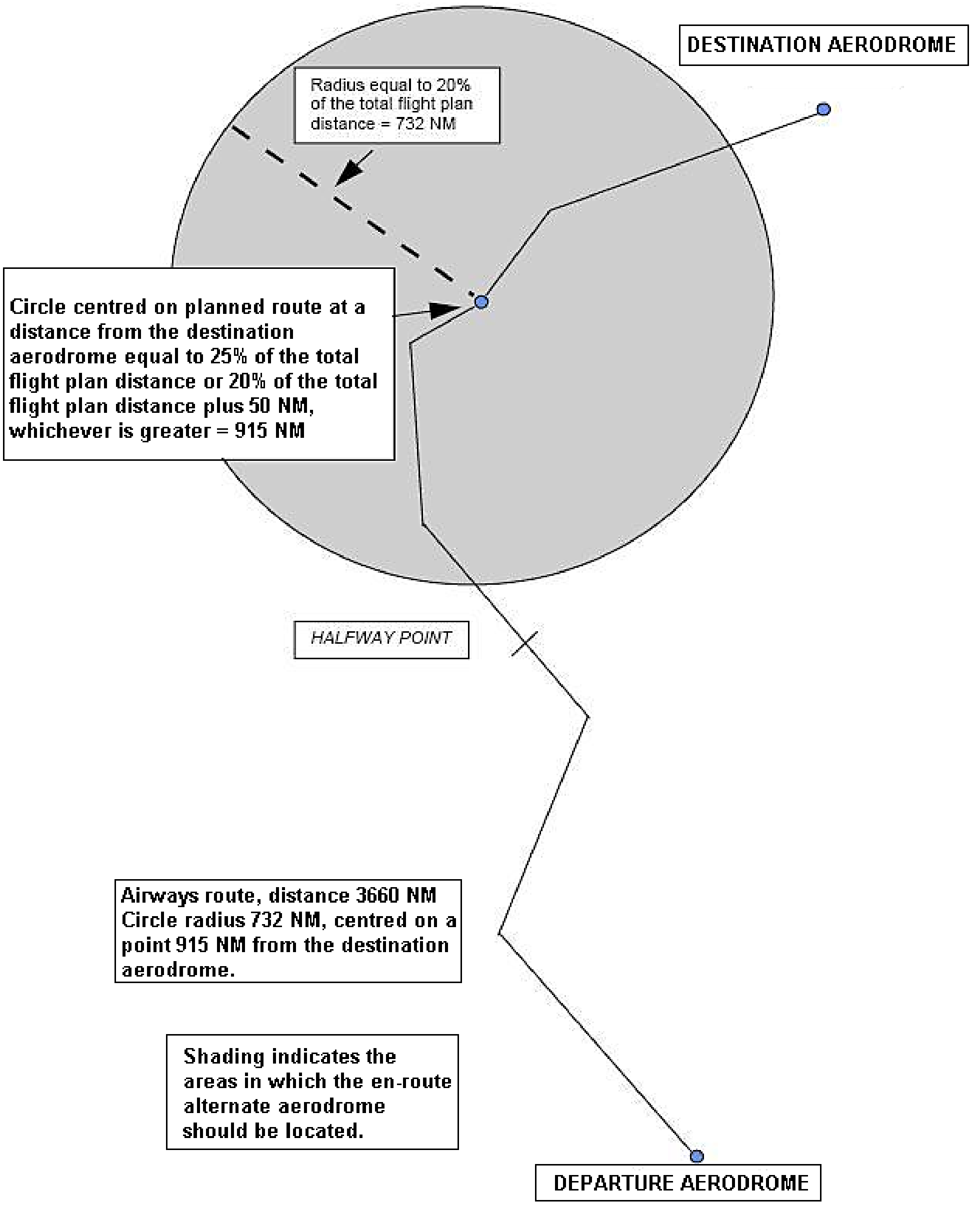
(viii) discretionary fuel, if required by the commander.

AMC7 CAT.OP.MPA.181 Fuel/energy scheme — fuel/energy planning and in-flight re-planning policy — aeroplanes

BASIC FUEL SCHEME WITH VARIATIONS — LOCATION OF THE FUEL EN ROUTE ALTERNATE AERODROME TO REDUCE CONTINGENCY FUEL TO 3 %

The fuel en route alternate (fuel ERA) aerodrome should be located within a circle with a radius equal to 20 % of the total flight plan distance; the centre of this circle lies on the planned route at a distance from the destination aerodrome equal to 25 % of the total flight plan distance, or at least 20 % of the total flight plan distance plus 50 NM, whichever is greater. All distances should be calculated in still-air conditions (see Figure 1). The fuel ERA aerodrome should be nominated in the operational flight plan.

Figure 1 — Location of the fuel ERA aerodrome to reduce contingency fuel to 3 %



GM2 CAT.OP.MPA.181 Fuel/energy scheme — fuel/energy planning and in-flight re-planning policy — aeroplanes

BASIC FUEL SCHEME WITH VARIATIONS — STATISTICAL CONTINGENCY FUEL METHOD

As an example of statistical contingency fuel, the following statistical values of the deviation from the planned to the actual trip fuel provide appropriate statistical coverage:

(a) 99 % coverage plus 3 % of the trip fuel if the calculated flight time:

(1) is less than 2 hours; or

(2) is more than 2 hours and no fuel ERA aerodrome is available;

(b) 99 % coverage if the calculated flight time is more than 2 hours and a fuel ERA aerodrome isavailable; and

(c) 90 % coverage if:

(1) the calculated flight time is more than 2 hours;

(2) a fuel ERA aerodrome is available; and

(3) at the destination aerodrome, two separate runways are available and usable, one of which is suitable for type B instrument approach operations, and the meteorological conditions are in accordance with point CAT.OP.MPA.182(e).

AMC8 CAT.OP.MPA.181 Fuel/energy scheme — fuel/energy planning and in-flight re-planning policy — aeroplanes

INDIVIDUAL FUEL SCHEME — FUEL CONSUMPTION MONITORING SYSTEM

A fuel consumption monitoring system should be data driven, and should include the following:

(a) a fuel performance monitoring system;

(b) a database that contains statistically significant data of at least 2 years;

(c) statistics and data normalisation; and

(d) data transparency and verification.

GM3 CAT.OP.MPA.181 Fuel/energy scheme — fuel/energy planning and in-flight re-planning policy — aeroplanes

INDIVIDUAL FUEL SCHEME — FUEL CONSUMPTION MONITORING SYSTEM

More information can be found in ICAO Doc 9976 Flight Planning and Fuel Management (FPFM) Manual, Appendix 5 to Chapter 5.

GM4 CAT.OP.MPA.181 Fuel/energy scheme — fuel/energy planning and in-flight re-planning policy — aeroplanes

INDIVIDUAL FUEL SCHEME — ANTICIPATED METEOROLOGICAL CONDITIONS

When determining the extent of the deviation in the area of operation, the operator should monitor the reliability of the meteorological forecast reports. The CAAT should consider restricting or even not allowing a deviation when reliable meteorological information is not available. To this end, tools to predict and improve the reliability of the meteorological forecast reports may be explored to allow for the intended deviation.

AMC1 CAT.OP.MPA.182 Fuel/energy scheme — aerodrome selection policy — aeroplanes

BASIC FUEL SCHEME — TAKE-OFF ALTERNATE AERODROME

The take-off alternate aerodrome should not be farther from the departure aerodrome than:

(a) for two-engined aeroplanes:

(1) 1-hour flight time at an one-engine-inoperative (OEI) cruising speed according to the AFM in ISA and still-air conditions using the actual take-off mass; or.

(2) the extended-range twin operations (ETOPS) diversion time that is approved in accordance with Subpart F of TCAR OPS Part SPA), subject to any minimum equipment list (MEL) restriction, up to a maximum of 2-hour flight time at OEI cruising speed

according to the AFM in ISA and still-air conditions using the actual take-off mass; and

(b) for three- or four-engined aeroplanes, 2-hour flight time at an all-engines-operating cruising speed according to the AFM in ISA and still-air conditions using the actual take-off mass;

(c) for operations approved in accordance with Part SPA, Subpart L SINGLE-ENGINED TURBINE AEROPLANE OPERATIONS AT NIGHT OR IN IMC (SET-IMC), 30 minutes flying time at normal cruising speed in still-air conditions, based on the actual take-off mass;

(d) in the case of multi-engined aeroplanes, if the AFM does not contain an OEI cruising speed, the speed to be used for calculation shall be that which is achieved with the remaining engine(s) set at maximum continuous power.

AMC2 CAT.OP.MPA.182 Fuel/energy scheme — aerodrome selection policy — aeroplanes

BASIC FUEL SCHEME — DESTINATION ALTERNATE AERODROME

(a) For each IFR flight, the operator should select and specify in the operational and ATS flight plans at least one destination alternate aerodrome.

(b) For each IFR flight, the operator should select and specify in the operational and ATS flight plans two destination alternate aerodromes when for the selected destination aerodrome, the safety margins for meteorological conditions of AMC5 CAT.OP.MPA.182, and the planning minima of AMC6 CAT.OP.MPA.182 cannot be met, or when no meteorological information is available.

BASIC FUEL SCHEME WITH VARIATIONS — NO DESTINATION ALTERNATE AERODROME

(c) The operator may operate with no destination alternate aerodrome when the destination aerodrome is an isolated aerodrome or when the following two conditions are met:

(1) the duration of the planned flight from take-off to landing does not exceed 6 hours or, in the event of in-flight re-planning, in accordance with point CAT.OP.MPA.181(d), the remaining flying time to destination does not exceed 4 hours; and

(2) two separate runways are usable at the destination aerodrome and the appropriate weather reports and/or weather forecasts indicate that for the period from 1 hour before to 1 hour after the expected time of arrival, the ceiling is at least 2 000 ft (600 m) or the circling height + 500 ft (150 m), whichever is greater, and ground visibility is at least 5 km.

AMC3 CAT.OP.MPA.182 Fuel/energy scheme — aerodrome selection policy — aeroplanes

BASIC FUEL SCHEME — AERODROME FORECAST METEOROLOGICAL CONDITIONS

Table 1 — Aerodrome forecasts (TAFs) and landing forecasts (TRENDs) to be used for pre-flight planning

APPLICATION OF AERODROME FORECASTS (TAF & TREND) TO PRE-FLIGHT PLANNING (ICAO ANNEX 3 refers)

(a) **APPLICATION OF INITIAL PART OF TAF**

(1) **Applicable period**: From the start of the TAF validity period up to the time of applicability of the first subsequent "FM…*" or "BECMG" or, if no "FM" or "BECMG" is given, to the end of the validity period of the TAF.

(2) **Application of forecast**: The forecast of the prevailing weather conditions in the initial part of the TAF should be fully applied, with the exception of mean wind and gusts that should be applied in accordance with the policy under column 'BECMG AT and FM…' in the table below. However, this may be temporarily superseded by a 'TEMPO' or 'PROB**', if applicable according to the table below.

(b) **APPLICATION OF FORECAST FOLLOWING CHANGE INDICATION IN THE TAF AND TREND**

TAF or TREND for AERODROME PLANNED AS:	**FM** (alone) and **BECMG AT**:	**BECMG (alone), BECMG FM, BECMG TL, BECMG FM…* TL in case of:**		**TEMPO** (alone), **TEMPO FM**, **TEMPO TL**, **TEMPO FM … TL, PROB30/40** (alone)			**PROB TEMPO**
	Deterioration and Improvement	**Deterioration**	**Improvement**	**Deterioration**		**Improvement in any case**	**Deterioration and improvement**
				Transient/shower conditions in connection with short-lived weather phenomena, e.g. thunderstorms, showers	**Persistent Conditions** in connection with e.g. haze, mist, fog, dust/sandstorm, continuous precipitation		
DESTINATION at ETA ± 1 HR **TAKE-OFF ALTERNATE** at ETA ± 1 HR **DEST. ALTERNATE** at ETA ± 1 HR **FUEL ERA** at ETA ± 1 HR	Applicable from the **start of the change** **Mean wind**: Should be within required limits. **Gusts**: May be disregarded.	Applicable from the **time of start** of the change. **Mean wind**: Should be within required limits. **Gusts**: May be disregarded.	Applicable from the **time of end** of the change **Mean wind**: Should be within required limits. **Gusts**: May be disregarded.	Not applicable **Mean wind and gusts** exceeding required limits may be disregarded.	Applicable **Mean wind**: Should be within required limits. **Gusts**: May be **disregarded**	Should be disregarded.	Deterioration may be disregarded; Improvement should be disregarded including mean wind and gusts
ETOPS ERA from earliest/latest ETA ± 1 HR	Applicable from the **time of start** of change. **Mean wind**: Should be within required limits **Gusts** exceeding crosswind limits should be fully applied	Applicable from the **time of start** of change **Mean wind:** Should be within required limits **Gusts** exceeding crosswind limits should be fully applied	Applicable from the **time of start** of change. **Mean wind**: Should be within required limits **Gusts** exceeding crosswind limits should be fully applied	**Applicable if below applicable landing minima** **Mean wind**: Should be within required limits. **Gusts** exceeding limits crosswind should be fully applied	**Applicable if below applicable landing minima** **Mean wind**: Should be within required limits. **Gusts** exceeding limits crosswind should be fully applied		

* The space following 'FM' should always include a time group, e.g. FM1030.

Note 1: 'required limits' are those contained in the OM.

Note 2: if promulgated aerodrome forecasts do not comply with the provisions of ICAO Annex 3, operators should ensure that guidance on the application of these reports is provided.

Note 3: for the definitions of the meteorological terms used in this table, see ICAO Annex 3.

AMC4 CAT.OP.MPA.182 Fuel/energy scheme — aerodrome selection policy — aeroplanes

BASIC FUEL SCHEME — REACHING THE DESTINATION AERODROME

In the context of the basic fuel scheme and basic fuel scheme with variations, 'reaching the destination' means the point at which the aircraft has reached the applicable DA/H or MDA/H at the destination aerodrome.

AMC5 CAT.OP.MPA.182 Fuel/energy scheme — aerodrome selection policy — aeroplanes

BASIC FUEL SCHEME — SAFETY MARGINS FOR METEOROLOGICAL CONDITIONS

(a) The operator should only select an aerodrome as:

(1) take-off alternate aerodrome; or

(2) destination aerodrome

when the appropriate weather reports and/or forecasts indicate that during a period commencing 1 hour before and ending 1 hour after the estimated time of arrival at the aerodrome, the weather conditions will be at or above the applicable landing minima as follows:

(i) RVR or VIS specified in accordance with point CAT.OP.MPA.110; and

(ii) for a type A or a circling operation, ceiling at or above MDH.

(b) The operator should only select an aerodrome as:

(1) destination alternate aerodrome;

(2) fuel ERA aerodrome; or

(3) isolated destination aerodrome

when the appropriate weather reports and/or forecasts indicate that during a period commencing 1 hour before and ending 1 hour after the estimated time of arrival at the aerodrome, the weather conditions will be at or above the planning minima.

(c) For the take-off alternate aerodrome and isolated destination aerodrome, any limitations related to OEI operations should be taken into account.

AMC6 CAT.OP.MPA.182 Fuel/energy scheme — aerodrome selection policy — aeroplanes

BASIC FUEL SCHEME— PLANNING MINIMA

The operator should select an aerodrome as:

(a) destination alternate aerodrome;

(b) fuel ERA aerodrome; or

(c) isolated destination aerodromeonly when the appropriate weather reports and/or forecasts indicate that the weather conditions will be at or above the planning minima of Table 2 below (any limitations related to OEI operations are also taken into account):

Table 2 — Basic fuel scheme — planning minima — aeroplanes

Destination alternate aerodrome, fuel ERA aerodrome, isolated destination aerodrome

Type of approach operation	Aerodrome ceiling (cloud base or vertical visibility)	RVR/VIS
Type B instrument approach operations	DA/H + 200 ft	RVR/VIS + 800 m
Type A instrument approach operations ft	DA/H or MDA/H + 400	RVR/VIS + 1 500 m
Circling approach operations	MDA/H + 400 ft	VIS + 1 500 m
Crosswind planning minima: see Table 1 of AMC3 CAT.OP.MPA.182		
Wind limitations should be applied taking into account the runway condition (dry, wet, contaminated).		

GM1 CAT.OP.MPA.182 Fuel/energy scheme — aerodrome selection policy — aeroplanes

BASIC FUEL SCHEME SAFE-LANDING OPTIONS

(a) Point CAT.OP.MPA.182 sets out the safety objectives of the selection of aerodromes policy. This GM expands on the intent of that provision.

ONE SAFE-LANDING OPTION

(b) Point CAT.OP.MPA.182(a) requires the fuel planning and in-flight re-planning policy to ensure that the aircraft can always proceed to at least one aerodrome where landing is possible, even in abnormal operational conditions. This may require additional fuel (point CAT.OP.MPA.181(c)(6)) to reach an en route alternate (ERA) aerodrome in case of engine or pressurisation failure.

ONE OR MORE AERODROMES

(c) Point CAT.OP.MPA.182(d) requires the operator to select one or more aerodromes at the planning stage; the operator may select only one aerodrome, i.e. the destination aerodrome, in compliance with point CAT.OP.MPA.181(c)(4)(ii).

TWO SAFE-LANDING OPTIONS

(d) Point CAT.OP.MPA.182(d) requires that when planning the flight, two safe-landing options are expected to remain available until the flight reaches its destination, where a decision will be made to commit to land or divert. This will typically be a runway at the destination aerodrome itself and a runway at a destination alternate aerodrome. The requirement may also be satisfied by two landing runways at the destination aerodrome, provided that the risk of a single event (such as an aircraft accident) or meteorological deterioration at that single aerodrome will not eliminate both options.

(e) Point CAT.OP.MPA.182(d) may also be satisfied by two destination alternate aerodromes when the destination aerodrome is not a weather-permissible aerodrome or when there is insufficient weather information at the time of planning.

(f) In the case of an isolated aerodrome, only one safe-landing option exists beyond the point of no return (PNR), therefore, an exception is set out in point CAT.OP.MPA.182(d)(2), where the conditions to proceed beyond the PNR are laid down, and further explained in AMC7 CAT.OP.MPA.182 and in point (b) of AMC2 CAT.OP.MPA.185(a).

SAFETY MARGINS

(g) Point CAT.OP.MPA.182(e) requires operators to apply safety margins to the aerodrome operating minima to mitigate the risk that the destination alternate aerodromes, isolated aerodromes, or fuel ERA aerodromes fall below aerodrome operating minima due to minor unforeseen weather deteriorations.

AMC7 CAT.OP.MPA.182 Fuel/energy scheme — aerodrome selection policy — aeroplanes

BASIC FUEL SCHEMES WITH VARIATIONS — ISOLATED AERODROME — POINT OF NO RETURN

(a) Unless destination alternate fuel is carried, the operator should use a destination aerodrome as an isolated aerodrome if the alternate fuel plus the FRF that is required to reach the nearest adequate destination alternate aerodrome is more than:

(1) for aeroplanes with reciprocating engines, the amount of fuel required to fly either for 45 minutes plus 15 % of the flying time planned for cruising, including FRF or for 2 hours, whichever is less; or

(2) for turbine-engined aeroplanes, the amount of fuel required to fly for 2 hours with normal cruise consumption above the destination aerodrome, including the FRF.

(b) If the operator's fuel planning policy includes an isolated aerodrome, a PNR should be determined by a computerised flight-planning system and specified in the operational flight plan. The required usable fuel for pre-flight calculation should be as indicated in points (b)(1) or (b)(2), whichever is greater:

(1) the sum of:

(i) taxi fuel;

(ii) trip fuel from the departure aerodrome to the isolated aerodrome via the PNR;

(iii) contingency fuel that is calculated in accordance with the operator's current fuel scheme;

(iv) additional fuel, if required, but not less than:

(A) for aeroplanes with reciprocating engines, the fuel to fly either for 45 minutes plus 15 % of the flight time planned for cruising or for 2 hours, whichever is less; or

(B) for turbine-engined aeroplanes, the fuel to fly for 2 hours with normal cruise consumption above the destination aerodrome, including the FRF;

(v) extra fuel if there are anticipated delays or specific operational constraints; and

(vi) discretionary fuel, if required by the commander; or

(2) the sum of:

(i) taxi fuel;

(ii) trip fuel from the departure aerodrome to the fuel ERA PNR aerodrome via the PNR;

(iii) contingency fuel that is calculated in accordance with the operator's current fuel scheme;

(iv) additional fuel, if required, but not less than:

(A) for aeroplanes with reciprocating engines, fuel to fly for 45 minutes; or

(B) for turbine-engined aeroplanes, fuel to fly for 30 minutes at holding speed at 1 500 ft (450 m) above the fuel ERA aerodrome elevation in standard conditions, which should not be less than the FRF;

(v) extra fuel if there are anticipated delays or specific operational constraints; and

(vi) discretionary fuel, if required by the commander.

AMC8 CAT.OP.MPA.182 Fuel/energy scheme — aerodrome selection policy — aeroplanes

BASIC FUEL SCHEME WITH VARIATIONS — PLANNING MINIMA

(a) Variations to the basic fuel schemes in the selection of aerodromes in regard to the planning minima are methods to reduce the meteorological margins based on the established mitigating measures.

(b) As a minimum, the operator should:

(1) use a suitable computerised flight-planning system; and

(2) have established an operational control system that includes flight monitoring.

(c) In addition:

(1) the duration of the planned flight from take-off to landing does not exceed 6 hours or, in the event of in-flight re-planning, in accordance with point CAT.OP.MPA.181(d), the remaining flying time to destination does not exceed 4 hours; and

(2) the planned flight should have a minimum flight crew of two pilots.

(d) Additionally, the operator should select an aerodrome as:

(1) a destination alternate aerodrome, or

(2) a fuel ERA aerodrome, only when the appropriate weather reports and/or forecasts indicate that the weather conditions will be at or above the planning minima of Table 3 below.

Table 3 —Basic fuel scheme with variations — planning minima — aeroplanes Destination alternate aerodrome, fuel ERA aerodrome

Row	Type of approach operation	Aerodrome ceiling (cloud base or vertical visibility)	RVR/VIS
1	Type B instrument approach operations	DA/H + 200 ft	RVR/VIS + 550 m
2	3D Type A instrument approach operations, based on a facility with a system minimum of 200 ft or less	DA/H* + 200 ft	RVR/VIS** + 800 m
3	Two or more usable type A instrument approach operations***, each based on a separate navigation aid	DA/H or MDA/H* + 200 ft	RVR/VIS** + 1 000 m
4	Other type A instrument approach operations	DA/H or MDA/H + 400 ft	RVR/VIS + 1 500 m
5	Circling approach operations	MDA/H + 400 ft	VIS + 1 500 m
Crosswind planning minima: see Table 1 of AMC3 CAT.OP.MPA.182			
Wind limitations should be applied taking into account the runway condition (dry, wet, contaminated).			

* The higher of the usable DA/H or MDA/H.

** The higher of the usable RVR or VIS.

*** Compliance with point CAT.OP.MPA.182(f) should be ensured.

Note: The operator may select the most convenient planning minima row. For example, aerodrome with two type A approaches: one ILS CAT I (DA 350 ft/DH250 ft/550 m) another VOR/DME (MDA 650 ft/1 500 m). The operator may use Row 2 instead of Row 3.

AMC9 CAT.OP.MPA.182 Fuel/energy scheme — aerodrome selection policy — aeroplanes

BASIC FUEL SCHEME WITH VARIATIONS — PLANNING MINIMA

(a) Variations to the basic fuel schemes in the selection of aerodromes in regard to the planning minima are methods to reduce the meteorological margins based on the established mitigating measures.

(b) As a minimum, the operator should:

  (1) use a suitable computerised flight-planning system;

  (2) hold an approval for low-visibility approach operations for that fleet; and

  (3) have established an operational control system that includes flight monitoring.

(c) Additionally, the operator should select an aerodrome as:

  (1) destination alternate aerodrome;

  (2) fuel ERA aerodrome; or

  (3) isolated destination aerodrome only when the appropriate weather reports and/or forecasts indicate that the weather conditions will be at or above the planning minima of Table 4 below.

Table 4 — Basic fuel scheme with variations — planning minima

Destination alternate aerodrome, fuel ERA aerodrome, isolated destination aerodrome

Row	Type of approach	Aerodrome ceiling (cloud base or vertical visibility)	RVR/VIS
1	Two or more usable type B instrument approach operations to two separate runways***	DA/H* + 100 ft	RVR** + 300 m
2	One usable type B instrument approach operation	DA/H + 150 ft	RVR + 450 m
3	3D Type A instrument approach operations, based on a facility with a system minimum of 200 ft or less	DA/H + 200 ft	RVR/VIS** + 800 m
4	Two or more usable type A instrument approach operations ***, each based on a separate navigation aid	DA/H or MDA/H* + 200 ft	RVR/VIS** + 1 000 m
5	One usable type A instrument approach operation	DA/H or MDA/H + 400 ft	RVR/VIS + 1 500 m
6	Circling approach operations	MDA/H + 400 ft	VIS + 1 500 m
Crosswind planning minima: see Table 1 of AMC3 CAT.OP.MPA.182			
Wind limitations should be applied taking into account the runway condition (dry, wet, contaminated).			

* The higher of the usable DA/H or MDA/H.

** The higher of the usable RVR or VIS.

*** Compliance with point CAT.OP.MPA.182(f) should be ensured.

Note: The operator may select the most convenient planning minima row. For example, aerodrome with two type B approaches: one CAT3 (0 ft/75 m) another CAT1 (200 ft/550 m). The operator may use Row 2 and use CAT3 (0 + 150 ft/75 + 450 m) instead of Row 1 CAT1 (200 + 100 ft/550 + 300 m).

GM2 CAT.OP.MPA.182 Fuel/energy scheme — aerodrome selection policy — aeroplanes

BASIC FUEL SCHEME WITH VARIATIONS — NORMAL CRUISE CONSUMPTION

In the context of AMC7 CAT.OP.MPA.182 on isolated aerodromes, normal cruise consumption is the consumption of fuel for 2 hours above the isolated aerodrome. These two hours include 30-minute FRF, leaving enough fuel for an approximately 90-minute hold over the destination.

More information is provided in ICAO Doc 9976 Flight Planning and Fuel Management (FPFM) Manual (1st Edition, 2015).

GM3 CAT.OP.MPA.182 Fuel/energy scheme — aerodrome selection policy — aeroplanes

BASIC FUEL SCHEME WITH VARIATIONS — FACILITIES WITH A SYSTEM MINIMUM OF 200 FT OR LESS

(a) Table 3 in AMC8 CAT.OP.MPA.182 and Table 4 in AMC9 CAT.OP.MPA.182 refer to type A instrument approach operations based on a facility with a system minimum of 200 ft or less. Such facilities include ILS/MLS, GBAS landing system (GLS) and GNSS/SBAS (LPV). The system minima for various facilities are contained in AMC3 CAT.OP.MPA.110, Table 3.

(b) In regard to system minima and type of instrument approach operation (type A or B), the following should be noted:

  (1) System minimum is the lowest height to which a facility can be used without visual references. This value is not related to a particular runway or obstacle environment.

  (2) The type of instrument approach operations is related to each individual runway with its obstacle environment.

(c) Amongst other things the lowest DH for an instrument approach operation is determined by the system minima for the facility and the obstacle clearance height (OCH). The resulting DH determines the type of approach operation (type A or B). If the DH is 250 ft or more, it will be a type A approach operation; if the DH is less than 250 ft, it will be a type B approach operation. So, while ILS approaches to most runways may be conducted as type B approach operations, difficult obstacle situations, driving up the DH to 250 ft or higher, will result in type A approach operations.

(d) For example, Row 2 of Table 3 in AMC8 CAT.OP.MPA.182 refers to a case where the obstacle situation and associated OCH result in a DH of 250 ft or more, even though the facility involved supports a DH of 200 ft or less.

(e) This GM refers only to DH (not MDH) since facilities with a system minimum of 200 ft or less are only operated with a DH (or DA), not an MDH.

GM4 CAT.OP.MPA.182 Fuel/energy scheme — aerodrome selection policy — aeroplanes

FUEL SCHEMES — PLANNING MINIMA — INSTRUMENT APPROACH OPERATIONS

An instrument approach operation is considered usable for planning minima (e.g. Tables 2, 3 and 4 in AMC6 CAT.OP.MPA.182, AMC8 CAT.OP.MPA.182 and AMC9 CAT.OP.MPA.182 respectively) when the approach facilities are available, the aircraft is equipped to perform such an approach, the flight crew is accordingly trained, and the runway is available for landing.

GM1 CAT.OP.MPA.182(d)(1) Fuel/energy scheme — aerodrome selection policy — aeroplanes

INDIVIDUAL FUEL SCHEME — REACHING THE DESTINATION AERODROME

In the context of individual fuel schemes, 'reaching the destination' means being as close as possible to the destination, but not necessarily overhead the destination, and no farther than IAF of the planned instrument approach procedure for the destination aerodrome.

AMC1 CAT.OP.MPA.182(f) Fuel/energy scheme — aerodrome selection policy — aeroplanes

BASIC FUEL SCHEME — DESTINATION AERODROMES — PBN OPERATIONS

(a) To comply with point CAT.OP.MPA.182(f), when the operator intends to use PBN, the operator should select an aerodrome as destination alternate aerodrome only if an instrument approach procedure that does not rely on a GNSS is available either at that aerodrome or at the destination aerodrome.

BASIC FUEL SCHEME — DESTINATION AERODROMES — OPERATIONAL CREDITS

(b) To comply with point CAT.OP.MPA.182(f), when the operator intends to use 'operational credits' (e.g. EFVS, SA CAT I, etc.), the operator should select an aerodrome as destination alternate aerodrome only if an approach procedure that does not rely on the same 'operational credit' is available either at that aerodrome or at the destination aerodrome.

GM1 CAT.OP.MPA.182(f) Fuel/energy scheme — aerodrome selection policy — aeroplanes

BASIC FUEL SCHEME — DESTINATION AERODROMES — PBN OPERATIONS

(a) Point (a) of AMC1 CAT.OP.MPA.182(f) applies only to destination alternate aerodromes in flights that require a destination alternate aerodrome. A take-off or an ERA aerodrome with instrument approach procedures that rely on a GNSS may be planned without restrictions. A destination aerodrome with all instrument approach procedures that rely solely on a GNSS may be used without a destination alternate aerodrome if the conditions for a flight without a destination alternate aerodrome are met.

(b) The term 'sufficient means are available to navigate to and land at' means that the procedure can be used in the planning stage and should comply with planning minima requirements.

GM1 CAT.OP.MPA.185 Fuel/energy scheme — in-flight fuel/energy management policy — aeroplanes

BASIC FUEL SCHEME

RELEVANT FUEL DATA TO BE RECORDED

(a) The operator may decide at which regular intervals the relevant fuel data should be recorded.

An example of such intervals could be every 30 minutes for short-range flights and every 60 minutes for longer flights.

(b) The operator should record at least the following relevant fuel-related data:

(1) off-block fuel;

(2) take-off fuel if this data can be recorded automatically;

(3) 'MINIMUM FUEL' declarations;

(4) 'MAYDAY MAYDAY MAYDAY FUEL' declarations;

(5) fuel after touchdown if this data can be recorded automatically; and

(6) on-block fuel.

When an aircraft communications addressing and reporting system (ACARS) is available, the pilot does not need to be the one recording this data.

RELIABLE SOURCE TO OBTAIN DELAY INFORMATION

(c) A reliable source to obtain delay information may be derived from data provided by an air navigation services provider (ANSP) and should have the following characteristics ranked in order of priority:

(1) integrity: provide timely warnings to users when the delay information should not be used;

(2) availability: the time during which the delay information is accessible to the crew;

(3) accuracy: the degree of conformity between the estimated delay and the true delay; the delay information should be communicated with its corresponding gap error, e.g. delay of 15 ± 2 minutes; the gap error should be added to the base value; and

(4) continuity: the capability of the service to provide the delay information without unscheduled interruptions during the intended operation.

‘MINIMUM FUEL’ DECLARATION

(d) The ‘MINIMUM FUEL’ declaration informs the ATC that all planned aerodrome options have been reduced to a specific aerodrome of intended landing. It also informs the ATC that any change to the existing clearance may result in landing with less than the planned FRF. This is not an emergency situation but an indication that an emergency situation is possible, should any additional delay occur.

(e) When committed to land at a specific aerodrome, the commander should take into account any operational factor that may cause a delay to landing, and thus determine whether the aircraft will land with less than the planned FRF, even after receiving clearance from ATC. A change that may cause a delay to landing could be other than the ATC, e.g. a change of weather conditions, etc. If any such factor is likely to result in landing with less than the planned FRF, the commander should declare ‘MINIMUM FUEL’ to ATC.

(f) The pilot should not expect any form of priority handling as a result of a ‘MINIMUM FUEL’ declaration. However, the ATC should advise the flight crew of any additional expected delays, as well as coordinate with other ATC units when transferring the control of the aeroplane, to ensure that the other ATC units are aware of the flight’s fuel state.

(g) **Example 1:** The aircraft is on the final approach to the destination aerodrome with a single runway, with just the destination alternate fuel plus FRF available. The aircraft ahead has a tyre burst upon landing and has stopped on the runway. The ATC orders the aircraft on final approach to execute a go-around as the destination aerodrome is closed due to a blocked runway. After completing the go-around, the flight crew decides to divert to the destination alternate aerodrome. After the ATC gives clearance for the destination alternate aerodrome and if the calculated fuel upon landing is close to the FRF, the flight crew should declare ‘MINIMUM FUEL’. The flight crew has now committed to land at the destination alternate aerodrome, and any change to the clearance may result in landing there with less than the planned FRF.

(h) **Example 2:** The aircraft is approaching the clearance limit point, which has a holding pattern operating at this point in time. The ATC gives the aircraft an expected arrival time that would result in a delay of 25 minutes, and the aircraft enters the holding zone. On receiving this information and prior to entering the holding pattern, the remaining fuel is 7-minute contingency fuel plus 25-minute destination alternate fuel plus 30-minute FRF. The weather conditions and aircraft serviceability are such that the flight crew can convert the destination alternate fuel into holding time over the destination aerodrome. When the remaining fuel no longer allows a diversion from the holding pattern, then the flight crew should declare ‘MINIMUM FUEL’. The flight crew has committed to land at the destination aerodrome, and any change to the clearance may result in landing with less than the planned FRF.

(i) **Example 3:** The aircraft reaches FL 350, which is the cruising flight level on its 5-hour flight. The weather forecast information that was obtained before departure was favourable and, therefore, the commander did not order any discretionary fuel. The destination alternate fuel is sufficient for 25-minute flight time and the destination alternate aerodrome is located beyond the destination aerodrome. For some reason (unexpected severe turbulence, cockpit window crack, etc.), the aircraft has to descend and continue the flight at FL 230, where fuel consumption is higher. In-flight fuel checks and fuel management now show that the destination aerodrome can still be reached but only if in-flight re-planning is done without the destination alternate aerodrome (the destination aerodrome has two runways and good weather, and it is less than 4-hour flight time away, thus meeting the conditions for not requiring an alternate aerodrome). By doing so, the aircraft will arrive at destination for a straight-in approach with exactly the FRF plus 15-minute flight time. During the next 3,5 hours, an ERA aerodrome is available, and the situation is under control. When approaching the destination, the aircraft has to commit to land at the destination aerodrome as there is no other destination alternate aerodrome within 15 minutes of reaching the destination aerodrome. The ATC now informs the pilots that there is a change of landing runway resulting in a 12-minute trip fuel increase. It is time to declare 'MINIMUM FUEL'.

(j) Several scenarios illustrating circumstances that could lead to a 'MINIMUM FUEL' declaration are provided in ICAO Doc 9976 Flight Planning and Fuel Management (FPFM) Manual (1st Edition, 2015) and the EASA Fuel Manual.

ENSURING A SAFE LANDING — FINAL RESERVE FUEL PROTECTION

(k) The objective of the FRF protection is to ensure that a safe landing is made at any aerodrome when unforeseen circumstances may not allow to safely complete the flight, as originally planned.

The commander should always consider first planning a safe-landing option and estimating whether this landing can be performed with more than the FRF. When this estimation indicates that the FRF can no longer be protected, then a fuel emergency should be declared and any landing option explored (e.g. aerodromes not assessed by operators, military aerodromes, closed runways), including deviating from rules, operational procedures, and methods in the interest of safety (as per point CAT.GEN.MPA.105(b)). ICAO Doc 9976 and the EASA *Fuel Manual* provide further detailed guidance on the development of a comprehensive in-flight fuel management policy and related procedures.

Note: See TCAR OPS Part DEF (Definitions) for the definition of 'safe landing'.

FURTHER GUIDANCE ON PROCEDURES FOR IN-FLIGHT FUEL MANAGEMENT

(l) ICAO Doc 9976 and the EASA *Fuel Manual* provide guidance on procedures for in-flight fuel management including reanalysis, adjustment, and/or re-planning considerations when a flight begins to consume contingency fuel before take-off.

AMC1 CAT.OP.MPA.185(a) Fuel/energy scheme — in-flight fuel/energy management policy — aeroplanes

BASIC FUEL SCHEME — PROCEDURES FOR IN-FLIGHT FUEL MANAGEMENT

(a) In-flight fuel checks

(1) The operator should establish a procedure to ensure that in-flight fuel checks are carried out at regular intervals or at specified points indicated in the operational flight plan (one check at least every 60 minutes).

(2) The remaining usable fuel should be evaluated to:

(i) compare the actual consumption with the planned consumption;

(ii) check that the remaining usable fuel is sufficient to complete the flight, in accordance with point (b); and

(iii) determine the usable fuel that is expected to remain upon landing at the destination aerodrome.

(3) In relation to the recording of relevant data, the operator should:

(i) agree with the CAAT on what constitutes relevant data for the purpose of recoding;

(ii) use the relevant data as safety performance indicators (SPIs) of the current fuel scheme; and

(iii) ensure that the recorded data is stored for at least 2 years.

The operator should establish a procedure for the data to be de-identified to a level that ensures the implementation of a 'just culture'.

(b) In-flight fuel management

(1) The flight should be conducted to ensure that the usable fuel expected to remain upon landing at the destination aerodrome is not less than:

(i) the required alternate fuel plus the FRF; or

(ii) the FRF if no alternate aerodrome is required.

(2) If an in-flight fuel check shows that the usable fuel expected to remain upon landing at the destination aerodrome is less than:

(i) the required alternate fuel plus the FRF, the commander should request delay information from the ATC, and take into account the prevailing traffic and operational conditions at the destination aerodrome, at the destination alternate aerodrome, and at any other adequate aerodrome, to decide whether to proceed to the destination aerodrome or to divert in order to perform a safe landing with not less than the FRF; or

(ii) the FRF, if no destination alternate aerodrome is required, the commander should take appropriate action and proceed to an aerodrome where a safe landing can be made with not less than the FRF.

(c) The use of fuel after flight commencement for objectives other than the ones originally intended during pre-flight planning should require reanalysis and, if applicable, adjustment of the planned operation.

AMC2 CAT.OP.MPA.185(a) Fuel/energy scheme — in-flight fuel/energy management policy — aeroplanes

BASIC FUEL SCHEME WITH VARIATIONS — PROCEDURES FOR IN-FLIGHT FUEL MANAGEMENT

(a) In addition to AMC1 CAT.OP.MPA.185(a) and in the context of point (d) of AMC6 CAT.OP.MPA.181, if the RCF procedure is used on a flight to proceed to destination 1 aerodrome, the commander should ensure that the remaining usable fuel at the decision point is at least the total of the following:

(1) trip fuel from the decision point to destination 1 aerodrome;

(2) contingency fuel that is equal to 5 % of the trip fuel from the decision point to destination 1 aerodrome;

(3) destination 1 aerodrome alternate fuel if a destination 1 alternate aerodrome is required;

(4) additional fuel, if required; and

(5) FRF.

(b) In addition to AMC1 CAT.OP.MPA.185(a), on a flight to an isolated aerodrome, the commander should ensure that the remaining usable fuel at the actual PNR is at least the total of the following:

(1) trip fuel from the PNR to the destination isolated aerodrome;

(2) contingency fuel from the PNR to the destination isolated aerodrome; and

(3) the additional fuel required for isolated aerodromes, as described in AMC7 CAT.OP.MPA.182.

AMC3 CAT.OP.MPA.185(a) Fuel/energy scheme — in-flight fuel/energy management policy — aeroplanes

INDIVIDUAL FUEL SCHEME — COMMITTING TO LAND AT A SPECIFIC AERODROME

The operator should provide relevant safety information to the commander before the commander decides to commit to land at a specific aerodrome.

AMC1 CAT.OP.MPA.191(b)&(c) Fuel/energy scheme — fuel/energy planning and in-flight re-planning policy —helicopters

PLANNING CRITERIA

(a) The pre-flight calculation of the required usable fuel to be carried on board should include the following:

(1) taxi fuel, which should take into account local conditions at the departure site and the APU consumption;

(2) trip fuel, which should include fuel:

(i) for take-off and climb from the departure site elevation to the initial cruising level/altitude, taking into account the expected departure routing;

(ii) from the top of climb to the top of descent, including any step climb/descent;

(iii) from the top of descent to the point where the approach procedure is initiated, taking into account the expected arrival procedure; and

(iv) for the approach and landing at the destination site;

(3) contingency fuel, which should be:

(i) for IFR flights, or for VFR flights in a hostile environment, 10 % of the planned trip fuel; or

(ii) for VFR flights in a non-hostile environment, 5 % of the planned trip fuel;

(4) alternate fuel, which should be:

(i) fuel for a missed approach from the applicable DA/H or MDA/H at the destination to the missed-approach altitude, taking into account the complete missed-approach procedure;

(ii) fuel for climb from the missed approach altitude to the cruising level/altitude;

(iii) fuel for the cruise from the top of climb to the top of descent;

(iv) fuel for descent from the top of descent to the point where the approach is initiated, taking into account the expected arrival procedure;

(v) fuel for the approach and landing at the destination alternate that is selected in accordance with point CAT.OP.MPA.192; and

(vi) for helicopters operating to or from helidecks that are located in a hostile environment, 10 % of points (a)(4)(i) to (a)(4)(v);

(5) FRF;

(6) extra fuel if there are anticipated delays or specific operational constraints; and

(7) discretionary fuel, which should be at the sole discretion of the commander.

(b) Reduced contingency fuel (RCF) IFR procedure

If the operator's fuel scheme includes pre-flight planning to a destination 1 aerodrome (commercial destination) with an RCF procedure using a decision point along the route and a destination 2 aerodrome (optional refuelling destination), the pre-flight calculation of the required usable fuel should be according to points (b)(1) or (b)(2), whichever is greater:

(1) the sum of:

(i) taxi fuel;

(ii) trip fuel to the destination 1 aerodrome via the decision point;

(iii) contingency fuel equal to not less than 10 % of the estimated fuel consumption from the decision point to the destination 1 aerodrome;

(iv) alternate fuel;

(v) FRF;

(vi) extra fuel if there are anticipated delays or specific operational constraints; and

(vii) discretionary fuel, which should be at the sole discretion of the commander; or

(2) the sum of:

(i) taxi fuel;

(ii) trip fuel to the destination 2 aerodrome via the decision point;

(iii) contingency fuel equal to not less than 10 % of the estimated fuel consumption from the decision point to the destination 2 aerodrome;

(iv) alternate fuel, if a destination 2 alternate aerodrome is required;

(v) FRF;

(vi) extra fuel if there are anticipated delays or specific operational constraints; and

(vii) discretionary fuel, which should be at the sole discretion of the commander.

(c) Isolated aerodrome IFR procedure

If the operator's fuel policy includes planning to fly to an isolated aerodrome under IFR or under VFR over routes not navigated by reference to visual landmarks, for which a destination alternate does not exist, the pre-flight calculation of the required usable fuel should include:

(1) taxi fuel;

(2) trip fuel;

(3) contingency fuel calculated in accordance with point (a)(3);

(4) additional fuel to fly for 2 hours at holding speed, including FRF; and

(5) extra fuel if there are anticipated delays or specific operational constraints; and

(6) discretionary fuel, which should be at the sole discretion of the commander.

(d) Sufficient fuel should be carried at all times to ensure that following the failure of an engine that occurs at the most critical point along the route, the helicopter is able to:

(1) descend as necessary and proceed to an adequate aerodrome;

(2) hold for 15 minutes at 1 500 ft (450 m) above aerodrome elevation in standard conditions; and

(3) make an approach and land.

AMC1 CAT.OP.MPA.192 Selection of aerodromes and operating sites — helicopters

PLANNING MINIMA AND SAFETY MARGINS FOR A DESTINATION AERODROME AND SELECTION OF ALTERNATE AERODROMES

(a) When selecting the destination aerodrome, the operator should ensure that one of the following conditions is met:

(1) for a land destination, the duration of the flight and the prevailing meteorological conditions are such that during a period commencing 1 hour before and ending 1 hour after the estimated time of arrival at the aerodrome or operating site, an approach and landing is possible under VMC from the minimum safe altitude at the IAF or before;

(2) for a land destination:

(i) the available current meteorological information indicates that the following meteorological conditions at the destination aerodrome will exist from 2 hours before to 2 hours after the estimated time of arrival, or from the actual time of departure to 2 hours after the estimated time of arrival, whichever is shorter:

(A) a ceiling of at least 120 m (400 ft) above the DA/H or MDA/H of the instrument approach procedure; and

(B) visibility of at least 3 000 m;

(ii) a runway and two published instrument approaches with independent navigation aids are available at the aerodrome of intended landing; and

(iii) fuel planning is based upon the approach procedure that requires the most fuel, and 15-minute fuel is added to the trip fuel;

(3) one destination alternate aerodrome is selected, and the appropriate weather reports and/or forecasts indicate that during a period commencing 1 hour before and ending 1 hour after the estimated time of arrival at the destination, the weather conditions at the destination will be at or above the applicable planning minima as follows:

(i) RVR or VIS specified in accordance with point CAT.OP.MPA.110; and

(ii) for type A instrument approach operations, ceiling at or above (M)DH;

(4) one destination alternate aerodrome is selected, and based on the meteorological information that is obtained in accordance with the procedures of the operations manual (OM), there is a reasonable probability of landing at the destination;

(5) two destination alternate aerodromes are selected; or

(6) the destination aerodrome is isolated, and the appropriate weather reports and/or forecasts indicate that during a period commencing 1 hour before and ending 1 hour after the estimated time of arrival at the destination, the weather conditions at the destination

will be at or above the applicable planning minima defined in Table 1.

(b) The operator should specify any alternate aerodrome(s) in the operational flight plan.

(c) If the site of intended landing is isolated and no alternate aerodrome is available, a PNR should be determined.

PLANNING MINIMA FOR DESTINATION ALTERNATE AERODROMES AND ISOLATED AERODROMES

(d) The operator should select the destination alternate aerodrome(s) only if the appropriate weather reports and/or forecasts indicate that during a period commencing 1 hour before and ending 1 hour after the estimated time of arrival at the aerodrome or operating site, the weather conditions will be at or above the applicable planning minima as follows:

(1) if the destination aerodrome is selected by meeting the conditions in points (a)(3) or (a)(5), the planning minima for the destination alternate aerodrome(s) and an isolated aerodrome are as shown in Table 1:

Table 1 — Planning minima for a destination alternate aerodrome and an isolated aerodrome

Type of approach	Planning minima
Type A or type B	RVR/VIS + 400 m Ceiling at or above (M)DH + 200 ft
VFR or visual approach	VFR from a position on the instrument flight path to the destination alternate aerodrome

or

(2) if the destination aerodrome is selected by meeting the condition in point (a)(4), the planning minima for the destination alternate aerodrome(s) are as shown in Table 2:

Table 2 — Planning minima for a destination alternate aerodrome with a reasonable probability of landing at the destination

Type of approach	Planning minima
Type A or type B	RVR/VIS + 800 m (M)DH + 400 ft
VFR or visual approach	VFR from a position on the instrument flight path to the destination alternate aerodrome

DETERMINATION OF THE METEOROLOGICAL CONDITIONS FOR A SAFE LANDING AT THE DESTINATION

(e) To assess the probability of landing at the destination, when flying under IFR to heliports/operating sites without the meteorological information from a certified service provider, the operator should use supplemental meteorological information, or the operator should select two destination alternates. Such meteorological information is usually available at aerodromes. In addition, all the following conditions should be met:

(1) The operator should establish a system for observing and assessing the weather, as well as for distributing meteorological information.

(2) The operator should describe in the OM the system defined in point (1).

(3) The operator should assess the weather at the destination aerodrome, and if different, also at the location of the instrument approach. The assessment should be based on the following:

(i) an appropriate weather forecast at an aerodrome where it is reasonable to expect that the local conditions are not significantly different from the conditions at the destination and the location of the instrument approach;

(ii) if the aerodrome described in point (e)(3)(i) is farther than 15 NM away from the location of the approach and the destination, the following conditions should be met:

(A) supplemental meteorological information should be available and confirm that the current weather conditions at destination and at the location of the instrument approach are expected to remain similar to the conditions at the aerodrome described in point (e)(3)(i); and

(B) low-level area forecasts should confirm that the weather is expected to remain similar at destination and at the aerodrome used for the weather assessment, at the expected time of landing; and

(iii) any risk of adverse local weather condition forecast in the low-level area forecasts and relevant to the destination and the location of the instrument approach.

(4) The following should qualify as supplemental meteorological information:

(i) a reliable, timestamped image from a serviceable digital camera of known location, bearing, and altitude, which shows the weather conditions in the approach path at destination;

(ii) a meteorological observation from a properly trained observer; and

(iii) a report from non-certified automatic weather observation systems to which the operator should apply relevant margins based on the reliability and precision of the system.

(5) The operator should establish that there is a reasonable probability of landing at the destination only if the flight time to the destination and then to the alternate aerodrome is less than 3 hours, and if according to the assessment described in point (e)(3), during a period commencing 1 hour before and ending 1 hour after the estimated time of arrival at the location of the approach, the following conditions are met:

(i) the weather conditions will be at or above the planning minima for the approach; and

(ii) if the location of the approach is different from that of the destination aerodrome, the weather conditions will allow to continue the flight to the destination.

(6) Weather observations from the aerodrome described in point (e)(3)(i), or the supplemental meteorological information that is described in point (e)(4), should be available, be no more than 30 minutes old, and be used to assess approach and landing conditions in accordance with point CAT.OP.MPA.300.

(7) The weather observations or information that are described in point (e)(6) may be transmitted to the flight crew using installed equipment, a T-PED, radio communication with trained personnel, or any equivalent means.

(8) The operator should store the weather assessments established in point (e)(3) and the weather observations referred to in point (e)(6) for a period of 3 months.

(9) In case a landing at the destination is not possible due to the weather, even though it was assessed that it would be, the operator should investigate and take all necessary measures to improve future weather assessments.

AMC1 CAT.OP.MPA.192(a) Selection of aerodromes and operating sites — helicopters

PLANNING MINIMA FOR TAKE-OFF ALTERNATE AERODROMES

The operator should select an aerodrome or landing site as a take-off alternate aerodrome or landing site only when the appropriate weather reports and/or forecasts indicate that during a period commencing 1 hour before and ending 1 hour after the estimated time of arrival at the take-off alternate aerodrome or landing site, the weather conditions will be at or above the applicable landing minima specified in accordance with point CAT.OP.MPA.110. The ceiling should be taken into account when the only available approach operations are type A. Any limitations related to OEI operations should be also taken into account.

GM1 CAT.OP.MPA.192(c)&(d) Selection of aerodromes and operating sites — helicopters

METEOROLOGICAL INFORMATION

(a) Meteorological data conforms to ICAO Annex 3. As the following meteorological data is point specific, caution should be exercised when associating it with nearby aerodromes (or helidecks).

(b) METARs

(1) Routine and special meteorological observations at offshore installations should be made during periods and at a frequency agreed between the competent authority of the meteorological services provider and the operator concerned. They should conform to applicable Meteorological Service standards equivalent to ICAO Annex 3, including the desirable accuracy of observations, which is specified in ICAO Annex 3 Attachment A Operationally Desirable Accuracy of Measurement or Observation.

(2) Routine and selected special reports are exchanged between meteorological offices in the METAR (aerodrome routine meteorological report) or SPECI (aerodrome special meteorological report) code forms that are prescribed by the World Meteorological Organization.

(c) Aerodrome forecasts (TAFs)

(1) The aerodrome forecast consists of a concise statement of the expected meteorological conditions at an aerodrome and any significant changes expected to occur during a specified period of validity, which is usually not less than 9 hours, and not more than 30 hours. The forecast includes surface wind, visibility, weather and cloud, and expected changes of one or more of these elements during the period. Additional elements may be included as agreed between the meteorological authority and the operators concerned. Where these forecasts relate to offshore installations, barometric pressure and temperature should be included to facilitate the planning of helicopter landing and take-off performance.

(2) Aerodrome forecasts are most commonly exchanged in the TAF code form, and the detailed description of an aerodrome forecast is detailed in ICAO Annex 3, together with the operationally desirable accuracy elements that are specified in ICAO Annex 3 Attachment B. Operationally Desirable Accuracy of Forcasts.

(d) Landing forecasts (TRENDS)

(1) The landing forecast consists of a concise statement that indicates any significant changes expected to occur at an aerodrome during the 2-hour period immediately following the time of the observation to which it is appended. It contains one or more of the following

meteorological elements: surface wind, visibility, weather phenomena, clouds, and other significant information, such as barometric pressure and temperature, as may be agreed between the meteorological authority and the operators concerned.

(2) The detailed description of the landing forecast is detailed in ICAO Annex 3, together with the operationally desirable accuracy of the forecast elements. In particular, the value of the observed cloud height and visibility elements should remain within ± 30 % of the forecast values in 90 % of the cases.

(3) Landing forecasts most commonly take the form of a TREND forecast appended to a local routine report, local special report, METAR, or SPECI.

GM2 CAT.OP.MPA.192(c)&(d) Selection of aerodromes and operating sites — helicopters

SUPPLEMENTAL METEOROLOGICAL INFORMATION USING DIGITAL IMAGERY

(a) One or more digital images from a digital camera may be considered as supplemental meteorological information if the following criteria are met:

(1) the camera has a known altitude, azimuth, elevation, and field of view; if pan, tilt or zoom functions are available, the image includes the elevation, azimuth, and an indication of how much the image is zoomed;

(2) the camera is robustly fixed to a solid surface and protected from deliberate or accidental interference; it is secured from the effects of wind and precipitation;

(3) the digital image contains date and timestamp information or other means to ensure that the image is up to date; and

(4) the digital image has a clearly specified update frequency.

(b) If the operator uses the digital image to assess ceiling and visibility, the operator should document the height, bearing, and distance of clearly distinguishable features, and provide a reference image taken on a clear day with negligible cloud or mist.

(c) The operator may achieve the purpose of point (b) with a selectable reference image or a selectable data layer to be superposed on the image. Any selectable reference image should clearly indicate that it is a reference image, and not a current image.

(d) If the operator uses night-time digital images, the quality of those images should remain sufficient to be compared to the reference image, and the darkness should not obscure the distinguishable features described in point (b). This may be achieved by adapting the camera to the current luminosity.

(e) If the digital image is stamped with the value of one or more weather parameters, there should be a means to ensure that each parameter is up to date and provided by a reliable and functional sensor; otherwise, that parameter should not be displayed.

(f) If the camera is exposed to local meteorological conditions such as the foehn effect, the operator should document these local conditions, or the supplemental meteorological information should only be valid in the immediate vicinity of the camera.

AMC1 CAT.OP.MPA.192(d) Selection of aerodromes and operating sites — helicopters

PBN OPERATIONS

(a) To comply with CAT.OP.MPA.192(d), when the operator intends to use PBN, the operator should either:

(1) demonstrate that the GNSS is robust against loss of capability; or

(2) select an aerodrome as a destination alternate aerodrome only if an instrument approach procedure that does not rely on a GNSS is available either at that aerodrome or at the destination aerodrome.

GNSS ROBUSTNESS AGAINST LOSS OF CAPABILITY — HELICOPTERS

(b) The operator may demonstrate robustness against the loss of capability of the GNSS if all of the following criteria are met:

(1) At flight planning stage, SBAS or GBAS are expected to be available and used.

(2) The failure of a single receiver or system should not compromise the navigation capability required for the intended instrument approach.

(3) The temporary jamming of all GNSS frequencies should not compromise the navigation capability required for the intended route. The operator should establish a procedure to deal with such cases unless other sensors are available to continue on the intended route.

(4) The duration of a jamming event should be determined as follows:

(i) Considering the average speed and height of a helicopter flight, the duration of a jamming event may be considered to be less than 2 minutes.

(ii) The time needed for the GNSS system to re-start and provide the aircraft position and navigation guidance should also be considered.

(iii) Based on (i) and (ii) above, the operator should establish the duration of the loss of GNSS navigation data due to jamming. This duration should be no less than 3 minutes, and may be no longer than 4 minutes.

(5) The operator should ensure resilience to jamming for the duration determined in (4) above, as follows:

(i) If the altitude of obstacles on both sides of the flight path is higher than the planned altitude for a given segment of the flight, the operator should ensure no excessive drift on either side by relying on navigation sensors such as a inertial system with performance in accordance with the intended function.

(ii) If (i) does not apply and the operator cannot rely on sensors other than GNSS, the operator should develop a procedure to ensure that a drift from the intended route during the jamming event has no adverse consequences on the safety of the flight. This procedure may involve air traffic services.

(6) The operator should ensure that no space weather event is predicted to disrupt the GNSS reliability and integrity at both the destination and the alternate aerodrome.

(7) The operator should verify the availability of RAIM for all phases of flight based on GNSS, including navigation to the alternate aerodrome.

(8) The operator's MEL should reflect the elements in points (b)(1) and (b)(2).

OPERATIONAL CREDITS

(c) To comply with point CAT.OP.MPA.192(d), when the operator intends to use 'operational credits' (e.g. EFVS, SA CAT I, etc.), the operator should select an aerodrome as destination alternate aerodrome only if an approach procedure that does not rely on the same 'operational credit' is available either at that aerodrome or at the destination aerodrome.

GM1 CAT.OP.MPA.192(d) Selection of aerodromes and operating sites — helicopters

DESTINATION AND DESTINATION ALTERNATE AERODROMES — PBN OPERATIONS

(a) AMC1 CAT.OP.MPA.192(d) applies only to destination alternate aerodromes in flights that require a destination alternate aerodrome. A take-off or ERA aerodrome with instrument approach procedures that rely on a GNSS may be planned without restrictions. A destination aerodrome with all instrument approach procedures that rely solely on a GNSS may be used without a destination alternate aerodrome if the conditions for a flight without a destination alternate aerodrome are met.

(b) The term 'available' means that the procedure can be used in the planning stage and should comply with planning minima requirements.

GM2 CAT.OP.MPA.192(d) Selection of aerodromes and operating sites — helicopters

GNSS ROBUSTNESS AGAINST LOSS OF CAPABILITY — HELICOPTERS

(a) Redundancy of on-board systems ensures that no single on-board equipment failure (e.g. antenna, GNSS receiver, FMS, or navigation display failure) results in the loss of the GNSS capability.

(b) Any shadowing of the GNSS signal or jamming of all GNSS frequencies from the ground is expected to be of a very short duration and affect a very small area. Additional sensors or functions, such as inertial coasting, may be used during jamming events. Jamming should be considered on all segments of the intended route, including the approach.

(c) The availability of GNSS signals can be compromised if space weather events cause 'loss of lock' conditions and more than one satellite signal may be lost on a given GNSS frequency. Until space weather forecasts are available, the operator may use 'nowcasts' as short-term predictions for helicopter flights of short durations.

(d) SBAS also contributes to the mitigation of space weather effects, by both providing integrity messages and correcting ionosphere-induced errors.

(e) Even though SBAS should be available and used, RAIM should remain available autonomously. In case of loss of SBAS, the route and the approach to the destination or alternate aerodrome should still be flown with an available RAIM function.

(f) When available, GNSS based on more than one constellation and more than one frequency may provide better integrity and redundancy regarding failures in the space segment of GNSS, jamming, and resilience to space weather events.

AMC1 CAT.OP.MPA.195 Fuel/energy scheme — in-flight fuel/energy management policy — helicopters

ENSURING A SAFE LANDING FOR COMPLEX MOTOR-POWERED HELICOPTERS IN OTHER THAN LOCAL OPERATIONS

The operator should base in-flight fuel management procedures on the following criteria:

(a) in-flight fuel checks:

(1) the commander should establish a procedure to ensure that in-flight fuel checks are carried out at regular intervals; the remaining usable fuel should be recorded and evaluated to:

(i) compare the actual consumption with the planned consumption;

(ii) check that the remaining usable fuel is sufficient to complete the flight; and

(iii) determine the usable fuel that is expected to remain upon landing at the destination; and

(2) the relevant fuel data should be recorded;

(b) in-flight fuel management:

(1) if an in-flight fuel check shows that the usable fuel that is expected to remain upon landing at the destination is less than the required alternate fuel plus the FRF, the commander should:

(i) divert; or

(ii) replan the flight in accordance with point SPA.HOFO.120(b)(1) unless the commander considers it safer to proceed to the destination; and

(2) at an onshore destination, when two suitable, separate touchdown and lift-off areas are available at the destination, and the expected weather conditions at the destination are as specified for planning in point CAT.OP.MPA.245(a)(2), the commander may permit alternate fuel to be used before landing at the destination; and

(c) if an in-flight fuel check on a flight to an isolated destination shows that the usable fuel expected to remain at the point of the last possible diversion is less than the sum of the following:

(1) trip fuel from the point of the last possible diversion to the destination isolated aerodrome;

(2) contingency fuel; and

(3) FRF, or the additional fuel required for isolated aerodromes,

the commander should either divert or proceed to the destination, provided that at onshore destinations, two suitable, separate touchdown and lift-off areas are available at the destination, and the expected weather conditions at the destination are as specified for planning in point CAT.OP.MPA.245(a).

GM1 CAT.OP.MPA.195 Fuel/energy scheme — in-flight fuel/energy management policy — helicopters

‘MINIMUM FUEL’ DECLARATION

(a) The ‘MINIMUM FUEL’ declaration informs the ATC that all planned landing-site options have been reduced to a specific aerodrome or operating site of intended landing. It also informs the ATC that no other operating site is available, and that any change to the existing clearance, or air traffic delays, may result in landing with less than the planned FRF. This is not an emergency situation but an indication that an emergency situation is possible, should any additional delay occur.

SAFE LANDING — final reserve fuel PROTECTION

(b) The protection of the FRF is intended to ensure that a safe landing is made at any aerodrome or operating site when unforeseen circumstances may not allow to safely complete the operation, as originally planned.

(c) When the FRF can no longer be protected, then a fuel emergency needs to be declared, as per point CAT.OP.MPA.195(d), and any landing option explored, including deviating from rules, operational procedures, and methods in the interest of safety (as per point CAT.GEN.MPA.105(b)).

(d) The 'MAYDAY MAYDAY MAYDAY FUEL' declaration informs the ATC that all available landing options have been reduced to a specific landing site, and that an FRF portion may be consumed prior to landing.

AMC1 CAT.OP.MPA.200 Special refuelling or defueling of the aircraft

REFUELLING WITH AN ENGINE RUNNING — AEROPLANES

(a) Refuelling with an engine running should only be conducted:

(1) when there are no other sources of electrical or pneumatic power to start the engine if shut down;

(2) in accordance with the specific procedures established by the type certificate (TC) holder of the aeroplane;

(3) with aeroplanes that use JET A, JET A-1 or TS-1 fuel types or any other fuel type that has a flash point above 38 °C and is approved by the CAAT;

(4) with no passengers embarking, on board, or disembarking;

(5) with permission from the aerodrome operator; and

(6) in the presence of the aerodrome rescue and firefighting services (RFFSs).

(b) The operator should assess the risks associated with refuelling with an engine running and establish appropriate procedures to be followed by all involved personnel, such as flight crew, cabin crew, and ground operations personnel. These procedures should be specified in the OM.

AMC2 CAT.OP.MPA.200 Special refuelling or defueling of the aircraft

OPERATIONAL PROCEDURES for REFUELLING WITH AN ENGINE RUNNING — AEROPLANES

(a) To reduce the likelihood of conducting refuelling with an engine running, the operator should include in the MEL an operational procedure for dispatch criteria in case of an unserviceable APU, if applicable, to prevent a flight from being dispatched to an aerodrome where no suitable ground support equipment is available.

(b) Appropriate training should be provided to flight crew and maintenance/ground operations personnel that are involved in refuelling with one engine running, as well as to cabin crew, if present on board.

AMC3 CAT.OP.MPA.200 Special refuelling or defueling of the aircraft

REFUELLING WITH THE ENGINE(S) RUNNING AND/OR ROTORS TURNING — HELICOPTERS

(a) Refuelling with the engine(s) running and/or rotors turning should only be conducted:

(1) with no passengers or technical-crew members embarking or disembarking;

(2) if the operator of the aerodrome/operating site allows such operations;

(3) in accordance with any specific procedures and limitations in the AFM;

(4) using JET A or JET A-1 fuel types; and

(5) in the presence of the appropriate rescue and firefighting (RFF) facilities or equipment.

(b) In addition, operational procedures in the OM should specify that at least the following precautions are taken:

(1) all necessary information should be exchanged in advance with the aerodrome operator, operating-site operator, and refuelling operator;

(2) the procedures to be used by crew members should be defined;

(3) the procedures to be used by the operator's ground operations personnel that may be in charge of refuelling or assisting in emergency evacuations should be described;

(4) the operator's training programmes for crew members and for the operator's ground operations personnel should be described;

(5) the minimum distance between the helicopter turning parts and the refuelling vehicle or installations should be defined when the refuelling takes place outside an aerodrome or at an aerodrome where there are no such limitations;

(6) besides any RFFSs that are required to be available by aerodrome regulations, an additional handheld fire extinguisher with the equivalent of 5 kg of dry powder should be immediately available and ready for use;

(7) a means for a two-way communication between the crew and the person in charge of refuelling should be defined and established;

(8) if fuel vapour is detected inside the helicopter, or any other hazard arises, refuelling/defuelling should be stopped immediately;

(9) one pilot should stay at the controls, constantly monitor the refuelling, and be ready to shut off the engines and evacuate at all times; and

(10) any additional precautions should be taken, as determined by the risk assessment.

AMC4 CAT.OP.MPA.200 Special refuelling or defueling of the aircraft

OPERATIONAL PROCEDURES — PASSENGERS ON BOARD for REFUELLING WITH THE ENGINE(S) RUNNING AND/OR ROTORS TURNING — HELICOPTERS

In addition to AMC3 CAT.OP.MPA.200, for refuelling with passengers on board, operational procedures in the OM should specify that at least the following precautions are taken:

(a) the positioning of the helicopter and the corresponding helicopter evacuation strategy should be defined taking into account the wind as well as the refuelling facilities or vehicles;

(b) on a heliport, the ground area beneath the exits that are intended for emergency evacuation should be kept clear;

(c) an additional passenger briefing as well as instructions should be defined, and the 'No smoking' signs should be on unless 'No smoking' placards are installed;

(d) interior lighting should be set to enable identification of emergency exits;

(e) the use of doors during refuelling should be defined: doors on the refuelling side should remain closed, while doors on the opposite side should remain unlocked or, weather permitting, open, unless otherwise specified in the AFM;

(f) at least one suitable person capable of implementing emergency procedures for firefighting, communications, as well as for initiating and directing an evacuation, should remain at a specified location; this person should not be the qualified pilot at the controls or the person performing the refuelling; and

(g) unless passengers are regularly trained in emergency evacuation procedures, an additional crew member or ground crew member should be assigned to assist in the rapid evacuation of the passengers.

GM1 CAT.OP.MPA.200 Special refuelling or defueling of the aircraft

OPERATIONAL PROCEDURES for REFUELLING WITH AN ENGINE RUNNING — AEROPLANES

For the purpose of refuelling with an engine running, the operator's procedures need to be aligned with the specific procedures laid down in the AFM. In case there are no specific procedures for refuelling with an engine running available in the AFM, the operator and the manufacturer may wish to cooperate to establish such procedures.

GM2 CAT.OP.MPA.200 Special refuelling or defueling of the aircraft

RISK ASSESSMENT for REFUELLING WITH THE ENGINE(S) RUNNING AND/OR ROTORS TURNING — HELICOPTERS

The risk assessment should explain why it is not practical to refuel with the engine(s) and rotors stopped, identify any additional hazards, and describe how the additional risks are controlled. Helicopter emergency medical services (HEMS) and helicopter offshore operations (HOFO) are typical operations where the benefits should outweigh the risks if mitigation measures are taken. Guidance on safe refuelling practices is contained in ICAO Doc 9137 Airport Services Manual, Parts 1 and 8.

The operators' risk assessment may include, but not be limited to, the following risks, hazards and mitigation measures:

(a) risk related to refuelling with rotors turning;

(b) risk related to the shutting down of the engines, including the risk of failures during start-up;

(c) environmental conditions, such as wind limitations, displacement of exhaust gases, and blade sailing;

(d) risk related to human factors and fatigue management, especially for single-pilot operations for long periods of time;

(e) risk mitigation, such as the safety features of the fuel installation, RFF capability, number of personnel members available, ease of emergency evacuation of the helicopter, etc.;

(f) assessment of the use of radio transmitting equipment;

(g) determination of the use of passenger seat belts;

(h) review of the portable electronic device (PED) policy; and

(i) if passengers are to disembark, consideration of their disembarking before rather than after the refuelling; and

(j) if passengers are to embark, consideration of their embarking after rather than before the refuelling.

AMC5 CAT.OP.MPA.200 Special refuelling or defueling of the aircraft

REFUELLING OR DEFUELLING WITH PASSENGERS EMBARKING, ON BOARD OR DISEMBARKING

(a) When passengers are embarking, on board, or disembarking, an aircraft should not be refuelled/defuelled with avgas (aviation gasoline) or wide-cut type fuel or a mixture of these types of fuel.

(b) For all other types of fuel, the necessary precautions should be taken, and the aircraft should be properly manned by qualified personnel that should be ready to initiate and direct an evacuation of the aircraft by the most practical and expeditious means available.

AMC6 CAT.OP.MPA.200 Special refuelling or defueling of the aircraft

OPERATIONAL PROCEDURES WITH PASSENGERS EMBARKING, ON BOARD OR DISEMBARKING — AEROPLANES

(a) When refuelling/defuelling with passengers on board, ground servicing activities and work inside the aeroplane, such as catering and cleaning, should be conducted in such a manner that they do not create a hazard and allow emergency evacuation through those aisles and exits that are intended for emergency evacuation.

(b) The deployment of integral aeroplane stairs or the opening of emergency exits are not necessarily a prerequisite to refuelling.

(c) Operational procedures should specify that at least the following precautions are taken:

  (1) one qualified person should remain at a specified location during refuelling/defuelling operations with passengers on board, and be capable of using emergency procedures for fire protection and firefighting, communications, as well as for initiating and directing an evacuation;

  (2) two-way communication should be established and remain available through the aeroplane’s intercommunications system, or other suitable means, between the ground crew that supervises the refuelling and the qualified personnel on board the aeroplane; all involved personnel should remain within easy reach of the intercommunications system;

  (3) crew, personnel, and passengers should be warned that refuelling/defuelling will take place;

  (4) the ‘FASTEN SEAT BELT’ signs should be off;

  (5) ‘NO SMOKING’ signs should be on, together with interior lighting to allow the identification of emergency exits;

  (6) passengers should be instructed to unfasten their seat belts and refrain from smoking;

  (7) the minimum required number of cabin crew should be on board and prepared for an immediate emergency evacuation;

  (8) if fuel vapour is detected inside the aeroplane, or any other hazard arises, refuelling/defuelling should be stopped immediately;

  (9) the ground area beneath the exits that are intended for emergency evacuation, as well as slide deployment areas, should be kept clear where stairs are not in position for use in the event of evacuation; and

  (10) provision is made for a safe and rapid evacuation.

AMC7 CAT.OP.MPA.200 Special refuelling or defueling of the aircraft

OPERATIONAL PROCEDURES FOR REFUELLING WITH PASSENGERS DISEMBARKING OR EMBARKING — HELICOPTERS WITH THE ENGINE(S) AND ROTORS STOPPED

When the helicopter engine(s) and rotors are stopped, the efficiency and speed of passengers disembarking from and re-embarking on board helicopters should be such that disembarking before refuelling and re-embarking after refuelling is the general practice, except for HEMS or air ambulance operations. However, if such operations are needed, the operator should refer to AMC3 CAT.OP.MPA.200 and AMC4 CAT.OP.MPA.200. Operational procedures to be described in the OM should specify that at least the relevant precautions referred to in the aforementioned AMC are taken.

AMC8 CAT.OP.MPA.200 Special refuelling or defueling of the aircraft

REFUELLING OR DEFUELLING WITH WIDE-CUT FUEL

Refuelling/defuelling with wide-cut fuel should be conducted only if the operator has established appropriate procedures, taking into account the high risk of using wide-cut fuel types.

GM3 CAT.OP.MPA.200 Special refuelling or defuelling of the aircraft

PROCEDURES FOR REFUELLING/DEFUELLING WITH WIDE-CUT FUEL

(a) 'Wide-cut fuel' (designated JET B, JP-4 or AVTAG) is an aviation turbine fuel that falls between gasoline and kerosene in the distillation range and consequently, compared to kerosene (JET A or JET A1), it has the properties of higher volatility (vapour pressure), lower flash point and lower freezing point.

(b) Wherever possible, the operator should avoid the use of wide-cut fuel types. If a situation arises such that only wide-cut fuels are available for refuelling/defuelling, operators should be aware that mixtures of wide-cut fuels and kerosene turbine fuels can result in the air/fuel mixture in the tank being in the combustible range at ambient temperatures. The extra precautions set out below are advisable to avoid arcing in the tank due to electrostatic discharge. The risk of this type of arcing can be minimised by the use of a static dissipation additive in the fuel. When this additive is present in the proportions stated in the fuel specification, the normal fuelling precautions set out below are considered adequate.

(c) Wide-cut fuel is considered to be 'involved' when it is being supplied or when it is already present in aircraft fuel tanks.

(d) When wide-cut fuel has been used, this should be recorded in the technical log. The next two uplifts of fuel should be treated as though they too involved the use of wide-cut fuel.

(e) When refuelling/defuelling with turbine fuels not containing a static dissipator, and where wide-cut fuels are involved, a substantial reduction on fuelling flow rate is advisable. Reduced flow rate, as recommended by fuel suppliers and/or aeroplane manufacturers, has the following benefits:

   (1) it allows more time for any static charge build-up in the fuelling equipment to dissipate before the fuel enters the tank;

   (2) it reduces any charge which may build up due to splashing; and

   (3) until the fuel inlet point is immersed, it reduces misting in the tank and consequently the extension of the flammable range of the fuel.

(f) The flow rate reduction necessary is dependent upon the fuelling equipment in use and the type of filtration employed on the aeroplane fuelling distribution system. It is difficult, therefore, to quote precise flow rates. Reduction in flow rate is advisable whether pressure fuelling or over-wing fuelling is employed.

(g) With over-wing fuelling, splashing should be avoided by making sure that the delivery nozzle extends as far as practicable into the tank. Caution should be exercised to avoid damaging bag tanks with the nozzle.

AMC1 CAT.OP.MPA.205 Push back and towing — aeroplanes

BARLESS TOWING

(a) Barless towing should be based on the applicable SAE ARP (Aerospace Recommended Practices), i.e. 4852B/4853B/5283/5284/5285 (as amended).

(b) Pre- or post-taxi positioning of the aeroplanes should only be executed by barless towing if one of the following conditions are met:

(1) an aeroplane is protected by its own design from damage to the nose wheel steering system;

(2) a system/procedure is provided to alert the flight crew that damage referred to in (b)(1) may have or has occurred;

(3) the towing vehicle is designed to prevent damage to the aeroplane type; or

(4) the aeroplane manufacturer has published procedures and these are included in the operations manual.

AMC1 CAT.OP.MPA.210(b) Crew members at stations

CABIN CREW SEATING POSITIONS

(a) When determining cabin crew seating positions, the operator should ensure that they are:

(1) close to a floor level door/exit;

(2) provided with a good view of the area(s) of the passenger cabin for which the cabin crew member is responsible; and

(3) evenly distributed throughout the cabin, in the above order of priority.

(b) Item (a) should not be taken as implying that, in the event of there being more cabin crew stations than required cabin crew, the number of cabin crew members should be increased.

GM1 CAT.OP.MPA.210 Crew members at stations

MITIGATING MEASURES — CONTROLLED REST

(a) This GM addresses controlled rest taken by the minimum certified flight crew. It is not related to planned in-flight rest by members of an augmented crew.

(b) Although flight crew members should stay alert at all times during flight, unexpected fatigue can occur as a result of sleep disturbance and circadian disruption. To cover for this unexpected fatigue, and to regain a high level of alertness, a controlled rest procedure in the flight crew compartment, organised by the commander may be used, if workload permits and a controlled rest procedure is described in the operations manual. 'Controlled rest' means a period of time 'off task' that may include actual sleep. The use of controlled rest has been shown to significantly increase the levels of alertness during the later phases of flight, particularly after the top of descent, and is considered to be good use of crew resource management (CRM) principles. Controlled rest should be used in conjunction with other on-board fatigue management countermeasures such as physical exercise, bright cockpit illumination at appropriate times, balanced eating and drinking, and intellectual activity.

(c) Controlled rest taken in this way should not be considered to be part of a rest period for the purposes of calculating flight time limitations, nor used to justify any duty period. Controlled rest may be used to manage both sudden unexpected fatigue and fatigue that is expected to become more severe during higher workload periods later in the flight. Controlled rest is not related to fatigue management, which is planned before flight.

(d) Controlled rest periods should be agreed according to individual needs and the accepted principles of CRM; where the involvement of the cabin crew is required, consideration should be given to their workload.

(e) When applying controlled rest procedures, the commander should ensure that:

(1) the other flight crew member(s) is (are) adequately briefed to carry out the duties of the resting flight crew member;

(2) one flight crew member is fully able to exercise control of the aircraft at all times; and

(3) any system intervention that would normally require a cross-check according to multi-crew principles is avoided until the resting flight crew member resumes his/her duties.

(f) Controlled rest procedures should satisfy all of the following criteria:

(1) Only one flight crew member at a time should take rest at his/her station; the restraint device should be used and the seat positioned to minimise unintentional interference with the controls.

(2) The rest period should be no longer than 45 minutes (in order to limit any actual sleep to approximately 30 minutes) to limit deep sleep and associated long recovery time (sleep inertia).

(3) After this 45-minute period, there should be a recovery period of 20 minutes to overcome sleep inertia during which control of the aircraft should not be entrusted to the flight crew member. At the end of this recovery period, an appropriate briefing should be given.

(4) In the case of two-crew operations, means should be established to ensure that the non-resting flight crew member remains alert. This may include:

(i) appropriate alarm systems;

(ii) on-board systems to monitor flight crew activity; and

(iii) frequent cabin crew checks. In this case, the commander should inform the senior cabin crew member of the intention of the flight crew member to take controlled rest, and of the time of the end of that rest; frequent contact should be established between the non-resting flight crew member and the cabin crew by communication means, and the cabin crew should check that the resting flight crew member is awake at the end of the period.

(5) There should be a minimum of 20 minutes between two subsequent controlled rest periods in order to overcome the effects of sleep inertia and allow for adequate briefing.

(6) If necessary, a flight crew member may take more than one rest period, if time permits, on longer sectors, subject to the restrictions above.

(7) Controlled rest periods should terminate at least 30 minutes before the top of descent.

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': the process of protecting the aircraft to prevent contamination due to existing or expected weather, typically by applying anti-icing fluids on uncontaminated aircraft surfaces.

(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': the process of eliminating frozen contamination from aircraft surfaces, typically by applying de-icing fluids.

(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 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) post-treatment checks;

(4) pre-take-off checks;

(5) pre-take-off contamination checks;

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

(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 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 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 is needed/desired, the use of a less diluted 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 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 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 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 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) Hold-over protection & LWE systems

The operator should publish in the OM, when required, the 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 training programmes (including communication training) for flight crew and for other personnel involved in de-icing operations should include additional training if any of the following 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 training on 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) 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).

(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.

(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 snow exceeding certain intensities, high wind velocity, and fast-dropping OAT. No 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) SAE AS6285 'Aircraft Ground Deicing/Anti-Icing Processes';

(iv) SAE AS6286 'Aircraft Ground Deicing/Anti-Icing Training and Qualification Programme';

(v) SAE AS6332 'Aircraft Ground Deicing/Anti-icing Quality Management';

(vi) SAE ARP6257 'Aircraft Ground De/Anti-Icing Communication Phraseology for Flight and Ground Crews';

(vii) FAA Holdover Time Guidelines

(viii) FAA 8900.xxx series Notice 'Revised FAA-Approved Deicing Programme Updates, Winter 20xx-20yy'.

(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. 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 than Type I fluids in similar conditions.

(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 (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 begins at the commencement of de-icing/anti-icing. With a two-step procedure, the 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 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 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.255 Ice and other contaminants — flight procedures

FLIGHT IN EXPECTED OR ACTUAL ICING CONDITIONS — AEROPLANES

(a) In accordance with the air operations requirements of the Air Navigation Act B.E 2497 and Kingdom of Thailand Civil Aviation Regulations in case of flight into known or expected icing conditions, the aircraft must be certified, equipped and/or treated to operate safely in such conditions. The procedures to be established by the operator should take account of the design, the equipment, the configuration of the aircraft and the necessary training. For these reasons, different aircraft types operated by the same company may require the development of different procedures. In every case, the relevant limitations are those which are defined in the AFM and other documents produced by the manufacturer.

(b) The operator should ensure that the procedures take account of the following:

(1) the equipment and instruments which must be serviceable for flight in icing conditions;

(2) the limitations on flight in icing conditions for each phase of flight. These limitations may be imposed by the aircraft's de-icing or anti-icing equipment or the necessary performance corrections that have to be made;

(3) the criteria the flight crew should use to assess the effect of icing on the performance and/or controllability of the aircraft;

(4) the means by which the flight crew detects, by visual cues or the use of the aircraft's ice detection system, that the flight is entering icing conditions; and

(5) the action to be taken by the flight crew in a deteriorating situation (which may develop rapidly) resulting in an adverse effect on the performance and/or controllability of the aircraft, due to:

(i) the failure of the aircraft's anti-icing or de-icing equipment to control a build-up of ice; and/or

(ii) ice build-up on unprotected areas.

(c) Training for dispatch and flight in expected or actual icing conditions. The content of the operations manual should reflect the training, both conversion and recurrent, which flight crew, cabin crew and all other relevant operational personnel require in order to comply with the procedures for dispatch and flight in icing conditions:

(1) For the flight crew, the training should include:

(i) instruction on how to recognise, from weather reports or forecasts which are available before flight commences or during flight, the risks of encountering icing conditions along the planned route and on how to modify, as necessary, the departure and in-flight routes or profiles;

(ii) instruction on the operational and performance limitations or margins;

(iii) the use of in-flight ice detection, anti-icing and de-icing systems in both normal and abnormal operation; and

(iv) instruction on the differing intensities and forms of ice accretion and the consequent action which should be taken.

(2) For the cabin crew, the training should include:

(i) awareness of the conditions likely to produce surface contamination; and

(ii) the need to inform the flight crew of significant ice accretion.

AMC2 CAT.OP.MPA.255 Ice and other contaminants — flight procedures

FLIGHT IN EXPECTED OR ACTUAL ICING CONDITIONS — HELICOPTERS

(a) The procedures to be established by the operator should take account of the design, the equipment and the configuration of the helicopter and also of the training which is needed. For these reasons, different helicopter types operated by the same company may require the development of different procedures. In every case, the relevant limitations are those that are defined in the AFM and other documents produced by the manufacturer.

(b) For the required entries in the operations manual, the procedural principles that apply to flight in icing conditions are referred to under Subpart MLR of TCAR OPS Part ORO (ORO.MLR) and should be cross- referenced, where necessary, to supplementary, type-specific data.

(c) Technical content of the procedures

The operator should ensure that the procedures take account of the following:

(1) CAT.IDE.H.165;

(2) the equipment and instruments that should be serviceable for flight in icing conditions;

(3) the limitations on flight in icing conditions for each phase of flight. These limitations may be specified by the helicopter's de-icing or anti-icing equipment or the necessary performance corrections which have to be made;

(4) the criteria the flight crew should use to assess the effect of icing on the performance and/or controllability of the helicopter;

(5) the means by which the flight crew detects, by visual cues or the use of the helicopter's ice detection system, that the flight is entering icing conditions; and

(6) the action to be taken by the flight crew in a deteriorating situation (which may develop rapidly) resulting in an adverse effect on the performance and/or controllability of the helicopter, due to either:

(i) the failure of the helicopter's anti-icing or de-icing equipment to control a build-up of ice; and/or

(ii) ice build-up on unprotected areas.

(d) Training for dispatch and flight in expected or actual icing conditions

The content of the operations manual, Part D, should reflect the training, both conversion and recurrent, which flight crew, and all other relevant operational personnel will require in order to comply with the procedures for dispatch and flight in icing conditions.

(1) For the flight crew, the training should include:

(i) instruction on how to recognise, from weather reports or forecasts that are available before flight commences or during flight, the risks of encountering icing conditions along the planned route and on how to modify, as necessary, the departure and in-flight routes or profiles;

(ii) instruction on the operational and performance limitations or margins;

(iii) the use of in-flight ice detection, anti-icing and de-icing systems in both normal and abnormal operation; and

(iv) instruction on the differing intensities and forms of ice accretion and the consequent action which should be taken.

(2) For crew members other than flight crew, the training should include;

(i) awareness of the conditions likely to produce surface contamination; and

(ii) the need to inform the flight crew of significant ice accretion.

AMC1 CAT.OP.MPA.265(a) Take-off conditions

METEOROLOGICAL CONDITIONS FOR TAKE-OFF — RUNWAYS

(a) The commander should not commence take-off unless the weather conditions at the aerodrome of departure are equal to or better than the applicable minima for landing at that aerodrome unless a weather-permissible take-off alternate aerodrome is available.

(b) If the reported VIS is below the minimum specified for take-off and RVR is not reported, then take-off should only be commenced if the commander can determine that the visibility along the take-off runway is equal to or better than the required minimum.

AMC1 CAT.OP.MPA.281 In-flight fuel management — helicopters

COMPLEX MOTOR-POWERED HELICOPTERS, OTHER THAN LOCAL OPERATIONS

The operator should base in-flight fuel management procedures on the following criteria:

(a) In-flight fuel checks

(1) The commander should ensure that fuel checks are carried out in-flight at regular intervals. The remaining fuel should be recorded and evaluated to:

(i) compare actual consumption with planned consumption;

(ii) check that the remaining fuel is sufficient to complete the flight; and

(iii) determine the expected fuel remaining on arrival at the destination.

(2) The relevant fuel data should be recorded.

(b) In-flight fuel management

(1) If, as a result of an in-flight fuel check, the expected fuel remaining on arrival at the destination is less than the required alternate fuel plus final reserve fuel, the commander should:

(i) divert; or

(ii) replan the flight in accordance with SPA.HOFO.120 unless he/she considers it safer to continue to the destination.

(2) At an onshore destination, when two suitable, separate touchdown and lift-off areas are available and the weather conditions at the destination comply with those specified for planning in CAT.OP.MPA.245 (a)(2), the commander may permit alternate fuel to be used before landing at the destination.

(c) If, as a result of an in-flight fuel check on a flight to an isolated destination, planned in accordance with (b), the expected fuel remaining at the point of last possible diversion is less than the sum of:

(1) fuel to divert to an operating site selected in accordance with CAT.OP.MPA.181 (a);

(2) contingency fuel; and

(3) final reserve fuel,

the commander should:

(i) divert; or

(ii) proceed to the destination provided that at onshore destinations, two suitable, separate touchdown and lift-off areas are available at the destination and the expected weather conditions at the destination comply with those specified for planning in CAT.OP.MPA.245 (a)(2).

GM1 CAT.OP.MPA.281 In-flight fuel management — helicopters

(a) the commander should advise ATC of a minimum fuel state by declaring MINIMUM FUEL when, having committed to land at a specific landing site, the pilot calculates that any change to the existing clearance to that landing site, or other air traffic delays may result in landing with the planned final reserve fuel.

(b) the commander should declare a situation of fuel emergency by broadcasting MAYDAY MAYDAY MAYDAY, when the useable fuel estimated to be made available upon landing at the nearest landing site, where a safe landing can be made is less than the required final reserve fuel.

GM1 CAT.OP.MPA.290 Ground proximity detection

TERRAIN AWARENESS WARNING SYSTEM (TAWS) FLIGHT CREW TRAINING PROGRAMMES

(a) Introduction

(1) This GM contains performance-based training objectives for TAWS flight crew training.

(2) The training objectives cover five areas: theory of operation; pre-flight operations; general in-flight operations; response to TAWS cautions; and response to TAWS warnings.

(3) The term 'TAWS' in this GM means a ground proximity warning system (GPWS) enhanced by a forward-looking terrain avoidance function. Alerts include both cautions and warnings.

(4) The content of this GM is intended to assist operators who are producing training programmes. The information it contains has not been tailored to any specific aircraft or TAWS equipment, but highlights features which are typically available where such systems are installed. It is the responsibility of the individual operator to determine the applicability of the content of this guidance material to each aircraft and TAWS equipment installed and their operation. Operators should refer to the AFM and/or aircraft/flight crew operating manual (A/FCOM), or similar documents, for information applicable to specific configurations. If there should be any conflict between the content of this guidance material and that published in the other documents described above, then information contained in the AFM or A/FCOM will take precedence.

(b) Scope

(1) The scope of this GM is designed to identify training objectives in the areas of: academic training; manoeuvre training; initial evaluation; and recurrent qualification. Under each

of these four areas, the training material has been separated into those items which are considered essential training items and those that are considered to be desirable. In each area, objectives and acceptable performance criteria are defined.

(2) No attempt is made to define how the training programme should be implemented. Instead, objectives are established to define the knowledge that a pilot operating a TAWS is expected to possess and the performance expected from a pilot who has completed TAWS training. However, the guidelines do indicate those areas in which the pilot receiving the training should demonstrate his/her understanding, or performance, using a real-time, interactive training device, i.e. a flight simulator. Where appropriate, notes are included within the performance criteria which amplify or clarify the material addressed by the training objective.

(c) Performance-based training objectives

(1) TAWS academic training

(i) This training is typically conducted in a classroom environment. The knowledge demonstrations specified in this section may be completed through the successful completion of written tests or by providing correct responses to non-real-time computer-based training (CBT) questions.

(ii) Theory of operation. The pilot should demonstrate an understanding of TAWS operation and the criteria used for issuing cautions and warnings. This training should address system operation. Objective: To demonstrate knowledge of how a TAWS functions. Criteria: The pilot should demonstrate an understanding of the following functions:

(A) Surveillance

(a) The GPWS computer processes data supplied from an air data computer, a radio altimeter, an instrument landing system (ILS)/microwave landing system (MLS)/multi-mode (MM) receiver, a roll attitude sensor, and actual position of the surfaces and of the landing gear.

(b) The forward-looking terrain avoidance function utilises an accurate source of known aircraft position, such as that which may be provided by a flight management system (FMS) or GPS, or an electronic terrain database. The source and scope of the terrain, obstacle and airport data, and features such as the terrain clearance floor, the runway picker, and geometric altitude (where provided) should all be described.

(c) Displays required to deliver TAWS outputs include a loudspeaker for voice announcements, visual alerts (typically amber and red lights), and a terrain awareness display (that may be combined with other displays). In addition, means should be provided for indicating the status of the TAWS and any partial or total failures that may occur.

(B) Terrain avoidance. Outputs from the TAWS computer provides visual and audio synthetic voice cautions and warnings to alert the flight crew about potential conflicts with terrain and obstacles.

(C) Alert thresholds. Objective: To demonstrate knowledge of the criteria for issuing cautions and warnings. Criteria: The pilot should be able to demonstrate an understanding of the methodology used by a TAWS to issue cautions and alerts and the general criteria for the issuance of these alerts, including:

(a) basic GPWS alerting modes specified in the ICAO Standard:

— Mode 1: excessive sink rate;

— Mode 2: excessive terrain closure rate;

— Mode 3: descent after take-off or go-around;

— Mode 4: unsafe proximity to terrain;

— Mode 5: descent below ILS glide slope (caution only); and

(b) an additional, optional alert mode — Mode 6: radio altitude call-out (information only); TAWS cautions and warnings which alert the flight crew to obstacles and terrain ahead of the aircraft in line with or adjacent to its projected flight path (forward-looking terrain avoidance (FLTA) and premature descent alert (PDA) functions).

(D) TAWS limitations. Objective: To verify that the pilot is aware of the limitations of TAWS. Criteria: The pilot should demonstrate knowledge and an understanding of TAWS limitations identified by the manufacturer for the equipment model installed, such as:

(a) navigation should not be predicated on the use of the terrain display;

(b) unless geometric altitude data are provided, use of predictive TAWS functions is prohibited when altimeter subscale settings display 'QFE';

(c) nuisance alerts can be issued if the aerodrome of intended landing is not included in the TAWS airport database;

(d) in cold weather operations, corrective procedures should be implemented by the pilot unless the TAWS has in-built compensation, such as geometric altitude data;

(e) loss of input data to the TAWS computer could result in partial or total loss of functionality. Where means exist to inform the flight crew that functionality has been degraded, this should be known and the consequences understood;

(f) radio signals not associated with the intended flight profile (e.g. ILS glide path transmissions from an adjacent runway) may cause false alerts;

(g) inaccurate or low accuracy aircraft position data could lead to false or non-annunciation of terrain or obstacles ahead of the aircraft; and

(h) minimum equipment list (MEL) restrictions should be applied in the event of the TAWS becoming partially or completely unserviceable. (It should be noted that basic GPWS has no forward-looking capability.)

(E) TAWS inhibits. Objective: To verify that the pilot is aware of the conditions under which certain functions of a TAWS are inhibited. Criteria: The pilot should demonstrate knowledge and an understanding of the various TAWS inhibits, including the following means of:

(a) silencing voice alerts;

(b) inhibiting ILS glide path signals (as may be required when executing an ILS back beam approach);

(c) inhibiting flap position sensors (as may be required when executing an approach with the flaps not in a normal position for landing);

(d) inhibiting the FLTA and PDA functions; and

(e) selecting or deselecting the display of terrain information, together with appropriate annunciation of the status of each selection.

(2) Operating procedures. The pilot should demonstrate the knowledge required to operate TAWS avionics and to interpret the information presented by a TAWS. This training should address the following topics:

(i) Use of controls. Objective: To verify that the pilot can properly operate all TAWS controls and inhibits. Criteria: The pilot should demonstrate the proper use of controls, including the following means by which:

(A) before flight, any equipment self-test functions can be initiated;

(B) TAWS information can be selected for display; and

(C) all TAWS inhibits can be operated and what the consequent annunciations mean with regard to loss of functionality.

(ii) Display interpretation. Objective: To verify that the pilot understands the meaning of all information that can be annunciated or displayed by a TAWS. Criteria: The pilot should demonstrate the ability to properly interpret information annunciated or displayed by a TAWS, including the following:

(A) knowledge of all visual and aural indications that may be seen or heard;

(B) response required on receipt of a caution;

(C) response required on receipt of a warning; and

(D) response required on receipt of a notification that partial or total failure of the TAWS has occurred (including annunciation that the present aircraft position is of low accuracy).

(iii) Use of basic GPWS or use of the FLTA function only. Objective: To verify that the pilot understands what functionality will remain following loss of the GPWS or of the FLTA function. Criteria: The pilot should demonstrate knowledge of how to recognise the following:

(A) un-commanded loss of the GPWS function, or how to isolate this function and how to recognise the level of the remaining controlled flight into terrain (CFIT) protection (essentially, this is the FLTA function); and

(B) un-commanded loss of the FLTA function, or how to isolate this function and how to recognise the level of the remaining CFIT protection (essentially, this is the basic GPWS).

(iv) Crew coordination. Objective: To verify that the pilot adequately briefs other flight crew members on how TAWS alerts will be handled. Criteria: The pilot should demonstrate that the pre-flight briefing addresses procedures that will be used in preparation for responding to TAWS cautions and warnings, including the following:

(A) the action to be taken, and by whom, in the event that a TAWS caution and/or warning is issued; and

(B) how multi-function displays will be used to depict TAWS information at take-off, in the cruise and for the descent, approach, landing (and any go-around). This will be in accordance with procedures specified by the operator, who will recognise that it may be more desirable that other data are displayed at certain phases of flight and that the terrain display has an automatic 'pop-up' mode in the event that an alert is issued.

(v) Reporting rules. Objective: To verify that the pilot is aware of the rules for reporting alerts to the controller and other authorities. Criteria: The pilot should demonstrate knowledge of the following:

(A) when, following recovery from a TAWS alert or caution, a transmission of information should be made to the appropriate ATC unit; and

(B) the type of written report that is required, how it is to be compiled, and whether any cross reference should be made in the aircraft technical log and/or voyage report (in accordance with procedures specified by the operator), following a flight in which the aircraft flight path has been modified in response to a TAWS alert, or if any part of the equipment appears not to have functioned correctly.

(vi) Alert thresholds. Objective: To demonstrate knowledge of the criteria for issuing cautions and warnings. Criteria: The pilot should be able to demonstrate an understanding of the methodology used by a TAWS to issue cautions and warnings and the general criteria for the issuance of these alerts, including awareness of the following:

(A) modes associated with basic GPWS, including the input data associated with each; and

(B) visual and aural annunciations that can be issued by TAWS and how to identify which are cautions and which are warnings.

(3) TAWS manoeuvre training. The pilot should demonstrate the knowledge required to respond correctly to TAWS cautions and warnings. This training should address the following topics:

(i) Response to cautions:

(A) Objective: To verify that the pilot properly interprets and responds to cautions. Criteria: The pilot should demonstrate an understanding of the need, without delay:

(a) to initiate action required to correct the condition which has caused the TAWS to issue the caution and to be prepared to respond to a warning, if this should follow; and

(b) if a warning does not follow the caution, to notify the controller of the new position, heading and/or altitude/flight level of the aircraft, and what the commander intends to do next.

(B) The correct response to a caution might require the pilot to:

(a) reduce a rate of descent and/or to initiate a climb;

(b) regain an ILS glide path from below, or to inhibit a glide path signal if an ILS is not being flown;

(c) select more flap, or to inhibit a flap sensor if the landing is being conducted with the intent that the normal flap setting will not be used;

(d) select gear down; and/or

(e) initiate a turn away from the terrain or obstacle ahead and towards an area free of such obstructions if a forward-looking terrain display indicates that this would be a good solution and the entire manoeuvre can be carried out in clear visual conditions.

(ii) Response to warnings. Objective: To verify that the pilot properly interprets and responds to warnings. Criteria: The pilot should demonstrate an understanding of the following:

(A) The need, without delay, to initiate a climb in the manner specified by the operator.

(B) The need, without delay, to maintain the climb until visual verification can be made that the aircraft will clear the terrain or obstacle ahead or until above the appropriate sector safe altitude (if certain about the location of the aircraft with respect to terrain) even if the TAWS warning stops. If, subsequently, the aircraft climbs up through the sector safe altitude, but the visibility does not allow the flight crew to confirm that the terrain hazard has ended, checks should be made to verify the location of the aircraft and to confirm that the altimeter subscale settings are correct.

(C) When the workload permits that, the flight crew should notify the air traffic controller of the new position and altitude/flight level, and what the commander intends to do next.

(D) That the manner in which the climb is made should reflect the type of aircraft and the method specified by the aircraft manufacturer (which should be reflected in the operations manual) for performing the escape manoeuvre. Essential aspects will include the need for an increase in pitch attitude, selection of maximum thrust, confirmation that external sources of drag (e.g. spoilers/speed brakes) are retracted, and respect of the stick shaker or other indication of eroded stall margin.

(E) That TAWS warnings should never be ignored. However, the pilot's response may be limited to that which is appropriate for a caution, only if:

(i) the aircraft is being operated by day in clear, visual conditions; and

(ii) it is immediately clear to the pilot that the aircraft is in no danger in respect of its configuration, proximity to terrain or current flight path.

(4) TAWS initial evaluation:

(i) The flight crew member's understanding of the academic training items should be assessed by means of a written test.

(ii) The flight crew member's understanding of the manoeuvre training items should be assessed in a FSTD equipped with TAWS visual and aural displays and inhibit selectors similar in appearance and operation to those in the aircraft which the pilot will fly. The results should be assessed by a synthetic flight instructor, synthetic flight examiner, type rating instructor or type rating examiner.

(iii) The range of scenarios should be designed to give confidence that proper and timely responses to TAWS cautions and warnings will result in the aircraft avoiding a CFIT accident. To achieve this objective, the pilot should demonstrate taking the correct action to prevent a caution developing into a warning and, separately, the escape manoeuvre needed in response to a warning. These demonstrations should take place when the external visibility is zero, though there is much to be learnt if, initially, the training is given in 'mountainous' or 'hilly' terrain with clear visibility. This training should comprise a sequence of scenarios, rather than be included in line oriented flight training (LOFT).

(iv) A record should be made, after the pilot has demonstrated competence, of the scenarios that were practised.

(5) TAWS recurrent training:

(i) TAWS recurrent training ensures that pilots maintain the appropriate TAWS knowledge and skills. In particular, it reminds pilots of the need to act promptly in response to cautions and warnings, and of the unusual attitude associated with flying the escape manoeuvre.

(ii) An essential item of recurrent training is the discussion of any significant issues and operational concerns that have been identified by the operator. Recurrent training should also address changes to TAWS logic, parameters or procedures and to any unique TAWS characteristics of which pilots should be aware.

(6) Reporting procedures:

(i) Verbal reports. Verbal reports should be made promptly to the appropriate air traffic control unit:

(A) whenever any manoeuvre has caused the aircraft to deviate from an air traffic clearance;

(B) when, following a manoeuvre which has caused the aircraft to deviate from an air traffic clearance, the aircraft has returned to a flight path which complies with the clearance; and/or

(C) when an air traffic control unit issues instructions which, if followed, would cause the pilot to manoeuvre the aircraft towards terrain or obstacle or it would appear from the display that a potential CFIT occurrence is likely to result.

(ii) Written reports. Written reports should be submitted in accordance with the operator's occurrence reporting scheme and they also should be recorded in the aircraft technical log:

(A) whenever the aircraft flight path has been modified in response to a TAWS alert (false, nuisance or genuine);

(B) whenever a TAWS alert has been issued and is believed to have been false; and/or

(C) if it is believed that a TAWS alert should have been issued, but was not.

(iii) Within this GM and with regard to reports:

(A) the term 'false' means that the TAWS issued an alert which could not possibly be justified by the position of the aircraft in respect to terrain and it is probable that a fault or failure in the system (equipment and/or input data) was the cause;

(B) the term 'nuisance' means that the TAWS issued an alert which was appropriate, but was not needed because the flight crew could determine by independent means that the flight path was, at that time, safe;

(C) the term 'genuine' means that the TAWS issued an alert which was both appropriate and necessary; and

(D) the report terms described in (c)(6)(iii) are only meant to be assessed after the occurrence is over, to facilitate subsequent analysis, the adequacy of the equipment and the programmes it contains. The intention is not for the flight crew to attempt to classify an alert into any of these three categories when visual and/or aural cautions or warnings are annunciated.

GM1 CAT.OP.MPA.295 Use of airborne collision avoidance system (ACAS)

GENERAL

(a) The ACAS operational procedures and training programmes established by the operator should take into account this GM. It incorporates advice contained in:

(1) ICAO Doc 8168 (PANS-OPS), Volume III[1] Aircraft Operating Procedures, Chapter 3 and Attachment A (ACAS training guidelines for pilots) and Attachment B (ACAS high vertical rate (HVR) encounters) to Section 4, Chapter 3; and

(2) ICAO PANS-ATM[2] Chapters 12 and 15 phraseology requirements;

(3) ICAO Annex 10, Volume IV; and

(4) ICAO PANS-ATM.

(b) Additional guidance material on ACAS may be referred to, including information available from such sources as EUROCONTROL.

ACAS FLIGHT CREW TRAINING PROGRAMMES

(c) During the implementation of ACAS, several operational issues were identified which had been attributed to deficiencies in flight crew training programmes. As a result, the issue of flight crew training has been discussed within the ICAO, which has developed guidelines for operators to use when designing training programmes.

(d) This GM contains performance-based training objectives for ACAS II flight crew training. Information contained in this paper related to traffic advisories (TAs) is also applicable to ACAS I and ACAS II users. The training objectives cover five areas: theory of operation; pre-flight operations; general in-flight operations; response to TAs; and response to resolution advisories (RAs).

(e) The information provided is valid for version 7 and 7.1 (ACAS II). Where differences arise, these are identified.

[1] ICAO Doc 8168 (Procedures for Air Navigation Services-Aircraft Operations), Volume III - Aircraft Operating Procedures

[2] ICAO Doc 4444-ATM/501 - PANS-ATM (Procedures for Air Navigation Services-Air Traffic Management).

(f) The performance-based training objectives are further divided into the areas of: academic training; manoeuvre training; initial evaluation and recurrent qualification. Under each of these four areas, the training material has been separated into those items which are considered essential training items and those which are considered desirable. In each area, objectives and acceptable performance criteria are defined.

(g) ACAS academic training

(1) This training is typically conducted in a classroom environment. The knowledge demonstrations specified in this section may be completed through the successful completion of written tests or through providing correct responses to non-real-time computer-based training (CBT) questions.

(2) Essential items

(i) Theory of operation. The flight crew member should demonstrate an understanding of ACAS II operation and the criteria used for issuing TAs and RAs. This training should address the following topics:

(A) System operation

Objective: to demonstrate knowledge of how ACAS functions.

Criteria: the flight crew member should demonstrate an understanding of the following functions:

(a) Surveillance

(1) ACAS interrogates other transponder-equipped aircraft within a nominal range of 14 NM.

(2) ACAS surveillance range can be reduced in geographic areas with a large number of ground interrogators and/or ACAS II-equipped aircraft.

(3) If the operator's ACAS implementation provides for the use of the Mode S extended squitter, the normal surveillance range may be increased beyond the nominal 14 NM. However, this information is not used for collision avoidance purposes.

(b) Collision avoidance

(1) TAs can be issued against any transponder-equipped aircraft which responds to the ICAO Mode C interrogations, even if the aircraft does not have altitude reporting capability.

(2) RAs can be issued only against aircraft that are reporting altitude and in the vertical plane only.

(3) RAs issued against an ACAS-equipped intruder are co-ordinated to ensure complementary RAs are issued.

(4) Failure to respond to an RA deprives own aircraft of the collision protection provided by own ACAS.

(5) Additionally, in ACAS-ACAS encounters, failure to respond to an RA also restricts the choices available to the other aircraft's ACAS and thus renders the other aircraft's ACAS less effective than if own aircraft were not ACAS-equipped.

(B) Advisory thresholds

Objective: to demonstrate knowledge of the criteria for issuing TAs and RAs.

Criteria: the flight crew member should demonstrate an understanding of the methodology used by ACAS to issue TAs and RAs and the general criteria for the issuance of these advisories, including the following:

(a) ACAS advisories are based on time to closest point of approach (CPA) rather than distance. The time should be short and vertical separation should be small, or projected to be small, before an advisory can be issued. The separation standards provided by ATS are different from the miss distances against which ACAS issues alerts.

(b) Thresholds for issuing a TA or an RA vary with altitude. The thresholds are larger at higher altitudes.

(c) A TA occurs from 15 to 48 seconds and an RA from 15 to 35 seconds before the projected CPA.

(d) RAs are chosen to provide the desired vertical miss distance at CPA. As a result, RAs can instruct a climb or descent through the intruder aircraft's altitude.

(C) ACAS limitations

Objective: to verify that the flight crew member is aware of the limitations of ACAS.

Criteria: the flight crew member should demonstrate knowledge and understanding of ACAS limitations, including the following:

(a) ACAS will neither track nor display non-transponder-equipped aircraft, nor aircraft not responding to ACAS Mode C interrogations.

(b) ACAS will automatically fail if the input from the aircraft's barometric altimeter, radio altimeter or transponder is lost.

(1) In some installations, the loss of information from other on board systems such as an inertial reference system (IRS) or attitude heading reference system (AHRS) may result in an ACAS failure. Individual operators should ensure that their flight crews are aware of the types of failure that will result in an ACAS failure.

(2) ACAS may react in an improper manner when false altitude information is provided to own ACAS or transmitted by another aircraft. Individual operators should ensure that their flight crew are aware of the types of unsafe conditions that can arise. Flight crew members should ensure that when they are advised, if their own aircraft is transmitting false altitude reports, an alternative altitude reporting source is selected, or altitude reporting is switched off.

(c) Some aeroplanes within 380 ft above ground level (AGL) (nominal value) are deemed to be 'on ground' and will not be displayed. If ACAS is able to determine an aircraft below this altitude is airborne, it will be displayed.

(d) ACAS may not display all proximate transponder-equipped aircraft in areas of high density traffic.

(e) The bearing displayed by ACAS is not sufficiently accurate to support the initiation of horizontal manoeuvres based solely on the traffic display.

(f) ACAS will neither track nor display intruders with a vertical speed in excess of 10 000 ft/min. In addition, the design implementation mayresult in some short-term errors in the tracked vertical speed of an intruder during periods of high vertical acceleration by the intruder.

(g) Ground proximity warning systems/ground collision avoidance systems (GPWSs/GCASs) warnings and wind shear warnings take precedence over ACAS advisories. When either a GPWS/GCAS or wind shear warning is active, ACAS aural annunciations will be inhibited and ACAS will automatically switch to the 'TA only' mode of operation.

(D) ACAS inhibits

Objective: to verify that the flight crew member is aware of the conditions under which certain functions of ACAS are inhibited.

Criteria: the flight crew member should demonstrate knowledge and understanding of the various ACAS inhibits, including the following:

(a) ‘Increase Descent’ RAs are inhibited below 1 450 ft AGL;

(b) ‘Descend’ RAs are inhibited below 1 100 ft AGL;

(c) all RAs are inhibited below 1 000 ft AGL;

(d) all TA aural annunciations are inhibited below 500 ft AGL; and

(e) altitude and configuration under which ‘Climb’ and ‘Increase Climb’ RAs are inhibited. ACAS can still issue ‘Climb’ and ‘Increase Climb’ RAs when operating at the aeroplane's certified ceiling. (In some aircraft types, ‘Climb’ or ‘Increase Climb’ RAs are never inhibited.)

(ii) Operating procedures

The flight crew member should demonstrate the knowledge required to operate the ACAS avionics and interpret the information presented by ACAS. This training should address the following:

(E) Use of controls

Objective: to verify that the pilot can properly operate all ACAS and display controls.

Criteria: demonstrate the proper use of controls including:

(a) aircraft configuration required to initiate a self-test;

(b) steps required to initiate a self-test;

(c) recognising when the self-test was successful and when it was unsuccessful. When the self-test is unsuccessful, recognising the reason for the failure and, if possible, correcting the problem;

(d) recommended usage of range selection. Low ranges are used in the terminal area and the higher display ranges are used in the en-route environment and in the transition between the terminal and en-route environment;

(e) recognising that the configuration of the display does not affect the ACAS surveillance volume;

(f) selection of lower ranges when an advisory is issued, to increase display resolution;

(g) proper configuration to display the appropriate ACAS information without eliminating the display of other needed information;

(h) if available, recommended usage of the above/below mode selector. The above mode should be used during climb and the below mode should be used during descent; and

(i) if available, proper selection of the display of absolute or relative altitude and the limitations of using this display if a barometric correction is not provided to ACAS.

(F) Display interpretation

Objective: to verify that the flight crew member understands the meaning of all information that can be displayed by ACAS. The wide variety of display implementations require the tailoring of some criteria. When the training programme is developed, these criteria should be expanded to cover details for the operator's specific display implementation.

Criteria: the flight crew member should demonstrate the ability to properly interpret information displayed by ACAS, including the following:

(a) other traffic, i.e. traffic within the selected display range that is not proximate traffic, or causing a TA or RA to be issued;

(b) proximate traffic, i.e. traffic that is within 6 NM and ±1 200 ft;

(c) non-altitude reporting traffic;

(d) no bearing TAs and RAs;

(e) off-scale TAs and RAs: the selected range should be changed to ensure that all available information on the intruder is displayed;

(f) TAs: the minimum available display range which allows the traffic to be displayed should be selected, to provide the maximum display resolution;

(g) RAs (traffic display): the minimum available display range of the traffic display which allows the traffic to be displayed should be selected, to provide the maximum display resolution;

(h) RAs (RA display): flight crew members should demonstrate knowledge of the meaning of the red and green areas or the meaning of pitch or flight path angle cues displayed on the RA display. Flight crew members should also demonstrate an understanding of the RA display limitations,i.e. if a vertical speed tape is used and the range of the tape is less than 2 500 ft/min, an increase rate RA cannot be properly displayed; and

(i) if appropriate, awareness that navigation displays oriented on 'Track-Up' may require a flight crew member to make a mental adjustment for drift angle when assessing the bearing of proximate traffic.

(G) Use of the TA-only mode

Objective: to verify that a flight crew member understands the appropriate times to select the TA-only mode of operation and the limitations associated with using this mode.

Criteria: the flight crew member should demonstrate the following:

(a) Knowledge of the operator's guidance for the use of TA only.

(b) Reasons for using this mode. If TA only is not selected when an airport is conducting simultaneous operations from parallel runways separated by less than 1 200 ft, and to some intersecting runways, RAs can be expected. If for any reason TA only is not selected and an RA is received in these situations, the response should comply with the operator's approved procedures.

(c) All TA aural annunciations are inhibited below 500 ft AGL. As a result, TAs issued below 500 ft AGL may not be noticed unless the TA display is included in the routine instrument scan.

(H) Crew coordination

Objective: to verify that the flight crew member understands how ACAS advisories will be handled.

Criteria: the flight crew member should demonstrate knowledge of the crew procedures that should be used when responding to TAs and RAs, including the following:

(a) task sharing between the pilot flying and the pilot monitoring;

(b) expected call-outs; and

(c) communications with ATC.

(I) Phraseology rules

Objective: to verify that the flight crew member is aware of the rules for reporting RAs to the controller.

Criteria: the flight crew member should demonstrate the following:

(a) the use of the phraseology contained in ICAO PANS-OPS;

(b) an understanding of the procedures contained in ICAO PANS-ATM and ICAO Annex 2; and

(c) the understanding that verbal reports should be made promptly to the appropriate ATC unit:

(1) whenever any manoeuvre has caused the aeroplane to deviate from an air traffic clearance;

(2) when, subsequent to a manoeuvre that has caused the aeroplane to deviate from an air traffic clearance, the aeroplane has returned to a flight path that complies with the clearance; and/or

(3) when air traffic issue instructions that, if followed, would cause the crew to manoeuvre the aircraft contrary to an RA with which they are complying.

(J) Reporting rules

Objective: to verify that the flight crew member is aware of the rules for reporting RAs to the operator.

Criteria: the flight crew member should demonstrate knowledge of where information can be obtained regarding the need for making written reports to various states when an RA is issued. Various States have different reporting rules and the material available to the flight crew member should be tailored to the operator's operating environment. For operators involved in commercial operations, this responsibility is satisfied by the flight crew member reporting to the operator according to the applicable reporting rules.

(3) Non-essential items: advisory thresholds

Objective: to demonstrate knowledge of the criteria for issuing TAs and RAs.

Criteria: the flight crew member should demonstrate an understanding of the methodology used by ACAS to issue TAs and RAs and the general criteria for the issuance of these advisories, including the following:

(i) the minimum and maximum altitudes below/above which TAs will not be issued;

(ii) when the vertical separation at CPA is projected to be less than the ACAS-desired separation, a corrective RA which requires a change to the existing vertical speed will be issued. This separation varies from 300 ft at low altitude to a maximum of 700 ft at high altitude;

(iii) when the vertical separation at CPA is projected to be just outside the ACAS-desired separation, a preventive RA that does not require a change to the existing vertical speed will be issued. This separation varies from 600 to 800 ft; and

(iv) RA fixed range thresholds vary between 0.2 and 1.1 NM.

(h) ACAS manoeuvre training

(1) Demonstration of the flight crew member's ability to use ACAS displayed information to properly respond to TAs and RAs should be carried out in a full flight simulator equipped with an ACAS display and controls similar in appearance and operation to those in the aircraft. If a full flight simulator is utilised, CRM should be practised during this training.

(2) Alternatively, the required demonstrations can be carried out by means of an interactive CBT with an ACAS display and controls similar in appearance and operation to those in the aircraft. This interactive CBT should depict scenarios in which real-time responses should be made. The flight crew member should be informed whether or not the responses made were correct. If the response was incorrect or inappropriate, the CBT should show what the correct response should be.

(3) The scenarios included in the manoeuvre training should include: corrective RAs; initial preventive RAs; maintain rate RAs; altitude crossing RAs; increase rate RAs; RA reversals; weakening RAs; and multi-aircraft encounters. The consequences of failure to respond correctly should be demonstrated by reference to actual incidents such as those publicised in EUROCONTROL ACAS II Bulletins (available on the EUROCONTROL website).

(i) TA responses

Objective: to verify that the pilot properly interprets and responds to TAs.

Criteria: the pilot should demonstrate the following:

(A) Proper division of responsibilities between the pilot flying and the pilot monitoring. The pilot flying should fly the aircraft using any type-specific procedures and be prepared to respond to any RA that might follow. For aircraft without an RA pitch display, the pilot flying should consider the likely magnitude of an appropriate pitch change. The pilot monitoring should provide updates on the traffic location shown on the ACAS display, using this information to help visually acquire the intruder.

(B) Proper interpretation of the displayed information. Flight crew members should confirm that the aircraft they have visually acquired is that which has caused the TA to be issued. Use should be made of all information shown on the display, note being taken of the bearing and range of the intruder (amber circle), whether it is above or below (data tag) and its vertical speed direction (trend arrow).

(C) Other available information should be used to assist in visual acquisition, including ATC 'party-line' information, traffic flow in use, etc.

(D) Because of the limitations described, the pilot flying should not manoeuvre the aircraft based solely on the information shown on the ACAS display. No attempt should be made to adjust the current flight path in anticipation of what an RA would advise, except that if own aircraft is approaching its cleared level at a high vertical rate with a TA present, vertical rate should be reduced to less than 1 500 ft/min.

(E) When visual acquisition is attained, and as long as no RA is received, normal right of way rules should be used to maintain or attain safe separation. No unnecessary manoeuvres should be initiated. The limitations of making manoeuvres based solely on visual acquisition, especially at high altitude or at night, or without a definite horizon should be demonstrated as being understood.

(ii) RA responses

Objective: to verify that the pilot properly interprets and responds to RAs. Criteria: the pilot should demonstrate the following:

(A) Proper response to the RA, even if it is in conflict with an ATC instruction and even if the pilot believes that there is no threat present.

(B) Proper task sharing between the pilot flying and the pilot monitoring. The pilot flying should respond to a corrective RA with appropriate control inputs. The pilot monitoring should monitor the response to the RA and should provide updates on the traffic location by checking the traffic display. Proper crew resource management (CRM) should be used.

(C) Proper interpretation of the displayed information. The pilot should recognise the intruder causing the RA to be issued (red square on display). The pilot should respond appropriately.

(D) For corrective RAs, the response should be initiated in the proper direction within five seconds of the RA being displayed. The change in vertical speed should be accomplished with an acceleration of approximately ¼ g (gravitational acceleration of 9.81 m/sec²).

(E) Recognition of the initially displayed RA being modified. Response to the modified RA should be properly accomplished, as follows:

(a) For increase rate RAs, the vertical speed change should be started within two and a half seconds of the RA being displayed. The change in vertical speed should be accomplished with an acceleration of approximately ⅓ g.

(b) For RA reversals, the vertical speed reversal should be started within two and a half seconds of the RA being displayed. The change in vertical speed should be accomplished with an acceleration of approximately ⅓ g.

(c) For RA weakenings, the vertical speed should be modified to initiate a return towards the original clearance.

(d) An acceleration of approximately ¼ g will be achieved if the change in pitch attitude corresponding to a change in vertical speed of 1 500 ft/min is accomplished in approximately 5 seconds, and of ⅓ g if the change is accomplished in approximately three seconds. The change in pitch attitude required to establish a rate of climb or descent of 1 500 ft/min from level flight will be approximately 6°when the true airspeed (TAS) is 150 kt, 4°at 250 kt, and 2°at 500 kt. (These angles are derived from the formula: 1 000 divided by TAS.).

(F) Recognition of altitude crossing encounters and the proper response to these RAs.

(G) For preventive RAs, the vertical speed needle or pitch attitude indication should remain outside the red area on the RA display.

(H) For maintain rate RAs, the vertical speed should not be reduced. Pilots should recognise that a maintain rate RA may result in crossing through the intruder's altitude.

(I) When the RA weakens, or when the green 'fly to' indicator changes position, the pilot should initiate a return towards the original clearance and when 'clear of conflict' is annunciated, the pilot should complete the return to the original clearance.

(J) The controller should be informed of the RA as soon as time and workload permit, using the standard phraseology.

(K) When possible, an ATC clearance should be complied with while responding to an RA. For example, if the aircraft can level at the assigned altitude while responding to RA (an 'adjust vertical speed' RA (version 7) or 'level off' (version 7.1)) it should be done; the horizontal (turn) element of an ATC instruction should be followed.

(L) Knowledge of the ACAS multi-aircraft logic and its limitations, and that ACAS can optimise separations from two aircraft by climbing or descending towards one of them. For example, ACAS only considers intruders that it considers to be a threat when selecting an RA. As such, it is possible for ACAS to issue an RA against one intruder that results in a manoeuvre towards another intruder which is not classified as a threat. If the second intruder becomes a threat, the RA will be modified to provide separation from that intruder.

(i) ACAS initial evaluation

(1) The flight crew member's understanding of the academic training items should be assessed by means of a written test or interactive CBT that records correct and incorrect responses to phrased questions.

(2) The flight crew member's understanding of the manoeuvre training items should be assessed in a full flight simulator equipped with an ACAS display and controls similar in appearance and operation to those in the aircraft the flight crew member will fly, and the results assessed by a qualified instructor, inspector, or check airman. The range of scenarios should include: corrective RAs; initial preventive RAs; maintain rate RAs; altitude crossing RAs; increase rate RAs; RA reversals; weakening RAs; and multi-threat encounters. The scenarios should also include demonstrations of the consequences of not responding to RAs, slow or late responses, and manoeuvring opposite to the direction called for by the displayed RA.

(3) Alternatively, exposure to these scenarios can be conducted by means of an interactive CBT with an ACAS display and controls similar in appearance and operation to those in the aircraft the pilot will fly. This interactive CBT should depict scenarios in which real-time responses should be made and a record made of whether or not each response was correct.

(j) ACAS recurrent training

(1) ACAS recurrent training ensures that flight crew members maintain the appropriate ACAS knowledge and skills. ACAS recurrent training should be integrated into and/or conducted in conjunction with other established recurrent training programmes. An essential item of recurrent training is the discussion of any significant issues and operational concerns that have been identified by the operator. Recurrent training should also address changes to ACAS logic, parameters or procedures and to any unique ACAS characteristics which flight crew members should be made aware of.

(2) It is recommended that the operator's recurrent training programmes using full flight simulators include encounters with conflicting traffic when these simulators are equipped with ACAS. The full range of likely scenarios may be spread over a 2-year period. If a full flight simulator, as described above, is not available, use should be made of interactive CBT that is capable of presenting scenarios to which pilot responses should be made in real time.

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

LANDING DISTANCE ASSESSMENT

(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.

GM1 CAT.OP.MPA.300(a) Approach and landing conditions — aeroplanes

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.301 Approach and landing conditions — helicopters

IN-FLIGHT DETERMINATION OF THE CONDITION OF THE FATO

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.

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

<table>
<tr><th>Runway surface condition</th><th>Surface condition descriptor</th><th>Depth</th><th>Notes</th><th>RWYCC</th></tr>
<tr><td>Dry</td><td></td><td>n/a</td><td></td><td>6</td></tr>
<tr><td rowspan="2">Wet</td><td>Damp (any visible dampness)</td><td rowspan="2">3 mm or less</td><td rowspan="2">Including wet and contaminated runways below 25 % coverage in each runway third</td><td rowspan="2">5</td></tr>
<tr><td>wet</td></tr>
<tr><td>Slippery wet</td><td></td><td></td><td></td><td>3</td></tr>
</table>

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, 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, 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

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.

GM1 CAT.OP.MPA.305 Commencement and continuation of approach

APPLICATION OF RVR OR VIS REPORTS — AEROPLANES

(a) There is no prohibition on the commencement of an approach based on the reported RVR or VIS. The restriction in CAT.OP.MPA.305 applies only if the RVR or VIS is reported and applies to. the continuation of the approach past a point where the aircraft is 1 000 ft above the aerodrome elevation or in the FAS, as applicable.

APPLICATION OF RVR OR VIS REPORTS — HELICOPTERS

(b) There is no prohibition on the commencement of an approach based on the reported RVR. The restriction in CAT.OP.MPA.305 applies to the continuation of the approach past a point where the aircraft is 1 000 ft above the aerodrome elevation or in the final approach segment as applicable. The prohibition to continue the approach applies only if the RVR is reported and it is below 550 m and below the operating minima. There is no prohibition based on VIS.

(c) If the reported RVR is 550 m or greater, but it is less than the RVR calculated in accordance with AMC5 CAT.OP.MPA.110, a go-around is likely to be necessary since visual reference may not be established at the DH or MDH. Similarly, in the absence of an RVR report, the reported visibility or a digital image may indicate that a go-around is likely. The commander should consider the available options, based on a thorough assessment of risk, such as diverting to an alternate, before commencing the approach.

APPLICATION OF RVR OR VIS REPORTS — ALL AIRCRAFT

(d) If a deterioration in the RVR or VIS is reported once the aircraft is below 1 000 ft or in the FAS, as applicable, then there is no requirement for the approach to be discontinued. In this situation, the normal visual reference requirements would apply at the DA/H.

(e) Where additional RVR information is provided (e.g. midpoint and stop end), this is advisory; such information may be useful to the pilot in order to determine whether there will be sufficient visual reference to control the aircraft during roll-out and taxi. For operations where the aircraft is controlled manually during roll-out, Table 1 (aeroplanes) in AMC1 SPA.LVO.100(a) and Table 3 (helicopters) in AMC2 SPA.LVO.100(a) provide an indication of the RVR (e.g. midpoint and stop end) that may be required to allow manual lateral control of the aircraft on the runway.

AMC1 CAT.OP.MPA.305(a) Commencement and continuation of approach

MINIMUM RVR FOR CONTINUATION OF APPROACH — AEROPLANES

(a) The touchdown RVR should be the controlling RVR.

(b) If the touchdown RVR is not reported, then the midpoint RVR should be the controlling RVR.

(c) Where the RVR is not available, CMV should be used except for the purpose of continuation of an approach in LVO in accordance with AMC10 CAT.OP.MPA.110.

AMC1 CAT.OP.MPA.305(b) Commencement and continuation of approach

MINIMUM RVR FOR CONTINUATION OF APPROACH — HELICOPTERS

(a) The touchdown RVR should be the controlling RVR.

(b) If the touchdown RVR is not reported, then the midpoint RVR should be the controlling RVR.

AMC1 CAT.OP.MPA.305(c) Commencement and continuation of approach

VISUAL REFERENCES FOR INSTRUMENT APPROACH OPERATIONS

For instrument approach operations Type A and CAT I instrument approach operations Type B, at least one of the visual references specified below should be distinctly visible and identifiable to the pilot at the MDA/H or the DA/H:

(a) elements of the approach lighting system;

(b) the threshold;

(c) the threshold markings;

(d) the threshold lights;

(e) the threshold identification lights;

(f) the visual glide path indicator;

(g) the TDZ or TDZ markings;

(h) the TDZ lights;

(i) the FATO/runway edge lights; or

(j) for helicopter PinS approaches, the identification beacon light and visual ground reference;

(k) for helicopter PinS approaches, the identifiable elements of the environment defined on the instrument chart;

(l) for helicopter PinS approaches with instructions to 'proceed VFR', sufficient visual cues to determine that VFR criteria are met; or

(m) other visual references specified in the operations manual.

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 TCAR OPS (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

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

GM1 CAT.OP.MPA.312 EFVS 200 operations

GENERAL

(a) EFVS operations exploit the improved visibility provided by the EFVS to extend the visual segment of an instrument approach. EFVSs cannot be used to extend the instrument segment of an approach and thus the DH for EFVS 200 operations is always the same as for the same approach conducted without EFVS.

(b) Equipment for EFVS 200 operations

(1) In order to conduct EFVS 200 operations, a certified EFVS is used (EFVS-A or EFVS-L). An EFVS is an enhanced vision system (EVS) that also incorporates a flight guidance system and displays the image on a head-up display (HUD) or equivalent display. The flight guidance system will incorporate aircraft flight information and flight symbology.

(2) In multi-pilot operations, a suitable display of EFVS sensory imagery is provided to the pilot monitoring.

(c) Suitable approach procedures

(1) Types of approach operation are specified in AMC1 CAT.OP.MPA.312(a)(2) EFVS 200 operations should be conducted as 3D approach operations. This may include operations based on NPA procedures, approach procedures with vertical guidance and precision approach procedures including approach operations requiring specific approvals, provided that the operator holds the necessary approvals.

(2) Offset approaches Refer to AMC1 CAT.OP.MPA.312(a)(2).

(3) Circling approaches EFVSs incorporate a HUD or an equivalent system so that the EFVS image of the scene ahead of the aircraft is visible in the pilot's forward external FOV. Circling operations require the pilot to maintain visual references that may not be directly ahead of the aircraft and may not be aligned with the current flight path. EFVSs cannot therefore be used in place of natural visual reference for circling approaches.

(d) Aerodrome operating minima for EFVS 200 operations determined in accordance with AMC1 CAT.OP.MPA.312(a)(8).

The performance of EFVSs depends on the technology used and weather conditions encountered. Table 1 'Operations utilising EFVS: RVR reduction' has been developed after an operational evaluation of two different EVSs both using infrared sensors, along with data and support provided by the FAA. Approaches were flown in a variety of conditions including fog, rain and snow showers, as well as at night to aerodromes located in mountainous terrain. Table 1 contains conservative figures to cater for the expected performance of infrared sensors in the variety of conditions that might be encountered. Some systems may have better capability than those used for the evaluation, but credit cannot be taken for such performance in EFVS 200 operations.

(e) The conditions for commencement and continuation of the approach in accordance with CAT.OP.MPA.305

Pilots conducting EFVS 200 operations may commence an approach and continue that approach below 1 000 ft above the aerodrome or into the FAS if the reported RVR or CMV is equal to or greater than the lowest RVR minima determined in accordance with AMC1 CAT.OP.MPA.312(a)(8) and if all the conditions for the conduct of EFVS 200 operations are met.

Should any equipment required for EFVS 200 operations be unserviceable or unavailable, the conditions to conduct EFVS 200 operations would not be satisfied, and the approach should not be commenced. In the event of failure of the equipment required for EFVS 200 operations after the aircraft descends below 1 000 ft above the aerodrome or into the FAS, the conditions of CAT.OP.MPA.305 would no longer be satisfied unless the RVR reported prior to commencement of the approach was sufficient for the approach to be flown without EFVS in lieu of natural vision.

(f) EFVS image requirements at the DA/H specified in AMC1 CAT.OP.MPA.312(a)(4)

The requirements for features to be identifiable on the EFVS image in order to continue the approach below the DH are more stringent than the visual reference requirements for the same approach flown without EFVS. The more stringent standard is needed because the EFVS might not display the colour of lights used to identify specific portions of the runway and might not consistently display the runway markings. Any visual approach path indicator using colour-coded lights may be unusable.

(g) Obstacle clearance in the visual segment

The 'visual segment' is the portion of the approach between the DH or the MAPt and the runway threshold. In the case of EFVS 200 operations, this part of the approach may be flown using the EFVS image as the primary reference and obstacles may not always be identifiable on an EFVS image. The operational assessment specified in AMC1 CAT.OP.MPA.312(a)(2) is therefore required to ensure obstacle clearance during the visual segment.

(h) Visual reference requirements at 200 ft above the threshold

For EFVS 200 operations, natural visual reference is required by a height of 200 ft above the runway threshold. The objective of this requirement is to ensure that the pilot will have sufficient visual reference to land. The visual reference should be the same as that required for the same approach flown without EFVS.

Some EFVSs may have additional requirements that have to be fulfilled at this height to allow the approach to continue, such as a requirement to check that elements of the EFVS display remain correctly aligned and scaled to the external view. Any such requirements will be detailed in the AFM and included in the operator's procedures.

(i) Specific approval for EFVS

In order to use an EFVS without natural visual reference below 200 ft above the threshold, the operator needs to hold a specific approval in accordance with Part SPA

(j) Go-around

A go-around will be promptly executed if the required visual references are not maintained on the EFVS image at any time after the aircraft has descended below the DA/H or if the required visual references are not distinctly visible and identifiable using natural vision after the aircraft is below 200 ft. It is considered more likely that an EFVS 200 operation could result in the initiation of a go-around below DA/H than the equivalent approach flown without EFVS, and thus the operational assessment required by AMC1 CAT.OP.MPA.312(a)(2) takes into account the possibility of a balked landing.

An obstacle free zone (OFZ) may be provided for CAT I precision approach procedures. Where an OFZ is not provided for a CAT I precision approach, this will be indicated on the approach chart. NPA procedures and approach procedures with vertical guidance (APV) provide obstacle clearance for the missed approach based on the assumption that a go-around is executed at the MAPt and not below the OCH.

AMC1 CAT.OP.MPA.312(a)(1) EFVS 200 operations

EQUIPMENT CERTIFICATION For EFVS 200 operations, the aircraft should be equipped with an approach system using EFVS-A or a landing system using EFVS-L.

AMC1 CAT.OP.MPA.312(a)(2) EFVS 200 operations

AERODROMES AND INSTRUMENT PROCEDURES SUITABLE FOR EFVS 200 OPERATIONS

(a) For EFVS 200 operations, the operator should verify the suitability of a runway before authorising EFVS operations to that runway through an operational assessment taking into account the following elements:

(1) the obstacle situation;

(2) the type of aerodrome lighting;

(3) the available IAPs;

(4) the aerodrome operating minima; and

(5) any non-standard conditions that may affect the operations.

(b) EFVS 200 operations should only be conducted as 3D operations, using an IAP in which the final approach track is offset by a maximum of 3 degrees from the extended centre line of the runway.

(c) The IAP should be designed in accordance with PANS-OPS, Volume I (ICAO Doc 8168) or equivalent criteria.

AMC2 CAT.OP.MPA.312(a)(2) EFVS 200 operations

VERIFICATION OF THE SUITABILITY OF RUNWAYS FOR EFVS 200 OPERATIONS

The operational assessment before authorising the use of a runway for EFVS 200 operations should be conducted as follows:

(a) Check whether the runway has been promulgated as suitable for EFVS operations or is certified as a precision approach runway category II or III by the State of the aerodrome. If this is so, then check whether and where the approach and runway lights installed (notably incandescent or LED lights) are adequate for the EFVS equipment used by the operator.

(b) If the check in point (a) above comes out negative (the runway is not promulgated as EFVS suitable or is not category II or III), then proceed as follows:

(1) For straight-in IAPs, US Standard for Terminal Instrument Procedures (TERPS) may be considered to be acceptable as an equivalent to PANS-OPS. If other design criteria than those in PANS-OPS or US TERPS are used, the operations should not be conducted.

(2) If an OFZ is established, this will ensure adequate obstacle protection from 960 m before the threshold. If an OFZ is not established or if the DH for the approach is above 250 ft, then check whether there is a visual segment surface (VSS).

(3) VSSs are required for procedures published after 15 March 2007, but the existence of the VSS has to be verified through the aeronautical information publication (AIP), operations manual Part C, or direct contact with the aerodrome. Where the VSS is established, it may

not be penetrated by obstacles. If the VSS is not established or is penetrated by obstacles and an OFZ is not established, then the operations should not be conducted. Note: obstacles of a height of less than 50 ft above the threshold may be disregarded when assessing the VSS.

(4) Runways with obstacles that require visual identification and avoidance should not be accepted.

(5) For the obstacle protection of a balked landing where an OFZ is not established, the operator may specify that pilots follow a departure procedure in the event of a balked landing, in which case it is necessary to verify that the aircraft will be able to comply with the climb gradients published for the instrument departure procedures for the expected landing conditions.

(6) Perform an assessment of the suitability of the runway which should include whether the approach and runway lights installed (notably incandescent or LED lights) are adequate for the EFVS equipment used by the operator.

(c) If the AFM stipulates specific requirements for approach procedures, then the operational assessment should verify that these requirements can be met.

AMC1 CAT.OP.MPA.312(a)(3) EFVS 200 operations

INITIAL TRAINING FOR EFVS 200 OPERATIONS

Operators should ensure that flight crew members complete the following conversion training before being authorised to conduct EFVS 200 operations unless credits related to training and checking for previous experience on similar aircraft types are defined in the operational suitability data established in accordance with EASA Part 21 or any equivalent material acceptable to the CAAT:

(a) A ground training course including at least the following:

(1) characteristics and limitations of HUDs or equivalent display systems including information presentation and symbology;

(2) EFVS sensor performance in different weather conditions, sensor limitations, scene interpretation, visual anomalies and other visual effects;

(3) EFVS display, control, modes, features, symbology, annunciations and associated systems and components;

(4) the interpretation of EFVS imagery;

(5) the interpretation of approach and runway lighting systems and display characteristics when using EFVS;

(6) pre-flight planning and selection of suitable aerodromes and approach procedures;

(7) principles of obstacle clearance requirements;

(8) the use and limitations of RVR assessment systems;

(9) normal, abnormal and emergency procedures for EFVS operations;

(10) the effect of specific aircraft/system malfunctions;

(11) human factors aspects of EFVS operations; and

(12) qualification requirements for pilots to obtain and retain approval for EFVS 200 operations.

(b) An aircraft/FSTD training course in two phases as follows:

(1) Phase one (EFVS 200 operations with aircraft and all equipment serviceable) — objectives:

(i) understand the operation of equipment required for EFVS 200 operations;

(ii) understand operating limitations of the installed EFVS;

(iii) practise the use of HUD or equivalent display systems;

(iv) practise the set-up and adjustment of EFVS equipment in different conditions (e.g. day and night);

(v) practise the monitoring of automatic flight control systems, EFVS information and status annunciators;

(vi) practise the interpretation of EFVS imagery;

(vii) become familiar with the features needed on the EFVS image to continue approach below DH;

(viii) practise the identification of visual references using natural vision while using EFVS equipment;

(ix) master the manual aircraft handling relevant to EFVS operations including, where appropriate, the use of the flare cue and guidance for landing;

(x) practise coordination with other crew members; and

(xi) become proficient at procedures for EFVS 200 operations.

(2) Phase one of the training should include the following exercises:

(i) the required checks for satisfactory functioning of equipment, both on the ground and in flight;

(ii) the use of HUD or equivalent display systems during at least approach, landing and go-around;

(iii) approach using the EFVSs installed on the aircraft to the appropriate DH and transition to natural vision for continuing approach and landing;

(iv) approach with all engines operating using the EFVS, down to the appropriate DH followed by a missed approach, all without external visual reference, as appropriate.

(3) Phase two (EFVS 200 operations with aircraft and equipment failures and degradations) — objectives:

(i) understand the effect of known aircraft unserviceabilities including use of the MEL;

(ii) understand the effect of failed or downgraded equipment on aerodrome operating minima;

(iii) understand the actions required in response to failures and changes in the status of the EFVS including HUD or equivalent display systems;

(iv) understand the actions required in response to failures above and below the DH;

(v) practise abnormal operations and incapacitation procedures; and (vi) become proficient at dealing with failures and abnormal situations during EFVS 200 operations.

(4) Phase two of the training should include the following exercises:

(i) approaches with engine failures at various stages of the approach;

(ii) approaches with failures of the EFVS at various stages of the approach, including failures between the DH and the height below which an approach should not be continued if natural visual reference is not acquired, require either:

(A) reversion to head down displays to control missed approach; or

(B) reversion to flight with downgraded or no guidance to control missed approaches from the DH or below, including those which may result in a touchdown on the runway;

(iii) incapacitation procedures appropriate to EFVS 200 operations;

(iv) failures and procedures applicable to the specific EFVS installation and aircraft type; and

(v) FSTD training including minimum eight approaches.

AMC2 CAT.OP.MPA.312(a)(3) EFVS 200 operations

RECURRENT TRAINING AND CHECKING FOR EFVS 200 OPERATIONS

(a) The operator should ensure that the pilots are competent to perform EFVS 200 operations. To do so, pilots should be trained every 6 months by performing at least two approaches on each type of aircraft operated.

(b) The operator should ensure that the pilots' competence to perform EFVS 200 operations is checked at each required operator proficiency check by performing at least two approaches on each type of aircraft operated, of which one should be flown without natural vision to 200 ft.

AMC3 CAT.OP.MPA.312(a)(3) EFVS 200 operations

RECENT EXPERIENCE REQUIREMENTS FOR EFVS 200 OPERATIONS

Pilots should complete a minimum of four approaches using the operator's procedures for EFVS 200 operations during the validity period of the operator proficiency check unless credits related to currency are defined in the operational suitability data established in accordance with EASA Part 21 or any equivalent material acceptable to the CAAT.

AMC4 CAT.OP.MPA.312(a)(3) EFVS 200 operations

DIFFERENCES TRAINING FOR EFVS 200 OPERATIONS

(a) The operator should ensure that the flight crew members authorised to conduct EFVS 200 operations are provided with differences training or familiarisation whenever there is a change to any of the following:

(1) the technology used in the flight guidance and flight control system;

(2) the HUD or equivalent display systems;

(3) the operating procedures.

(b) The differences training should:

(1) meet the objectives of the appropriate initial training course;

(2) take into account the flight crew members' previous experience; and

(3) take into account the operational suitability data established in accordance with EASA Part 21 or any equivalent material acceptable to the CAAT.

AMC5 CAT.OP.MPA.312(a)(3) EFVS 200 operations

TRAINING FOR EFVS 200 OPERATIONS

If a flight crew member is to be authorised to operate as pilot flying and pilot monitoring during EFVS 200 operations, then the flight crew member should complete the required FSTD training for each operating capacity.

GM1 CAT.OP.MPA.312(a)(3) EFVS 200 operations

RECURRENT CHECKING FOR EFVS 200 OPERATIONS

In order to provide the opportunity to practise decision-making in the event of system failures and failure to acquire natural visual reference, the recurrent training and checking for EFVS 200 operations is recommended to periodically include different combinations of equipment failures, go-around due to loss of visual reference, and landings.

AMC1 CAT.OP.MPA.312(a)(4) EFVS 200 operations

OPERATING PROCEDURES FOR EFVS 200 OPERATIONS

(a) When conducting EFVS 200 operations:

(1) the pilot flying should use the EFVS throughout the approach;

(2) in multi-pilot operations, a suitable display of EFVS sensory imagery should be provided to the pilot monitoring;

(3) the approach between the FAF and the DA/H should be flown using vertical flight path guidance;

(4) the approach may be continued below the DA/H provided that the pilot can identify on the EFVS image either:

(i) the approach light system; or

(ii) both of the following:

(A) the runway threshold identified by the beginning of the runway landing surface, the threshold lights or the runway end identifier lights;

(B) the TDZ identified by the TDZ lights, the TDZ runway markings or the runway lights; and

(5) a missed approach should be executed promptly if the required visual reference is not distinctly visible and identifiable to the pilot without reliance on the EFVS by 200 ft above the threshold.

(b) Operating procedures for EFVS 200 operations should:

(1) be consistent with the AFM;

(2) be appropriate to the technology and equipment to be used;

(3) specify the duties and responsibilities of each flight crew member in each relevant phase of flight;

(4) ensure that the flight crew workload is managed to facilitate effective decision-making and monitoring of the aircraft; and

(5) deviate to the minimum extent practicable from normal procedures used for routine operations.

(c) Operating procedures for EFVS 200 operations should include:

(1) required checks for the satisfactory functioning of the aircraft equipment, both before departure and in flight;

(2) correct seating and eye position;

(3) determination of aerodrome operating minima;

(4) required visual references at the DH;

(5) the action to be taken if natural visual reference is not acquired by 200 ft;

(6) the action to be taken in the event of loss of the required visual reference; and

(7) procedures for balked landing.

(d) Operating procedures for EFVS 200 operations should be included in the operations manual.

AMC1 CAT.OP.MPA.312(a)(8) EFVS 200 operations

AERODROME OPERATING MINIMA — EFVS 200 OPERATIONS

When conducting EFVS 200 operations:

(a) the DA/H used should be the same as for operations without EFVS;

(b) the lowest RVR minima to be used should be determined by reducing the RVR presented in:

(1) Table 9 in AMC5 CAT.OP.MPA.110 in accordance with Table 1 below for aeroplanes;

(2) Table 13 in AMC6 CAT.OP.MPA.110 in accordance with Table 1 below for helicopters;

(c) in case of failed or downgraded equipment, Table 17 in AMC11 CAT.OP.MPA.110 should apply.

Table 1 Operations utilising EFVS: RVR reduction

RVR presented in Table 9 in AMC5 CAT.OP.MPA.110 and Table 13 in AMC6 CAT.OP.MPA.110	RVR (m) for EFVS 200 operations
550	550
600	550
650	550
700	550
750	550
800	550
900	600
1 000	650
1 100	750
1 200	800
1 300	900
1 400	900
1 500	1 000
1 600	1 100
1 700	1 100
1 800	1 200
RVR presented in Table 9 in AMC5 CAT.OP.MPA.110 and Table 13 in AMC6 CAT.OP.MPA.110	**RVR (m) for EFVS 200 operations**
1 900	1 300
2 000	1 300
2 100	1 400
2 200	1 500
2 300	1 500
2 400	1 600

AMC1 CAT.OP.MPA.312(c) EFVS 200 operations

EFVS 200 WITH EVSs MEETING THE MINIMUM CRITERIA

The EVS should be certified before 1 January 2022 as 'EVS with an operational credit'.

GM1 CAT.OP.MPA.312(c) EFVS 200 operations

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GM1 CAT.OP.MPA.315 Flight hours reporting — helicopters

FLIGHT HOURS REPORTING

(a) The requirement in CAT.OP.MPA.315 may be achieved by making available either:

(1) the flight hours flown by each helicopter — identified by its serial number and registration mark — during the previous calendar year; or

(2) the total flight hours of each helicopter — identified by its serial number and registration mark — on the 31st of December of the previous calendar year.

(b) Where possible, the operator should have available, for each helicopter, the breakdown of hours for CAT operations. If the exact hours for the functional activity cannot be established, the estimated proportion will be sufficient.

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SUBPART C: AIRCRAFT PERFORMANCE AND OPERATING LIMITATIONS

SECTION 1 - Aeroplanes

CHAPTER 1 - General requirements

Note; No AMC / GM for Chapter 1

CHAPTER 2 - Performance class A

AMC1 CAT.POL.A.200 General

WET AND CONTAMINATED RUNWAY DATA

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. The RWYCC is reported through an RCR in the SNOWTAM format in accordance with ICAO Annex 15.

AMC1 CAT.POL.A.205 Take-off

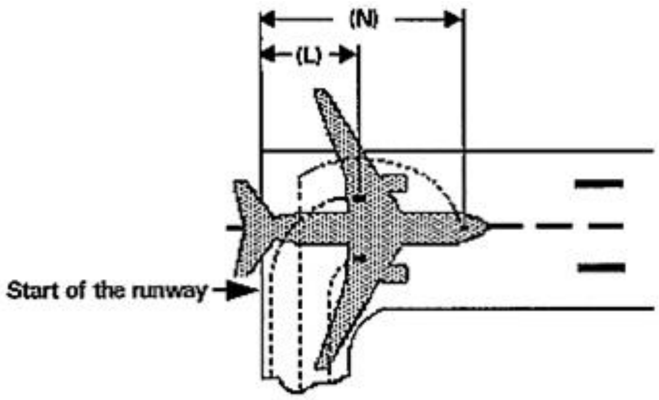
LOSS OF RUNWAY LENGTH DUE TO ALIGNMENT

(a) The length of the runway that is declared for the calculation of take-off distance available (TODA), accelerate-stop distance available (ASDA) and take-off run available (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

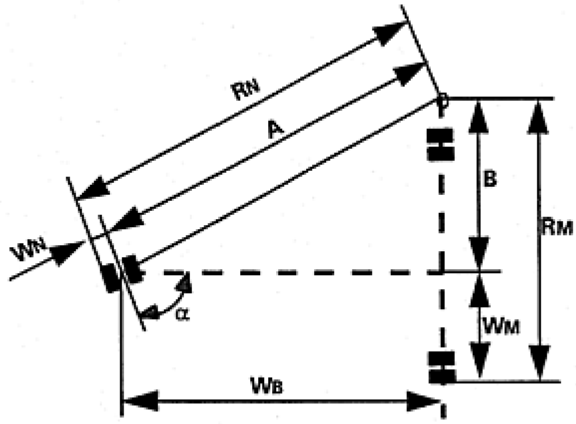
(2) the minimum distance of the most forward wheel(s) from the start of the runway for determining ASDA,’N’.

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) should be used to determine the alignment distance.

(b) Alignment distance calculation



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

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

where:

RN = A + WN = WB/cos(90°-α) + WN RM = B + WM = WB tan(90°-α) + WM

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 WB = wheel base

α = steering angle.

GM1 CAT.POL.A.205 Take-off

RUNWAY SURFACE CONDITION

(a) 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, 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 commander is to wait until the runway is cleared. If this is impracticable, he/she may consider a take-off, provided that he/she has applied the applicable performance adjustments, and any further safety measures he/she considers justified under the prevailing conditions.

(b) An adequate overall level of safety will only be maintained if operations in accordance with AMC 25.1591 or equivalent are limited to rare occasions. Where the frequency of such operations on contaminated runways is not limited to rare occasions, the operator should provide additional measures ensuring an equivalent level of safety. Such measures could include special crew training, additional distance factoring and more restrictive wind limitations.

AMC1 CAT.POL.A.210 Take-off obstacle clearance

TAKE-OFF OBSTACLE CLEARANCE

(a) In accordance with the definitions used in preparing the take-off distance and take-off flight path data provided in the AFM:

(1) The net take-off flight path is considered to begin at a height of 35 ft above the runway or clearway at the end of the take-off distance determined for the aeroplane in accordance with (b) below.

(2) The take-off distance is the longest of the following distances:

(i) 115 % of the distance with all engines operating from the start of the take-off to the point at which the aeroplane is 35 ft above the runway or clearway;

(ii) the distance from the start of the take-off to the point at which the aeroplane is 35 ft above the runway or clearway assuming failure of the critical engine occurs at the point corresponding to the decision speed (V1) for a dry runway; or

(iii) if the runway is wet or contaminated, the distance from the start of the take-off to the point at which the aeroplane is 15 ft above the runway or clearway assuming failure of the critical engine occurs at the point corresponding to the decision speed (V_1) for a wet or contaminated runway.

(b) The net take-off flight path, determined from the data provided in the AFM in accordance with (a)(1) and (a)(2), should clear all relevant obstacles by a vertical distance of 35 ft. When taking off on a wet or contaminated runway and an engine failure occurs at the point corresponding to the decision speed (V_1) for a wet or contaminated runway, this implies that the aeroplane can initially be as much as 20 ft below the net take-off flight path in accordance with (a) and, therefore, may clear close-in obstacles by only 15 ft. When taking off on wet or contaminated runways, the operator should exercise special care with respect to obstacle assessment, especially if a take-off is obstacle-limited and the obstacle density is high.

AMC2 CAT.POL.A.210 Take-off obstacle clearance

EFFECT OF BANK ANGLES

(a) The AFM generally provides a climb gradient decrement for a 15° bank turn. For bank angles of less than 15°, a proportionate amount should be applied unless the manufacturer or AFM has provided other data.

(b) Unless otherwise specified in the AFM or other performance or operating manuals from the manufacturer, acceptable adjustments to assure adequate stall margins and gradient corrections are provided by the following table:

Table 1 Effect of bank angles

Bank	Speed	Gradient correction
15°	V2	1 x AFM 15° gradient loss
20°	V2 + 5 kt	2 x AFM 15° gradient loss
25°	V2 + 10 kt	3 x AFM 15° gradient loss

AMC3 CAT.POL.A.210 Take-off obstacle clearance

REQUIRED NAVIGATIONAL ACCURACY

(a) Navigation systems

The obstacle accountability semi-widths of 300 m and 600 m may be used if the navigation system under OEI conditions provides a two standard deviation accuracy of 150 m and 300 m respectively.

(b) Visual course guidance

(1) The obstacle accountability semi-widths of 300 m and 600 m may be used where navigational accuracy is ensured at all relevant points on the flight path by use of external references. These references may be considered visible from the flight crew compartment if they are situated more than 45° either side of the intended track and with a depression of not greater than 20° from the horizontal.

(2) For visual course guidance navigation, the operator should ensure that the weather conditions prevailing at the time of operation, including ceiling and visibility, are such that the obstacle and/or ground reference points can be seen and identified. The operations manual should specify, for the aerodrome(s) concerned, the minimum weather conditions which enable the flight crew to continuously determine and maintain the correct flight path with respect to ground reference points, so as to provide a safe clearance with respect to obstructions and terrain as follows:

(i) the procedure should be well-defined with respect to ground reference points so that the track to be flown can be analysed for obstacle clearance requirements;

(ii) the procedure should be within the capabilities of the aeroplane with respect to forward speed, bank angle and wind effects;

(iii) a written and/or pictorial description of the procedure should be provided for crew use; and

(iv) the limiting environmental conditions (such as wind, the lowest cloud base, ceiling, visibility, day/night, ambient lighting, obstruction lighting) should be specified.

GM1 CAT.POL.A.210 Take-off obstacle clearance

CONTINGENCY PROCEDURES FOR OBSTACLES CLEARANCES

If compliance with CAT.POL.A.210 is based on an engine failure route that differs from the all engine departure route or SID normal departure, a 'deviation point' can be identified where the engine failure route deviates from the normal departure route. Adequate obstacle clearance along the normal departure route with failure of the critical engine at the deviation point will normally be available.

However, in certain situations the obstacle clearance along the normal departure route may be marginal and should be checked to ensure that, in case of an engine failure after the deviation point, a flight can safely proceed along the normal departure route.

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

ROUTE ANALYSIS

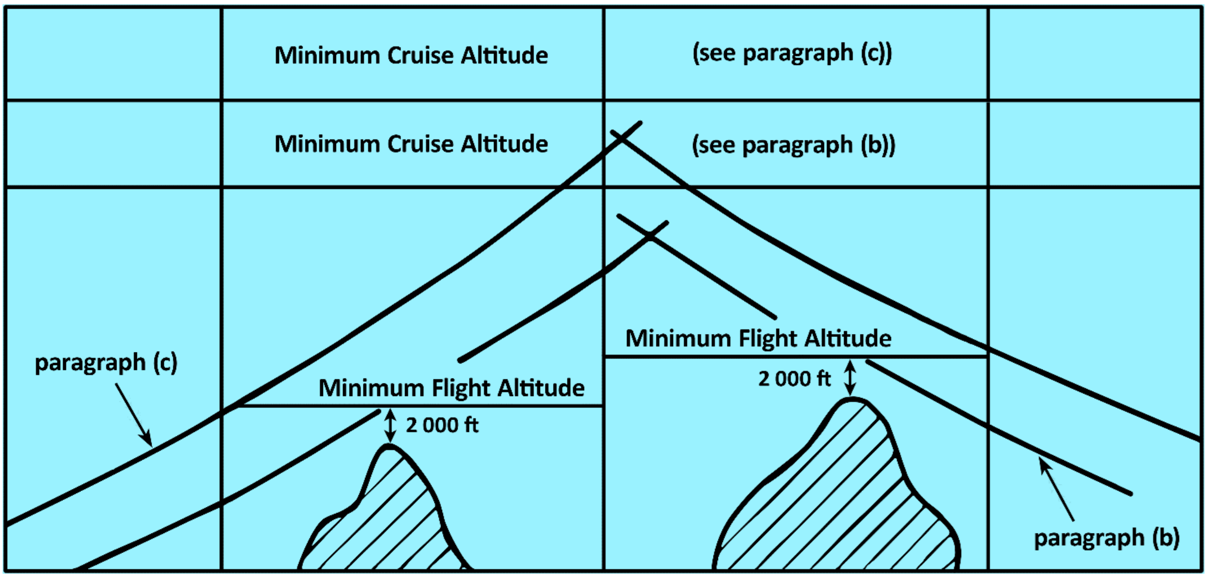
(a) The high terrain or obstacle analysis required should be carried out by a detailed analysis of the route.

(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.

AMC1 CAT.POL.A.225 Landing — destination and alternate aerodromes

ALTITUDE MEASURING

The operator should use either pressure altitude or geometric altitude for its operation and this should be reflected in the operations manual.

AMC2 CAT.POL.A.225 Landing — destination and alternate aerodromes

MISSED APPROACH

(a) For instrument approaches with a missed approach climb gradient greater than 2.5 %, the operator should verify that the expected landing mass of the aeroplane allows for a missed approach with a climb gradient equal to or greater than the applicable missed approach gradient in the OEI missed approach configuration and at the associated speed.

(b) For instrument approaches with DH below 200 ft, the operator should verify that the expected landing mass of the aeroplane allows a missed approach gradient of climb, with the critical engine failed and with the speed and configuration used for a missed approach of at least 2.5 %, or the published gradient, whichever is greater.

GM1 CAT.POL.A.225 Landing — destination and alternate aerodromes

MISSED APPROACH GRADIENT

(a) Where an aeroplane cannot achieve the missed approach gradient specified in AMC2 CAT.POL.A.225, when operating at or near maximum certificated landing mass and in engine-out conditions, the operator has the opportunity to propose an alternative means of compliance to the CAAT demonstrating that a missed approach can be executed safely taking into account appropriate mitigating measures.

(b) The proposal for an alternative means of compliance may involve the following:

(1) considerations to mass, altitude and temperature limitations and wind for the missed approach;

(2) a proposal to increase the DA/H or MDA/H; and

(3) a contingency procedure ensuring a safe route and avoiding obstacles.

AMC1 CAT.POL.A.230 Landing — dry 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

(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.

AMC2 CAT.POL.A.230 Landing — dry runways

FACTORING OF LANDING DISTANCE PERFORMANCE DATA WHEN USING A HEAD-UP DISPLAY (HUD) OR AN EQUIVALENT DISPLAY WITH FLARE CUE

In those cases where the landing requires the use of a HUD or an equivalent display with flare cue, and the landing distance published in the AFM includes safety factors, 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); or

(b) the landing mass determined, when using a HUD or an equivalent display with flare cue for the appropriate surface condition, as given in the AFM or equivalent document.

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 %, 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 CAT.POL.A.230 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.

AMC1 CAT.POL.A.235 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.235, the landing mass of the aeroplane should be the lesser of:

(a) the landing mass determined in accordance with CAT.POL.A.235; or

(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.

AMC2 CAT.POL.A.235 Landing — wet and contaminated runways

FACTORING OF LANDING DISTANCE PERFORMANCE DATA WHEN USING A HEAD-UP DISPLAY (HUD) OR AN EQUIVALENT DISPLAY WITH FLARE CUE

In those cases where the landing requires the use of a HUD or an equivalent display with flare cue, and the landing distance published in the AFM includes safety factors, the landing mass of the aeroplane should be the lesser of:

(a) the landing mass determined in accordance with CAT.POL.A.235; or

(b) the landing mass determined, when using a HUD or an equivalent display with flare cue for the appropriate surface condition, as given in the AFM or equivalent document.

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). This implies that the AFM distance may be presented as factored distance. When the AFM distance is not factored, a safety factor of 15 % should be applied. These 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

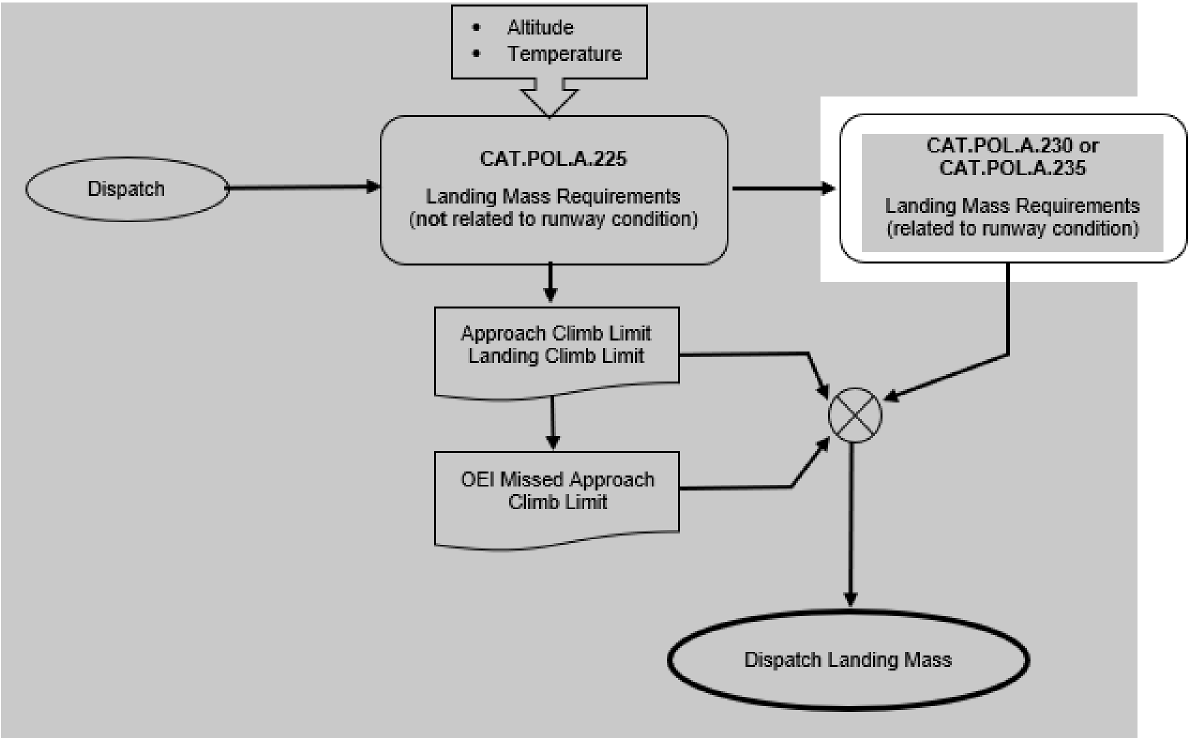
RUNWAYS WITH FRICTION IMPROVING CHARACTERISTICS

(a) 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.

(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.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

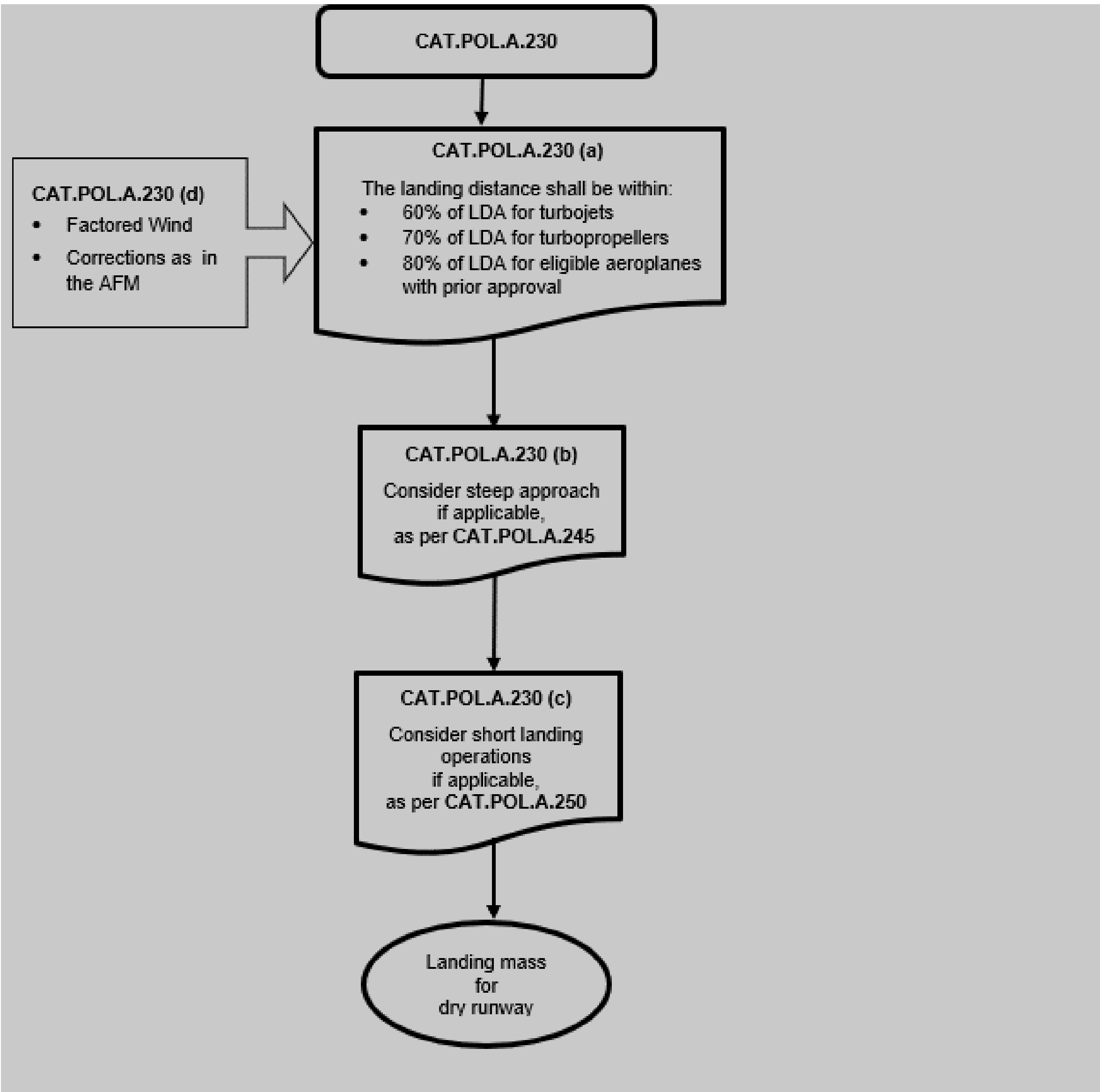
CAT.POL.A.230(e) and CAT.POL.A.235(e)		
For landing distance assessment at time of dispatch:	Check: - Most favourable runway - at no wind	**And** Check: - Most likely runway to be assigned - at probable wind
	If unable to comply	
Dry runway	Dispatch not allowed	CAT.POL.A.230(f) 1 alternate aerodrome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

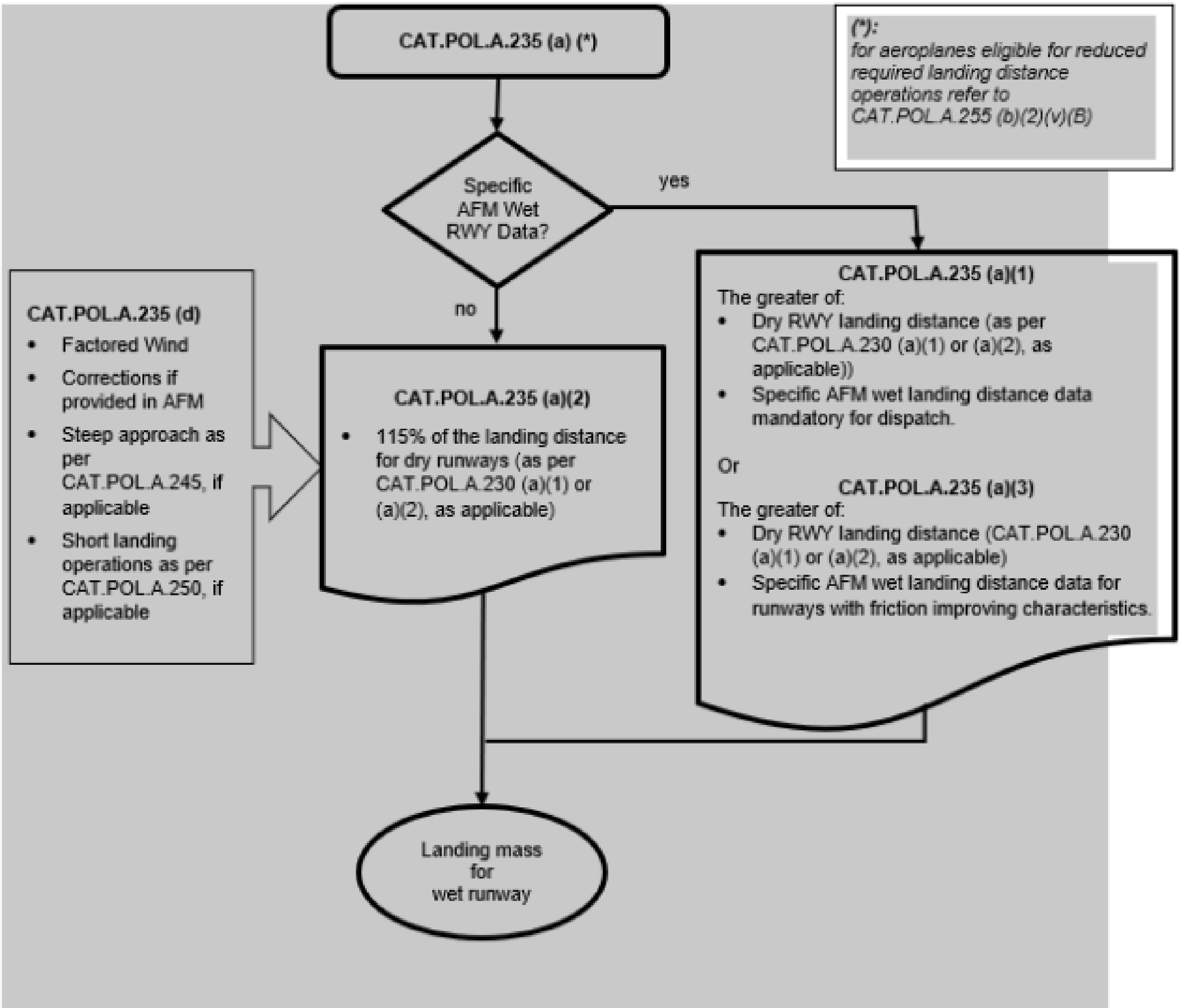
Alternate aerodromes shall permit full compliance with:

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

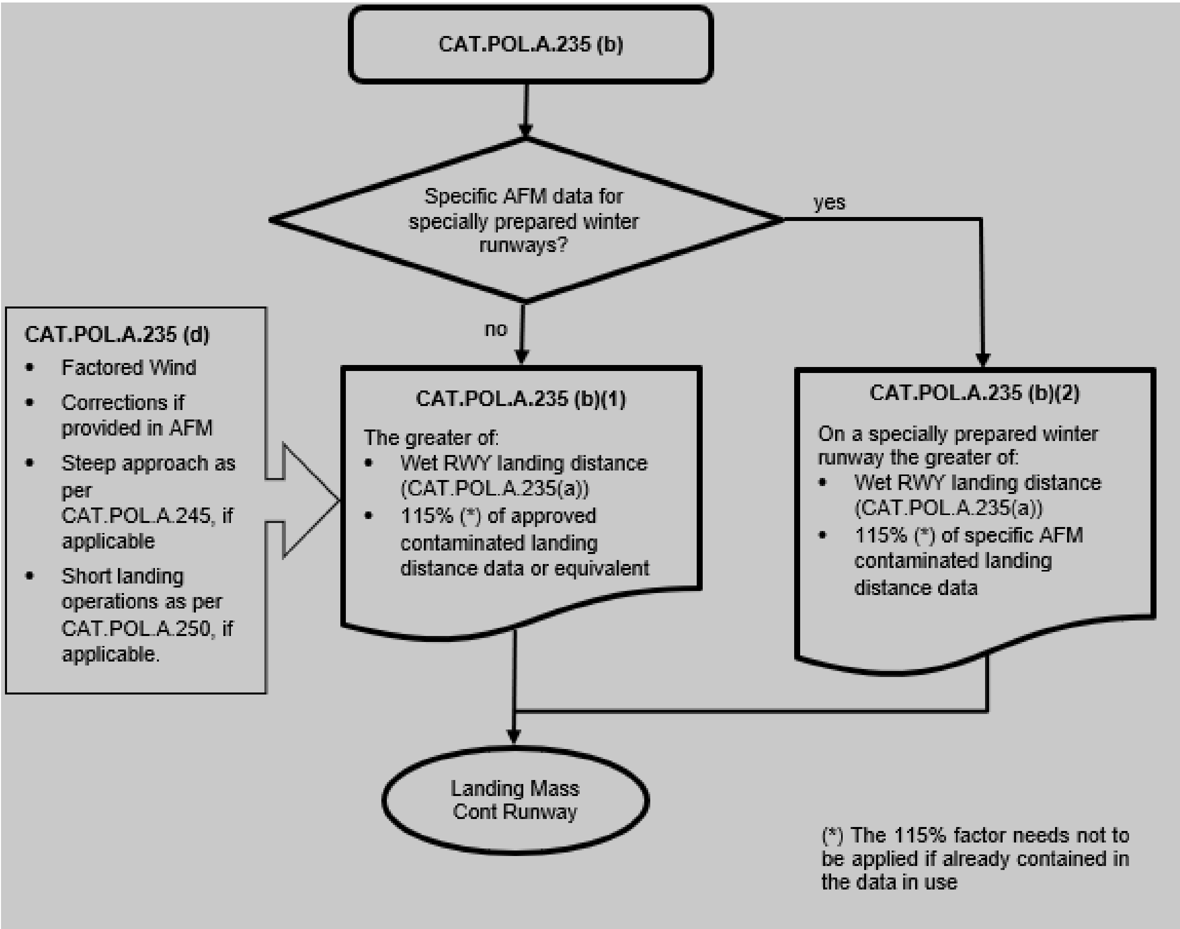
WORKFLOW OF THE LANDING DISTANCE ASSESSMENT AT THE TIME OF DISPATCH — DRY RUNWAYS



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 CAAT the equivalent level of safety 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 CAAT 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 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;

(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) 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;

(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.

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) The items of the ground training should cover 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.

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).

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.

CHAPTER 3 - Performance class B

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
	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.

AMC2 CAT.POL.A.305 Take-off

RUNWAY SLOPE

Unless otherwise specified in the AFM, or other performance or operating manuals from the manufacturer, the take-off distance should be increased by 5 % for each 1 % of upslope except that correction factors for runways with slopes in excess of 2 % should only be applied when the operator has demonstrated to the CAAT that the necessary data in the AFM or the operations manual contain the appropriated procedures and the crew is trained to take-off in runway with slopes in excess of 2 %.

GM1 CAT.POL.A.305 Take-off

RUNWAY SURFACE CONDITION

(a) Due to the inherent risks, operations from contaminated runways are inadvisable, and should be avoided whenever possible. Therefore, it is advisable to delay the take-off until the runway is cleared.

(b) Where this is impracticable, the commander should also consider the excess runway length available including the criticality of the overrun area.

AMC1 CAT.POL.A.310 Take-off obstacle clearance — multi-engined aeroplanes

TAKE-OFF FLIGHT PATH — VISUAL COURSE GUIDANCE NAVIGATION

(a) In order to allow visual course guidance navigation, the weather conditions prevailing at the time of operation, including ceiling and visibility, should be such that the obstacle and/or ground reference points can be seen and identified. For VFR operations by night, the visual course guidance should be considered available when the flight visibility is 1 500 m or more.

(b) The operations manual should specify, for the aerodrome(s) concerned, the minimum weather conditions that enable the flight crew to continuously determine and maintain the correct flight path with respect to ground reference points so as to provide a safe clearance with respect to obstructions and terrain as follows:

(1) the procedure should be well defined with respect to ground reference points so that the track to be flown can be analysed for obstacle clearance requirements;

(2) the procedure should be within the capabilities of the aeroplane with respect to forward speed, bank angle and wind effects;

(3) a written and/or pictorial description of the procedure should be provided for crew use; and

(4) the limiting environmental conditions should be specified (e.g. wind, cloud, visibility, day/night, ambient lighting, obstruction lighting).

AMC2 CAT.POL.A.310 Take-off obstacle clearance — multi-engined aeroplanes

TAKE-OFF FLIGHT PATH CONSTRUCTION

(a) For demonstrating that the aeroplane clears all obstacles vertically, a flight path should be constructed consisting of an all-engines segment to the assumed engine failure height, followed by an engine-out segment. Where the AFM does not contain the appropriate data, the approximation given in (b) may be used for the all-engines segment for an assumed engine failure height of 200 ft, 300 ft, or higher.

(b) Flight path construction

(1) All-engines segment (50 ft to 300 ft)

The average all-engines gradient for the all-engines flight path segment starting at an altitude of 50 ft at the end of the take-off distance ending at or passing through the 300 ft point is given by the following formula:

$$Y_{300} = \frac{0{\cdot}57(Y_{ERC})}{1 + (V_{ERC}^{2} - V_{2}^{2}) / 5647}$$

The factor of 0.77 as required by CAT.POL.A.310 is already included where:

Y_{300} = average all-engines gradient from 50 ft to 300 ft;

Y_{ERC} = scheduled all engines en-route gross climb gradient;

V_{ERC} = en-route climb speed, all engines knots true airspeed (TAS);

V_2 = take-off speed at 50 ft, knots TAS;

(2) All-engines segment (50 ft to 200 ft)

This may be used as an alternative to (b)(1) where weather minima permit. The average all- engines gradient for the all-engines flight path segment starting at an altitude of 50 ft at the end of the take-off distance ending at or passing through the 200 ft point is given by the following formula:

$$Y_{200} = \frac{0{\cdot}51\,(Y_{ERC})}{1 + (V_{ERC}^{2} - V_{2}^{2})\,/\,3388}$$

The factor of 0.77 as required by CAT.POL.A.310 is already included where:

Y_{200} = average all-engines gradient from 50 ft to 200 ft;

Y_{ERC} = scheduled all engines en-route gross climb gradient;

V_{ERC} = en-route climb speed, all engines, knots TAS;

V_2 = take-off speed at 50 ft, knots TAS.

(3) All-engines segment (above 300 ft)

The all-engines flight path segment continuing from an altitude of 300 ft is given by the AFM en-route gross climb gradient, multiplied by a factor of 0.77.

(4) The OEI flight path

The OEI flight path is given by the OEI gradient chart contained in the AFM.

GM1 CAT.POL.A.310 Take-off obstacle clearance — multi-engined aeroplanes

OBSTACLE CLEARANCE IN LIMITED VISIBILITY

(a) Unlike the Certification Specifications applicable for performance class A aeroplanes, those for performance class B aeroplanes do not necessarily provide for engine failure in all phases of flight. It is accepted that performance accountability for engine failure need not be considered until a height of 300 ft is reached.

(b) The weather minima given up to and including 300 ft imply that if a take-off is undertaken with minima below 300 ft, an OEI flight path should be plotted starting on the all-engines take-off flight path at the assumed engine failure height. This path should meet the vertical and lateral obstacle clearance specified in CAT.POL.A.310. Should engine failure occur below this height, the associated visibility is taken as being the minimum that would enable the pilot to make, if necessary, a forced landing broadly in the direction of the take-off. At or below 300 ft, a circle and land procedure is extremely inadvisable. The weather minima provisions specify that, if the assumed engine failure height is more than 300 ft, the visibility should be at least 1 500 m and, to allow for manoeuvring, the same minimum visibility should apply whenever the obstacle clearance criteria for a continued take-off cannot be met.

GM2 CAT.POL.A.310 Take-off obstacle clearance — multi-engined aeroplanes

TAKE-OFF FLIGHT PATH CONSTRUCTION

(a) This GM provides examples to illustrate the method of take-off flight path construction given in AMC2 CAT.POL.A.310. The examples are based on an aeroplane for which the AFM shows, at a given mass, altitude, temperature and wind component the following performance data:

– factored take-off distance – 1 000 m;

– take-off speed, V_2 – 90 kt;

– en-route climb speed, VERC – 120 kt;

– en-route all-engines climb gradient, YERC – 0.2;

– en-route OEI climb gradient, Y_{ERC-1} – 0.032.

(1) Assumed engine failure height 300 ft

The average all-engines gradient from 50 ft to 300 ft may be read from Figure 1 or calculated with the following formula:

$$Y_{300} = \frac{0{\cdot}57\,(Y_{ERC})}{1 + (V_{ERC}^{2} - V_{2}^{2}) / 5647}$$

The factor of 0.77 as required by CAT.POL.A.310 is already included where:

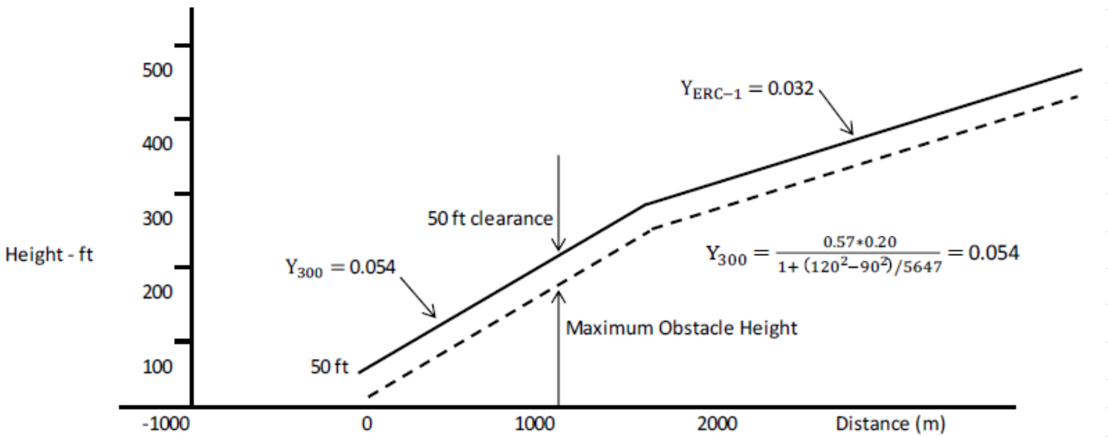
Y_{300} = average all-engines gradient from 50 ft to 300 ft;

Y_{ERC} = scheduled all engines en-route gross climb gradient;

V_{ERC} = en-route climb speed, all engines knots TAS; and

V_2 = take-off speed at 50 ft, knots TAS.

Figure 1 Assumed engine failure height 300 ft



(2) Assumed engine failure height 200ft

The average all-engines gradient from 50 ft to 200 ft may be read from Figure 2 or calculated with the following formula:

$$Y_{200} = \frac{0{\cdot}51\,(Y_{ERC})}{1 + (V_{ERC}^{2} - V_{2}^{2}) / 3388}$$

The factor of 0.77 as required by CAT.POL.A.310 is already included where:

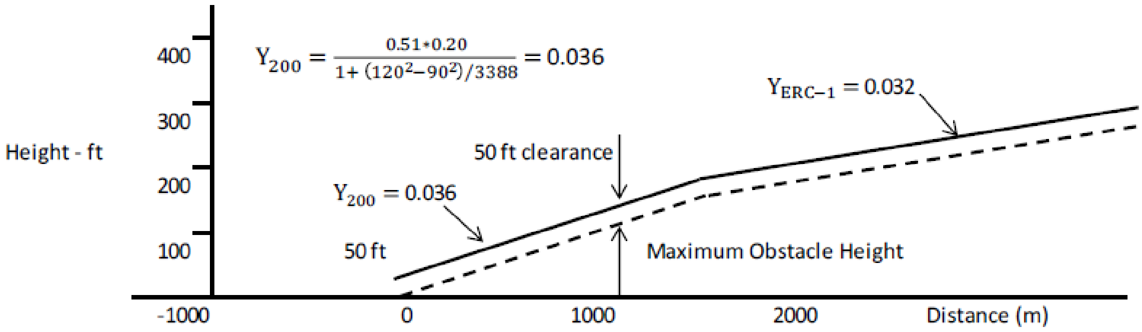
Y_{200} = average all-engines gradient from 50 ft to 200 ft;

Y_{ERC} = scheduled all engines en-route gross gradient;

V_{ERC} = en-route climb speed, all engines, knots TAS; and

V_2 = take-off speed at 50 ft, knots TAS.

Figure 2 Assumed engine failure height 200 ft



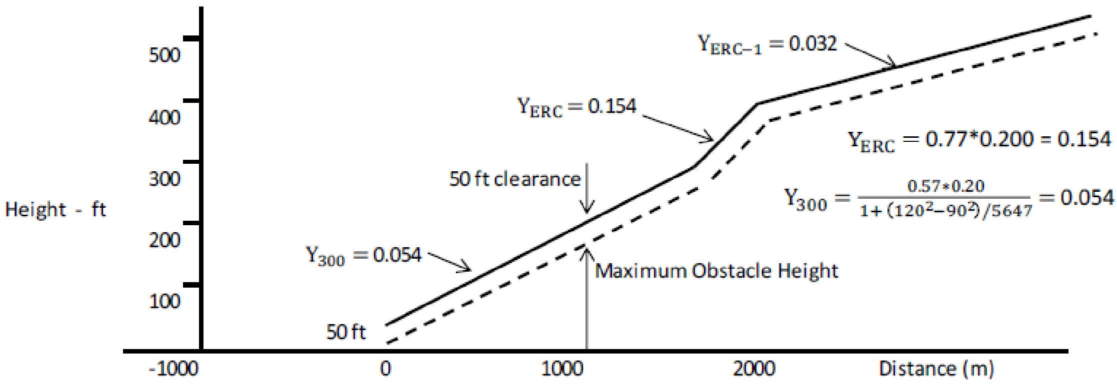
(3) Assumed engine failure height less than 200 ft

Construction of a take-off flight path is only possible if the AFM contains the required flight path data.

(4) Assumed engine failure height more than 300 ft

The construction of a take-off flight path for an assumed engine failure height of 400 ft is illustrated below.

Figure 3 Assumed engine failure height less than 200 ft



GM1 CAT.POL.A.315 En-route — multi-engined aeroplanes

CRUISING ALTITUDE

(a) The altitude at which the rate of climb equals 300 ft per minute is not a restriction on the maximum cruising altitude at which the aeroplane can fly in practice, it is merely the maximum altitude from which the driftdown procedure can be planned to start.

(b) Aeroplanes may be planned to clear en-route obstacles assuming a driftdown procedure, having first increased the scheduled en-route OEI descent data by 0.5 % gradient.

AMC1 CAT.POL.A.320 En-route — single-engined aeroplanes

ENGINE FAILURE

CAT.POL.A.320 requires the operator not approved by the CAAT in accordance with Subpart L (SET-IMC) of TCAR OPS Part SPA , and not making use of a risk period, to ensure that in the event of an engine failure, the aeroplane should be capable of reaching a point from which a safe forced landing can be made. Unless otherwise specified by the CAAT, this point should be 1 000 ft above the intended landing area.

GM1 CAT.POL.A.320 En-route — single-engined aeroplanes

ENGINE FAILURE

Considerations for the operator not approved by the CAAT in accordance with Subpart L (SET-IMC) of TCAR OPS Part SPA, and not making use of a risk period:

(a) In the event of an engine failure, single-engined aeroplanes have to rely on gliding to a point suitable for a safe forced landing. Such a procedure is clearly incompatible with flight above a cloud layer that extends below the relevant minimum safe altitude.

(b) The operator should first increase the scheduled engine-inoperative gliding performance data by 0.5 % gradient when verifying the en-route clearance of obstacles and the ability to reach a suitable place for a forced landing.

(c) The altitude at which the rate of climb equals 300 ft per minute is not a restriction on the maximum cruising altitude at which the aeroplane can fly in practice, it is merely the maximum altitude from which the engine-inoperative procedure can be planned to start.

GM2 CAT.POL.A.320 En-route — single-engined aeroplanes

RISK PERIOD

In the context of commercial air transport operations with single-engined turbine aeroplanes in instrument meteorological conditions or at night (CAT SET-IMC), a risk period is a period of flight during which no landing site has been selected by the operator.

AMC1 CAT.POL.A.325 Landing — destination and alternate aerodromes

ALTITUDE MEASURING

The operator should use either pressure altitude or geometric altitude for its operation and this should be reflected in the operations manual.

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.

AMC2 CAT.POL.A.330 Landing — dry runways

RUNWAY SLOPE

Unless otherwise specified in the AFM, or other performance or operating manuals from the manufacturer, the landing distances required should be increased by 5 % for each 1 % of downslope.

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 applicable aerodrome requirements. The RWYCC is reported through an RCR in the SNOWTAM format in accordance with ICAO Annex 15.

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

LANDING ON WET GRASS RUNWAYS

(a) When landing on very short grass that is wet and with a firm subsoil, the surface may be slippery, in which case the distances may increase by as much as 60 % (1.60 factor).

(b) As it may not be possible for a pilot to determine accurately the degree of wetness of the grass, particularly when airborne, in cases of doubt, the use of the wet factor (1.15) is recommended.

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

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 the application of the 15 % safety factor used in CAT.POL.A.335(a)(2) not necessary. This implies that the AFM distance may be presented as factored distance. When the AFM distance is not factored, a safety factor of 15 % should be applied. These distances may be longer or shorter than those resulting from CAT.POL.A.335(a)(2), but when provided, they are intended as a replacement of CAT.POL.A.335(a)(2) and it is mandatory to be used 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.

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.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

However, for aeroplanes 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, 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 CAAT 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 ensured 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 Part ORO, 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 the aircraft in case of a runway excursion. ICAO Annex 14 provides the SARPS to this regard.

GM1 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.

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.

CHAPTER 4 - Performance class C

AMC1 CAT.POL.A.400 Take-off

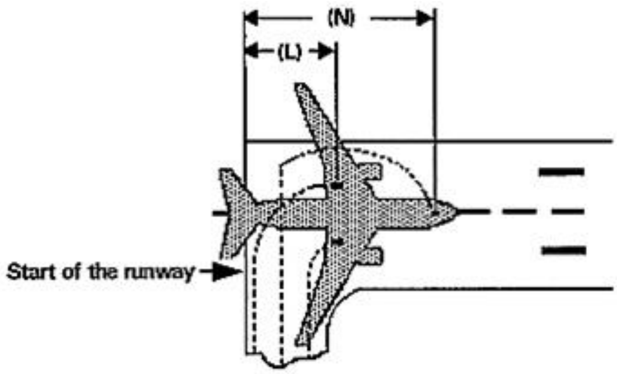
LOSS OF RUNWAY LENGTH DUE TO ALIGNMENT

(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

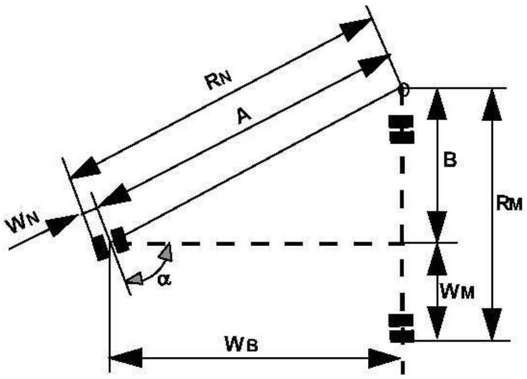
(2) the minimum distance of the most forward wheel(s) from the start of the runway for determining ASDA, 'N'.

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:

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

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.

AMC2 CAT.POL.A.400 Take-off

RUNWAY SLOPE

Unless otherwise specified in the AFM, or other performance or operating manuals from the manufacturers, the take-off distance should be increased by 5 % for each 1 % of upslope. However, correction factors for runways with slopes in excess of 2 % should only be applied when:

(a) the operator has demonstrated to the CAAT that the necessary data in the AFM or the operations manual contain the appropriated procedures; and

(b) the crew is trained to take-off on runways with slopes in excess of 2 %.

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.400 Take-off

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, since the actual conditions may not completely match the assumptions on which the performance information is based. An adequate overall level of safety can, therefore, only be maintained if such operations are limited to rare occasions. In case of a contaminated runway, the first option for the commander is to wait until the runway is cleared. If this is impracticable, he/she may consider a take-off, provided that he/she has applied the applicable performance adjustments, and any further safety measures he/she considers justified under the prevailing conditions.

AMC1 CAT.POL.A.405 Take-off obstacle clearance

EFFECT OF BANK ANGLES

(a) The AFM generally provides a climb gradient decrement for a 15° bank turn. Unless otherwise specified in the AFM or other performance or operating manuals from the manufacturer, acceptable adjustments to assure adequate stall margins and gradient corrections are provided by the following:

Table 1 Effect of bank angles

Bank	**Speed**	**Gradient correction**
15°	V_2	1 x AFM 15° gradient loss
20°	V_2 + 5 kt	2 x AFM 15° gradient loss
25°	V_2 + 10 kt	3 x AFM 15° gradient loss

(b) For bank angles of less than 15°, a proportionate amount may be applied, unless the manufacturer or AFM has provided other data.

AMC2 CAT.POL.A.405 Take-off obstacle clearance

REQUIRED NAVIGATIONAL ACCURACY

(a) Navigation systems

The obstacle accountability semi-widths of 300 m and 600 m may be used if the navigation system under OEI conditions provides a two-standard deviation accuracy of 150 m and 300 m respectively.

(b) Visual course guidance

(1) The obstacle accountability semi-widths of 300 m and 600 m may be used where navigational accuracy is ensured at all relevant points on the flight path by use of external references. These references may be considered visible from the flight crew compartment if they are situated more than 45° either side of the intended track and with a depression of not greater than 20° from the horizontal.

(2) For visual course guidance navigation, the operator should ensure that the weather conditions prevailing at the time of operation, including ceiling and visibility, are such that the obstacle and/or ground reference points can be seen and identified. The operations

manual should specify, for the aerodrome(s) concerned, the minimum weather conditions that enable the flight crew to continuously determine and maintain the correct flight path with respect to ground reference points, so as to provide a safe clearance with respect to obstructions and terrain as follows:

(i) the procedure should be well defined with respect to ground reference points so that the track to be flown can be analysed for obstacle clearance requirements;

(ii) the procedure should be within the capabilities of the aeroplane with respect to forward speed, bank angle and wind effects;

(iii) a written and/or pictorial description of the procedure should be provided for crew use; and

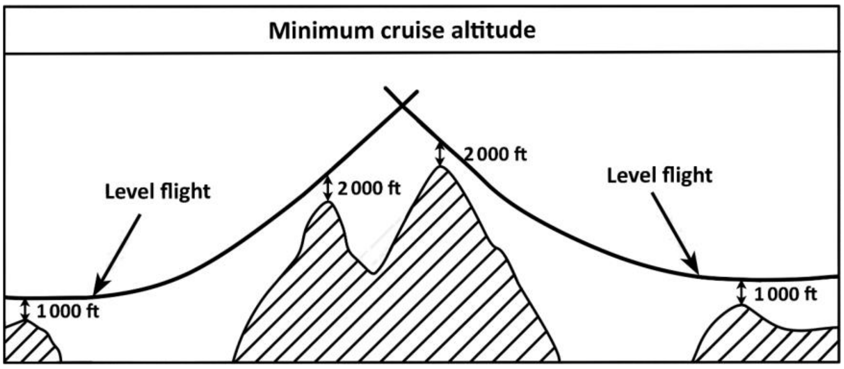
(iv) the limiting environmental conditions (such as wind, the lowest cloud base, ceiling, visibility, day/night, ambient lighting, obstruction lighting) should be specified.

AMC1 CAT.POL.A.415 En-route – OEI

ROUTE ANALYSIS

The high terrain or obstacle analysis should be carried out by making a detailed analysis of the route using contour maps of the high terrain, and plotting the highest points within the prescribed corridor 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 must be evaluated, based on engine failure at the most critical point, and must show obstacle clearance during the drift down by at least 2 000 ft. The minimum cruise altitude is determined from the drift down path, taking into account allowances for decision making, and the reduction in the scheduled rate of climb (See Figure 1).

Figure 1 Intersection of the drift down paths



AMC1 CAT.POL.A.425 Landing — destination and alternate aerodromes

ALTITUDE MEASURING

The operator should use either pressure altitude or geometric altitude for its operation and this should be reflected in the operations manual.

AMC1 CAT.POL.A.430 Landing — dry runways

LANDING DISTANCE CORRECTION FACTORS

(a) Unless otherwise specified in the AFM or other performance or operating manuals from the manufacturers, the variables affecting the landing performance and the associated factors to be applied to the AFM data are shown in the table below. It should be applied in addition to the factor specified in CAT.POL.A.430.

Table 1 Landing distance correction factor

Surface type	factor
Grass (on firm soil up to 20 cm long)	1.2

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

AMC2 CAT.POL.A.430 Landing — dry runways

RUNWAY SLOPE

Unless otherwise specified in the AFM, or other performance or operating manuals from the manufacturer, the landing distances required should be increased by 5 % for each 1 % of downslope.

GM1 CAT.POL.A.430 Landing — dry runways

LANDING MASS

CAT.POL.A.430 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 % 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.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 applicable aerodrome requirements. 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, unless otherwise indicated, include a safety factor, which renders the application of the 15% safety factor used in CAT.POL.A.435(a)(2) not necessary. This implies that the AFM distance may be presented as factored distance. When the AFM distance is not factored, a safety factor of 15 % should be applied. These distances may be longer or shorter than those resulting from CAT.POL.A.435(a)(2), but when provided they are intended as a replacement of CAT.POL.A.435(a)(2) and it is mandatory to be used 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.

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.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

SECTION 2 - Helicopters

CHAPTER 1 - General requirements

GM1 CAT.POL.H.105(c)(3)(ii)(A) General

REPORTED HEADWIND COMPONENT

The reported headwind component should be interpreted as being that reported at the time of flight planning and may be used, provided there is no significant change of unfactored wind prior to take-off.

GM1 CAT.POL.H.110(a)(2)(i) Obstacle accountability

COURSE GUIDANCE

Standard course guidance includes automatic direction finder (ADF) and VHF omnidirectional radio range (VOR) guidance.

Accurate course guidance includes ILS, MLS or other course guidance providing an equivalent navigational accuracy.

CHAPTER 2 - Performance class 1

GM1 CAT.POL.H.200 & CAT.POL.H.300 & CAT.POL.H.400 General

CATEGORY A AND CATEGORY B

(a) Helicopters that have been certified according to any of the following standards are considered to satisfy the Category A criteria. Provided that they have the necessary performance information scheduled in the AFM, such helicopters are, therefore, eligible for performance class 1 or 2 operations:

(1) certification as Category A under CS-27 or CS-29;

(2) certification as Category A under JAR-27 or JAR-29;

(3) certification as Category A under FAR Part 29;

(4) certification as group A under BCAR Section G; and

(5) certification as group A under BCAR-29.

(b) In addition to the above, certain helicopters have been certified under FAR Part 27 and with compliance with FAR Part 29 engine isolation requirements as specified in FAA Advisory Circular AC 27-1. Provided that compliance is established with the following additional requirements of CS- 29:

(1) CS 29.1027(a) Independence of engine and rotor drive system lubrication;

(2) CS 29.1187(e);

(3) CS 29.1195(a) & (b) Provision of a one-shot fire extinguishing system for each engine;

(i) The requirement to fit a fire extinguishing system may be waived if the helicopter manufacturer can demonstrate equivalent safety, based on service experience for the entire fleet showing that the actual incidence of fires in the engine fire zones has been negligible.

(4) CS 29.1197;

(5) CS 29.1199;

(6) CS 29.1201; and

(7) CS 29.1323(c)(1) Ability of the airspeed indicator to consistently identify the take-off decision point,

these helicopters are considered to satisfy the requirement to be certified as equivalent to Category A.

(c) The performance operating rules of JAR-OPS 3, which were transposed into this Part, were drafted in conjunction with the performance requirements of JAR-29 Issue 1 and FAR Part 29 at amendment 29-39. For helicopters certificated under FAR Part 29 at an earlier amendment, or under BCAR section G or BCAR-29, performance data will have been scheduled in the AFM according to these earlier requirements. This earlier scheduled data may not be fully compatible with this Part.

(d) Before any AOC is issued under which performance class 1 or 2 operations are conducted, it should be established that scheduled performance data are available that are compatible with the requirements of performance class 1 and 2 respectively.

(e) Any properly certified helicopter is considered to satisfy the Category B criteria. If appropriately equipped (in accordance with CAT.IDE.H), such helicopters are, therefore, eligible for performance class 3 operations.

AMC1 CAT.POL.H.205(b)(4) Take-off

THE APPLICATION OF TODRH

The selected height should be determined with the use of AFM data, and be at least 10.7 m (35 ft) above:

(a) the take-off surface; or

(b) as an alternative, a level height defined by the highest obstacle in the take-off distance required.

GM1 CAT.POL.H.205(b)(4) Take-off

THE APPLICATION OF TODRH

(a) Introduction

Original definitions for helicopter performance were derived from aeroplanes; hence, the definition of take-off distance owes much to operations from runways. Helicopters on the other hand can operate from runways, confined and restricted areas and rooftop FATOs — all bounded by obstacles. As an analogy, this is equivalent to a take-off from a runway with obstacles on and surrounding it.

It can, therefore, be said that unless the original definitions from aeroplanes are tailored for helicopters, the flexibility of the helicopter might be constrained by the language of operational performance.

This GM concentrates on the critical term 'take-off distance required (TODRH)' and describes the methods to achieve compliance with it and, in particular, the alternative procedure described in ICAO Annex 6 A 4.1.1.3.

(1) the take-off distance required does not exceed the take-off distance available; or

(2) as an alternative, the take-off distance required may be disregarded provided that the helicopter with the critical engine failure recognised at TDP can, when continuing the take- off, clear all obstacles between the end of the take-off distance available and the point at which it becomes established in a climb at V_{TOSS} by a vertical margin of 10.7 m (35 ft) or more. An obstacle is considered to be in the path of the helicopter if its distance from the nearest point on the surface below the intended line of flight does not exceed 30 m or 1.5 times the maximum dimension of the helicopter, whichever is greater.

(b) Definition of TODRH

The definition of TODRH from TCAR OPS Part DEF I is as follows:

'Take-off distance required (TODRH)' in the case of helicopters means the horizontal distance required from the start of the take-off to the point at which take-off safety speed (V_{TOSS}), a selected height and a positive climb gradient are achieved, following failure of the critical engine being recognised at the TDP, the remaining engines operating within approved operating limits.

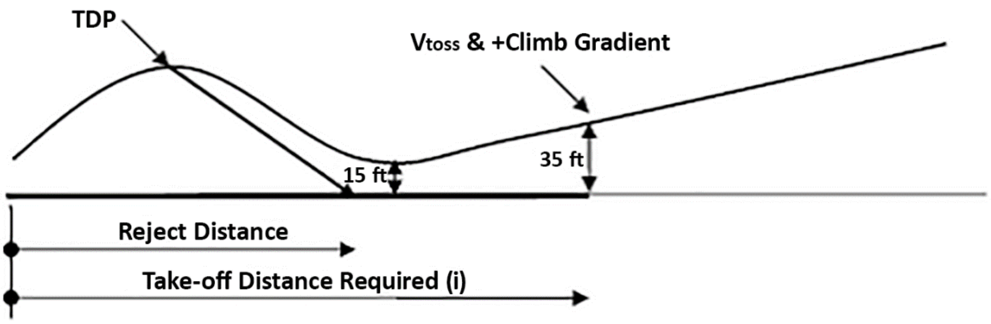
AMC1 CAT.POL.H.205(b)(4) states how the specified height should be determined. The original definition of TODRH was based only on the first part of this definition.

(c) The clear area procedure (runway)

In the past, helicopters certified in Category A would have had, at the least, a 'clear area' procedure. This procedure is analogous to an aeroplane Category A procedure and assumes a runway (either metalled or grass) with a smooth surface suitable for an aeroplane take-off (see Figure 1).

The helicopter is assumed to accelerate down the FATO (runway) outside of the height velocity (HV) diagram. If the helicopter has an engine failure before TDP, it must be able to land back on the FATO (runway) without damage to helicopter or passengers; if there is a failure at or after TDP the aircraft is permitted to lose height — providing it does not descend below a specified height above the surface (usually 15 ft if the TDP is above 15 ft). Errors by the pilot are taken into consideration, but the smooth surface of the FATO limits serious damage if the error margin is eroded (e.g. by a change of wind conditions).

Figure 1 Clear Area take – off



The operator only has to establish that the distances required are within the distance available (take-off distance and reject distance). The original definition of TODRH meets this case exactly.

From the end of the TODRH obstacle clearance is given by the climb gradient of the first or second climb segment meeting the requirement of CAT.POL.H.210 (or for performance class 2 (PC2): CAT.POL.H.315). The clearance margin from obstacles in the take-off flight path takes account of the distance travelled from the end of the take-off distance required and operational conditions (IMC or VMC).

(d) Category A procedures other-than-clear area

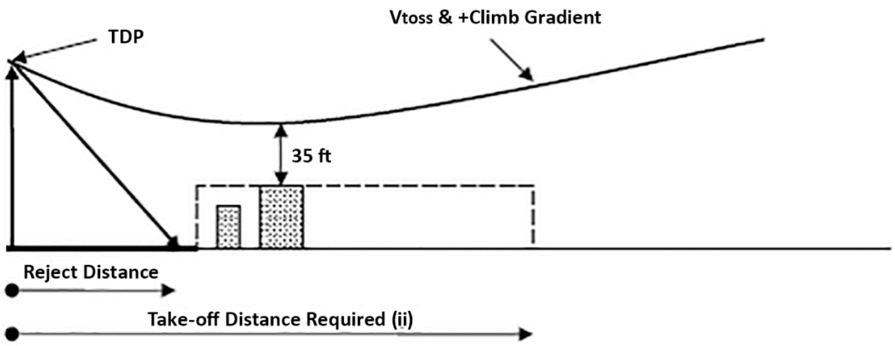
Procedures other-than-the-clear area are treated somewhat differently. However, the short field procedure is somewhat of a hybrid as either (a) or (b) of AMC1 CAT.POL.H.205(b)(4) can be utilised (the term 'helipad' is used in the following section to illustrate the principle only, it is not intended as a replacement for 'aerodrome' or 'FATO').

(1) Limited area, restricted area and helipad procedures (other than elevated)

The exact names of the procedure used for other-than-clear area are as many as there are manufacturers. However, principles for obstacle clearance are generic and the name is unimportant.

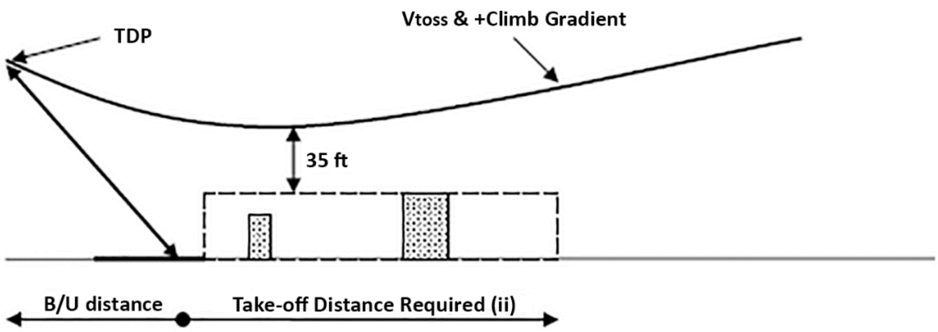
These procedures (see Figure 2 and Figure 3) are usually associated with an obstacle in the continued take-off area — usually shown as a line of trees or some other natural obstacle. As clearance above such obstacles is not readily associated with an accelerative procedure, as described in (c), a procedure using a vertical climb (or a steep climb in the forward, sideways or rearward direction) is utilised.

Figure 2 Short Field take-off



With the added complication of a TDP principally defined by height together with obstacles in the continued take off area, a drop down to within 15 ft of the take-off surface is not deemed appropriate and the required obstacle clearance is set to 35 ft (usually called 'min-dip'). The distance to the obstacle does not need to be calculated (provided it is outside the rejected distance required), as clearance above all obstacles is provided by ensuring that helicopter does not descend below the min-dip associated with a level defined by the highest obstacle in the continued take-off area.

Figure 3 Helipad take–off



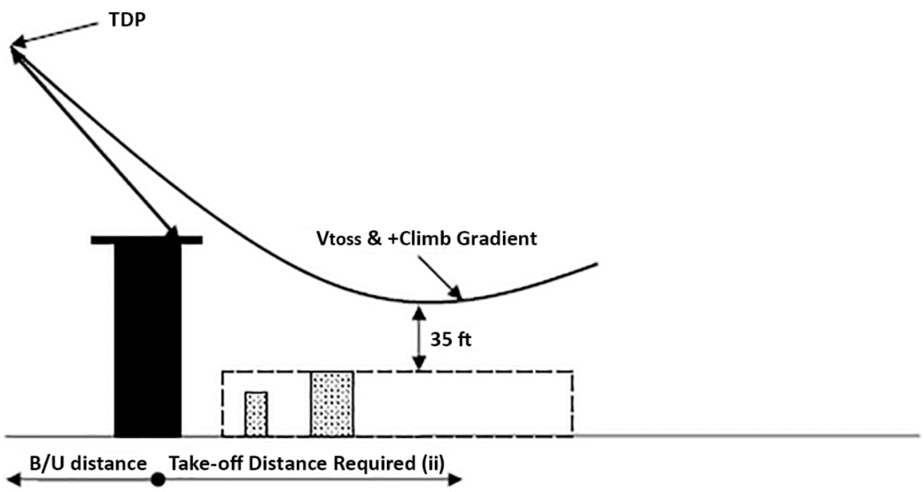
These procedures depend upon (b) of AMC1 CAT.POL.H.205(b)(4).

As shown in Figure 3, the point at which VTOSS and a positive rate of climb are met defines the TODRH. Obstacle clearance from that point is assured by meeting the requirement of CAT.POL.H.210 (or for PC2, CAT.POL.H.315). Also shown in Figure 3 is the distance behind the helipad which is the backup distance (B/U distance).

(2) Elevated helipad procedures

The elevated helipad procedure (see Figure 4) is a special case of the ground level helipad procedure discussed above.

Figure 4 Elevate Helipad take–off



The main difference is that drop down below the level of the take-off surface is permitted. In the drop down phase, the Category A procedure ensures deck-edge clearance but, once clear of the deck-edge, the 35 ft clearance from obstacles relies upon the calculation of drop down. Subparagraph (b) of AMC1 CAT.POL.H.205(b)(4) is applied.

Although 35 ft is used throughout the requirements, it may be inadequate at particular elevated FATOs that are subject to adverse airflow effects, turbulence, etc.

AMC1 CAT.POL.H.205(e) Take-off

OBSTACLE CLEARANCE IN THE BACKUP AREA

(a) The requirement in CAT.POL.H.205(e) has been established in order to take into account the following factors:

(1) in the backup: the pilot has few visual cues and has to rely upon the altimeter and sight picture through the front window (if flight path guidance is not provided) to achieve an accurate rearward flight path;

(2) in the rejected take-off: the pilot has to be able to manage the descent against a varying forward speed whilst still ensuring an adequate clearance from obstacles until the helicopter gets in close proximity for landing on the FATO; and

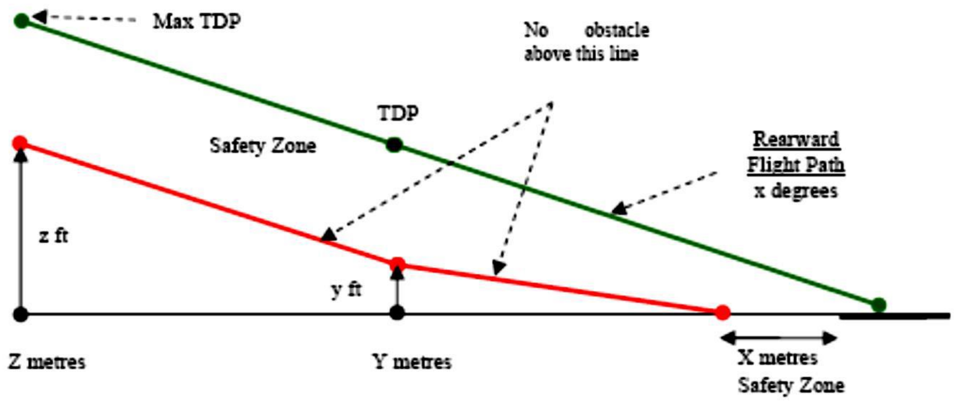
(3) in the continued take-off; the pilot has to be able to accelerate to V_{TOSS} (take-off safety speed for Category A helicopters) whilst ensuring an adequate clearance from obstacles.

(b) The requirements of CAT.POL.H.205(e) may be achieved by establishing that:

(1) in the backup area no obstacles are located within the safety zone below the rearward flight path when described in the AFM (see Figure 1, in the absence of such data in the AFM, the operator should contact the manufacturer in order to define a safety zone);or

(2) during the backup, the rejected take-off and the continued take-off manoeuvres, obstacle clearance is demonstrated to the CAAT.

Figure 1 Rearward flight path



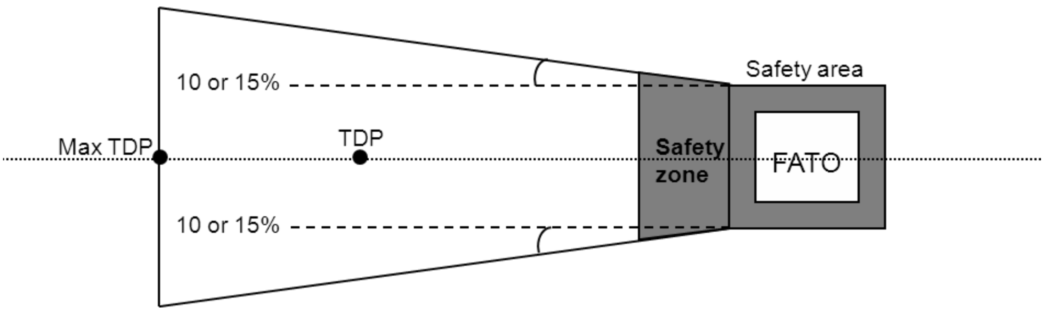
(c) An obstacle, in the backup area, is considered if its lateral distance from the nearest point on the surface below the intended flight path is not further than:

(1) half of the minimum FATO (or the equivalent term used in the AFM) width defined in the AFM (or, when no width is defined 0.75 D, where D is the largest dimension of the helicopter when the rotors are turning); plus

(2) 0.25 times D (or 3 m, whichever is greater); plus

(3) 0.10 for VFR day, or 0.15 for VFR night, of the distance travelled from the back of the FATO (see Figure 2).

Figure 2 Obstacle accountability



AMC1 CAT.POL.H.205 & CAT.POL.H.220 Take-off and landing

APPLICATION FOR ALTERNATIVE TAKE-OFF AND LANDING PROCEDURES

(a) A reduction in the size of the take-off surface may be applied when the operator has demonstrated to the CAAT that compliance with the requirements of CAT.POL.H.205, 210 and 220 can be assured with:

(1) a procedure based upon an appropriate Category A take-off and landing profile scheduled in the AFM;

(2) a take-off or landing mass not exceeding the mass scheduled in the AFM for a hover-out-of- ground-effect one-engine-inoperative (HOGE OEI) ensuring that:

(i) following an engine failure at or before TDP, there are adequate external references to ensure that the helicopter can be landed in a controlled manner; and

(ii) following an engine failure at or after the landing decision point (LDP), there are adequate external references to ensure that the helicopter can be landed in a controlled manner.

(b) An upwards shift of the TDP and LDP may be applied when the operator has demonstrated to the CAAT that compliance with the requirements of CAT.POL.H.205, 210 and 220 can be assured with:

(1) a procedure based upon an appropriate Category A take-off and landing profile scheduled in the AFM;

(2) a take-off or landing mass not exceeding the mass scheduled in the AFM for a HOGE OEI ensuring that:

(i) following an engine failure at or after TDP compliance with the obstacle clearance requirements of CAT.POL.H.205 (b)(4) and CAT.POL.H.210 can be met; and

(ii) following an engine failure at or before the LDP the balked landing obstacle clearance requirements of CAT.POL.H.220 (b) and CAT.POL.H.210 can be met.

(c) The Category A ground level surface area requirement may be applied at a specific elevated FATO when the operator can demonstrate to the CAAT that the usable cue environment at that aerodrome/operating site would permit such a reduction in size.

GM1 CAT.POL.H.205&CAT.POL.H.220 Take-off and landing

APPLICATION FOR ALTERNATIVE TAKE-OFF AND LANDING PROCEDURES

The manufacturer's Category A procedure defines profiles and scheduled data for take-off, climb, performance at minimum operating speed and landing, under specific environmental conditions and masses.

Associated with these profiles and conditions are minimum operating surfaces, take-off distances, climb performance and landing distances; these are provided (usually in graphic form) with the take-off and landing masses and the take-off decision point (TDP) and landing decision point (LDP).

The landing surface and the height of the TDP are directly related to the ability of the helicopter — following an engine failure before or at TDP — to reject onto the surface under forced landing conditions. The main considerations in establishing the minimum size of the landing surface are the scatter during flight testing of the reject manoeuvre, with the remaining engine operating within approved limits, and the required usable cue environment.

Hence, an elevated site with few visual cues — apart from the surface itself — would require a greater surface area in order that the helicopter can be accurately positioned during the reject manoeuvre within the specified area. This usually results in the stipulation of a larger surface for an elevated site than for a ground level site (where lateral cues may be present).

This could have the unfortunate side effect that a FATO that is built 3 m above the surface (and, therefore, elevated by definition) might be out of operational scope for some helicopters — even though there might be a rich visual cue environment where rejects are not problematical. The presence of elevated sites where ground level surface requirements might be more appropriate could be brought to the attention of the CAAT.

It can be seen that the size of the surface is directly related to the requirement of the helicopter to complete a rejected take-off following an engine failure. If the helicopter has sufficient power such that a failure before or at TDP will not lead to a requirement for rejected take-off, the need for large surfaces is removed; sufficient power for the purpose of this GM is considered to be the power required for hover- out-of-ground-effect one-engine-inoperative (HOGE OEI).

Following an engine failure at or after the TDP, the continued take-off path provides OEI clearance from the take-off surface and the distance to reach a point from where climb performance in the first, and subsequent segments, is assured.

If HOGE OEI performance exists at the height of the TDP, it follows that the continued take-off profile, which has been defined for a helicopter with a mass such that a rejected take-off would be required following an engine failure at or before TDP, would provide the same, or better, obstacle clearance and the same, or less, distance to reach a point where climb performance in the first, and subsequent segments, is assured.

If the TDP is shifted upwards, provided that the HOGE OEI performance is established at the revised TDP, it will not affect the shape of the continued take-off profile but should shift the min-dip upwards by the same amount that the revised TDP has been increased — with respect to the basic TDP.

Such assertions are concerned only with the vertical or the backup procedures and can be regarded as achievable under the following circumstances:

(a) when the procedure is flown, it is based upon a profile contained in the AFM — with the exception of the necessity to perform a rejected take-off;

(b) the TDP, if shifted upwards (or upwards and backward in the backup procedure) will be the height at which the HOGE OEI performance is established; and

(c) if obstacles are permitted in the backup area, they should continue to be permitted with a revised TDP.

GM1 CAT.POL.H.215(b)(3) En-route — critical engine inoperative

FUEL JETTISON

The presence of obstacles along the en-route flight path may preclude compliance with point CAT.POL.H.215 (a)(1) with the planned mass at the critical point along the route. In this case fuel jettison at the most critical point may be planned, provided that the procedures of point (d) of AMC1 CAT.OP.MPA.191(b)&(c) are complied with.

GM1 CAT.POL.H.205&CAT.POL.H.220 Take-off and landing

APPLICATION FOR ALTERNATIVE TAKE-OFF AND LANDING PROCEDURES

The manufacturer’s Category A procedure defines profiles and scheduled data for take-off, climb, performance at minimum operating speed and landing, under specific environmental conditions and masses.

Associated with these profiles and conditions are minimum operating surfaces, take-off distances, climb performance and landing distances; these are provided (usually in graphic form) with the take-off and landing masses and the take-off decision point (TDP) and landing decision point (LDP).

The landing surface and the height of the TDP are directly related to the ability of the helicopter — following an engine failure before or at TDP — to reject onto the surface under forced landing conditions. The main considerations in establishing the minimum size of the landing surface are the scatter during flight testing of the reject manoeuvre, with the remaining engine operating within approved limits, and the required usable cue environment.

Hence, an elevated site with few visual cues — apart from the surface itself — would require a greater surface area in order that the helicopter can be accurately positioned during the reject manoeuvre within the specified area. This usually results in the stipulation of a larger surface for an elevated site than for a ground level site (where lateral cues may be present).

This could have the unfortunate side effect that a FATO that is built 3 m above the surface (and, therefore, elevated by definition) might be out of operational scope for some helicopters — even though there might be a rich visual cue environment where rejects are not problematical. The presence of elevated sites where ground level surface requirements might be more appropriate could be brought to the attention of the CAAT.

It can be seen that the size of the surface is directly related to the requirement of the helicopter to complete a rejected take-off following an engine failure. If the helicopter has sufficient power such that a failure before or at TDP will not lead to a requirement for rejected take-off, the need for large surfaces is removed; sufficient power for the purpose of this GM is considered to be the power required for hover- out-of-ground-effect one-engine-inoperative (HOGE OEI).

Following an engine failure at or after the TDP, the continued take-off path provides OEI clearance from the take-off surface and the distance to reach a point from where climb performance in the first, and subsequent segments, is assured.

If HOGE OEI performance exists at the height of the TDP, it follows that the continued take-off profile, which has been defined for a helicopter with a mass such that a rejected take-off would be required following an engine failure at or before TDP, would provide the same, or better, obstacle clearance and the same, or less, distance to reach a point where climb performance in the first, and subsequent segments, is assured.

If the TDP is shifted upwards, provided that the HOGE OEI performance is established at the revised TDP, it will not affect the shape of the continued take-off profile but should shift the min-dip upwards by the same amount that the revised TDP has been increased — with respect to the basic TDP.

Such assertions are concerned only with the vertical or the backup procedures and can be regarded as achievable under the following circumstances:

(a) when the procedure is flown, it is based upon a profile contained in the AFM — with the exception of the necessity to perform a rejected take-off;

(b) the TDP, if shifted upwards (or upwards and backward in the backup procedure) will be the height at which the HOGE OEI performance is established; and

(c) if obstacles are permitted in the backup area, they should continue to be permitted with a revised TDP.

AMC1 CAT.POL.H.225(a)(5) Helicopter operations to/from a public interest site

HELICOPTER MASS LIMITATION

(a) The helicopter mass limitation at take-off or landing specified in CAT.POL.H.225(a)(5) should be determined using the climb performance data from 35 ft to 200 ft at V_{TOSS} (first segment of the take-off flight path) contained in the Category A supplement of the AFM (or equivalent manufacturer data acceptable in accordance with GM1-CAT.POL.H.200 & CAT.POL.H.300 & CAT.POL.H.400).

(b) The first segment climb data to be considered is established for a climb at the take-off safety speed V_{TOSS}, with the landing gear extended (when the landing gear is retractable), with the critical engine inoperative and the remaining engines operating at an appropriate power rating (the 2 min 30 sec or 2 min OEI power rating, depending on the helicopter type certification). The appropriate V_{TOSS}, is the value specified in the Category A performance section of the AFM for vertical take-off and landing procedures (VTOL, helipad or equivalent manufacturer terminology).

(c) The ambient conditions at the site (pressure-altitude and temperature) should be taken into account.

(d) The data are usually provided in charts in one of the following ways:

(1) Height gain in ft over a horizontal distance of 100 ft in the first segment configuration (35 ft to 200 ft, V_{TOSS}, 2 min 30 sec/2 min OEI power rating). This chart should be entered with a height gain of 8 ft per 100 ft horizontally travelled, resulting in a mass value for every pressure-altitude/temperature combination considered.

(2) Horizontal distance to climb from 35 ft to 200 ft in the first segment configuration (V_{TOSS}, 2 min 30 sec/2 min OEI power rating). This chart should be entered with a horizontally distance of 628 m (2 062 ft), resulting in a mass value for every pressure-altitude/temperature combination considered.

(3) Rate of climb in the first segment configuration (35 ft to 200 ft, V_{TOSS}, 2 min 30 sec/2 min OEI power rating). This chart can be entered with a rate of climb equal to the climb speed (V_{TOSS}) value in knots (converted to true airspeed) multiplied by 8.1, resulting in a mass value for every pressure-altitude/temperature combination considered.

GM1 CAT.POL.H.225 Helicopter operations to/from a public interest site

UNDERLYING PRINCIPLES

(a) General

The original Joint Aviation Authorities (JAA) Appendix 1 to JAR-OPS 3.005(i) was introduced in January 2002 to address problems that had been encountered by Member States at hospital sites due to the applicable performance requirements of JAR-OPS 3 Subparts G and H. These problems were enumerated in ACJ to Appendix 1 to JAR-OPS 3.005(d) paragraph 8, part of which is reproduced below.

'8 Problems with hospital sites

During implementation of JAR-OPS 3, it was established that a number of States had encountered problems with the impact of performance rules where helicopters were operated for HEMS. Although States accept that progress should be made towards operations where risks associated with a critical power unit failure are eliminated, or limited by the exposure time concept, a number of landing sites exist which do not (or never can) allow operations to performance class 1 or 2 requirements.

These sites are generally found in a congested hostile environment:

in the grounds of hospitals; or

on hospital buildings;

The problem of hospital sites is mainly historical and, whilst the Authority could insist that such sites not be used - or used at such a low weight that critical power unit failure performance is assured, it would seriously curtail a number of existing operations.

Even though the rule for the use of such sites in hospital grounds for HEMS operations (Appendix 1 to JAR-OPS 3.005(d) sub-paragraph (c)(2)(i)(A)) attracts alleviation until 2005, it is only partial and will still impact upon present operations.

Because such operations are performed in the public interest, it was felt that the Authority should be able to exercise its discretion so as to allow continued use of such sites provided that it is satisfied that an adequate level of safety can be maintained - notwithstanding that the site does not allow operations to performance class 1 or 2 standards. However, it is in the interest of continuing improvements in safety that the alleviation of such operations be constrained to existing sites, and for a limited period.'

As stated in this ACJ and embodied in the text of the appendix, the solution was short-term (until 31 December 2004). During the commenting period of JAA NPA 18, representations were made to the JAA that the alleviation should be extended to 2009. The review committee, in not accepting this request, had in mind that this was a short-term solution to address an immediate problem, and a permanent solution should be sought.

(b) After 1 January 2005

Although elimination of such sites would remove the problem, it is recognised that phasing out, or rebuilding existing hospital sites, is a long-term goal which may not be cost-effective, or even possible, in some Member States.

It should be noted, however, that CAT.POL.H.225 (a) limits the problem by confining approvals to hospital sites established before 1 July 2002 (established in this context means either: built before that date, or brought into service before that date — this precise wording was used to avoid problems associated with a ground level aerodrome/operating site where no building would be required). Thus the problem of these sites is contained and reducing in severity. This date was set approximately 6 months after the intended implementation of the original JAR-OPS 3 appendix.

EASA adopted the JAA philosophy that, from 1st January 2005, approval would be confined to those sites where a CAT A procedure alone cannot solve the problem. The determination of whether the helicopter can or cannot be operated in accordance with performance class 1 should be established with the helicopter at a realistic payload and fuel to complete the mission. However, in order to reduce the risk at those sites, the application of the requirements contained in CAT.POL.H.225(a) should be applied.

Additionally and in order to promote understanding of the problem, the text contained in CAT.POL.H.225(c) refers to the performance class and not to ICAO Annex 14. Thus, Part C of the operations manual should reflect the non-conformance with performance class 1, as well as the site-specific procedures (approach and departure paths) to minimise the danger to third parties in the event of an incident.

The following paragraphs explain the problem and solutions.

(c) The problem associated with such sites

There is a number of problems: some of which can be solved with the use of appropriate helicopters and procedures; and others which, because of the size of the site or the obstacle environment, cannot. They consist of:

(1) the size of the surface of the site (smaller than that required by the manufacturer's procedure);

(2) an obstacle environment that prevents the use of the manufacturer's procedure (obstacles in the backup area); and

(3) an obstacle environment that does not allow recovery following an engine failure in the critical phase of take-off (a line of buildings requiring a demanding gradient of climb) at a realistic payload and fuel to complete the mission.

– Problems associated with (c)(1): the inability to climb and conduct a rejected landing back to the site following an engine failure before the Decision Point (DP).

– Problems associated with (c)(2): as in (c)(1)).

– Problems associated with (c)(3): climb into an obstacle following an engine failure after DP.

Problems cannot be solved in the immediate future, but can, when mitigated with the use of the latest generation of helicopters (operated at a weight that can allow useful payloads and endurance), minimise exposure to risk.

(d) Long-term solution

Although not offering a complete solution, it was felt that a significant increase in safety could be achieved by applying an additional performance margin to such operations. This solution allowed the time restriction of 2004 to be removed.

The required performance level of 8 % climb gradient in the first segment reflects ICAO Annex 14 Volume II in 'Table 4-3 'Dimensions and slopes of obstacle limitations surfaces' for performance class 2.

The performance delta is achieved without the provision of further manufacturer's data by using existing graphs to provide the reduced take-off mass (RTOM).

If the solution in relation to the original problem is examined, the effects can be seen.

(1) Solution with relation to (c)(1): although the problem still exists, the safest procedure is a dynamic take-off reducing the time taken to achieve V_{stayup} and thus allowing VFR recovery — if the failure occurs at or after V_Y and 200 ft, an IFR recovery is possible.

(2) Solution with relation to (c)(2): as in (c)(1) above.

(3) Solution with relation to (c)(3): once again this does not give a complete solution, however, the performance delta minimises the time during which a climb over the obstacle cannot be achieved.

GM1 CAT.POL.H.225(a)(6) Helicopter operations to/from a public interest site

ENDORSEMENT FROM ANOTHER STATE (foreign country)

(a) Application to another State

To obtain an endorsement from another State, the operator should submit to that State:

(1) the reasons that preclude compliance with the requirements for operations in performance class 1;

(2) the site-specific procedures to minimise the period during which there would be danger to helicopter occupants and person on the surface in the event of an engine failure during take-off and landing; and

(3) the extract from the operations manual to comply with CAT.POL.H.225(c).

(b) Endorsement from another State

Upon receiving the endorsement from another State, the operator should submit it together with the site-specific procedures and the reasons and justification that preclude the use of performance class 1 criteria to the CAAT issuing the AOC to obtain the approval or extend the approval to a new public interest site.

CHAPTER 3 - Performance class 2

GM to Section 2, Chapter 3 performance class 2

OPERATIONS IN PERFORMANCE CLASS 2

(a) Introduction

This GM describes performance class 2 as established in Part CAT. It has been produced for the purpose of:

(1) explaining the underlying philosophy of operations in performance class 2;

(2) showing simple means of compliance; and

(3) explaining how to determine — with examples and diagrams:

(i) the take-off and landing masses;

(ii) the length of the safe forced landing area;

(iii) distances to establish obstacle clearance; and

(iv) entry point(s) into performance class 1.

It explains the derivation of performance class 2 from ICAO Annex 6 Part III and describes an alleviation that may be approved in accordance with CAT.POL.H.305 following a risk assessment.

It examines the basic requirements, discusses the limits of operation, and considers the benefits of the use of performance class 2.

It contains examples of performance class 2 in specific circumstances, and explains how these examples may be generalised to provide operators with methods of calculating landing distances and obstacle clearance.

(b) Definitions used in this GM

The definitions for the following terms, used in this GM, are contained in TCAR OPS Part DEF and its AMC:

(1) distance DR;

(2) defined point after take-off (DPATO);

(3) defined point before landing (DPBL);

(4) landing distance available (LDAH);

(5) landing distance required (LDRH);

(6) performance class 2;

(7) safe forced landing (SFL); and

(8) take-off distance available (TODAH).

The following terms, which are not defined TCAR OPS Part DEF, are used in this GM:

– V_T : a target speed at which to aim at the point of minimum ground clearance (min-dip) during acceleration from TDP to V_{TOSS};

– $V_{50.}$: a target speed and height utilised to establish an AFM distance (in compliance with the requirement of CS/JAR 29.63) from which climb out is possible; and

– V_{stayup} : a colloquial term used to indicate a speed at which a descent would not result following an engine failure. This speed is several knots lower than V_{TOSS} at the equivalent take-off mass.

(c) What defines performance class 2

Performance class 2 can be considered as performance class 3 take-off or landing, and performance class 1 climb, cruise and descent. It comprises an all-engines-operating (AEO) obstacle clearance regime for the take-off or landing phases, and a OEI obstacle clearance regime for the climb, cruise, descent, approach and missed approach phases.

For the purpose of performance calculations in Part CAT, the CS/JAR 29.67 Category A climb performance criteria is used:

– 150 ft/min at 1 000 ft (at V_Y);

and depending on the choice of DPATO:

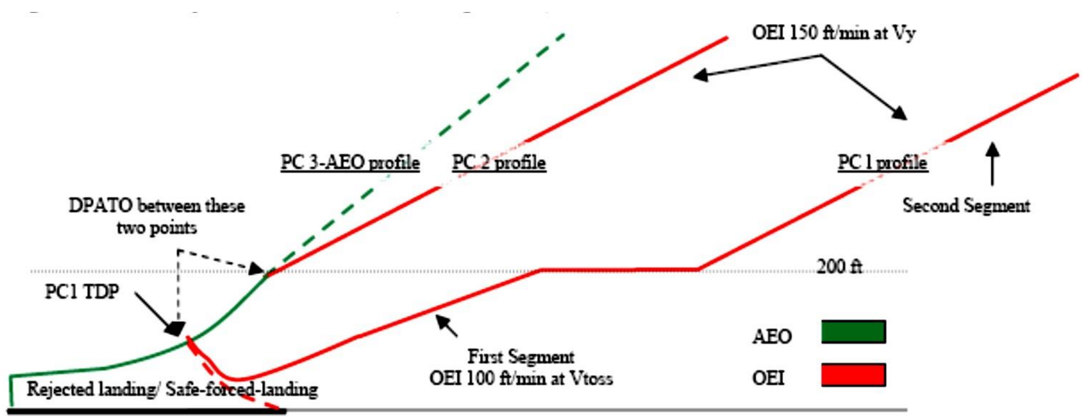
– 100 ft/min up to 200 ft (at V_{TOSS}) at the appropriate power settings.

(1) Comparison of obstacle clearance in all performance classes

Figure 1 shows the profiles of the three performance classes — superimposed on one diagram.

– Performance class 1 (PC1): from TDP, requires OEI obstacle clearance in all phases of flight; the construction of Category A procedures, provides for a flight path to the first climb segment, a level acceleration segment to V_Y (which may be shown concurrent with the first segment), followed by the second climb segment from V_Y at 200 ft (see Figure 1).

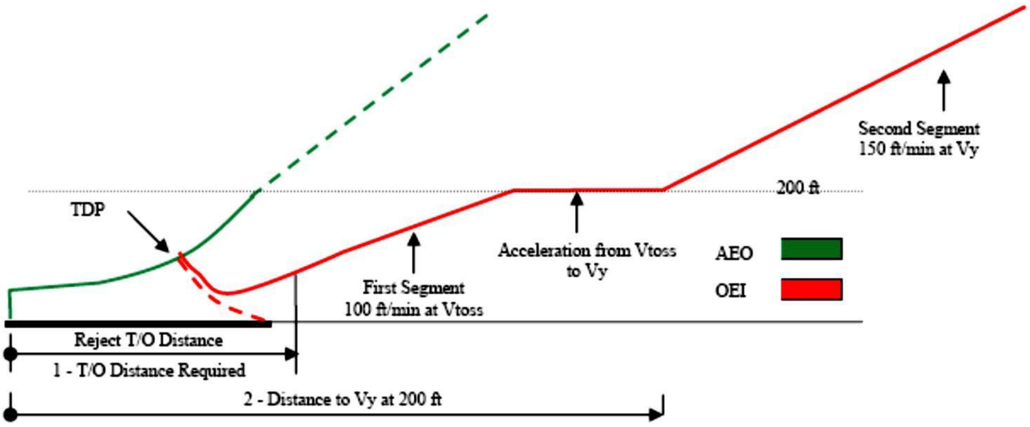
Figure 1 All Performance Classes (a comparison)



– Performance class 2 (PC2): requires AEO obstacle clearance to DPATO and OEI from then on. The take-off mass has the PC1 second segment climb performance at its basis therefore, at the point where V_Y at 200 ft is reached, Performance Class 1 is achieved (see also Figure 3).

– Performance class 3 (PC3): requires AEO obstacle clearance in all phases.

Figure 2 Performance Class 1 distances



(2) Comparison of the discontinued take-off in all performance classes

(i) PC1 — requires a prepared surface on which a rejected landing can be undertaken (no damage); and

(ii) PC2 and 3 — require a safe forced landing surface (some damage can be tolerated, but there must be a reasonable expectancy of no injuries to persons in the aircraft or third parties on the surface).

(d) The derivation of performance class 2

PC2 is primarily based on the text of ICAO Annex 6 Part III Section II and its attachments which provide for the following:

(1) obstacle clearance before DPATO: the helicopter shall be able, with all engines operating, to clear all obstacles by an adequate margin until it is in a position to comply with (2);

(2) obstacle clearance after DPATO: the helicopter shall be able, in the event of the critical engine becoming inoperative at any time after reaching DPATO, to continue the take-off clearing all obstacles along the flight path by an adequate margin until it is able to comply with en-route clearances; and

(3) engine failure before DPATO: before the DPATO, failure of the critical engine may cause the helicopter to force land; therefore, a safe forced landing should be possible (this is analogous to the requirement for a reject in performance class 1, but where some damage to the helicopter can be tolerated.)

(e) Benefits of performance class 2

Operations in performance class 2 permit advantage to be taken of an AEO procedure for a short period during take-off and landing — whilst retaining engine failure accountability in the climb, descent and cruise. The benefits include the ability to:

(1) use (the reduced) distances scheduled for the AEO — thus permitting operations to take place at smaller aerodromes and allowing airspace requirements to be reduced;

(2) operate when the safe forced landing distance available is located outside the boundary of the aerodrome;

(3) operate when the take-off distance required is located outside the boundary of the aerodrome; and

(4) use existing Category A profiles and distances when the surface conditions are not adequate for a reject, but are suitable for a safe forced landing (for example, when the ground is waterlogged).

Additionally, following a risk assessment when the use of exposure is approved by the CAAT the ability to:

(i) operate when a safe forced landing is not assured in the take-off phase; and

(ii) penetrate the HV curve for short periods during take-off or landing.

(f) Implementation of performance class 2 in Part CAT

The following sections explain the principles of the implementation of performance class 2.

(1) Does ICAO spell it all out?

ICAO Annex 6 does not give guidance on how DPATO should be calculated nor does it require that distances be established for the take-off. However, it does require that, up to DPATO AEO, and from DPATO OEI, obstacle clearance is established (see Figure 3 and Figure 4 which are simplified versions of the diagrams contained in Annex 6 Part III, Attachment A).

(ICAO Annex 8 – Airworthiness of Aircraft (IVA 2.2.3.1.4' and 'IVB 2.2.7 d) requires that an AEO distance be scheduled for all helicopters operating in performance classes 2 & 3. ICAO Annex 6 is dependent upon the scheduling of the AEO distances, required in Annex 8, to provide data for the location of DPATO.)

When showing obstacle clearance, the divergent obstacle clearance height required for IFR is — as in performance class 1 — achieved by the application of the additional obstacle clearance of 0.01 distance DR (the distance from the end of 'take-off-distance-available' — see the pictorial representation in Figure 4 and the definition in TCAR OPS Part DEF.

As can also be seen from Figure 4, flight must be conducted in VFR until DPATO has been achieved (and deduced that if an engine failure occurs before DPATO, entry into IFR is not permitted (as the OEI climb gradient will not have been established)).

Figure 3 Performance Class 2 Obstacle Clearance

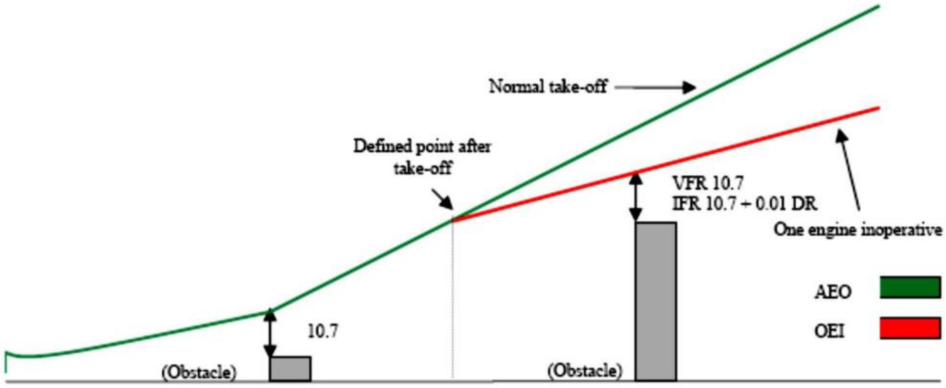
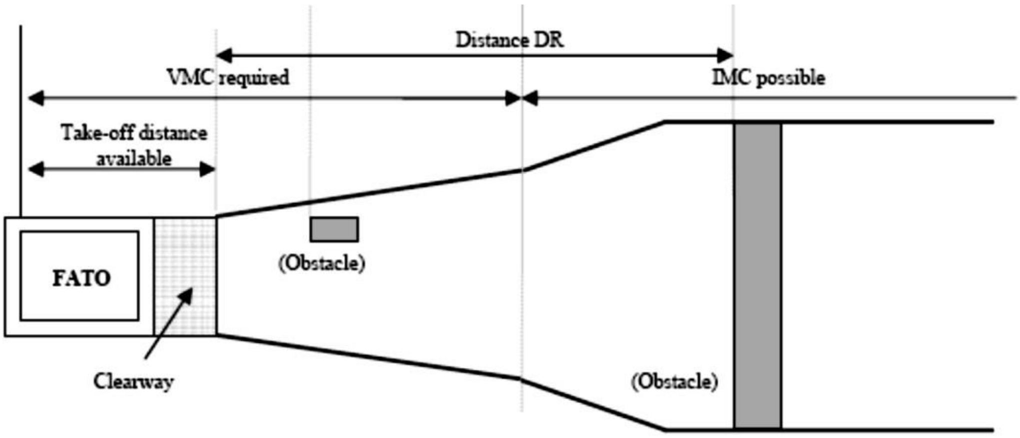


Figure 4 Performance Class 2 Obstacle Clearance (plan view)



(2) Function of DPATO

From the preceding paragraphs, it can be seen that DPATO is germane to PC2. It can also be seen that, in view of the many aspects of DPATO, it has, potentially, to satisfy a number of requirements that are not necessarily synchronised (nor need to be).

It is clear that it is only possible to establish a single point for DPATO, satisfying the requirement of (d)(2) & (d)(3), when:

– accepting the TDP of a Category A procedure; or

– extending the safe forced landing requirement beyond required distances (if data are available to permit the calculation of the distance for a safe forced landing from the DPATO).

It could be argued that the essential requirement for DPATO is contained in section (d)(2) — OEI obstacle clearance. From careful examination of the flight path reproduced in Figure 3 above, it may be reasonably deduced that DPATO is the point at which adequate climb performance is established (examination of Category A procedures would indicate that this could be (in terms of mass, speed and height above the take-off surface) the conditions at the start of the first or second segments — or any point between.)

(The diagrams in Attachment A of ICAO Annex 6 do not appear to take account of drop down — permitted under Category A procedures; similarly with helideck departures, the potential for acceleration in drop down below deck level (once the deck edge has been cleared) is also not shown. These omissions could be regarded as a simplification of the diagram, as drop down is discussed and accepted in the accompanying ICAO text.)

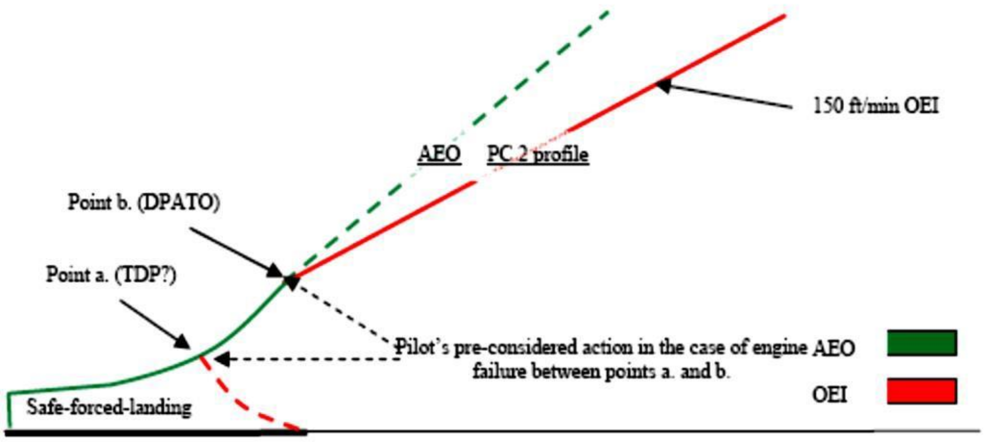
It may reasonably be argued that, during the take-off and before reaching an appropriate climb speed (V_{TOSS} or V_y), V_{stayup} will already have been achieved (where V_{stayup} is the ability to continue the flight and accelerate without descent — shown in some Category A procedures as V_T or target speed) and where, in the event of an engine failure, no landing would be required.

It is postulated that, to practically satisfy all the requirements of (d)(1), (2) and (3), DPATO does not need to be defined at one synchronised point; provisions can be met separately,

i.e. defining the distance for a safe forced landing, and then establishing the OEI obstacle clearance flight path.

As the point at which the helicopter's ability to continue the flight safely, with the critical engine inoperative is the critical element, it is that for which DPATO is used in this text.

Figure 5 The three elements in a PC 2 take-off



(i) The three elements from the pilot's perspective

When seen from the pilot's perspective (see Figure 5), there are three elements of the PC 2 take-off — each with associated related actions which need to be considered in the case of an engine failure:

(A) action in the event of an engine failure — up to the point where a forced-landing will be required;

(B) action in the event of an engine failure — from the point where OEI obstacle clearance is established (DPATO); and

(C) pre-considered action in the event of an engine failure — in the period between (A) and (B)

The action of the pilot in (A) and (B) is deterministic, i.e. it remains the same for every occasion. For pre-consideration of the action at point (C), as is likely that the planned flight path will have to be abandoned (the point at which obstacle clearance using the OEI climb gradients not yet being reached), the pilot must (before take-off) have considered his/her options and the associated risks, and have in mind the course of action that will be pursued in the event of an engine failure during that short period. (As it is likely that any action will involve turning manoeuvres, the effect of turns on performance must be considered.)

(3) Take-off mass for performance class 2

As previously stated, performance class 2 is an AEO take-off that, from DPATO, has to meet the requirement for OEI obstacle clearance in the climb and en-route phases. Take-off mass is, therefore, the mass that gives at least the minimum climb performance of 150 ft/min at V_Y, at 1 000 ft above the take-off point, and obstacle clearance.

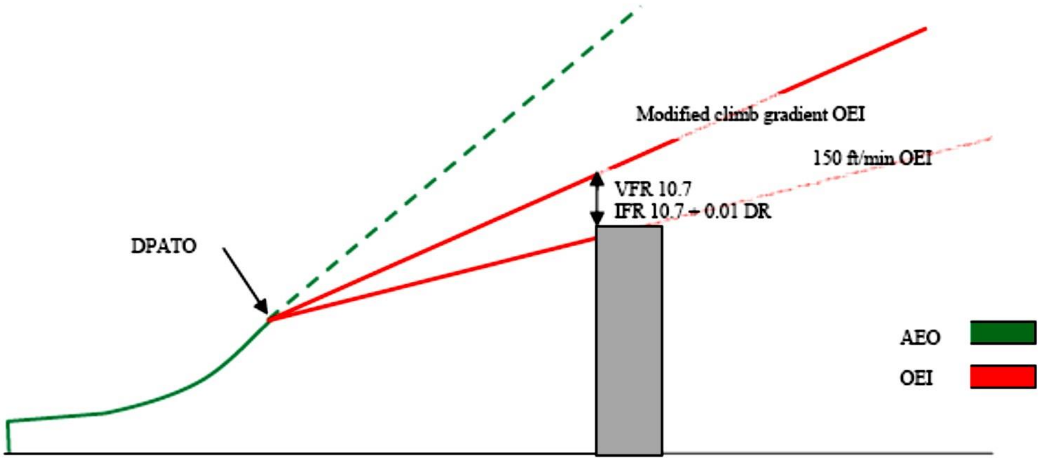
As can be seen in Figure 6 below, the take-off mass may have to be modified when it does not provide the required OEI clearance from obstacles in the take-off-flight path (exactly as in performance class 1). This could occur when taking off from an aerodrome/operating site where the flight path has to clear an obstacle such a ridge line (or line of buildings) that can neither be:

(i) flown around using VFR and see and avoid; nor

(ii) cleared using the minimum climb gradient given by the take-off mass (150 ft/min at 1 000 ft).

In this case, the take-off mass has to be modified (using data contained in the AFM) to give an appropriate climb gradient.

Figure 6 Performance Class 2 (enhanced climb gradient)



(4) Do distances have to be calculated?

Distances do not have to be calculated if, by using pilot judgement or standard practice, it can be established that:

(i) a safe forced landing is possible following an engine failure (notwithstanding that there might be obstacles in the take-off path); and

(ii) obstacles can be cleared (or avoided) — AEO in the take-off phase and OEI in the climb.

If early entry (in the sense of cloud base) into IMC is expected, an IFR departure should be planned. However, standard masses and departures can be used when described in the operations manual.

(5) The use of Category A data

In Category A procedures, TDP is the point at which either a rejected landing or a safe continuation of the flight, with OEI obstacle clearance, can be performed.

For PC2 (when using Category A data), only the safe forced landing (reject) distance depends on the equivalent of the TDP; if an engine fails between TDP and DPATO, the pilot has to decide what action is required. It is not necessary for a safe forced landing distance to be established from beyond the equivalent of TDP (see Figure 5 and discussion in (f)(2)(ii)(A)).

Category A procedures based on a fixed V_{TOSS} are usually optimised either for the reduction of the rejected take-off distance, or the take-off distance. Category A procedures based on a variable V_{TOSS} allow either a reduction in required distances (low V_{TOSS}) or an improvement in OEI climb capability (high V_{TOSS}). These optimisations may be beneficial in PC2 to satisfy the dimensions of the take-off site.

In view of the different requirements for PC2 (from PC1), it is perfectly acceptable for the two calculations (one to establish the safe forced landing distance and the other to establish DPATO) to be based upon different Category A procedures. However, if this method is used, the mass resulting from the calculation cannot be more than the mass from the more limiting of the procedures.

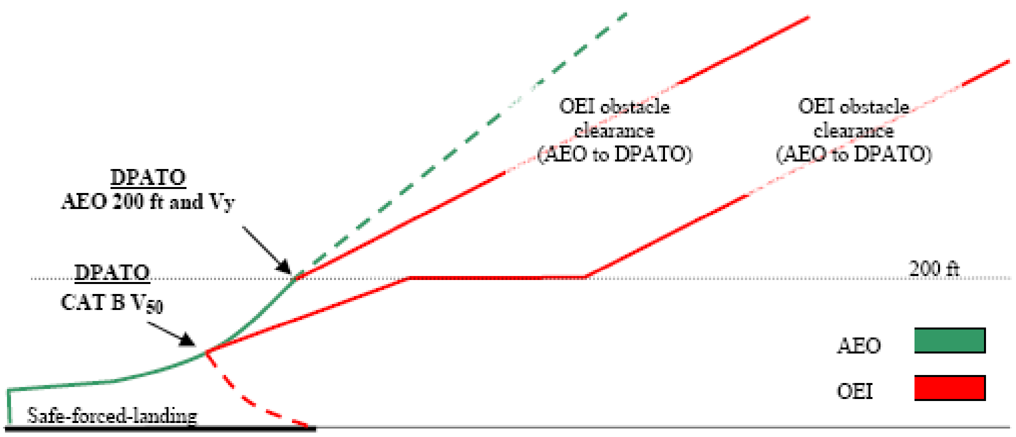
(6) DPATO and obstacle clearance

If it is necessary for OEI obstacle clearance to be established in the climb, the starting point (DPATO) for the (obstacle clearance) gradient has to be established. Once DPATO is defined, the OEI obstacle clearance is relatively easy to calculate with data from the AFM.

(i) DPATO based on AEO distance

In the simplest case; if provided, the scheduled AEO to 200 ft at V_Y can be used (see Figure 7).

Figure 7 Suggested AEO locations for DPATO

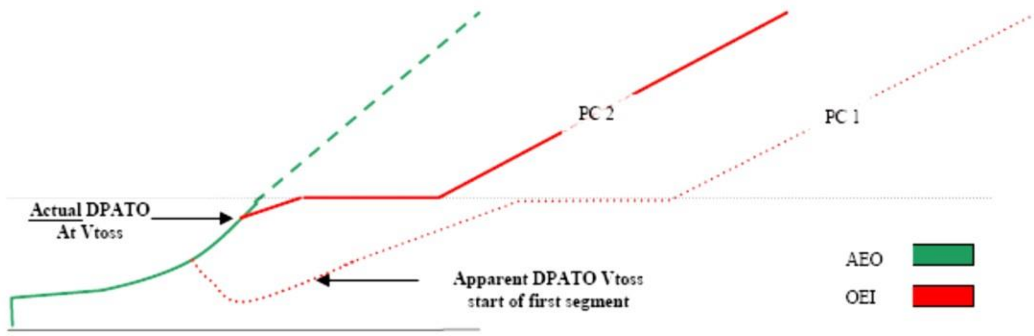


Otherwise, and if scheduled in the AFM, the AEO distance to 50 ft (V_{50}) — determined in accordance with CS/JAR 29.63 — can be used (see Figure 7). Where this distance is used, it will be necessary to ensure that the V_{50} climb out speed is associated with a speed and mass for which OEI climb data are available so that, from V_{50}, the OEI flight path can be constructed.

(ii) DPATO based on Category A distances

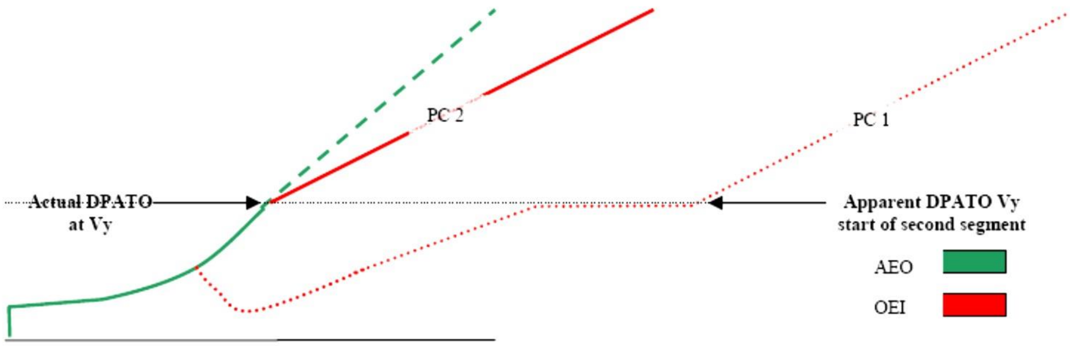
It is not necessary for specific AEO distances to be used (although for obvious reasons it is preferable); if they are not available, a flight path (with OEI obstacle clearance) can be established using Category A distances (see Figure 8 and Figure 9) — which will then be conservative.

Figure 8 Using Cat A data; actual and apparent position of DPATO (V_{toss} and start of first segment)



The apparent DPATO is for planning purposes only in the case where AEO data are not available to construct the take-off flight path. The actual OEI flight path will provide better obstacle clearance than the apparent one (used to demonstrate the minimum requirement) — as seen from the firm and dashed lines in the above figure.

Figure 9 Using Cat A data; actual and apparent position of DPATO (Vy and start of second segment)



(iii) Use of most favourable Category A data

The use of AEO data are recommended for calculating DPATO. However, where an AEO distance is not provided in the flight manual, distance to V_y at 200 ft, from the most favourable of the Category A procedures, can be used to construct a flight path (provided it can be demonstrated that AEO distance to 200 ft at V_y is always closer to the take-off point than the CAT A OEI flight path).

In order to satisfy the requirement of CAT.POL.H.315, the last point from where the start of OEI obstacle clearance can be shown is at 200 ft.

(7) The calculation of DPATO — a summary

DPATO should be defined in terms of speed and height above the take-off surface and should be selected such that AFM data (or equivalent data) are available to establish the distance from the start of the take-off up to the DPATO (conservatively if necessary).

(i) First method

DPATO is selected as the AFM Category B take-off distance (V_{50} speed or any other take-off distance scheduled in accordance with CS/JAR 29.63) provided that within the distance the helicopter can achieve:

(A) one of the V_{TOSS} values (or the unique V_{TOSS} value if it is not variable) provided in the AFM, selected so as to assure a climb capability according to Category A criteria; or

(B) V_y.

Compliance with CAT.POL.H.315 would be shown from V_{50} (or the scheduled Category B take-off distance).

(ii) Second method

DPATO is selected as equivalent to the TDP of a Category A 'clear area' take-off procedure conducted in the same conditions.

Compliance with CAT.POL.H.315 would be shown from the point at which V_{TOSS}, a height of at least 35 ft above the take-off surface and a positive climb gradient are achieved (which is the Category A 'clear area' take-off distance).

Safe forced landing areas should be available from the start of the take-off, to a distance equal to the Category A 'clear area' rejected take-off distance.

(iii) Third method

As an alternative, DPATO could be selected such that AFM OEI data are available to establish a flight path initiated with a climb at that speed. This speed should then be:

(A) one of the V_{TOSS} values (or the unique V_{TOSS} value if it is not variable) provided in the AFM, selected so as to assure a climb capability according to Category A criteria; or

(B) V_y

The height of the DPATO should be at least 35 ft and can be selected up to 200 ft. Compliance with CAT.POL.H.315 would be shown from the selected height.

(8) Safe forced landing distance

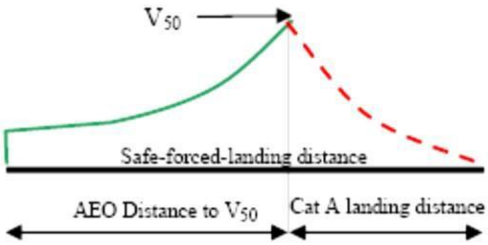
Except as provided in (f)(7)(ii), the establishment of the safe forced landing distance could be problematical as it is not likely that PC2 specific data will be available in the AFM.

By definition, the Category A reject distance may be used when the surface is not suitable for a reject, but may be satisfactory for a safe forced landing (for example, where the surface is flooded or is covered with vegetation).

Any Category A (or other accepted) data may be used to establish the distance. However, once established, it remains valid only if the Category A mass (or the mass from the accepted data) is used and the Category A (or accepted) AEO profile to the TDP is flown. In view of these constraints, the likeliest Category A procedures are the clear area or the short field (restricted area/site) procedures.

From Figure 10, it can be seen that if the Category B V_{50} procedure is used to establish DPATO, the combination of the distance to 50 ft and the Category A 'clear area' landing distance, required by CS/JAR 29.81 (the horizontal distance required to land and come to a complete stop from a point 50 ft above the landing surface), will give a good indication of the maximum safe-forced-landing distance required (see also the explanation on V_{stayup} above).

Figure 10 Category B (V_{50}) safe–forced–landing distance



(9) Performance class 2 landing

For other than PC2 operations to elevated FATOs or helidecks (see section (g)(4)(i)), the principles for the landing case are much simpler. As the performance requirements for PC1 and PC2 landings are virtually identical, the condition of the landing surface is the main issue.

If the engine fails at any time during the approach, the helicopter must be able either: to perform a go-around meeting the requirements of CAT.POL.H.315; or perform a safe forced landing on the surface. In view of this, and if using PC1 data, the LDP should not be lower that the corresponding TDP (particularly in the case of a variable TDP).

The landing mass will be identical to the take-off mass for the same site (with consideration for any reduction due to obstacle clearance — as shown in Figure 6 above).

In the case of a balked landing (i.e. the landing site becomes blocked or unavailable during the approach), the full requirement for take-off obstacle clearance must be met.

(g) Operations in performance class 2 with exposure

The Regulations offer an opportunity to discount the requirement for an assured safe forced landing area in the take-off or landing phase — subject to an approval from the CAAT. The following sections deals with this option:

(1) Limit of exposure

As stated above, performance class 2 has to ensure AEO obstacle clearance to DPATO and OEI obstacle clearance from that point. This does not change with the application of exposure.

It can, therefore, be stated that operations with exposure are concerned only with alleviation from the requirement for the provision of a safe forced landing.

The absolute limit of exposure is 200 ft — from which point OEI obstacle clearance must be shown.

(2) The principle of risk assessment

ICAO Annex 6 Part III Chapter 3.1.2 states that:

'3.1.2 In conditions where the safe continuation of flight is not ensured in the event of a critical engine failure, helicopter operations shall be conducted in a manner that gives appropriate consideration for achieving a safe forced landing.'

Although a safe forced landing may no longer be the (absolute) Standard, it is considered that risk assessment is obligatory to satisfy the amended requirement for 'appropriate consideration'.

Risk assessment used for fulfilment of this proposed Standard is consistent with principles described in 'AS/NZS 4360:1999'. Terms used in this text and defined in the AS/NZS Standard are shown in Sentence Case e.g. risk assessment or risk reduction.

(3) The application of risk assessment to performance class 2

Under circumstances where no risk attributable to engine failure (beyond that inherent in the safe forced landing) is present, operations in performance class 2 may be conducted in accordance with the non-alleviated requirements contained above — and a safe forced landing will be possible.

Under circumstances where such risk would be present, i.e. operations to an elevated FATO (deck edge strike); or, when permitted, operations from a site where a safe forced landing cannot be accomplished because the surface is inadequate; or where there is penetration into the HV curve for a short period during take-off or landing (a limitation in CS/JAR 29 AFMs), operations have to be conducted under a specific approval.

Provided such operations are risk assessed and can be conducted to an established safety target, they may be approved in accordance with CAT.POL.H.305.

(i) The elements of the risk management

The approval process consists of an operational risk assessment and the application of four principles:

(A) a safety target;

(B) a helicopter reliability assessment;

(C) continuing airworthiness; and

(D) mitigating procedures.

(ii) The safety target

The main element of the risk assessment when exposure was initially introduced by the JAA into JAR-OPS 3 (NPA OPS-8), was the assumption that turbine engines in helicopters would have failure rates of about 1:100 000 per flying hour, which would permit (against the agreed safety target of 5 x 10^{-8} per event) an exposure of about 9 seconds for twins during the take-off or landing event. (When choosing this target it was assumed that the majority of current well-maintained turbine powered helicopters would be capable of meeting the event target — it, therefore, represents the residual risk).

(Residual risk is considered to be the risk that remains when all mitigating procedures — airworthiness and operational — are applied (see sections (g)(3)(iv) and (g)(3)(v))).

(iii) The reliability assessment

The reliability assessment was initiated to test the hypothesis (stated in (g)(3)(ii)) that the majority of turbine powered types would be able to meet the safety target. This hypothesis could only be confirmed by an examination of the manufacturers' power-loss data.

(iv) Mitigating procedures (airworthiness)

Mitigating procedures consist of a number of elements:

(A) the fulfilment of all manufacturers' safety modifications;

(B) a comprehensive reporting system (both failures and usage data); and

(C) the implementation of a usage monitoring system (UMS).

Each of these elements is to ensure that engines, once shown to be sufficiently reliable to meet the safety target, will sustain such reliability (or improve upon it).

The monitoring system is felt to be particularly important as it had already been demonstrated that when such systems are in place it inculcates a more considered approach to operations. In addition, the elimination of 'hot starts', prevented by the UMS, itself minimises the incidents of turbine burst failures.

(v) Mitigating procedures (operations)

Operational and training procedures, to mitigate the risk — or minimise the consequences — are required of the operator. Such procedures are intended to minimise risk by ensuring that:

(A) the helicopter is operated within the exposed region for the minimum time; and

(B) simple but effective procedures are followed to minimise the consequence should an engine failure occur.

(4) Operation with exposure

When operating with exposure, there is alleviation from the requirement to establish a safe forced landing area (which extends to landing as well as take-off). However, the requirement for obstacle clearance — AEO in the take-off and from DPATO OEI in the climb and en-route phases — remains (both for take-off and landing).

The take-off mass is obtained from the more limiting of the following:

– the climb performance of 150 ft/min at 1 000 ft above the take-off point; or

– obstacle clearance (in accordance with (f)(3) above); or

– AEO hover out of ground effect (HOGE) performance at the appropriate power setting. (AEO HOGE is required to ensure acceleration when (near) vertical dynamic take-off techniques are being used. Additionally, for elevated FATO or helidecks, it ensures a power reserve to offset ground cushion dissipation; and ensures that, during the landing manoeuvre, a stabilised HOGE is available — should it be required.)

(i) Operations to elevated FATOs or helidecks

PC2 operations to elevated FATOs and helidecks are a specific case of operations with exposure. In these operations, the alleviation covers the possibility of:

(A) a deck-edge strike if the engine fails early in the take-off or late in the landing;

(B) penetration into the HV Curve during take-off and landing; and

(C) forced landing with obstacles on the surface (hostile water conditions) below the elevated FATO (helideck). The take-of mass is as stated above and relevant techniques are as described in GM1 CAT.POL.H.310(c) & CAT.POL.H.325(c).

It is unlikely that the DPATO will have to be calculated with operations to helidecks (due to the absence of obstacles in the take-off path).

(ii) Additional requirements for operations to helidecks in a hostile environment

For a number of reasons (e.g. the deck size, and the helideck environment — including obstacles and wind vectors), it was not anticipated that operations in PC1 would be technically feasible or economically justifiable by the projected JAA deadline of 2010 (OEI HOGE could have provided a method of compliance, but this would have resulted in a severe and unwarranted restriction on payload/range).

However, due to the severe consequences of an engine failure to helicopters involved in take-off and landings to helidecks located in hostile sea areas (such as the North Sea or the North Atlantic), a policy of risk reduction is called for. As a result, enhanced class 2 take-off and landing masses together with techniques that provide a high confidence of safety due to:

(A) deck-edge avoidance; and

(B) drop-down that provides continued flight clear of the sea,

are seen as practical measures.

For helicopters which have a Category A elevated helideck procedure, certification is satisfied by demonstrating a procedure and adjusted masses (adjusted for wind as well as temperature and pressure) that assure a 15-ft deck edge clearance on take- off and landing. It is, therefore, recommended that manufacturers, when providing enhanced PC2 procedures, use the provision of this deck-edge clearance as their benchmark.

As the height of the helideck above the sea is a variable, drop down has to be calculated; once clear of the helideck, a helicopter operating in PC1 would be expected to meet the 35-ft obstacle clearance. Under circumstances other than open sea areas and with less complex environmental conditions, this would not present difficulties. As the provision of drop down takes no account of operational circumstances, standard drop down graphs for enhanced PC2 — similar to those in existence for Category A procedures — are anticipated.

Under conditions of offshore operations, calculation of drop down is not a trivial matter — the following examples indicate some of the problems which might be encountered in hostile environments:

(A) Occasions when tide is not taken into account and the sea is running irregularly — the level of the obstacle (i.e. the sea) is indefinable making a true calculation of drop down impossible.

(B) Occasions when it would not be possible — for operational reasons — for the approach and departure paths to be clear of obstacles — the 'standard' calculation of drop-down could not be applied.

Under these circumstances, practicality indicates that drop down should be based upon the height of the deck AMSL and the 35-ft clearance should be applied.

There are, however, other and more complex issues which will also affect the deck-edge clearance and drop down calculations.

(C) When operating to moving decks on vessels, a recommended landing or take- off profile might not be possible because the helicopter might have to hover alongside in order that the rise and fall of the ship is mentally mapped;

or, on take-off re-landing in the case of an engine failure might not be an option.

Under these circumstances, the commander might adjust the profiles to address a hazard more serious or more likely than that presented by an engine failure.

It is because of these and other (unforeseen) circumstances that a prescriptive requirement is not used. However, the target remains a 15-ft deck-edge clearance and a 35-ft obstacle clearance and data should be provided such that, where practically possible, these clearances can be planned.

As accident/incident history indicates that the main hazard is collision with obstacles on the helideck due to human error, simple and reproducible take-off and landing procedures are recommended.

In view of the reasons stated above, the future requirement for PC1 was replaced by the new requirement that the take-off mass takes into account:

- the procedure;
- deck-edge miss; and
- drop down appropriate to the height of the helideck.

This will require calculation of take-off mass from information produced by manufacturers reflecting these elements. It is expected that such information will be produced by performance modelling/simulation using a model validated through limited flight testing.

(iii) Operations to helidecks for helicopters with a maximum operational passenger seating configuration (MOPSC) of more than 19

The original requirement for operations of helicopters with an MOPSC of more than 19 was PC1 (as set out in CAT.POL.H.100 (b)(2)).

However, when operating to helidecks, the problems enumerated in (g)(4)(ii) above are equally applicable to these helicopters. In view of this, but taking into account that increased numbers are (potentially) being carried, such operations are permitted in PC2 (CAT.POL.H.100 (b)(2)) but, in all helideck environments (both hostile and non- hostile), have to satisfy, the additional requirements, set out in (g)(4)(ii) above.

AMC1 CAT.POL.H.305(a) Operations without an assured safe forced landing capability

VALIDITY OF THE RISK ASSESSMENT

The operator should periodically review and update the procedures and associated risk assessments, pertaining to the granting of the CAT.POL.H.305(a) approval, to ensure that they are adequate and remain relevant for the operation.

AMC1 CAT.POL.H.305(b) Helicopter operations without an assured safe forced landing capability

ENGINE RELIABILITY STATISTICS

(a) As part of the risk assessment prior to granting an approval under CAT.POL.H.305, the operator should provide appropriate engine reliability statistics available for the helicopter type and the engine type.

(b) Except in the case of new engines, such data should show sudden power loss from the set of in-flight shutdown (IFSD) events not exceeding 1 per 100 000 engine hours in a 5 year moving window. However, a rate in excess of this value, but not exceeding 3 per 100 000 engine hours, may be accepted by the CAAT after an assessment showing an improving trend.

(c) New engines should be assessed on a case-by-case basis.

(d) After the initial assessment, updated statistics should be periodically reassessed; any adverse sustained trend will require an immediate evaluation to be accomplished by the operator in consultation with the CAAT and the manufacturers concerned. The evaluation may result in corrective action or operational restrictions being applied.

(e) The purpose of this paragraph is to provide guidance on how the in-service power plant sudden power loss rate is determined.

(1) Share of roles between the helicopter and engine type certificate holders (TCH)

(i) The provision of documents establishing the in-service sudden power loss rate for the helicopter/engine installation; the interface with the operational authority of the State of the operator should be the engine TCH or the helicopter TCH depending on the way they share the corresponding analysis work.

(ii) The engine TCH should provide the helicopter TCH with a document including: the list of in-service power loss events, the applicability factor for each event (if used), and the assumptions made on the efficiency of any corrective actions implemented (if used).

(iii) The engine or helicopter TCH should provide the operational authority of the State of the operator, with a document that details the calculation results taking into account the following:

(A) events caused by the engine and the events caused by the engine installation;

(B) applicability factor for each event (if used), the assumptions made on the efficiency of any corrective actions implemented on the engine and on the helicopter (if used); and

(C) calculation of the power plant power loss rate.

(2) Documentation

The following documentation should be updated every year:

(i) the document with detailed methodology and calculation as distributed to the authority of the State of design;

(ii) a summary document with results of computation as made available on request to any operational authority; and

(iii) a service letter establishing the eligibility for such operation and defining the corresponding required configuration as provided to the operators.

(3) Definition of 'sudden in-service power loss'

Sudden in-service power loss is an engine power loss:

(i) larger than 30 % of the take-off power;

(ii) occurring during operation; and

(iii) without the occurrence of an early intelligible warning to inform and give sufficient time for the pilot to take any appropriate action.

(4) Database documentation

Each power loss event should be documented, by the engine and/or helicopter TCHs, as follows:

(i) incident report number;

(ii) engine type;

(iii) engine serial number;

(iv) helicopter serial number;

(v) date;

(vi) event type (demanded IFSD, un-demanded IFSD);

(vii) presumed cause;

(viii) applicability factor when used; and

(ix) reference and assumed efficiency of the corrective actions that will have to be applied (if any).

(5) Counting methodology

Various methodologies for counting engine power loss rate have been accepted by authorities. The following is an example of one of these methodologies.

(i) The events resulting from:

(A) unknown causes (wreckage not found or totally destroyed, undocumented or unproven statements);

(B) where the engine or the elements of the engine installation have not been investigated (for example, when the engine has not been returned by the customer); or

(C) an unsuitable or non-representative use (operation or maintenance) of the helicopter or the engine,

are not counted as engine in-service sudden power loss and the applicability factor is 0 %.

(ii) The events caused by:

(A) the engine or the engine installation; or

(B) the engine or helicopter maintenance, when the applied maintenance was compliant with the maintenance manuals,

are counted as engine in-service sudden power loss and the applicability factor is 100 %.

(iii) For the events where the engine or an element of the engine installation has been submitted for investigation, but where this investigation subsequently failed to define a presumed cause, the applicability factor is 50 %.

(6) Efficiency of corrective actions

The corrective actions made by the engine and helicopter manufacturers on the definition or maintenance of the engine or its installation may be defined as mandatory for specific operations. In this case, the associated reliability improvement may be considered as a mitigating factor for the event.

A factor defining the efficiency of the corrective action may be applied to the applicability factor of the concerned event.

(7) Method of calculation of the power plant power loss rate

The detailed method of calculation of the power plant power loss rate should be documented by engine or helicopter TCH and accepted by the relevant authority.

AMC2 CAT.POL.H.305(b) Helicopter operations without an assured safe forced landing capability

IMPLEMENTATION OF THE SET OF CONDITIONS

To obtain an approval under CAT.POL.H.305(a), the operator conducting operations without an assured safe forced landing capability should implement the following:

(a) Attain and then maintain the helicopter/engine modification standard defined by the manufacturer that has been designated to enhance reliability during the take-off and landing phases.

(b) Conduct the preventive maintenance actions recommended by the helicopter or engine manufacturer as follows:

(1) engine oil spectrometric and debris analysis — as appropriate;

(2) engine trend monitoring, based on available power assurance checks;

(3) engine vibration analysis (plus any other vibration monitoring systems where fitted); and

(4) oil consumption monitoring.

(c) The usage monitoring system should fulfil at least the following:

(1) Recording of the following data:

(i) date and time of recording, or a reliable means of establishing these parameters;

(ii) amount of flight hours recorded during the day plus total flight time;

(iii) N_1 (gas producer RPM) cycle count;

(iv) N_2 (power turbine RPM) cycle count (if the engine features a free turbine);

(v) turbine temperature exceedance: value, duration;

(vi) power-shaft torque exceedance: value, duration (if a torque sensor is fitted);

(vii) engine shafts speed exceedance: value, duration.

(2) Data storage of the above parameters, if applicable, covering the maximum flight time in a day, and not less than 5 flight hours, with an appropriate sampling interval for each parameter.

(3) The system should include a comprehensive self-test function with a malfunction indicator and a detection of power-off or sensor input disconnection.

(4) A means should be available for downloading and analysis of the recorded parameters. Frequency of downloading should be sufficient to ensure data are not lost through overwriting.

(5) The analysis of parameters gathered by the usage monitoring system, the frequency of such analysis and subsequent maintenance actions should be described in the maintenance documentation.

(6) The data should be stored in an acceptable form and accessible to the CAAT for at least 24 months.

(d) The training for flight crew should include the discussion, demonstration, use and practice of the techniques necessary to minimise the risks.

(e) Report to the manufacturer any loss of power control, engine shutdown (precautionary or otherwise) or engine failure for any cause (excluding simulation of engine failure during training). The content of each report should provide:

(1) date and time;

(2) operator (and maintenance organisations where relevant);

(3) type of helicopter and description of operations;

(4) registration and serial number of airframe;

(5) engine type and serial number;

(6) power unit modification standard where relevant to failure;

(7) engine position;

(8) symptoms leading up to the event;

(9) circumstances of engine failure including phase of flight or ground operation;

(10) consequences of the event;

(11) weather/environmental conditions;

(12) reason for engine failure — if known;

(13) in case of an in-flight shutdown (IFSD), nature of the IFSD (demanded/un-demanded);

(14) procedure applied and any comment regarding engine restart potential;

(15) engine hours and cycles (from new and last overhaul);

(16) airframe flight hours;

(17) rectification actions applied including, if any, component changes with part number and serial number of the removed equipment; and

(18) any other relevant information.

GM1 CAT.POL.H.305(b) Helicopter operations without an assured safe forced landing capability

USE OF FULL AUTHORITY DIGITAL ENGINE CONTROL (FADEC)

Current technology increasingly allows for the recording function required in (c)(1) of AMC2 CAT.POL.H.305(b) to be incorporated in the full authority digital engine control (FADEC).

Where a FADEC is capable of recording some of the parameters required by (c)(1) of AMC2 CAT.POL.H.305(b), it is not intended that the recording of the parameters is to be duplicated.

Providing that the functions as set out in (c) of AMC2 CAT.POL.H.305(b) are satisfied, the FADEC may partially, or in whole, fulfil the requirement for recording and storing parameters in a usage monitoring system.

GM1 CAT.POL.H.310(c) & CAT.POL.H.325(c) Take-off and landing

PROCEDURE FOR CONTINUED OPERATIONS TO HELIDECKS

(a) Factors to be considered when taking off from or landing on a helideck

(1) In order to take account of the considerable number of variables associated with the helideck environment, each take-off and landing may require a slightly different profile. Factors such as helicopter mass and centre of gravity, wind velocity, turbulence, deck size, deck elevation and orientation, obstructions, power margins, platform gas turbine exhaust plumes etc., will influence both the take-off and landing. In particular, for the landing, additional considerations such as the need for a clear go-around flight path, visibility and cloud base, etc. will affect the commander's decision on the choice of landing profile. Profiles may be modified, taking account of the relevant factors noted above and the characteristics of individual helicopter types.

(b) Performance

(1) To perform the following take-off and landing profiles, adequate all engines operating (AEO) hover performance at the helideck is required. In order to provide a minimum level of performance, data (derived from the AFM AEO out of ground effect (OGE)) should be used to provide the maximum take-off or landing mass. Where a helideck is affected by downdrafts or turbulence or hot gases, or where the take-off or landing profile is obstructed, or the approach or take-off cannot be made into wind, it may be necessary to decrease this take-off or landing mass by using a suitable calculation method. The helicopter mass should not exceed that required by CAT.POL.H.310(a) or CAT.POL.H.325(a).

(For helicopter types no longer supported by the manufacturer, data may be established by the operator, provided it is acceptable to the CAAT.)

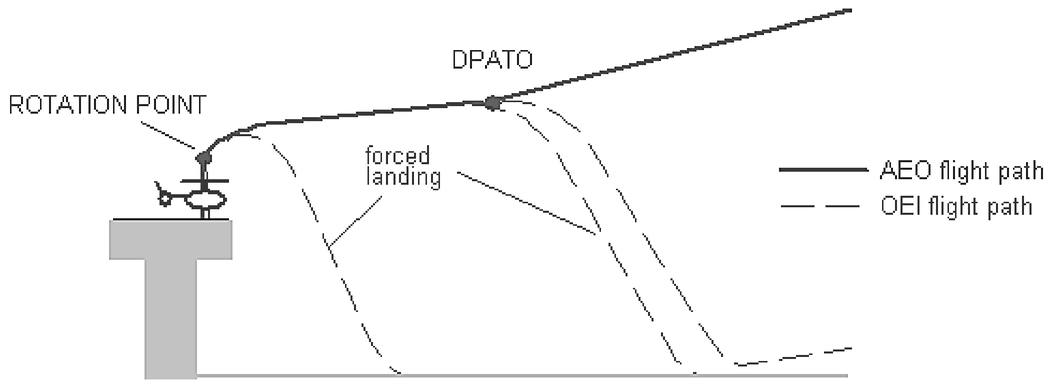
(c) Take-off profile

(1) The take-off should be performed in a dynamic manner ensuring that the helicopter continuously moves vertically from the hover to the rotation point (RP) and thence into forward flight. If the manoeuvre is too dynamic, then there is an increased risk of losing spatial awareness (through loss of visual cues) in the event of a rejected take-off, particularly at night.

(2) If the transition to forward flight is too slow, the helicopter is exposed to an increased risk of contacting the deck edge in the event of an engine failure at or just after the point of cyclic input (RP).

(3) It has been found that the climb to RP is best made between 110 % and 120 % of the power required in the hover. This power offers a rate of climb that assists with deck-edge clearance following engine failure at RP, whilst minimising ballooning following a failure before RP. Individual types will require selection of different values within this range.

Figure 1 Take-off profile



(d) Selection of a lateral visual cue

(1) In order to obtain the maximum performance in the event of an engine failure being recognised at or just after RP, the RP should be at its optimum value, consistent with maintaining the necessary visual cues. If an engine failure is recognised just before RP, the helicopter, if operating at a low mass, may 'balloon' a significant height before the reject action has any effect. It is, therefore, important that the pilot flying selects a lateral visual marker and maintains it until the RP is achieved, particularly on decks with few visual cues. In the event of a rejected take-off, the lateral marker will be a vital visual cue in assisting the pilot to carry out a successful landing.

(e) Selection of the rotation point

(1) The optimum RP should be selected to ensure that the take-off path will continue upwards and away from the deck with AEO, but minimising the possibility of hitting the deck edge due to the height loss in the event of an engine failure at or just after RP.

(2) The optimum RP may vary from type to type. Lowering the RP will result in a reduced deck edge clearance in the event of an engine failure being recognised at or just after RP. Raising the RP will result in possible loss of visual cues, or a hard landing in the event of an engine failure just prior to RP.

(f) Pilot reaction times

(1) Pilot reaction time is an important factor affecting deck edge clearance in the event of an engine failure prior to or at RP. Simulation has shown that a delay of 1 second can result in a loss of up to 15 ft in deck edge clearance.

(g) Variation of wind speed

(1) Relative wind is an important parameter in the achieved take-off path following an engine failure; wherever practicable, take-off should be made into wind. Simulation has shown that a 10-kt wind can give an extra 5-ft deck edge clearance compared to a zero wind condition.

(h) Position of the helicopter relative to the deck edge

(1) It is important to position the helicopter as close to the deck edge (including safety nets) as possible whilst maintaining sufficient visual cues, particularly a lateral marker.

(2) The ideal position is normally achieved when the rotor tips are positioned at the forward deck edge. This position minimises the risk of striking the deck edge following recognition of an engine failure at or just after RP. Any take-off heading which causes the helicopter to fly over obstructions below and beyond the deck edge should be avoided if possible. Therefore, the final take-off heading and position will be a compromise between the take- off path for least obstructions, relative wind, turbulence and lateral marker cue considerations.

(i) Actions in the event of an engine failure at or just after RP

(1) Once committed to the continued take-off, it is important, in the event of an engine failure, to rotate the aircraft to the optimum attitude in order to give the best chance of missing the deck edge. The optimum pitch rates and absolute pitch attitudes should be detailed in the profile for the specific type.

(j) Take-off from helidecks that have significant movement

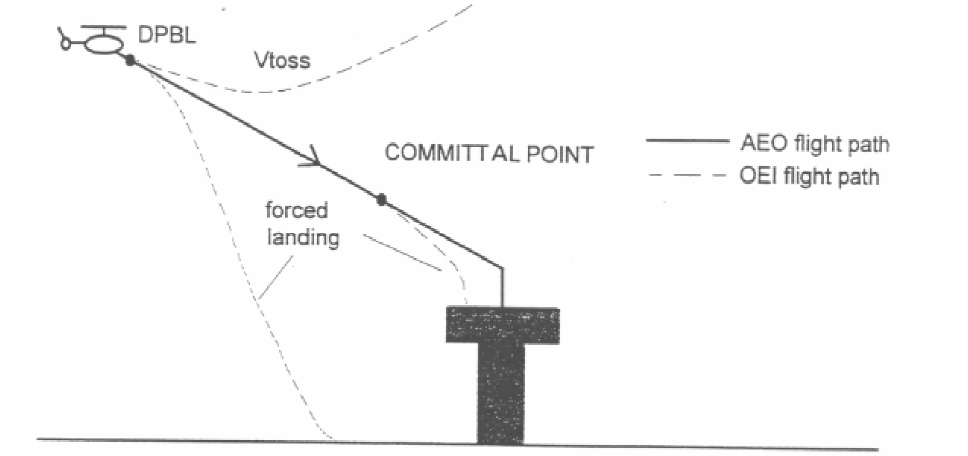
(1) This technique should be used when the helideck movement and any other factors, e.g. insufficient visual cues, makes a successful rejected take-off unlikely. Weight should be reduced to permit an improved one-engine-inoperative capability, as necessary.

(2) The optimum take-off moment is when the helideck is level and at its highest point, e.g. horizontal on top of the swell. Collective pitch should be applied positively and sufficiently to make an immediate transition to climbing forward flight. Because of the lack of a hover, the take-off profile should be planned and briefed prior to lift off from the deck.

(k) Standard landing profile

(1) The approach should be commenced into wind to a point outboard of the helideck. Rotor tip clearance from the helideck edge should be maintained until the aircraft approaches this position at the requisite height (type dependent) with approximately 10 kt of ground-speed and a minimal rate of descent. The aircraft is then flown on a flight path to pass over the deck edge and into a hover over the safe landing area.

Figure 2 Standard landing profile



(l) Offset landing profile

(1) If the normal landing profile is impracticable due to obstructions and the prevailing wind velocity, the offset procedure may be used. This should involve flying to a hover position, approximately 90° offset from the landing point, at the appropriate height and maintaining rotor tip clearance from the deck edge. The helicopter should then be flown slowly but positively sideways and down to position in a low hover over the landing point.

Normally, the committal point (CP) will be the point at which helicopter begins to transition over the helideck edge.

(m) Training

(1) These techniques should be covered in the training required by TCAR OPS Part ORO.

GM1 CAT.POL.H.310 & CAT.POL.H.325 Take-off and landing

TAKE-OFF AND LANDING TECHNIQUES

(a) This GM describes three types of operation to/from helidecks and elevated FATOs by helicopters operating in performance class 2.

(b) In two cases of take-off and landing, exposure time is used. During the exposure time (which is only approved for use when complying with CAT.POL.H.305), the probability of an engine failure is regarded as extremely remote. If an engine failure occurs during the exposure time, a safe forced landing may not be possible.

(c) Take-off — non-hostile environment (without an approval to operate with an exposure time) CAT.POL.H.310(b).

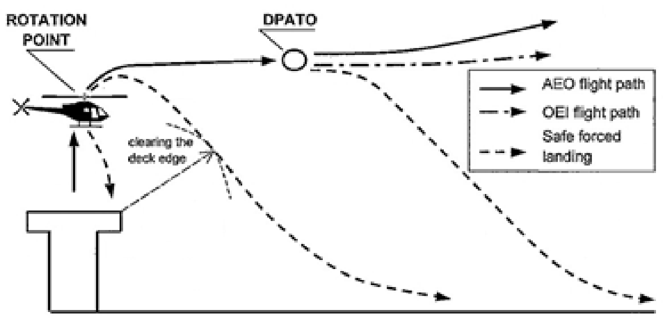
(1) Figure 1 shows a typical take-off profile for performance class 2 operations from a helideck or an elevated FATO in a non-hostile environment.

(2) If an engine failure occurs during the climb to the rotation point, compliance with CAT.POL.H.310(b) will enable a safe landing or a safe forced landing on the deck.

(3) If an engine failure occurs between the rotation point and the DPATO, compliance with CAT.POL.H.310(b) will enable a safe forced landing on the surface, clearing the deck edge.

(4) At or after the DPATO, the OEI flight path should clear all obstacles by the margins specified in CAT.POL.H.315.

Figure 1 Typical take-off profile PC2 from a helideck/elevated FATO, non-hostile environment



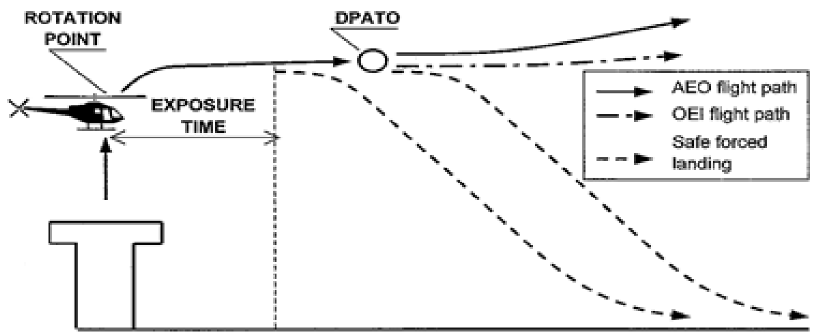
(d) Take-off — non-hostile environment (with exposure time) CAT.POL.H.310(c)

(1) Figure 2 shows a typical take-off profile for performance class 2 operations from a helideck or an elevated FATO in a non-hostile environment (with exposure time).

(2) If an engine failure occurs after the exposure time and before DPATO, compliance with CAT.POL.H.310(c) will enable a safe forced landing on the surface.

(3) At or after the DPATO, the OEI flight path should clear all obstacles by the margins specified in CAT.POL.H.315.

Figure 2 Typical take-off profile PC2 from a helideck/elevated FATO with exposure time, non-hostile environment



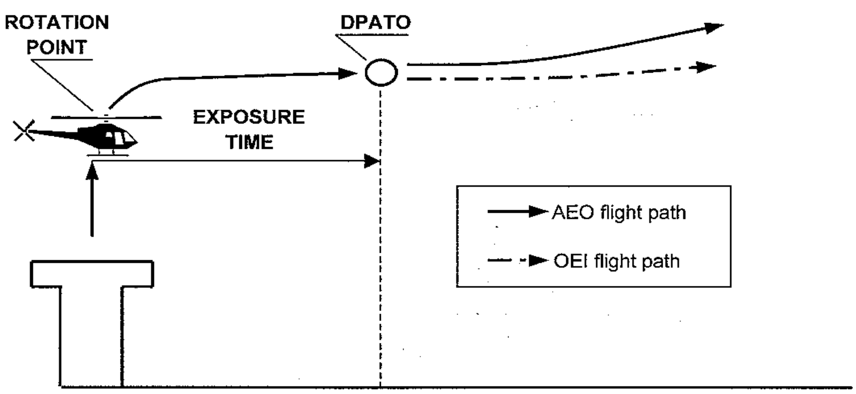
(e) Take-off — non-congested hostile environment (with exposure time) CAT.POL.H.310(c)

(1) Figure 3 shows a typical take off profile for performance class 2 operations from a helideck or an elevated FATO in a non-congested hostile environment (with exposure time).

(2) If an engine failure occurs after the exposure time, the helicopter is capable of a safe forced landing or safe continuation of the flight.

(3) At or after the DPATO, the OEI flight path should clear all obstacles by the margins specified in CAT.POL.H.315.

Figure 3 Typical take-off profile PC2 from a helideck/elevated FATO, non-congested hostile environment



(f) Landing — non-hostile environment (without an approval to operate with an exposure time) CAT.POL.H.325 (b)

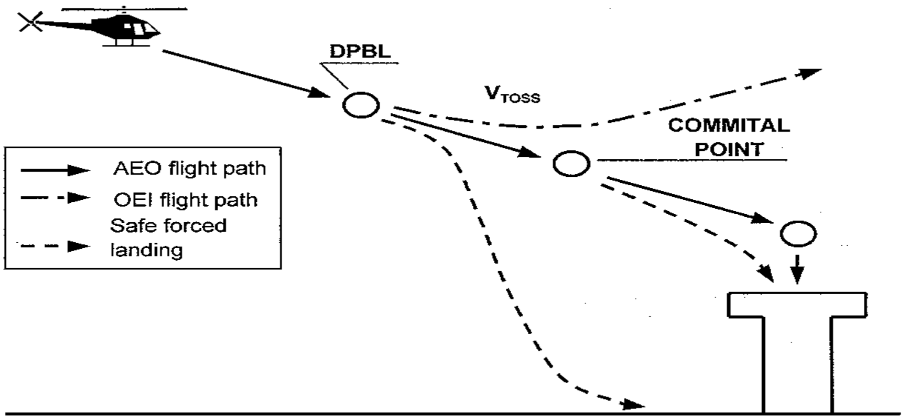
(1) Figure 4 shows a typical landing profile for performance class 2 operations to a helideck or an elevated FATO in a non-hostile environment.

(2) The DPBL is defined as a 'window' in terms of airspeed, rate of descent, and height above the landing surface. If an engine failure occurs before the DPBL, the pilot may elect to land or to execute a balked landing.

(3) In the event of an engine failure being recognised after the DPBL and before the committal point, compliance with CAT.POL.H.325(b) will enable a safe forced landing on the surface.

(4) In the event of an engine failure at or after the committal point, compliance with CAT.POL.H.325(b) will enable a safe forced landing on the deck.

Figure 4 Typical landing profile PC2 to a helideck/elevated FATO, non-hostile environment



(g) Landing — non-hostile environment (with exposure time) CAT.POL.H.325 (c)

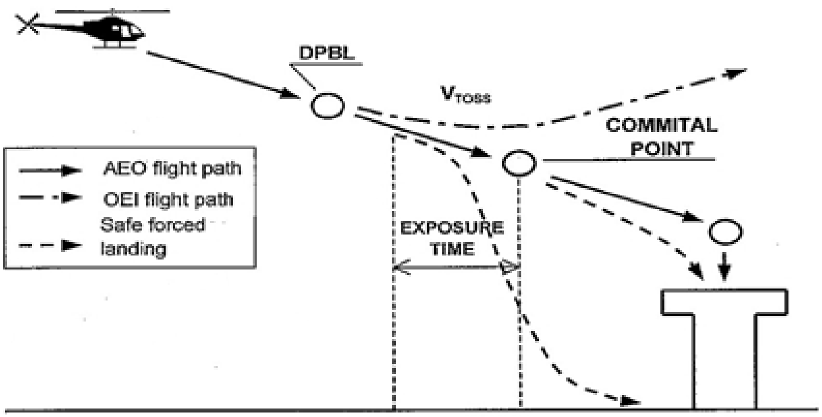
(1) Figure 5 shows a typical landing profile for performance class 2 operations to a helideck or an elevated FATO in a non-hostile environment (with exposure time).

(2) The DPBL is defined as a 'window' in terms of airspeed, rate of descent, and height above the landing surface. If an engine failure occurs before the DPBL, the pilot may elect to land or to execute a balked landing.

(3) In the event of an engine failure being recognised before the exposure time, compliance with CAT.POL.H.325(c) will enable a safe forced landing on the surface.

(4) In the event of an engine failure after the exposure time, compliance with CAT.POL.H.325(c) will enable a safe forced landing on the deck.

Figure 5 Typical landing profile PC2 to a helideck/elevated FATO with exposure time, non-hostile environment



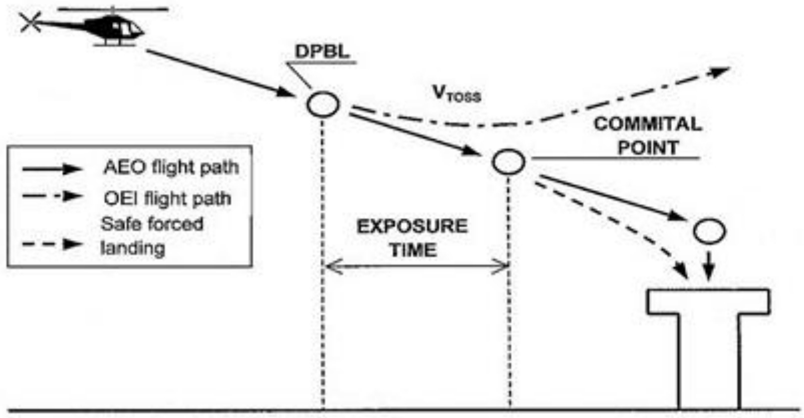
(h) Landing — non-congested hostile environment (with exposure time) CAT.POL.H.325(c)

(1) Figure 6 shows a typical landing profile for performance class 2 operations to a helideck or an elevated FATO in a non-congested hostile environment (with exposure time).

(2) In the event of an engine failure at any point during the approach and landing phase up to the start of exposure time, compliance with CAT.POL.H.325(b) will enable the helicopter, after clearing all obstacles under the flight path, to continue the flight.

(3) In the event of an engine failure after the exposure time (i.e. at or after the committal point), a safe forced landing should be possible on the deck.

Figure 6 Typical landing profile PC2 to a helideck/elevated FATO with exposure time, non-congested hostile environment



AMC1 CAT.POL.H.310(c)(2) and CAT.POL.H.325(c)(2) Take-off and landing

FACTORS

(a) To ensure that the necessary factors are taken into account, the operator should:

(1) use take-off and landing procedures that are appropriate to the circumstances, and that minimise the risks of collision with obstacles at the individual offshore location under the prevailing conditions; and

(2) use the aircraft flight manual (AFM) performance data or, where such data is not available, alternative data approved by the CAAT, which show take-off and landing masses that take into account drop-down and take-off deck-edge miss, under varying conditions of pressure altitude, temperature, and wind.

(b) Replanning of offshore location take-off or landing masses during the flight should only be performed in accordance with procedures established in the operations manual (OM). These procedures should be simple and safe to carry out, with no significant increase in the crew workload during critical phases of the flight.

GM1 CAT.POL.H.310 & CAT.POL.H.325 Take-off and landing

TAKE-OFF AND LANDING TECHNIQUES

(a) This GM describes three types of operation to/from helidecks and elevated FATOs by helicopters operating in performance class 2.

(b) In two cases of take-off and landing, exposure time is used. During the exposure time (which is only approved for use when complying with CAT.POL.H.305), the probability of an engine failure is regarded as extremely remote. If an engine failure occurs during the exposure time, a safe forced landing may not be possible.

(c) Take-off — non-hostile environment (without an approval to operate with an exposure time) CAT.POL.H.310(b).

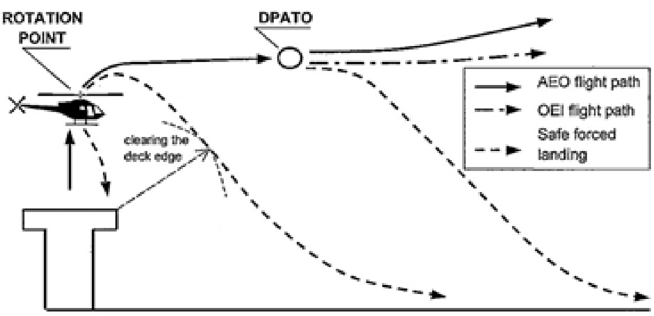
(1) Figure 1 shows a typical take-off profile for performance class 2 operations from a helideck or an elevated FATO in a non-hostile environment.

(2) If an engine failure occurs during the climb to the rotation point, compliance with CAT.POL.H.310(b) will enable a safe landing or a safe forced landing on the deck.

(3) If an engine failure occurs between the rotation point and the DPATO, compliance with CAT.POL.H.310(b) will enable a safe forced landing on the surface, clearing the deck edge.

(4) At or after the DPATO, the OEI flight path should clear all obstacles by the margins specified in CAT.POL.H.315.

Figure 1 Typical take-off profile PC2 from a helideck/elevated FATO, non-hostile environment



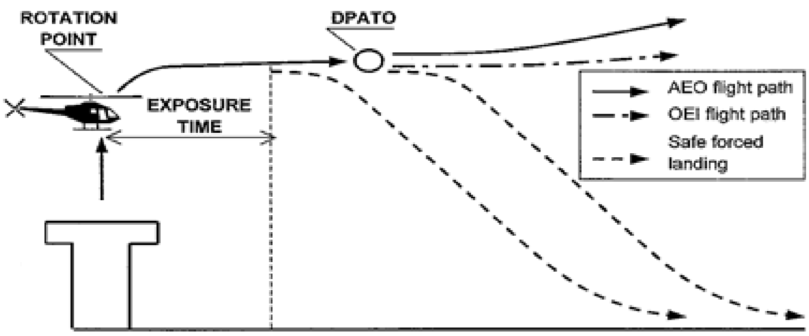
(d) Take-off — non-hostile environment (with exposure time) CAT.POL.H.310(c)

(1) Figure 2 shows a typical take-off profile for performance class 2 operations from a helideck or an elevated FATO in a non-hostile environment (with exposure time).

(2) If an engine failure occurs after the exposure time and before DPATO, compliance with CAT.POL.H.310(c) will enable a safe forced landing on the surface.

(3) At or after the DPATO, the OEI flight path should clear all obstacles by the margins specified in CAT.POL.H.315.

Figure 2 Typical take-off profile PC2 from a helideck/elevated FATO with exposure time, non-hostile environment



(e) Take-off — non-congested hostile environment (with exposure time) CAT.POL.H.310(c)

(1) Figure 3 shows a typical take off profile for performance class 2 operations from a helideck or an elevated FATO in a non-congested hostile environment (with exposure time).

(2) If an engine failure occurs after the exposure time, the helicopter is capable of a safe forced landing or safe continuation of the flight.

(3) At or after the DPATO, the OEI flight path should clear all obstacles by the margins specified in CAT.POL.H.315.

CHAPTER 4 - Performance class 3

GM1 CAT.POL.H.400(c) General

THE TAKE-OFF AND LANDING PHASES (PERFORMANCE CLASS 3)

(a) To understand the use of ground level exposure in performance class 3, it is important first to be aware of the logic behind the use of 'take-off and landing phases'. Once this is clear, it is easier to appreciate the aspects and limits of the use of ground level exposure. This GM shows the derivation of the term from the ICAO definition of the 'en-route phase' and then gives practical examples of the use, and limitations on the use, of ground level exposure in CAT.POL.400(c).

(b) The take-off phase in performance class 1 and performance class 2 may be considered to be bounded by 'the specified point in the take-off' from which the take-off flight path begins.

(1) In performance class 1, this specified point is defined as 'the end of the take-off distance required'.

(2) In performance class 2, this specified point is defined as DPATO or, as an alternative, no later than 200 ft above the take-off surface.

(3) There is no simple equivalent point for bounding of the landing in performance classes 1 & 2.

(c) Take-off flight path is not used in performance class 3 and, consequently, the term 'take-off and landing phases' is used to bound the limit of exposure. For the purpose of performance class 3, the take-off and landing phases are as set out in CAT.POL.H.400(c) and are considered to be bounded by:

(1) during take-off before reaching V_Y (speed for best rate of climb) or 200 ft above the take-off surface; and

(2) during landing, below 200 ft above the landing surface.

(ICAO Annex 6 Part III, defines en-route phase as being 'That part of the flight from the end of the take-off and initial climb phase to the commencement of the approach and landing phase.' The use of take-off and landing phase in this text is used to distinguish the take-off from the initial climb, and the landing from the approach: they are considered to be complementary and not contradictory.)

(d) Ground level exposure — and exposure for elevated FATOs or helidecks in a non-hostile environment — is permitted for operations under an approval in accordance with CAT.POL.H.305. Exposure in this case is limited to the 'take-off and landing phases'.

The practical effect of bounding of exposure can be illustrated with the following examples:

(1) A clearing: the operator may consider a take-off/landing in a clearing when there is sufficient power, with all engines operating, to clear all obstacles in the take-off path by an adequate margin (this, in ICAO, is meant to indicate 35 ft). Thus, the clearing may be bounded by bushes, fences, wires and, in the extreme, by power lines, high trees, etc. Once the obstacle has been cleared, by using a steep or a vertical climb (which itself may infringe the height velocity (HV) diagram), the helicopter reaches V_Y or 200 ft, and from that point a safe forced landing must be possible. The effect is that whilst operation to a clearing is possible, operation to a clearing in the middle of a forest is not (except when operated in accordance with CAT.POL.H.420).

(2) An aerodrome/operating site surrounded by rocks: the same applies when operating to a landing site that is surrounded by rocky ground. Once Vy or 200 ft has been reached, a safe forced landing must be possible.

(3) An elevated FATO or helideck: when operating to an elevated FATO or helideck in performance class 3, exposure is considered to be twofold: firstly, to a deck-edge strike if the engine fails after the decision to transition has been taken; and secondly, to operations in the HV diagram due to the height of the FATO or helideck. Once the take-off surface has been cleared and the helicopter has reached the knee of the HV diagram, the helicopter should be capable of making a safe forced landing.

(e) Operation in accordance with CAT.POL.400(b) does not permit excursions into a hostile environment as such and is specifically concerned with the absence of space to abort the take-off or landing when the take-off and landing space are limited; or when operating in the HV diagram.

(f) Specifically, the use of this exception to the requirement for a safe forced landing (during take-off or landing) does not permit semi-continuous operations over a hostile environment such as a forest or hostile sea area.

(g) Except as provided in CAT.POL.H.400(b), in the event of an engine failure, the helicopter shall be able to perform a safe forced landing.

AMC1 CAT.POL.H.420 Helicopter operations over a hostile environment located outside a congested area

SAFETY RISK ASSESSMENT

(a) Introduction

Two cases that are deemed to be acceptable for the alleviation under the conditions of CAT.POL.H.420 for the en-route phase of the flight (operations without an assured safe forced landing capability during take-off and landing phases are subject to a separate approval under CAT.POL.H.400(c)) are flights over mountainous areas and remote areas, both already having been considered by the JAA in comparison to ground transport in the case of remote areas and respectively to multi-engined helicopters in the case of mountain areas.

(1) Remote areas

Remote area operation is acceptable when alternative surface transportation does not provide the same level of safety as helicopter transportation. In this case, the operator should demonstrate why the economic circumstances do not justify replacement of single- engined helicopters by multi-engined helicopters.

(2) Mountainous areas

Current generation twin-engined helicopters may not be able to meet the performance class 1 or 2 requirements at the operational altitude; consequently, the outcome of an engine failure is the same as a single-engined helicopter. In this case, the operator should justify the use of exposure in the en-route phase.

(b) Other areas of operation

For other areas of operations to be considered for the operational approval, a risk assessment should be conducted by the operator that should, at least, consider the following factors:

(1) type of operations and the circumstances of the flight;

(2) area/terrain over which the flight is being conducted;

(3) probability of an engine failure and the consequence of such an event;

(4) safety target;

(5) procedures to maintain the reliability of the engine(s);

(6) installation and utilisation of a usage monitoring system; and

(7) when considered relevant, any available publications on (analysis of) accident or other safety data.

GM1 CAT.POL.H.420 Helicopter operations over a hostile environment located outside a congested area

EXAMPLE OF A SAFETY RISK ASSESSMENT

(a) Introduction

Where it can be substantiated that helicopter limitations, or other justifiable considerations, preclude the use of appropriate performance, the approval effectively alleviates from compliance with the requirement in CAT.OP.MPA.137, that requires the availability of surfaces that permit a safe forced landing to be executed.

Circumstances where an engine failure will result in a catastrophic event are those defined for a hostile environment:

(1) a lack of adequate surfaces to perform a safe landing;

(2) the inability to protect the occupants of the helicopter from the elements; or

(3) a lack of search and rescue services to provide rescue consistent with the expected survival time in such environment.

(b) The elements of the risk assessment

The risk assessment process consists of the application of three principles:

– a safety target;

– a helicopter reliability assessment; and

– continuing airworthiness.

(1) The safety target

The main element of the risk assessment when exposure was initially introduced by the JAA into JAR-OPS 3 (NPA OPS-8), was the assumption that turbine engines in helicopters would have failure rates of about 1:100 000 per flying hour — which would permit (against the agreed safety target of 5×10^{-8} per event) an exposure of about 9 seconds for twin-engined helicopters and 18 seconds for single-engined helicopters during the take-off or landing event.

An engine failure in the en-route phase over a hostile environment will inevitably result in a higher risk (in the order of magnitude of 1×10^{-5} per flying hour) to a catastrophic event.

The approval to operate with this high risk of endangering the helicopter occupants should, therefore, only be granted against a comparative risk assessment (i.e. compared to other means of transport, the risk is demonstrated to be lower), or where there is no economic justification to replace single-engined helicopters by multi-engined helicopters.

(2) The reliability assessment

The purpose of the reliability assessment is to ensure that the engine reliability remains at or better than 1 x 10^{-5}.

(3) Continuing airworthiness

Mitigating procedures consist of a number of elements:

(i) the fulfilment of all manufacturers' safety modifications;

(ii) a comprehensive reporting system (both failures and usage data); and

(iii) the implementation of a usage monitoring system (UMS).

Each of these elements is to ensure that engines, once shown to be sufficiently reliable to meet the safety target, will sustain such reliability (or improve upon it).

The monitoring system is felt to be particularly important as it had already been demonstrated that when such systems are in place, it inculcates a more considered approach to operations. In addition, the elimination of 'hot starts', prevented by the UMS, itself minimises the incidents of turbine burst failures.

GM2 CAT.POL.H.420(a) Helicopter operations over a hostile environment located outside a congested area

ENDORSEMENT FROM ANOTHER STATE (foreign country)

(a) Application to another State

To obtain an endorsement from another State, the operator should submit to that State the safety risk assessment and the reasons and justification that preclude the use of appropriate performance criteria, over those hostile areas outside a congested area over which the operator is planning to conduct operations.

(b) Endorsement from another State

Upon receiving the endorsement from another State, the operator should submit it together with the safety risk assessment and the reasons and justification that preclude the use of appropriate performance criteria, to the CAAT issuing the AOC to obtain the approval or extend the existing approval to a new area.

SECTION 3 - Mass and balance

CHAPTER 1 - Motor-powered aircraft

AMC1 CAT.POL.MAB.100(a) Mass and balance, loading

CENTRE OF GRAVITY LIMITS — OPERATIONAL CG ENVELOPE AND IN-FLIGHT CG

In the Certificate Limitations section of the AFM, forward and aft CG limits are specified. These limits ensure that the certification stability and control criteria are met throughout the whole flight and allow the proper trim setting for take-off. The operator should ensure that these limits are respected by:

(a) Defining and applying operational margins to the certified CG envelope in order to compensate for the following deviations and errors:

(1) Deviations of actual CG at empty or operating mass from published values due, for example, to weighing errors, unaccounted modifications and/or equipment variations.

(2) Deviations in fuel distribution in tanks from the applicable schedule.

(3) Deviations in the distribution of baggage and cargo in the various compartments as compared with the assumed load distribution as well as inaccuracies in the actual mass of baggage and cargo.

(4) Deviations in actual passenger seating from the seating distribution assumed when preparing the mass and balance documentation. Large CG errors may occur when 'free seating', i.e. freedom of passengers to select any seat when entering the aircraft, is permitted. Although in most cases reasonably even longitudinal passenger seating can be expected, there is a risk of an extreme forward or aft seat selection causing very large and unacceptable CG errors, assuming that the balance calculation is done on the basis of an assumed even distribution. The largest errors may occur at a load factor of approximately 50% if all passengers are seated in either the forward or aft half of the cabin. Statistical analysis indicates that the risk of such extreme seating adversely affecting the CG is greatest on small aircraft.

(5) Deviations of the actual CG of cargo and passenger load within individual cargo compartments or cabin sections from the normally assumed mid position.

(6) Deviations of the CG caused by gear and flap positions and by application of the prescribed fuel usage procedure, unless already covered by the certified limits.

(7) Deviations caused by in-flight movement of cabin crew, galley equipment and passengers.

(8) On small aeroplanes, deviations caused by the difference between actual passenger masses and standard passenger masses when such masses are used.

(b) Defining and applying operational procedures in order to:

(1) ensure an even distribution of passengers in the cabin;

(2) take into account any significant CG travel during flight caused by passenger/crew movement; and

(3) take into account any significant CG travel during flight caused by fuel consumption/transfer.

AMC1 CAT.POL.MAB.100(b) Mass and balance, loading

WEIGHING OF AN AIRCRAFT

(a) New aircraft that have been weighed at the factory may be placed into operation without reweighing if the mass and balance records have been adjusted for alterations or modifications to the aircraft. Aircraft transferred from one CAT operator to another CAT operator do not have to be weighed prior to use by the receiving operator unless more than 4 years have elapsed since the last weighing.

(b) The mass and centre of gravity (CG) position of an aircraft should be revised whenever the cumulative changes to the dry operating mass exceed ±0.5 % of the maximum landing mass or, for aeroplanes, the cumulative change in CG position exceeds 0.5 % of the mean aerodynamic chord. This may be done by weighing the aircraft or by calculation. If the AFM requires to record changes to mass and CG position below these thresholds, or to record changes in any case, and make them known to the commander, mass and CG position should be revised accordingly and made known to the commander.

(c) When weighing an aircraft, normal precautions should be taken consistent with good practices such as:

(1) checking for completeness of the aircraft and equipment;

(2) determining that fluids are properly accounted for;

(3) ensuring that the aircraft is clean; and

(4) ensuring that weighing is accomplished in an enclosed building.

(d) Any equipment used for weighing should be properly calibrated, zeroed, and used in accordance with the manufacturer's instructions. Each scale should be calibrated either by the manufacturer, by a civil department of weights and measures or by an appropriately authorised organisation within two years or within a time period defined by the manufacturer of the weighing equipment, whichever is less. The equipment should enable the mass of the aircraft to be established accurately. One single accuracy criterion for weighing equipment cannot be given. However, the weighing accuracy is considered satisfactory if the accuracy criteria in Table1 are met by the individual scales/cells of the weighing equipment used:

Table 1 Accuracy criteria for weighing equipment

For a scale/cell load	An accuracy of
below 2 000 kg	±1 %
from 2 000 kg to 20 000 kg	±20 kg
above 20 000 kg	±0.1 %

AMC2 CAT.POL.MAB.100(b) Mass and balance, loading

FLEET MASS AND CG POSITION — AEROPLANES

(a) For a group of aeroplanes of the same model and configuration, an average dry operating mass and CG position may be used as the fleet mass and CG position, provided that:

(1) the dry operating mass of an individual aeroplane does not differ by more than ±0.5 % of the maximum structural landing mass from the established dry operating fleet mass; or

(2) the CG position of an individual aeroplane does not differ by more than ±0.5 % of the mean aerodynamic chord from the established fleet CG.

(b) The operator should verify that, after an equipment or configuration change or after weighing, the aeroplane falls within the tolerances above.

(c) To add an aeroplane to a fleet operated with fleet values, the operator should verify by weighing or calculation that its actual values fall within the tolerances specified in (a)(1) and (2).

(d) To obtain fleet values, the operator should weigh, in the period between two fleet mass evaluations, a certain number of aeroplanes as specified in Table 1, where 'n' is the number of aeroplanes in the fleet using fleet values. Those aeroplanes in the fleet that have not been weighed for the longest time should be selected first.

Table 1 Minimum number of weighings to obtain fleet values

Number of aeroplanes in the fleet	Minimum number of weighings
2 or 3	n
4 to 9	(n + 3)/2
10 or more	(n + 51)/10

(e) The interval between two fleet mass evaluations should not exceed 48 months.

(f) The fleet values should be updated at least at the end of each fleet mass evaluation.

(g) Aeroplanes that have not been weighed since the last fleet mass evaluation may be kept in a fleet operated with fleet values, provided that the individual values are revised by calculation and stay within the tolerances above. If these individual values no longer fall within the tolerances, the operator should determine new fleet values or operate aeroplanes not falling within the limits with their individual values.

(h) If an individual aeroplane mass is within the dry operating fleet mass tolerance but its CG position exceeds the tolerance, the aeroplane may be operated under the applicable dry operating fleet mass but with an individual CG position.

(i) Aeroplanes for which no mean aerodynamic chord has been published, should be operated with their individual mass and CG position values. They may be operated under the dry operating fleet mass and CG position, provided that a risk assessment has been completed.

AMC1 CAT.POL.MAB.100(d) Mass and balance, loading

DRY OPERATING MASS

The dry operating mass includes:

(a) crew and crew baggage;

(b) catering and removable passenger service equipment; and

(c) tank water and lavatory chemicals.

AMC2 CAT.POL.MAB.100(d) Mass and balance, loading

MASS VALUES FOR CREW MEMBERS

(a) The operator should use the following mass values for crew to determine the dry operating mass:

(1) actual masses including any crew baggage; or

(2) standard masses, including hand baggage, of 85 kg for flight crew/technical crew members and 75 kg for cabin crew members.

(b) The operator should correct the dry operating mass to account for any additional baggage. The position of this additional baggage should be accounted for when establishing the centre of gravity of the aeroplane.

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 S.E Asian 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 (TBC) 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 Asian region with origin and destination in different continents.

(5) Flights within the (TBC) are flights conducted within the following area:

as depicted in Figure 1.

(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 CAAT 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) 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) 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.

AMC2 CAT.POL.MAB.100(e) Mass and balance, loading

PROCEDURE FOR ESTABLISHING REVISED STANDARD MASS VALUES FOR PASSENGERS AND BAGGAGE

(a) Passengers

(1) Weight sampling method. The average mass of passengers and their hand baggage should be determined by weighing, taking random samples. The selection of random samples should by nature and extent be representative of the passenger volume, considering the type of operation, the frequency of flights on various routes, in/outbound flights, applicable season and seat capacity of the aircraft.

(2) Sample size. The survey plan should cover the weighing of at least the greatest of:

(i) a number of passengers calculated from a pilot sample, using normal statistical procedures and based on a relative confidence range (accuracy) of 1 % for all adult and 2 % for separate male and female average masses; and

(ii) for aircraft:

(A) with a passenger seating capacity of 40 or more, a total of 2 000 passengers; or

(B) with a passenger seating capacity of less than 40, a total number of 50 multiplied by the passenger seating capacity.

(3) Passenger masses. Passenger masses should include the mass of the passengers' belongings that are carried when entering the aircraft. When taking random samples of passenger masses, infants should be weighted together with the accompanying adult.

(4) Weighing location. The location for the weighing of passengers should be selected as close as possible to the aircraft, at a point where a change in the passenger mass by disposing of or by acquiring more personal belongings is unlikely to occur before the passengers board the aircraft.

(5) Weighing machine. The weighing machine used for passenger weighing should have a capacity of at least 150 kg. The mass should be displayed at minimum graduations of 500 g. The weighing machine should have an accuracy of at least 0.5 % or 200 g, whichever is greater.

(6) Recording of mass values. For each flight included in the survey the mass of the passengers, the corresponding passenger category (i.e. male/female/children) and the flight number should be recorded.

(b) Checked baggage. The statistical procedure for determining revised standard baggage mass values based on average baggage masses of the minimum required sample size should comply with (a)(1) and (a)(2). For baggage, the relative confidence range (accuracy) should amount to 1 %. A minimum of 2 000 pieces of checked baggage should be weighed.

(c) Determination of revised standard mass values for passengers and checked baggage

(1) To ensure that, in preference to the use of actual masses determined by weighing, the use of revised standard mass values for passengers and checked baggage does not adversely affect operational safety, a statistical analysis should be carried out. Such an analysis should generate average mass values for passengers and baggage as well as other data.

(2) On aircraft with 20 or more passenger seats, these averages apply as revised standard male and female mass values.

(3) On aircraft with 19 passenger seats or less, the increments in Table 1 should be added to the average passenger mass to obtain the revised standard mass values.

Table 1 Increments for revised standard masses values

Number of passenger seats	Required mass increment
1 – 5 incl.	16 kg
6 – 9 incl.	8 kg
10 – 19 incl.	4 kg

Alternatively, all adult revised standard (average) mass values may be applied on aircraft with 30 or more passenger seats. Revised standard (average) checked baggage mass values are applicable to aircraft with 20 or more passenger seats.

(4) The revised standard masses should be reviewed at intervals not exceeding 5 years.

(5) All adult revised standard mass values should be based on a male/female ratio of 80/20 in respect of all flights except holiday charters that are 50/50. A different ratio on specific routes or flights may be used, provided supporting data shows that the alternative male/female ratio is conservative and covers at least 84 % of the actual male/female ratios on a sample of at least 100 representative flights.

(6) The resulting average mass values should be rounded to the nearest whole number in kg. Checked baggage mass values should be rounded to the nearest 0.5 kg figure, as appropriate.

(7) When operating on similar routes or networks, operators may pool their weighing surveys provided that in addition to the joint weighing survey results, results from individual operators participating in the joint survey are separately indicated in order to validate the joint survey results.

GM1 CAT.POL.MAB.100(e) Mass and balance, loading

ADJUSTMENT OF STANDARD MASSES

When standard mass values are used, AMC1 CAT.POL.MAB.100(e) subparagraph (g) states that the operator should identify and adjust the passenger and checked baggage masses in cases where significant numbers of passengers or quantities of baggage are suspected of significantly deviating from the standard values. Therefore, the operations manual should contain instructions to ensure that:

(a) check-in, operations and cabin staff and loading personnel report or take appropriate action when a flight is identified as carrying a significant number of passengers whose masses, including hand baggage, are expected to significantly deviate from the standard passenger mass, and/or groups of passengers carrying exceptionally heavy baggage (e.g. military personnel or sports teams); and

(b) on small aircraft, where the risks of overload and/or CG errors are the greatest, pilots pay special attention to the load and its distribution and make proper adjustments.

GM2 CAT.POL.MAB.100(e) Mass and Balance, Loading

STATISTICAL EVALUATION OF PASSENGERS AND BAGGAGE DATA

(a) Sample size

(1) For calculating the required sample size, it is necessary to make an estimate of the standard deviation on the basis of standard deviations calculated for similar populations or for preliminary surveys. The precision of a sample estimate is calculated for 95 % reliability or 'significance', i.e. there is a 95 % probability that the true value falls within the specified confidence interval around the estimated value. This standard deviation value is also used for calculating the standard passenger mass.

(2) As a consequence, for the parameters of mass distribution, i.e. mean and standard deviation, three cases have to be distinguished:

(i) μ, σ = the true values of the average passenger mass and standard deviation, which are unknown and which are to be estimated by weighing passenger samples.

(ii) μ', σ' = the 'a priori' estimates of the average passenger mass and the standard deviation, i.e. values resulting from an earlier survey, which are needed to determine the current sample size.

(iii) $\bar{x}$, s = the estimates for the current true values of m and s, calculated from the sample.

The sample size can then be calculated using the following formula:

$$n \geq \frac{(1.96 * \sigma' * 100)^2}{(e_r' * \mu')^2}$$

where:

n = number of passengers to be weighed (sample size)

e'_r = allowed relative confidence range (accuracy) for the estimate of μ by x (see also equation in (c)). The allowed relative confidence range specifies the accuracy to be achieved when estimating the true mean. For example, if it is proposed to estimate the true mean to within ±1 %, then e'_r will be 1 in the above formula.

1.96 = value from the Gaussian distribution for 95 % significance level of the resulting confidence interval.

(b) Calculation of average mass and standard deviation. If the sample of passengers weighed is drawn at random, then the arithmetic mean of the sample ($\bar{x}$) is an unbiased estimate of the true average mass (μ) of the population.

(1) Arithmetic mean of sample where:

$$\bar{x} = \frac{\sum_{j=1}^{n} x_j}{n}$$

x_j = mass values of individual passengers (sampling units).

(2) Standard deviation where:

$$S = \sqrt{\frac{\sum_{j=1}^{n}(x_j - \bar{x})^2}{n-1}}$$

– $x_j - \bar{x}$ = deviation of the individual value from the sample mean.

(c) Checking the accuracy of the sample mean. The accuracy (confidence range) which can be ascribed to the sample mean as an indicator of the true mean is a function of the standard deviation of the sample which has to be checked after the sample has been evaluated. This is done using the formula:

$$e_r = \frac{1.96 * S * 100}{\sqrt{n} * \bar{x}} (\%)$$

whereby e_r should not exceed 1 % for an all adult average mass and 2 % for an average male and/or female mass. The result of this calculation gives the relative accuracy of the estimate of μ at the 95 % significance level. This means that with 95 % probability, the true average mass μ lies within the interval:

$$\bar{x} \pm \frac{1.96 * S}{\sqrt{n}}$$

(d) Example of determination of the required sample size and average passenger mass

(1) Introduction. Standard passenger mass values for mass and balance purposes require passenger weighing programmes to be carried out. The following example shows the various steps required for establishing the sample size and evaluating the sample data. It is provided primarily for those who are not well versed in statistical computations. All mass figures used throughout the example are entirely fictitious.

(2) Determination of required sample size. For calculating the required sample size, estimates of the standard (average) passenger mass and the standard deviation are needed. The 'a priori' estimates from an earlier survey may be used for this purpose. If such estimates are not available, a small representative sample of about 100 passengers should be weighed so that the required values can be calculated. The latter has been assumed for the example.

Step 1: Estimated average passenger mass.

n	x_j (kg)
1 2	79.9 68.1
3	77.9
4	74.5
5	54.1
6	62.2
7	89.3
8	108.7
.	.
85	63.2
86	75.4
$\sum_{j=1}^{86}$	6 071.6

$$\mu' = \bar{x} = \frac{\sum x_j}{n} = \frac{6071.6}{86}$$

$= 70.6$ kg

Step 2: Estimated standard deviation.

n	xj	$(x_j - \bar{x})$	$(x_j - \bar{x})^2$
1	79.9	+9.3	86.49
2	68.1	–2.5	6.25
3	77.9	+7.3	53.29
4	74.5	+3.9	15.21
5	54.1	–16.5	272.25
6	62.2	–8.4	70.56
7	89.3	+18.7	349.69
8	108.7	+38.1	1 451.61
.	.	.	.
85	63.2	–7.4	54.76
86	75.4	–4.8	23.04
$\sum_{j=1}^{86}$	6 071.6		34 683.40

$$\sigma' = \sqrt{\frac{\sum (x_j - \bar{x})^2}{n-1}}$$

$$\sigma' = \sqrt{\frac{34\,683.40}{86-1}}$$

σ' = 20.20 kg

Step 3: Required sample size.

The required number of passengers to be weighed should be such that the confidence range, e'_r does not exceed 1 %, as specified in (c).

$$n \geq \frac{(1.96 * \sigma' * 100)^2}{(e'_r * \mu')^2}$$

$$n \geq \frac{(1.96 * 20.20 * 100)^2}{(1 * 70.6)^2}$$

$$n \geq 3145$$

The result shows that at least 3 145 passengers should be weighed to achieve the required accuracy. If e'_r is chosen as 2 % the result would be n ≥786.

Step 4: After having established the required sample size, a plan for weighing the passengers is to be worked out.

(3) Determination of the passenger average mass

Step 1: Having collected the required number of passenger mass values, the average passenger mass can be calculated. For the purpose of this example, it has been assumed that 3 180 passengers were weighed. The sum of the individual masses amounts to 231 186.2 kg.

n = 3180

$$\sum_{j=1}^{3180} X_j = 231186.2 \text{ kg}$$

$$\bar{x} = \frac{\sum x_j}{n} = \frac{231186.2}{3180} \text{ kg}$$

$$\bar{x} = 72.7 \text{ kg}$$

Step 2: Calculation of the standard deviation

For calculating the standard deviation, the method shown in paragraph (2) step 2 should be applied.

$$\sum (x_j - \bar{x})^2 = 745\ 145.20$$

$$s = \sqrt{\frac{\sum (x_j - \bar{x})^2}{n - 1}}$$

$$s = \sqrt{\frac{745\ 145.20}{3180 - 1}}$$

$s = 15.31$ kg

Step 3: Calculation of the accuracy of the sample mean

$$e_r = \frac{1.96 * s * 100}{\sqrt{n} * \bar{x}} \%$$

$$e_r = \frac{1.96 * 15.31 * 100}{\sqrt{3180} * 72.7} \%$$

$e_r = 0.73$ %

Step 4: Calculation of the confidence range of the sample mean

$$\bar{x} \pm \frac{1.96 * s}{\sqrt{n}}$$

$$\bar{x} \pm \frac{1.96 * 15.31}{\sqrt{3180}} \text{ kg}$$

72.7 ± 0.5 kg

The result of this calculation shows that there is a 95 % probability of the actual mean for all passengers lying within the range 72.2 kg to 73.2 kg.

GM3 CAT.POL.MAB.100(e) Mass and balance, loading

GUIDANCE ON PASSENGER WEIGHING SURVEYS

(a) Detailed survey plan

(1) The operator should establish and submit to the CAAT a detailed weighing survey plan that is fully representative of the operation, i.e. the network or route under consideration and the survey should involve the weighing of an adequate number of passengers.

(2) A representative survey plan means a weighing plan specified in terms of weighing locations, dates and flight numbers giving a reasonable reflection of the operator's timetable and/or area of operation.

(3) The minimum number of passengers to be weighed is the highest of the following:

(i) The number that follows from the means of compliance that the sample should be representative of the total operation to which the results will be applied; this will often prove to be the overriding requirement.

(ii) The number that follows from the statistical requirement specifying the accuracy of the resulting mean values, which should be at least 2 % for male and female standard masses and 1 % for all adult standard masses, where applicable. The required sample size can be estimated on the basis of a pilot sample (at least 100 passengers) or from a previous survey. If analysis of the results of the survey indicates that the requirements on the accuracy of the mean values for male or female standard masses or all adult standard masses, as applicable, are not met, an additional number of representative passengers should be weighed in order to satisfy the statistical requirements.

(4) To avoid unrealistically small samples, a minimum sample size of 2 000 passengers (males + females) is also required, except for small aircraft where in view of the burden of the large number of flights to be weighed to cover 2 000 passengers, a lesser number is considered acceptable.

(b) Execution of weighing programme

(1) At the beginning of the weighing programme, it is important to note, and to account for, the data requirements of the weighing survey report (see (e)).

(2) As far as is practicable, the weighing programme should be conducted in accordance with the specified survey plan.

(3) Passengers and all their personal belongings should be weighed as close as possible to the boarding point and the mass, as well as the associated passenger category (male/female/child), should be recorded.

(c) Analysis of results of weighing survey. The data of the weighing survey should be analysed as explained in this GM. To obtain an insight to variations per flight, per route, etc. this analysis should be carried out in several stages, i.e. by flight, by route, by area, inbound/outbound, etc. Significant deviations from the weighing survey plan should be explained as well as their possible effect(s) on the results.

(d) Results of the weighing survey

(1) The results of the weighing survey should be summarised. Conclusions and any proposed deviations from published standard mass values should be justified. The results of a passenger weighing survey are average masses for passengers, including hand baggage, which may lead to proposals to adjust the standard mass values given in AMC1 CAT.POL.MAB.100(e) Tables 1 and 2. These averages, rounded to the nearest whole number may, in principle, be applied as standard mass values for males and females on aircraft with 20 or more passenger seats. Because of variations in actual passenger masses, the total passenger load also varies and statistical analysis indicates that the risk of a significant overload becomes unacceptable for aircraft with less than 20 seats. This is the reason for passenger mass increments on small aircraft.

(2) The average masses of males and females differ by some 15 kg or more. Because of uncertainties in the male/female ratio, the variation of the total passenger load is greater if all adult standard masses are used than when using separate male and female standard masses. Statistical analysis indicates that the use of all adult standard mass values should be limited to aircraft with 30 passenger seats or more.

(3) Standard mass values for all adults must be based on the averages for males and females found in the sample, taking into account a reference male/female ratio of 80/20 for all flights except holiday charters where a ratio of 50/50 applies. The operator may, based on the data from his weighing programme, or by proving a different male/female ratio, apply for approval of a different ratio on specific routes or flights.

(e) Weighing survey report

The weighing survey report, reflecting the content of (d)(1) - (3), should be prepared in a standard format as follows:

WEIGHING SURVEY REPORT

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(1) Introduction

Objective and brief description of the weighing survey.

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(2) Weighing survey plan

Discussion of the selected flight number, airports, dates, etc.

Determination of the minimum number of passengers to be weighed.

Survey plan.

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(3) Analysis and discussion of weighing survey results

Significant deviations from survey plan (if any).

Variations in means and standard deviations in the network.

Discussion of the (summary of) results.

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(4) Summary of results and conclusions

Main results and conclusions.

Proposed deviations from published standard mass values.

Attachment 1

Applicable summer and/or winter timetables or flight programmes.

Attachment 2

Weighing results per flight (showing individual passenger masses and sex); means and standard deviations per flight, per route, per area and for the total network.

GM1 CAT.POL.MAB.100(g) Mass and balance, loading

FUEL DENSITY

(a) If the actual fuel density is not known, the operator may use standard fuel density values for determining the mass of the fuel load. Such standard values should be based on current fuel density measurements for the airports or areas concerned.

(b) Typical fuel density values are:

(1) Gasoline (piston engine fuel) – 0.71

(2) JET A1 (Jet fuel JP 1) – 0.79

(3) JET B (Jet fuel JP 4) – 0.76

(4) Oil – 0.88

GM1 CAT.POL.MAB.100(i) Mass and balance, loading

IN-FLIGHT CHANGES IN LOADING — HELICOPTERS

In-flight changes in loading may occur in hoist operations.

AMC1 CAT.POL.MAB.105(a) Mass and balance data and documentation

CONTENTS

The mass and balance documentation should include advice to the commander whenever a non-standard method has been used for determining the mass of the load.

AMC1 CAT.POL.MAB.105(b) Mass and balance data and documentation

INTEGRITY

The operator should verify the integrity of mass and balance data and documentation generated by a computerised mass and balance system, at intervals not exceeding 6 months. The operator should establish a system to check that amendments of its input data are incorporated properly in the system and that the system is operating correctly on a continuous basis.

AMC1 CAT.POL.MAB.105(c) Mass and balance data and documentation

SIGNATURE OR EQUIVALENT

Where a signature by hand is impracticable or it is desirable to arrange the equivalent verification by electronic means, the following conditions should be applied in order to make an electronic signature the equivalent of a conventional hand-written signature:

(a) electronic 'signing' by entering a personal identification number (PIN) code with appropriate security, etc.;

(b) entering the PIN code generates a print-out of the individual's name and professional capacity on the relevant document(s) in such a way that it is evident, to anyone having a need for that information, who has signed the document;

(c) the computer system logs information to indicate when and where each PIN code has been entered;

(d) the use of the PIN code is, from a legal and responsibility point of view, considered to be fully equivalent to signature by hand;

(e) the requirements for record keeping remain unchanged; and.

(f) all personnel concerned are made aware of the conditions associated with electronic signature and this is documented.

AMC2 CAT.POL.MAB.105(c) Mass and balance data and documentation

MASS AND BALANCE DOCUMENTATION SENT VIA DATA LINK

Whenever the mass and balance documentation is sent to the aircraft via data link, a copy of the final mass and balance documentation, as accepted by the commander, should be available on the ground.

SUBPART D: INSTRUMENTS, DATA, EQUIPMENT

SECTION 1 - Aeroplanes

GM1 CAT.IDE.A.100 Instruments and equipment — general

When EUROCAE Standards are referred to in the AMCs to TCAR OPS Part CAT, equivalent standards acceptable to the CAAT may be used to establish compliance.

GM1 CAT.IDE.A.100(a) Instruments and equipment — general

REQUIRED INSTRUMENTS AND EQUIPMENT THAT DO NOT NEED TO BE APPROVED IN ACCORDANCE WITH Initial airworthiness regulations.

The functionality of non-installed instruments and equipment required by this Subpart and that do not need an equipment approval, as listed in CAT.IDE.A.100(a), should be checked against recognised industry standards appropriate to the intended purpose. The operator is responsible for ensuring the maintenance of these instruments and equipment.

GM1 CAT.IDE.A.100(b) Instruments and equipment — general

NOT REQUIRED INSTRUMENTS AND EQUIPMENT THAT DO NOT NEED TO BE APPROVED IN ACCORDANCE WITH Initial airworthiness regulations, BUT ARE CARRIED ON A FLIGHT

(a) The provision of this paragraph does not exempt any installed instrument or item of equipment from complying with Initial airworthiness regulations. In this case, the installation should be approved as required in Initial airworthiness regulations and should comply with the applicable Certification Specifications as required under the same Regulation.

(b) The failure of additional non-installed instruments or equipment not required by this Part or by Initial airworthiness regulations or any applicable airspace requirements should not adversely affect the airworthiness and/or the safe operation of the aeroplane. Examples may be the following:

(1) portable electronic flight bag (EFB);

(2) portable electronic devices carried by flight crew or cabin crew; and

(3) non-installed passenger entertainment equipment.

GM1 CAT.IDE.A.100(d) Instruments and equipment — general

POSITIONING OF INSTRUMENTS

This requirement implies that whenever a single instrument is required to be installed in an aeroplane operated in a multi-crew environment, the instrument needs to be visible from each flight crew station.

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.

GM1 CAT.IDE.A.110 Spare electrical fuses

FUSES

A 'spare electrical fuse' means a replaceable fuse in the flight crew compartment, not an automatic circuit breaker, or circuit breakers in the electric compartments.

AMC1 CAT.IDE.A.120 Equipment to clear windshield

MEANS TO MAINTAIN A CLEAR PORTION OF THE WINDSHIELD DURING PRECIPITATION

The means used to maintain a clear portion of the windshield during precipitation should be windshield wipers or an equivalent.

AMC1 CAT.IDE.A.125 & CAT.IDE.A.130 Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

INTEGRATED INSTRUMENTS

(a) Individual equipment requirements may be met by combinations of instruments, by integrated flight systems or by a combination of parameters on electronic displays, provided that the information so available to each required pilot is not less than that required in the applicable operational requirements, and the equivalent safety of the installation has been shown during type certification approval of the aeroplane for the intended type of operation.

(b) The means of measuring and indicating turn and slip, aeroplane attitude and stabilised aeroplane heading may be met by combinations of instruments or by integrated flight director systems, provided that the safeguards against total failure, inherent in the three separate instruments, are retained.

AMC2 CAT.IDE.A.125 Operations under VFR by day — flight and navigational instruments and associated equipment

LOCAL FLIGHTS

For flights that do not exceed 60 minutes' duration, that take off and land at the same aerodrome and that remain within 50 NM of that aerodrome, an equivalent means of complying with CAT.IDE.A.125 (a)(1)(vi) may be:

(a) a turn and slip indicator;

(b) a turn coordinator; or

(c) both an attitude indicator and a slip indicator.

AMC1 CAT.IDE.A.125(a)(1)(i) & CAT.IDE.A.130(a)(1) Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

MEANS OF MEASURING AND DISPLAYING MAGNETIC HEADING

The means of measuring and displaying magnetic direction should be a magnetic compass or equivalent.

AMC1 CAT.IDE.A.125(a)(1)(ii) & CAT.IDE.A.130(a)(2) Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

MEANS OF MEASURING AND DISPLAYING THE TIME

An acceptable means of compliance is a clock displaying hours, minutes and seconds, with a sweep-second pointer or digital presentation.

AMC1 CAT.IDE.A.125(a)(1)(iii) & CAT.IDE.A.130(b) Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

CALIBRATION OF THE MEANS OF MEASURING AND DISPLAYING PRESSURE ALTITUDE

The instrument measuring and displaying barometric altitude should be of a sensitive type calibrated in feet (ft), with a sub-scale setting, calibrated in hectopascals/millibars, adjustable for any barometric pressure likely to be set during flight.

AMC1 CAT.IDE.A.125(a)(1)(iv) & CAT.IDE.A.130(a)(3) Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

CALIBRATION OF THE INSTRUMENT INDICATING AIRSPEED

The instrument indicating airspeed should be calibrated in knots (kt).

AMC1 CAT.IDE.A.125(a)(1)(ix) & CAT.IDE.A.130(a)(8) Operations under VFR by day & operations under IFR or at night — flight and navigational instruments and associated equipment

MEANS OF DISPLAYING OUTSIDE AIR TEMPERATURE

(a) The means of displaying outside air temperature should be calibrated in degrees Celsius.

(b) The means of displaying outside air temperature may be an air temperature indicator that provides indications that are convertible to outside air temperature.

AMC1 CAT.IDE.A.125(b) & CAT.IDE.A.130(h) Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

MULTI-PILOT OPERATIONS — DUPLICATE INSTRUMENTS

Duplicate instruments should include separate displays for each pilot and separate selectors or other associated equipment where appropriate.

AMC1 CAT.IDE.A.125(c) & CAT.IDE.A.130(d) Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

MEANS OF PREVENTING MALFUNCTION DUE TO CONDENSATION OR ICING

The means of preventing malfunction due to either condensation or icing of the airspeed indicating system should be a heated pitot tube or equivalent.

GM1 CAT.IDE.A.125 & CAT.IDE.A.130 Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

SUMMARY TABLE

Table 1 Flight and navigational instruments and associated equipment

SERIAL		FLIGHTS UNDER VFR		FLIGHTS UNDER IFR OR AT NIGHT	
INSTRUMENT		SINGLE-PILOT	TWO PILOTS REQUIRED	SINGLE-PILOT	TWO PILOTS REQUIRED
1	Magnetic direction	1	1	1	1
2	Time	1	1	1	1
3	Pressure altitude	1	2	2 Note (5)	2 Note (5)
4	Indicated airspeed	1	2	1	2
5	Vertical speed	1	2	1	2
6	Turn and slip or turn coordinator	1 Note (1)	2 Note (1) & Note (2)	1 Note (4)	2 Note (4)
7	Attitude	1 Note (1)	2 Note (1) & Note (2)	1	2
8	Stabilised direction	1 Note (1)	2 Note (1) & Note (2)	1	2
9	Outside air temperature	1	1	1	1
10	Mach number indicator	See Note (3)			
11	Airspeed icing protection	1 Note (6)	2 Note (6)	1	2
12	Airspeed icing protection failure indicating			1 Note (7)	2 Note (7)
13	Static pressure source			2	2
14	Standby attitude indicator			1 Note (8)	1 Note (8)
15	Chart holder			1 Note (6)	1 Note (6)

Note (1) For local flights (A to A, 50 NM radius, not more than 60 minutes' duration), the instruments at serials (a)(6) and (a)(8) may be replaced by either a turn and slip indicator, or a turn coordinator, or both an attitude indicator and a slip indicator.

Note (2) The substitute instruments permitted by Note (1) above should be provided at each pilot's station.

Note (3) A Mach number indicator is required for each pilot whenever compressibility limitations are not otherwise indicated by airspeed indicators.

Note (4) For IFR or at night, a turn and slip indicator, or a slip indicator and a third (standby) attitude indicator certified according to CS 25.1303 (b)(4) or equivalent, is required.

Note (5) Except for unpressurised aeroplanes operating below 10 000 ft, neither three pointers, nor drum-pointer altimeters satisfy the requirement.

Note (6) Applicable only to aeroplanes with a maximum certified take-off mass (MCTOM) of more than 5 700 kg, or with an MOPSC of more than 9. It also applies to all aeroplanes first issued with an individual certificate of airworthiness (CofA) on or after 1 April 1999.

Note (7) The pitot heater failure annunciation applies to any aeroplane issued with an individual CofA on or after 1 April 1998. It also applies before that date when: the aeroplane has an MCTOM of more than 5 700 kg and an MOPSC greater than 9.

Note (8) Applicable only to aeroplanes with an MCTOM of more than 5 700 kg, or with an MOPSC of more than 9.

AMC1 CAT.IDE.A.125 & CAT.IDE.A.130 Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

See for IDE.A.125 earlier in this document.

AMC1 CAT.IDE.A.125(a)(1)(i) & CAT.IDE.A.130(a)(1) Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

See for IDE.A.125 (a) (1) (i) earlier in this document.

AMC1 CAT.IDE.A.125(a)(1)(ii) & CAT.IDE.A.130(a)(2) Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

See for IDE.A.125 (a) (1) (ii) earlier in this document.

AMC1 CAT.IDE.A.125(a)(1)(iv) & CAT.IDE.A.130(a)(3) Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

See for IDE.A.125 (a) (1) (iv) earlier in this document.

AMC1 CAT.IDE.A.130(a)(5) Operations under IFR or at night — flight and navigational instruments and associated equipment

SLIP INDICATOR

If only slip indication is provided, the means of measuring and displaying standby attitude should be certified according to CS 25.1303(b)(4) or equivalent.

AMC1 CAT.IDE.A.125(a)(1)(ix) & CAT.IDE.A.130(a)(8) Operations under VFR by day & operations under IFR or at night — flight and navigational instruments and associated equipment

See for IDE.A.125 (a) (1) (ix) earlier in this document.

AMC1 CAT.IDE.A.125(a)(1)(iii) & CAT.IDE.A.130(b) Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

See for IDE.A.125 (a) (1) (iii) earlier in this document.

AMC2 CAT.IDE.A.130(b) Operations under IFR or at night — flight and navigational instruments and associated equipment

ALTIMETERS — IFR OR NIGHT OPERATIONS

Except for unpressurised aeroplanes operating below 10 000 ft, the altimeters of aeroplanes operating under IFR or at night should have counter drum-pointer or equivalent presentation.

AMC1 CAT.IDE.A.125(c) & CAT.IDE.A.130(d) Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

See for IDE.A.125(c) earlier in this document.

AMC1 CAT.IDE.A.130(e) Operations under IFR or at night — flight and navigational instruments and associated equipment

MEANS OF INDICATING FAILURE OF THE AIRSPEED INDICATING SYSTEM'S MEANS OF PREVENTING MALFUNCTION DUE TO EITHER CONDENSATION OR ICING

A combined means of indicating failure of the airspeed indicating system's means of preventing malfunction due to either condensation or icing is acceptable provided that it is visible from each flight crew station and that there is a means to identify the failed heater in systems with two or more sensors.

AMC1 CAT.IDE.A.125(b) & CAT.IDE.A.130(h) Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

See for IDE.A.125(b) earlier in this document.

AMC1 CAT.IDE.A.130(i)(5) Operations under IFR or at night — flight and navigational instruments and associated equipment

ILLUMINATION OF STANDBY MEANS OF MEASURING AND DISPLAYING ATTITUDE

The standby means of measuring and displaying attitude should be illuminated so as to be clearly visible under all conditions of daylight and artificial lighting.

AMC1 CAT.IDE.A.130(j) Operations under IFR or at night — flight and navigational instruments and associated equipment

CHART HOLDER

An acceptable means of compliance with the chart holder requirement is to display a pre-composed chart on an electronic flight bag (EFB).

GM1 CAT.IDE.A.125 & CAT.IDE.A.130 Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

See for IDE.A.125 earlier in this document.

AMC1 CAT.IDE.A.150 Terrain awareness warning system (TAWS)

EXCESSIVE DOWNWARDS GLIDE SLOPE DEVIATION WARNING FOR CLASS A TAWS

The requirement for a Class A TAWS to provide a warning to the flight crew for excessive downwards glide slope deviation should apply to all final approach glide slopes with angular vertical navigation (VNAV) guidance, whether provided by the instrument landing system (ILS), microwave landing system (MLS), satellite based augmentation system approach procedure with vertical guidance (SBAS APV (localiser performance with vertical guidance approach LPV)), ground-based augmentation system (GBAS (GPS landing system, GLS) or any other systems providing similar guidance. The same requirement should not apply to systems providing vertical guidance based on barometric VNAV.

GM1 CAT.IDE.A.150 Terrain awareness warning system (TAWS)

ACCEPTABLE STANDARD FOR TAWS

An acceptable standard for Class A and Class B TAWS may be the applicable European technical standards order (ETSO) issued by EASA or FAA standard or any equivalent standard that is acceptable to the CAAT.

GM1 CAT.IDE.A.151 Runway overrun awareness and alerting system (ROAAS)

ACCEPTABLE STANDARD FOR ROAAS

An acceptable standard for ROAAS design is contained in EUROCAE ED-250, Minimum Operation Performance Specification (MOPS) for Runway Overrun Awareness and Alerting System (ROAAS), or any equivalent documents acceptable to the CAAT.

AMC1 CAT.IDE.A.160 Airborne weather detecting equipment

GENERAL

The airborne weather detecting equipment should be an airborne weather radar, except for propeller-driven pressurised aeroplanes with an MCTOM not more than 5 700 kg and an MOPSC of not more than 9, for which other equipment capable of detecting thunderstorms and other potentially hazardous weather conditions, regarded as detectable with airborne weather radar equipment, are also acceptable.

AMC1 CAT.IDE.A.170 Flight crew interphone system

TYPE OF FLIGHT CREW INTERPHONE

The flight crew interphone system should not be of a handheld type.

AMC1 CAT.IDE.A.175 Crew member interphone system

SPECIFICATIONS

The crew member interphone system should:

(a) operate independently of the public address system except for handsets, headsets, microphones, selector switches and signalling devices;

(b) in the case of aeroplanes where at least one cabin crew member is required, be readily accessible for use at required cabin crew member stations close to each separate or pair of floor level emergency exits;

(c) in the case of aeroplanes where at least one cabin crew member is required, have an alerting system incorporating aural or visual signals for use by flight and cabin crew;

(d) have a means for the recipient of a call to determine whether it is a normal call or an emergency call that uses one or a combination of the following:

(1) lights of different colours;

(2) codes defined by the operator (e.g. different number of rings for normal and emergency calls); or

(3) any other indicating signal specified in the operations manual;

(e) provide two-way communication between:

(1) the flight crew compartment and each passenger compartment, in the case of aeroplanes where at least one cabin crew member is required;

(2) the flight crew compartment and each galley located other than on a passenger deck level, in the case of aeroplanes where at least one cabin crew member is required;

(3) the flight crew compartment and each remote crew compartment and crew member station that is not on the passenger deck and is not accessible from a passenger compartment; and

(4) ground personnel and at least two flight crew members. This interphone system for use by the ground personnel should be, where practicable, so located that the personnel using the system may avoid detection from within the aeroplane; and

(f) be readily accessible for use from each required flight crew station in the flight crew compartment.

AMC1 CAT.IDE.A.180 Public address system

SPECIFICATIONS

The public address system should:

(a) operate independently of the interphone systems except for handsets, headsets, microphones, selector switches and signalling devices;

(b) be readily accessible for immediate use from each required flight crew station;

(c) have, for each floor level passenger emergency exit that has an adjacent cabin crew seat, a microphone operable by the seated cabin crew member, except that one microphone may serve more than one exit, provided the proximity of exits allows unassisted verbal communication between seated cabin crew members;

(d) be operable within 10 seconds by a cabin crew member at each of those stations; and

(e) be audible at all passenger seats, lavatories, galleys, cabin crew seats and work stations, and other crew remote areas.

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.

AMC1.1 CAT.IDE.A.190 Flight data recorder

OPERATIONAL PERFORMANCE REQUIREMENTS FOR AEROPLANES FIRST ISSUED WITH AN INDIVIDUAL CofA ON OR AFTER 1 JANUARY 2016 AND BEFORE 1 JANUARY 2023

(a) The operational performance requirements for flight data recorders (FDRs) 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.

(b) The FDR should record with reference to a timescale the list of parameters in Table 1 and Table 2, as applicable.

(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 ED-112, including amendments No 1 and No 2, 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
3a	Indicated airspeed; or Calibrated airspeed
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
7	Roll attitude
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 Flight crew compartment thrust/power lever position for aeroplanes with non-mechanically linked flight crew compartment — engine control
14	Total or outside air temperature
16	Longitudinal acceleration (body axis)
17	Lateral acceleration

No*	Parameter
18	Primary flight control surface and/or primary flight control pilot input (for aeroplanes with control systems in which movement of a control surface will back drive the pilot's control, 'or' applies. For aeroplanes with control systems in which 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. Foraeroplanes that have a flight control break-away capability that allows either pilot to operate
18a	Pitch axis
18b	Roll axis
18c	Yaw axis
19	Pitch trim surface position
23	Marker beacon passage
24	Warnings — in addition to the master warning, each 'red' warning (including smoke warnings from other compartments) should be recorded when the warning condition cannot be determined from other parameters or from the CVR
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 ED-112.

Table 2 FDR — Aeroplanes for which the data source for the parameter is either used by 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	Ground spoiler and speed brake
13a 13b 13c 13d	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
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 (IRNAV), vertical deviation
22 22a 22b 22c	Horizontal deviation — the approach aid in use should be recorded. For auto 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)

No*	Parameter
28 28a 28b 28c	Ground proximity warning system (GPWS)/terrain awareness warning system (TAWS)/ground collision avoidance system (GCAS) status: 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	Landing gear: Landing gear position
32b	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 34a 34b	Brakes: Left and right brake pressure Left and right brake pedal position
35 35a 35b 35c 35d 35e	Additional engine parameters (if not already recorded in parameter 9 of Table 1 of AMC1CAT.IDE.190.A, and if the aeroplane is equipped with a suitable data source): Engine pressure ratio (EPR) N1 Indicated vibration level N2 Exhaust gas temperature (EGT)

No*	Parameter
35f 35g 35h	Fuel flow Fuel cut-off lever position N3
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 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

No*	Parameter
46 46a 46b	Electronic flight instrument system (EFIS) display format: Pilot Co-pilot
47	Multi-function/engine/alerts display format
48	Alternating current (AC) electrical bus status — each bus
49	Direct current (DC) electrical bus status — each bus
50	Engine bleed valve position
51	Auxiliary power unit (APU) bleed valve 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	Para visual display on
59	Operational stall protection, stick shaker and pusher activation
60 60a 60b	Primary navigation system reference: GNSS Inertial navigational system (INS)
60c 60d 60e 60f	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 over speed

No*	Parameter
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
75b	Control column
75c	Rudder pedal
76	Event marker
77	Date
78	Actual navigation performance (ANP) or estimate of position error (EPE) or estimate of position uncertainty (EPU)

* The number in the left hand column reflects the serial number depicted in EUROCAE Document ED-112.

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 bythe relevant regulatory agency such as the CAAT, EASA or the FAA.

(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)

No*	Parameter
14	Total or outside air temperature
16	Longitudinal acceleration (body axis)
17	Lateral acceleration
18	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):
18a	Pitch axis
18b	Roll axis
18c	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.
21 21a	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
21b 21c	MLS elevation Integrated approach navigation (IAN) /Integrated Area Navigation (IRNAV), vertical
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

No*	Parameter
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 limite din 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 34a 34b	Brakes: Left and right brake pressure Left and right brake pedal position
35 35a	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)
35b	N1

No*	Parameter
35c 35d 35e 35f 35g 35h 35i	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 comibation of discretes should be recorded to determine the status of the systems: 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	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)

No*	Parameter
44b 44c	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	Primary navigation system reference:
60a 60b 60c	GNSS Inertial navigational system (INS) VHF omnidirectional radio range (VOR)/distance measuring equipment (DME)
60d 60e 60f	MLS Loran C ILS

No*	Parameter
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	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)

No*	Parameter
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 81c 81d	Flight director command: Left flight director pitch command – for aeroplanes type certified before 1 January 2023, to be Left flight director roll command – for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification. 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.

AMC2 CAT.IDE.A.190 Flight data recorder

OPERATIONAL PERFORMANCE REQUIREMENTS FOR AEROPLANES FIRST ISSUED WITH AN INDIVIDUAL CofA ON OR AFTER 1 APRIL 1998 AND BEFORE 1 JANUARY 2016

(a) The operational performance requirements for FDRs should be those laid down in EUROCAE Document ED-55 (Minimum Operational Performance Requirements For Flight Data Recorder Systems) dated May 1990, 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) The FDR should record, with reference to a timescale:

(1) the parameters listed in Table 1a or Table 1b below, as applicable;

(2) the additional parameters listed in Table 2 below, for those aeroplanes with an MCTOM exceeding 27 000 kg;

(3) any dedicated parameters relating to novel or unique design or operational characteristics of the aeroplane as determined by the CAAT; and

(4) the additional parameters listed in Table 3 below, for those aeroplanes equipped with electronic display systems.

(c) The FDR of aeroplanes first issued with an individual CofA before 20 August 2002 and equipped with an electronic display system does not need to record those parameters listed in Table 3 for which:

(1) the sensor is not available;

(2) the aeroplane system or equipment generating the data needs to be modified; or

(3) the signals are incompatible with the recording system;

(d) The FDR of aeroplanes first issued with an individual CofA on or after 1 April 1998 but not later than 1 April 2001 is not required to comply with (b) above if:

(1) compliance with (a) cannot be achieved without extensive modification to the aeroplane system and equipment other than the flight recording system; and

(2) the FDR of the aeroplane can comply with AMC4 CAT.IDE.A.190(a) except that parameter 15b in Table 1 of AMC4 CAT.IDE.A.190 need not be recorded.

(e) The parameters to be recorded should meet, as far as practicable, the performance specifications (ranges, sampling intervals, accuracy limits, and resolution in read-out) defined in Table 1 of AMC3 CAT.IDE.A.190.

(f) For aeroplanes with novel or unique design or operational characteristics, the additional parameters should be those required in accordance with applicable Certification Specifications during type or supplemental certification or validation.

(g) If recording capacity is available, as many as possible of the additional parameters specified in table II-A.1 of EUROCAE Document ED 112 dated March 2003 should be recorded.

Table 1a FDR — Aeroplanes with an MCTOM of more than 5 700 kg

No	Parameter
1	Time or relative time count
2	Pressure altitude
3	Indicated airspeed or calibrated airspeed
4	Heading
5	Normal acceleration
6	Pitch attitude
7	Roll attitude
8	Manual radio transmission keying
9	Propulsive thrust/power on each engine and flight crew compartment thrust/power lever position if applicable
10	Trailing edge flap or flight crew compartment control selection
11	Leading edge flap or flight crew compartment control selection
12	Thrust reverse status
13	Ground spoiler position and/or speed brake selection
14	Total or outside air temperature
15	Autopilot, autothrottle and AFCS mode and engagement status
16	Longitudinal acceleration (body axis)
17	Lateral acceleration

Table 1b FDR — Aeroplanes with an MCTOM 5 700 kg or below

No	Parameter
1	Time or relative time count
2	Pressure altitude
3	Indicated airspeed or calibrated airspeed
4	Heading
5	Normal acceleration
6	Pitch attitude
7	Roll attitude
8	Manual radio transmission keying
9	Propulsive thrust/power on each engine and flight crew compartment thrust/power lever position if applicable
10	Trailing edge flap or flight crew compartment control selection
11	Leading edge flap or flight crew compartment control selection
12	Thrust reverse status
13	Ground spoiler position and/or speed brake selection
14	Total or outside air temperature
15	Autopilot/autothrottle engagement status
16	Longitudinal acceleration (body axis)
17	Angle of attack (if a suitable sensor is available)

Table 2 FDR — Additional parameters for aeroplanes with an MCTOM of more than 27 000 kg

No	Parameter
18	Primary flight controls — control surface position and/or pilot input (pitch, roll, yaw)
19	Pitch trim position
20	Radio altitude
21	Vertical beam deviation (ILS or GLS glide path or MLS elevation)
22	Horizontal beam deviation (ILS localiser or GLS lateral deviation or MLS azimuth)
23	Marker beacon passage
24	Warnings
25	Reserved (navigation receiver frequency selection or GLS channel is recommended)
26	Reserved (DME or GLS distance is recommended)
27	Landing gear squat switch status or air/ground status
28	Ground proximity warning system
29	Angle of attack
30	Low pressure warning (hydraulic and pneumatic power)
31	Groundspeed
32	Landing gear or gear selector position

Table 3 FDR — Aeroplanes equipped with electronic display systems

No	Parameter
33	Selected barometric setting (each pilot station)
34	Selected altitude
35	Selected speed
36	Selected Mach
37	Selected vertical speed
38	Selected heading
39	Selected flight path
40	Selected decision height
41	EFIS display format
42	Multi-function/engine/alerts display format

AMC3 CAT.IDE.A.190 Flight data recorder

PERFORMANCE SPECIFICATIONS FOR THE PARAMETERS TO BE RECORDED FOR AEROPLANES FIRST ISSUED WITH AN INDIVIDUAL CofA ON OR AFTER 1 APRIL 1998 AND BEFORE 1 JANUARY 2016

Table 1: FDR

No	Parameter	Range	Sampling interval in seconds	Accuracy limits (sensor input compared to FDR readout)	Recommended resolution in readout	Remarks
1a or	Time	24 hours	4	± 0.125 % per hour	1 second	(a) UTC time preferred where available.
1b	Relative time count	0 to 4 095	4	± 0.125 % per hour		(b) Counter increments every 4 seconds of system operation.
2	Pressure altitude	-1 000 ft to maximum certificated altitude of aircraft +5 000 ft	1	±100 ft to ±700 ft Refer to Table II-A.3 of EUROCAE Document ED-112	5 ft	Should be obtained from air data computer when installed.
3	Indicated airspeed or calibrated airspeed	50 kt or minimum value installed pitot static system to Max V_{S0} Max V_{S0} to 1.2 V_D	1	±5 % ±3 %	1 kt (0.5 kt recommended)	Should be obtained from air data computer when installed. V_{S0}: stalling speed or minimum steady flight speed in the landing configuration V_D design diving speed
4	Heading	360 degrees	1	±2 degrees	0.5 degrees	
5	Normal acceleration	-3 g to +6 g	0.125	1 % of maximum range excluding a datum error of 5 %	0.004 g	The recording resolution may be rounded from 0.004 g to 0.01 g provided that one sample is recorded at full resolution at least every 4 seconds.
6	Pitch attitude	±75 degrees	0.25	±2 degrees	0.5 degrees	
7	Roll attitude	±180 degrees	0.5	±2 degrees	0.5 degrees	

No	Parameter	Range	Sampling interval in seconds	Accuracy limits (sensor input compared to FDR readout)	Recommended resolution in readout	Remarks
8	Manual radio transmission keying	Discrete	1	-	-	Preferably each crew member but one discrete acceptable for all transmissions provided that the replay of a recording made by any required recorder can be synchronised in time with any other required recording to within 1 second.
9a	Propulsive thrust/power on each engine	Full range	Each engine each second	±2 %	0.2 % of full range	Sufficient parameters, e.g. EPR/N, or Torque/N_P as appropriate to the particular engine must be recorded to determine power in both normal and reverse thrust. A margin for possible overspeed should be provided.
9b	Flight crew compartment thrust/power lever position	Full range	Each lever each second	±2 % or sufficient to determine any gated position	2 % of full range	Parameter 9b must be recorded for aeroplanes with non-mechanically linked cockpit-engine controls, otherwise recommended.
10	Trailing edge flap or flight crew compartment control selection	Full range or each discrete position	2	±3° or as pilot's indicator and sufficient to determine each discrete position	0.5 % of full range	Flap position and cockpit control may be sampled at 4-second intervals so as to give a data point each 2 seconds.
11	Leading edge flap or flight crew compartment control selection	Full range or each discrete position	1	±3° or as pilot's indicator and sufficient to determine each discrete position	0.5 % of full range	Left and right sides, or flap position and cockpit control may be sampled at 2-second intervals so as to give a data point each second.

No	Parameter	Range	Sampling interval in seconds	Accuracy limits (sensor input compared to FDR readout)	Recommended resolution in readout	Remarks
12	Thrust reverser status	Turbo-jet: stowed, in transit and reverse Turbo-prop: reverse	Each reverser each second	-	-	Turbo-jet: 2 discretes enable the 3 states to be determined Turbo-prop: 1 discrete
13	Ground spoiler and/or speed brake selection	Full range or each discrete position	0.5	±2º unless higher accuracy uniquely required	0.2 % of full range	Sufficient to determine use of the cockpit selector and the activation and positions of the surfaces
14	Outside air temperatures or total air temperature	-50°C to +90°C or available sensor range	2	±2ºC	0.3ºC	
15	Autopilot/Autothrottle/AFCS mode and engagement status	A suitable combination of discretes	1	-	-	Discretes should show which systems are engaged and which primary modes are controlling the flight path and speed of the aircraft.
16	Longitudinal acceleration (Body axis)	± 1 g	0.25	±1.5 % of maximum range excluding a datum error of ±5 %	0.004 g	The recording resolution may be rounded from 0.004 g to 0.01 g provided that one sample is recorded at full resolution at least every 4 seconds.
17	Lateral acceleration	±1 g	0.25	±1.5 % of maximum range excluding a datum error of ±5 %	0.004 g	The recording resolution may be rounded from 0.004 g to 0.01 g provided that one sample is recorded at full resolution at least every 4 seconds.

No	Parameter	Range	Sampling interval in seconds	Accuracy limits (sensor input compared to FDR readout)	Recommended resolution in readout	Remarks
18	Primary flight controls, control surface positions and/or* pilot input	Full range	1	±2º unless higher accuracy uniquely required	0.2 % of full range	*For aeroplanes that can demonstrate the capability of deriving either the control input or control movement (one from the other) for all modes of operation and flight regimes, the 'or' applies. For aeroplanes with non-mechanical control systems, the 'and' applies. Where the input controls for each pilot can be operated independently, both inputs will need to be recorded. For multiple or split surfaces, a suitable combination of inputs is acceptable in
18a	Pitch axis		0.25			
18b	Roll axis		0.25			
18c	Yaw axis		0.5			
19	Pitch trim position	Full range	1	±3 % unless higher accuracy uniquely required	0.3 % of full range	Where dual surfaces are provided it is permissible to record each surface alternately.
20	Radio altitude	-20 ft to +2 500 ft	1	As installed ±2 ft or ±3 % whichever is greater below 500 ft and ±5 % above 500 ft recommended.	1 ft below 500 ft, 1 ft +0.5 % of full range above 500 ft	For auto-land/category III operations, each radio altimeter should be recorded, but arranged so that at least one is recorded each second.

No	Parameter	Range	Sampling interval in seconds	Accuracy limits (sensor input compared to FDR readout)	Recommended resolution in readout	Remarks
21	Vertical beam deviation		1	As installed ±3 % recommended	0.3 % of full range	Data from all of the ILS, GLS and MLS systems need not to be recorded at the same time. The approach aid in use should be recorded. For auto-land/ category III operations, each radio altimeter should be recorded, but arranged so that at least one is recorded each second.
21a	ILS or GLS glide path	±0.22 DDM or available sensor range as installed				
21b	MLS elevation	0.9° to 30°				
22	Horizontal beam deviation	Signal range	1	As installed ±3 % recommended	0.3 % of full range	See parameter 21 remarks.
22a	ILS localiser or GLS lateral deviation	±0.22 DDM or available sensor range as installed				
22b	MLS azimuth	±62°				
23	Marker beacon passage	Discrete	1	—	—	A single discrete is acceptable for all markers.
24	Warnings	Discretes	1	–	–	A discrete must be recorded for the master warning. Each 'red' warning (including lavatory smoke) should be recorded when the warning condition cannot be determined from other parameters or from the cockpit voice

No	Parameter	Range	Sampling interval in seconds	Accuracy limits (sensor input compared to FDR readout)	Recommended resolution in readout	Remarks
25	Reserved	–	–	–	–	
26	Reserved	–	–	–	–	
27	Landing gear squat switch status	Discrete(s)	1 (0.25 recommen - ded for main gears)	–	–	Discretes should be recorded for the nose and main landing gears.
28	Ground proximity warning system (GPWS)	Discrete	1	–	–	A suitable combination of discretes unless recorder capacity is limited in which case a single discrete for all modes is acceptable.
29	Angle of attack	As installed	0.5	As installed	0.3 % of full range	If left and right sensors are available, each may be recorded at 1-second intervals so as to give a data point each half second.
30	Low pressure	Discrete(s) or available sensor range	2	-	0.5 % of full range	Each essential system to be recorded.
30a	Hydraulic power					
30b	Pneumatic power					
31	Groundspeed	As installed	1	Data should be obtained from the most accurate system	1 kt	
32	Landing gear or gear selector position	Discrete(s)	4	-	–	A suitable combination of discretes should be recorded.

No	Parameter	Range	Sampling interval in seconds	Accuracy limits (sensor input compared to FDR readout)	Recommended resolution in readout	Remarks
33	Selected barometric setting (each pilot station)	As installed	64	As installed	1 mb	Where practicable, a sampling interval of 4 seconds is recommended
33a	Pilot					
33b	Co-pilot					
34	Selected altitude	As installed	1	As installed	100 ft	Where capacity is limited, a sampling interval of 64 seconds is permissible.
34a	Manual					
34b	Automatic					
35	Selected speed	As installed	1	As installed	1 kt	Where capacity is limited, a sampling interval of 64 seconds is permissible.
35a	Manual					
35b	Automatic					
36	Selected Mach	As installed	1	As installed	0.01	Where capacity is limited, a sampling interval of 64 seconds is permissible.
36a	Manual					
36b	Automatic					
37	Selected vertical speed	As installed	1	As installed	100 ft/min	Where capacity is limited, a sampling interval of 64 seconds is permissible.
37a	Manual					
37b	Automatic					

No	Parameter	Range	Sampling interval in seconds	Accuracy limits (sensor input compared to FDR readout)	Recommended resolution in readout	Remarks
38	Selected heading	360 degrees	1	As installed	1 degree	Where capacity is limited ,a sampling interval of 64 seconds is permissible.
39	Selected flight path		1	As installed		Where capacity is limited, a sampling interval of 64 seconds is permissible.
39a	Course/DSTRK	360 degrees				
39b	Path Angle	As installed				
40	Selected decision height	0-500 ft	64	As installed	1 ft	
41	EFIS display format	Discrete(s)	4	–	–	Discretes should show the display system status e.g. off, normal, fail, composite, sector, plan, rose, nav aids, wxr, range, copy.
41a	Pilot					
41b	Co-pilot					
42	Multifunction/Engine / Alerts display format	Discrete(s)	4	–	–	Discretes should show the display system status e.g. off, normal, fail, and the identity of display pages for emergency procedures and checklists. Information in checklists and procedures need not be

AMC4 CAT.IDE.A.190 Flight data recorder

LIST OF PARAMETERS TO BE RECORDED FOR AEROPLANES FIRST ISSUED WITH AN INDIVIDUAL CofA ON OR AFTER 1 JUNE 1990 UP TO AND INCLUDING 31 MARCH 1998

(a) The FDR should, with reference to a timescale, record:

(1) the parameters listed in Table 1 below; and

(2) the additional parameters listed in Table 2 below for those aeroplanes with an MCTOM exceeding 27 000 kg.

(b) The FDR of aeroplanes having an MCTOM of 27 000 kg or below does not need to record parameters 14 and 15b of Table 1 below if any of the following conditions are met:

(1) the sensor is not readily available;

(2) sufficient capacity is not available in the flight recorder system; or

(3) a change is required in the equipment that generates the data.

(c) The FDR of aeroplanes having an MCTOM exceeding 27 000 kg does not need to record parameter 15b of Table 1 below, and parameters 23, 24, 25, 26, 27, 28, 29, 30 and 31 of Table 2 below, if any of the following conditions are met:

(1) the sensor is not readily available;

(2) sufficient capacity is not available in the FDR system;

(3) a change is required in the equipment that generates the data; or

(4) for navigational data (NAV frequency selection, DME distance, latitude, longitude, ground speed and drift), the signals are not available in digital form.

(d) The FDR does not need to record individual parameters that can be derived by calculation from the other recorded parameters.

(e) The parameters to be recorded should meet, as far as practicable, the performance specifications (range, sampling intervals, accuracy limits, and resolution in read-out) defined in Table 1 of AMC5 CAT.IDE.A.190.

Table 1 Flight data recorder — Aeroplanes with an MCTOM of more than 5 700 kg

No	Parameter
1	Time or relative time count
2	Pressure altitude
3	Indicated airspeed or calibrated airspeed
4	Heading
5	Normal acceleration
6	Pitch attitude
7	Roll attitude

No	Parameter
8	Manual radio transmission keying unless an alternate means to synchronise FDR and CVR recordings is provided
9	Power on each engine
10	Trailing edge flap or flight crew compartment control selection
11	Leading edge flap or flight crew compartment control selection
12	Thrust reverse position (for turbojet aeroplanes only)
13	Ground spoiler position and/or speed brake selection
14	Outside air temperature or total air temperature
15a 15b	Autopilot engagement status Autopilot operating modes, autothrottle and AFCS systems engagement status and operating modes.

Table 2 Flight data recorder — Additional parameters for aeroplanes with an MCTOM of more than 27 000 kg

No	Parameter
16	Longitudinal acceleration
17	Lateral acceleration
18	Primary flight controls — control surface position and/or pilot input (pitch, roll and yaw)
19	Pitch trim position
20	Radio altitude
21	Glide path deviation
22	Localiser deviation
23	Marker beacon passage
24	Master warning
25	NAV 1 and NAV 2 frequency selection
26	DME 1 and DME 2 distance
27	Landing gear squat switch status
28	Ground proximity warning system (GPWS)

No	Parameter
29	Angle of attack
30	Hydraulics, each system (low pressure)
31	Navigation data
32	Landing gear or gear selector position

AMC5 CAT.IDE.A.190 Flight data recorder

PERFORMANCE SPECIFICATIONS FOR THE PARAMETERS TO BE RECORDED FOR AEROPLANES FIRST ISSUED WITH AN INDIVIDUAL COFA UP TO AND INCLUDING 31 MARCH 1998

Table 1: Flight data recorder

No	Parameter	Range	Sampling interval in seconds	Accuracy limits (sensor input compared to FDR readout)	Recommended resolution in readout	Remarks
1	Time or relative time count	24 hours	4	±0.125 % per hour	1 second	Coordinated universal time (UTC) preferred where available, otherwise elapsed time
2	Pressure altitude	-1 000 ft to maximum certificated altitude of aircraft +5 000 ft	1	±100 ft to ±700 ft	5 ft	For altitude record error see EASA ETSO-C124a
3	Indicated airspeed or calibrated airspeed	50 kt to max V_{S0} Max V_{S0} to 1.2 V_D	1	±5 % ±3 %	1 kt	V_{S0} stalling speed or minimum steady flight speed in the landing configuration V_D design diving speed
4	Heading	360 degrees	1	±2 degrees	0.5 degrees	
5	Normal acceleration	-3 g to +6 g	0.125 ±	±1 % of maximum range excluding a datum error of ±5 %	0.004 g	
6	Pitch attitude	±75 degrees	1	±2 degrees	0.5 degrees	
7	Roll attitude	±180 degrees	1	±2 degrees	0.5 degrees	

No	Parameter	Range	Sampling interval in seconds	Accuracy limits (sensor input compared to FDR readout)	Recommended resolution in readout	Remarks
8	Manual radio transmission keying	Discrete	1	-	-	On-off (one discrete). An FDR/CVR time synchronisation signal complying with 4.2.1 of EUROCAE ED-55 is considered to be an acceptable alternative means of compliance
9	Power on each engine	Full range	Each engine each second	±2 %	0.2 % of full range	Sufficient parameters e.g. EPR/N, or Torque/N_P as appropriate to the particular engine should be recorded to determine power.
10	Trailing edge flap or flight crew compartment control selection	Full range or each discrete position	2	±5 % or as pilot's indicator	0.5 % of full range	
11	Leading edge flap or flight crew compartment control selection	Full range or each discrete position	2	-	0.5 % of full range	
12	Thrust reverser position	Stowed, in transit and reverse	Each reverser	±2 % unless higher accuracy uniquely required	-	
13	Ground spoiler and/or speed brake selection	Full range or each discrete position	1	±2 degrees	0.2 % of full range	

No	Parameter	Range	Sampling interval in seconds	Accuracy limits (sensor input compared to FDR readout)	Recommended resolution in readout	Remarks
14	Outside air temperatures or total air temperature	Sensor range	2	-	0.3ºC	
15a 15b	Autopilot engagement status Autopilot operating modes, auto-throttle and AFCS systems engagement status and operating modes	A suitable combination of discretes	1		-	
16	Longitudinal acceleration	± 1 g	0.25	±1.5 % of maximum range excluding a datum error of ±5 %	0.004 g	
17	Lateral acceleration	±1 g	0.25	±1.5 % of maximum range excluding a datum error of ±5 %	0.004 g	

No	Parameter	Range	Sampling interval in seconds	Accuracy limits (sensor input compared to FDR readout)	Recommended resolution in readout	Remarks
18	Primary flight controls, control surface positions and/or pilot input (pitch, roll, yaw)	Full range	1	±2 degreesunless higher accuracy uniquely required	0.2 % of full range	For aeroplanes with conventional control systems, 'or' applies. For aeroplanes with non-mechanical control systems, 'and' applies. For aeroplanes with split surfaces, a suitable combination of inputs is acceptable in lieu of recording each surface separately.
19	Pitch trim position	Full range	1	±3 % unless higher accuracy uniquely required	0.3 % of full range	
20	Radio altitude	-20 ft to +2 500 ft	1	±2 ft or ±3 % whichever is greater below 500 ft and ±5 % above 500 ft	1 ft below 500 ft, 1 ft +5 % of full range above 500 ft	As installed. Accuracy limits are recommended
21	Glide path deviation	Signal range	1	±3 %	0.3 % of full range	As installed. Accuracy limits are recommended
22	Localiser deviation	Signal range	1	±3 %	0.3 % of full range	As installed. Accuracy limits are recommended.
23	Marker beacon passage	Discrete	1	–	–	A single discrete is acceptable for all markers.

No	Parameter	Range	Sampling interval in seconds	Accuracy limits (sensor input compared to FDR readout)	Recommended resolution in readout	Remarks
24	Master warning	Discrete	1	–	–	
25	NAV 1 and 2 frequency selection	Full range	4	As installed	–	
26	DME 1 and 2 distance	0-200 NM	4	As installed	–	Recording of latitude and longitude from INS or other navigation system is a preferred alternative.
27	Landing gear squat switch status	Discrete	1	–	–	
28	Ground proximity warning system (GPWS)	Discrete	1	–	–	
29	Angle of attack	Full range	0.5	As installed	0.3 % of full range	
30	Hydraulics	Discrete(s)	2	–	–	
31	Navigation data	As installed	1	As installed	–	
32	Landing gear or gear selector position	Discrete	4	As installed	–	

* The number in the left hand column reflects the serial number depicted in EUROCAE Document ED-112.

AMC6 CAT.IDE.A.190 Flight data recorder

LIST OF PARAMETERS TO BE RECORDED FOR AEROPLANES FIRST ISSUED WITH AN INDIVIDUAL CofA BEFORE 1 JUNE 1990

(a) The FDR should, with reference to a timescale, record:

(1) the parameters listed in Table 1 below;

(2) the additional parameters 6 to 15b of Table 2 below, for aeroplanes with an MCTOM exceeding 5 700 kg but not exceeding 27 000 kg and first issued with an individual CofA on or after 1 January 1989, when the following conditions are met:

(i) sufficient capacity is available on a flight recorder system;

(ii) the sensor is readily available; and

(iii) a change is not required in the equipment that generates the data;

(3) the additional parameters from 6 to 15b of Table 2 below, for aeroplanes with a maximum certificated take-off mass exceeding 27 000 kg that are of a type first type certified after 30 September 1969; and

(4) the additional parameters listed in Table 2 below for aeroplanes with an MCTOM exceeding 27 000 kg and first issued with an individual CofA on or after 1 January 1987, when the following conditions are met:

(i) sufficient capacity is available on a flight recorder system;

(ii) the sensor is readily available; and

(iii) a change is not required in the equipment that generates the data.

(b) The FDR of aeroplanes with an MCTOM exceeding 27 000 kg that are of a type first type certified after 30 September 1969 does not need to record the parameters 13, 14 and 15b in Table 2 below, when any of the following conditions are met:

(1) sufficient capacity is not available on a flight recorder system;

(2) the sensor is not readily available; and

(3) a change is required in the equipment that generates the data.

(c) The parameters to be recorded should meet, as far as practicable, the performance specifications (range, sampling intervals, accuracy limits, and resolution in read-out) defined in Table 1 of AMC5 CAT.IDE.A.190).

(d) When so determined by the relevant regulatory agency such as EASA or the FAA, equivalent standard acceptable to the CAAT the FDR does not need to record individual parameters that can be derived by calculation from the other recorded parameters.

Table 1 Flight data recorder — aeroplanes with an MCTOM exceeding 5 700 kg

No	Parameter
1	Time or relative time count
2	Pressure altitude
3	Indicated airspeed or calibrated airspeed
4	Heading
5	Normal acceleration

* The number in the left hand column reflects the serial number depicted in EUROCAE Document ED-112.

Table 2 Additional parameters for aeroplanes under conditions of AMC6 CAT.IDE.A.190, 1 & 2

No	Parameter
6	Pitch attitude
7	Roll attitude
8	Manual radio transmission keying unless an alternate means to synchronise the FDR and CVR recordings is provided
9	Power on each engine
10	Trailing edge flap or flight crew compartment control selection
11	Leading edge flap or flight crew compartment control selection
12	Thrust reverse position (for turbojet aeroplanes only)
13	Ground spoiler position and/or speed brake selection
14	Outside air temperature (OAT) or total air temperature
15a 15b	Autopilot engagement status Autopilot operating modes, autothrottle and AFCS, systems engagement status and operating modes.
16	Longitudinal acceleration
17	Lateral acceleration
18	Primary flight controls — control surface position and/or pilot input (pitch, roll and yaw)

No	Parameter
19	Pitch trim position
20	Radio altitude
21	Glide path deviation
22	Localiser deviation
23	Marker beacon passage
24	Master warning
25	NAV 1 and NAV 2 frequency selection
26	DME 1 and DME 2 distance
27	Landing gear squat switch status
28	Ground proximity warning system (GPWS)
29	Angle of attack
30	Hydraulics, each system (low pressure)
31	Navigation data (latitude, longitude, ground speed and drift angle)
32	Landing gear or gear selector position

* The number in the left hand column reflects the serial number depicted in EUROCAE Document ED-112.

GM1 CAT.IDE.A.190 Flight data recorder

GENERAL

(a) The alleviation of AMC2 CAT.IDE.A.190(d) affects a small number of aeroplanes first issued with an individual CofA on or after 1 April 1998 that were either constructed prior to this date or to a specification in force just prior to this date. These aeroplanes may not comply fully with AMC2 CAT.IDE.A.190(b), but are able to comply with AMC4 CAT.IDE.A.190. In addition, this alleviation applies only if compliance with AMC2 CAT.IDE.A.190(b) would imply significant modifications to the aeroplane with a severe re-certification effort.

(b) Flight data recorder systems installed on board aeroplanes first issued with an individual CofA up to and including 31 March 1998, and for which the recorded parameters do not comply with the performance specifications of Table 1 of AMC5 CAT.IDE.A.190 (i.e. range, sampling intervals, accuracy limits and recommended resolution readout) may be acceptable to the relevant regulatory agency such as EASA or the FAA, equivalent standard acceptable to the CAAT.

(c) The alleviations of AMC4 CAT.IDE.A.190(b) and (c), and AMC6 CAT.IDE.A.190(b), are acceptable only if adding the recording of missing parameters to the existing flight data recorder system would require a major upgrade of the system itself. Account is taken of the following:

(1) The extent of the modification required;

(2) The downtime period; and

(3) Equipment software development.

(d) For the purpose of AMC4 CAT.IDE.A.190(b) and (c), and AMC6 CAT.IDE.A.190(a) and (b), 'capacity available' refers to the space on both the flight data acquisition unit and the flight data recorder not allocated for recording the required parameters, or the parameters recorded for the purpose of the Flight Data Monitoring programme, as determined by the relevant regulatory agency such as EASA or the FAA, equivalent standard acceptable to the CAAT.

(e) For the purpose of AMC4 CAT.IDE.A.190(b) and (c), and AMC6 CAT.IDE.A.190(a) and (b), a sensor is considered 'readily available' when it is already available or can be easily incorporated.

(f) For aeroplanes first issued with an individual CofA up to and including 31 March 1998, the recording of the following additional parameters may be considered:

(1) Remaining parameters in Table 2 of AMC4 CAT.IDE.A.190 or Table 2 of AMC6 CAT.IDE.A.190 as applicable;

(2) Any dedicated parameter relating to novel or unique design or operational characteristics of the aeroplane;

(3) operational information from electronic display systems, such as EFIS, ECAM or EICAS, with the following order of priority:

(i) parameters selected by the flight crew relating to the desired flight path, e.g. barometric pressure setting, selected altitude, selected airspeed, decision height, and autoflight system engagement and mode indications if not recorded from another source;

(ii) display system selection/status, e.g. SECTOR, PLAN, ROSE, NAV, WXR, COMPOSITE, COPY, etc.;

(iii) warning and alerts;

(iv) the identity of displayed pages from emergency procedures and checklists.

(4) retardation information including brake application for use in the investigation of landing overruns or rejected take offs; and

(5) additional engine parameters (EPR, N1, EGT, fuel flow, etc.).

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,

(9) ground speed,

(10) positioning system: track (if available),

(11) normal acceleration,

(12) longitudinal acceleration, and

(13) 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 EASA.

(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 EASA for lightweight flight recorders; or

(2) EUROCAE Document ED-112 or any later equivalent standard accepted by EASA 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.195 Data link recording

GENERAL

(a) As a means of compliance with CAT.IDE.A.195(a), the recorder on which the data link messages is recorded may be:

(1) the CVR;

(2) the FDR;

(3) a combination recorder when CAT.IDE.A.200 is applicable; or

(4) a dedicated flight recorder. In that case, the operational performance requirements for this recorder 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.

(b) As a means of compliance with CAT.IDE.A.195(a)(2), the operator should enable correlation by providing information that allows an accident investigator to understand what data was provided to the aeroplane and, when the provider identification is contained in the message, by which provider.

(c) The timing information associated with the data link communications messages required to be recorded by CAT.IDE.A.195(a)(3) should be capable of being determined from the airborne-based recordings. This timing information should include at least the following:

(1) the time each message was generated;

(2) the time any message was available to be displayed by the crew;

(3) the time each message was actually displayed or recalled from a queue; and

(4) the time of each status change.

(d) The message priority should be recorded when it is defined by the protocol of the data link communication message being recorded.

(e) The expression 'taking into account the system architecture', in CAT.IDE.A.195(a)(3), means that the recording of the specified information may be omitted if the existing source systems involved would require a major upgrade. The following should be considered:

(1) the extent of the modification required;

(2) the down-time period; and

(3) equipment software development.

The intention is that new designs of source systems should include this functionality and support the full recording of the required information.

(f) Data link communications messages that support the applications in Table 1 below should be recorded.

(g) Further details on the recording requirements can be found in the recording requirement matrix in Appendix D.2 of EUROCAE Document ED-93 (Minimum Aviation System Performance Specification for CNS/ATM Recorder Systems, dated November 1998).

Table 1 Applications

Item No	Application Type	Application Description	Required Recording Content
1	Data link initiation	This includes any application used to log on to, or initiate, a data link service. In future air navigation system (FANS)-1/A and air traffic navigation (ATN), these are ATS facilities notification (AFN) and context management (CM) respectively.	C
2	Controller/pilot communication	This includes any application used to exchange requests, clearances, instructions and reports between the flight crew and air traffic controllers. In FANS-1/A and ATN, this includes the controller pilot data link communications (CPDLC) application. It also includes applications used for the exchange of oceanic (OCL) and departure clearances (DCL) as well as data link delivery of taxi clearances.	C
3	Addressed surveillance	This includes any surveillance application in which the ground sets up contracts for delivery of surveillance data. In FANS-1/A and ATN, this includes the automatic dependent surveillance-contract (ADS-C) application.	C, F2
4	Flight information	This includes any application used for delivery of flight information data to specific aeroplanes. This includes for example, digital automatic terminal information service (D-ATIS), data link operational terminal information service (D-OTIS), digital weather information services (D-METAR or TWIP), data link flight information service (D-FIS), and Notice to Airmen (electronic NOTAM) delivery.	C

5	Aircraft broadcast surveillance	This includes elementary and enhanced surveillance systems, as well as automatic dependent surveillance-broadcast (ADS-B) output data.	M*, F2
6	Aeronautical operational control (AOC) data	This includes any application transmitting or receiving data used for AOC purposes (in accordance with the ICAO definition of AOC). Such systems may also process AAC messages, but there is no requirement to record AAC messages.	M*
7	Graphics	This includes any application receiving graphical data to be used for operational purposes (i.e. excluding applications that are receiving such things as updates to manuals).	M* F1

GM1 CAT.IDE.A.195 Data link recording

DEFINITIONS AND ACRONYMS

(a) The letters and expressions in Table 1 of AMC1 CAT.IDE.A.195 have the following meaning:

C: complete contents recorded

M: information that enables correlation with any associated records stored separately from the aeroplane.

*: Applications that are to be recorded only as far as is practicable, given the architecture of the system.

F1: graphics applications may be considered as AOC messages when they are part of a data link communications application service run on an individual basis by the operator itself in the framework of the operational control.

F2: where parametric data sent by the aeroplane, such as Mode S, is reported within the message, it should be recorded unless data from the same source is recorded on the FDR.

(b) The definitions of the applications type in Table 1 of AMC1 CAT.IDE.A.195 are described in Table 1 below.

Table 1 Definitions of applications type

Item No	Application Type	Messages	Comments
1	CM		CM is an ATN service
2	AFN		AFN is a FANS 1/A service
3	CPDLC		All implemented up and downlink messages to be recorded
4	ADS-C	ADS-C reports	All contract requests and reports recorded
		Position reports	Only used within FANS 1/A. Only used in oceanic and remote areas.
5	ADS-B	Surveillance data	Information that enables correlation with any associated records stored separately from the
6	D-FIS		D-FIS is an ATN service All implemented up and downlink messages to be recorded
7	TWIP	TWIP messages	Terminal weather information for pilots
8	D-ATIS	ATIS messages	Refer to EUROCAE Document ED-89A dated December 2003. Data Link Application System Document (DLASD) for the 'ATIS' Data Link Service
9	OCL	OCL messages	Refer to EUROCAE Document ED-106A dated March 2004. Data Link Application System Document (DLASD) for 'Oceanic Clearance' Data Link Service
10	DCL	DCL messages	Refer to EUROCAE Document ED-85A dated December 2003. Data Link Application System Document (DLASD) for 'Departure Clearance' Data
11	Graphics	Weather maps & other graphics	Graphics exchanged in the framework of procedures within the operational control, as specified in Part ORO. Information that enables correlation with any associated records stored separately from the
12	AOC	Aeronautical operational control messages	Messages exchanged in the framework of procedures within the operational control, as specified in Part ORO. Information that enables correlation with any associated records stored separately from the aeroplane. Definition in EUROCAE Document ED-112,
13	Surveillance	Downlinked aircraft parameters (DAP)	As defined in ICAO Annex 10 Volume IV (Surveillance systems and ACAS).

AAC aeronautical administrative communications

ADS-B automatic dependent surveillance — broadcast

ADS-C automatic dependent surveillance — contract AFN aircraft flight notification

AOC aeronautical operational control

ATIS automatic terminal information service

ATSC air traffic service communication

CAP controller access parameters

CPDLC controller pilot data link communications

CM configuration/context management

D-ATIS digital ATIS

D-FIS data link flight information service

D-METAR data link meteorological airport report

DCL departure clearance

FANS Future Air Navigation System

FLIPCY flight plan consistency

OCL oceanic clearance

SAP system access parameters

TWIP terminal weather information for pilots

GM1 CAT.IDE.A.195(a) Data link recording

APPLICABILITY OF THE DATA LINK RECORDING REQUIREMENT

(a) If it is certain that the aeroplane cannot use data link communication messages for ATS communications corresponding to any application designated by CAT.IDE.A.195(a)(1), then the data link recording requirement does not apply.

(b) Examples where the aeroplane cannot use data link communication messages for ATS communications include but are not limited to the cases where:

(1) the aeroplane data link communication capability is disabled permanently and in a way that it cannot be enabled again during the flight;

(2) data link communications are not used to support air traffic service (ATS) in the area of operation of the aeroplane; and

(3) the aeroplane's data link communication equipment cannot communicate with the equipment used by ATS in the area of operation of the aeroplane.

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.

GM1 CAT.IDE.A.200 Combination recorder

GENERAL

(a) A flight data and cockpit voice combination recorder is a flight recorder that records:

(1) all voice communications and aural environment required by CAT.IDE.A.185 regarding CVRs; and

(2) all parameters required by CAT.IDE.A.190 regarding FDRs, with the same specifications required by those paragraphs.

(b) In addition, a flight data and cockpit voice combination recorder may record data link communication messages and related information required by CAT.IDE.A.195.

AMC1 CAT.IDE.A.205 Seats, seat safety belts, restraint systems and child restraint devices

CHILD RESTRAINT DEVICES (CRDs)

(a) A CRD is considered to be acceptable if:

(1) it is a 'supplementary loop belt' manufactured with the same techniques and the same materials as the approved safety belts; or

(2) it complies with (b).

(b) Provided the CRD can be installed properly on the respective aircraft seat, the following CRDs are considered acceptable:

(1) CRDs approved for use in aircraft according to the European Technical Standard Order ETSO-C100c on Aviation Child Safety Device (ACSD);

(2) CRDs approved by the EASA through a Type Certificate or Supplemental Type Cretificate;

(3) Child seats approved for use in motor vehicles on the basis of the technical standards specificed in point (i) below. The child seat must also be approved for use in aircraft on the basis of the technical standard specified in either point (ii) or point (ii):

(i) UN Standard ECE R44-04 (or 03), or ECE R129 bearing the respective 'ECE R' label; and

(ii) German 'Qualification Procedure for Child Restraint Systems for Use in Aircraft' (TÜV/958-01/2001) bearing the label 'For Use in Aircraft'; or

(iii) Other technical standard acceptable to the CAAT. The child seat should hold a qualification sign that it can be used in aircraft.

(4) Child seats approved for use in motor vehicles and aircraft according to Canadian CMVSS 213/213.1 bearing the respective label;

(5) Child seats approved for use in motor vehicles and aircraft according to US FMVSS No 213 and bearing one or two label displaying the following two sentences in red letters:

(i) 'THIS CHILD RESTRAINT SYSTEM CONFORMS TO ALL APPLICABLE FEDERAL MOTOR VEHICLE SAFETY STANDARDS'; and

(ii) In red letters 'THIS RESTRAINT IS CERTIFIED FOR USE IN MOTOR VEHICLES AND AIRCRAFT';

(6) Child sears approved for use in motor vehicles and aircraft according to Australia/New Zeland's technical standards AS/NZS 1754:2013 bearing the green part on the label displaying 'For use in aircraft'; and

(7) CRDs manufactured and tested according to other technical standards equivalent to those listed above. The devices should be marked with an associated qualification sign, which shows the name of the qualification organisation and a specific identification number, related to the associated qualification project. The qualifying organisation should be a competent and independent organisation that is acceptable to the CAAT.

(c) Location

(1) Forward-facing child seats may be installed on both forward-and rearward-facing passenger seats, but only when fitted in the same direction as the passenger seat on which they are positioned. Rearward-facing child seats should only be installed on forward-facing passenger seats. A child seat should not be installed within the radius of action of an airbag unless it is obvious that the airbag is de-activated or it can be demonstrated that there is no negative impact from the airbag.

(2) An infant/child in a CRD should be located as near to a floor level exit as feasible.

(3) An infant/child in a CRD should not hinder evacuation for any passenger.

(4) An infant/child in a CRD should neither be located in the row (where rows are existing) leading to an emergency exit nor located in a row immediately forward or aft of an emergency exit. A window passenger seat is the preferred location. An aisle passenger seat or a cross aisle passenger seat that forms part of the evacuation route to exits is not recommended. Other locations may be acceptable provided the access of neighbour passengers to the nearest aisle is not obstructed by the CRD.

(5) In general, only one CRD per row segment is recommended. More than one CRD per row segment is allowed if the infants/children are from the same family or travelling group provided the infants/children are accompanied by a responsible adult sitting next to them in the same row segment.

(6) A row segment is one or more seats side by side separated from the next row/segment by an aisle.

(d) Installation

(1) CRDs tested and approved for use in aircraft should only be installed on a suitable passenger seat by the method shown in the manufacturer's instructions provided with each CRD and with the type of connecting device they are approved for the installation in aircraft. CRDs designed to be installed only by means of rigid bar lower anchorages (ISOFIX or equivalent) should only be used on passenger seats equipped with such connecting devices and should not be secured by passenger seat lap belt.

(2) All safety and installation instructions should be followed carefully by the responsible adult accompanying the infant/child. Operators should prohibit the use of a CRD not installed on the passenger seat according to the manfufacturer's instructions or not approved for use in aircraft.

(3) If a forward-facing child seat with a rigid backrest is to be fastened by a seat lap belt, the restraint device should be fastened when the backrest of the passenger seat on which it rests is in a reclined position. Thereafter, the backrest is to be positioned upright. This procedure ensures better tightening of the child seat on the aircraft seat if the aircraft seat is reclinable.

(4) The buckle of the adult safety belt must be easily accessible for both opening and closing, and must be in line with the seat belt halves (not canted) after tightening.

(5) Forward-facing restraint devices with an integral harness must not be installed such that the adult safety belt is secured over the infant.

(e) Operation

(1) Each CRD should remain secured to a passenger seat during all phases of flight unless it is properly stowed when not in use.

(2) Where a child seat is adjustable in recline, it must be in an upright position for all occasions when passenger restraint devices are required.

AMC2 CAT.IDE.A.205 Seats, seat safety belts, restraint systems and child restraint devices

UPPER TORSO RESTRAINT SYSTEM

(a) A restraint system, including a seat belt, two shoulder straps and additional straps is deemed to be compliant with the requirement for restraint systems with two shoulder straps.

(b) An upper torso restraint system which restrains permanently the torso of the occupant is deemed to be compliant with the requirement for an upper torso restraint system incorporating a device that will automatically restrain the occupant's torso in the event of rapid deceleration.

(c) The use of the upper torso restraint independently from the use of the seat belt is intended as an option for the comfort of the occupant of the seat in those phases of flight where only the seat belt is required to be fastened. A restraint system including a seat belt and an upper torso restraint that both remain permanently fastened is also acceptable.

SEAT BELT

(a) A seat belt with a diagonal shoulder strap (three anchorage points) is deemed to be compliant with the requirement for a seat belt (two anchorage points).

AMC3 CAT.IDE.A.205 Seats, seat safety belts, restraint systems and child restraint devices

SEATS FOR MINIMUM REQUIRED CABIN CREW

(a) Seats for the minimum required cabin crew members should be located near required floor level emergency exits, except if the emergency evacuation of passengers would be enhanced by seating cabin crew members elsewhere. In this case, other locations are acceptable.

(b) Such seats should be forward-or rearward-facing within 15° of the longitudinal axis of the aeroplane.

GM1 CAT.IDE.A.205 Seats, seat safety belts, restraint systems and child restraint devices

EMERGENCY LANDING DYNAMIC CONDITIONS

Emergency landing dynamic conditions are defined in 23.562 of CS-23 or equivalent and in 25.562 of CS- 25 or equivalent.

GM2 CAT.IDE.A.205 Seats, seat safety belts, restraint systems and child restraint devices

USE OF CHILD SEATS ON BOARD

Guidance on child restraint devices and facilitation of mutual acceptance of these devices can be found in ICAO Doc 10049 'Manual on the approval and use of child restraint systems'.

AMC1 CAT.IDE.A.220 First-aid kit & Universal Precaution Kit

CONTENT OF FIRST-AID KITS

(a) First-aid kits should be equipped with appropriate and sufficient medications and instrumentation. However, these kits should be supplemented by the operator according to the characteristics of the operation (scope of operation, flight duration, number and demographics of passengers, number of decks, etc.).

(b) The following should be included in the first-aid kit:

(1) Equipment

(i) bandages (assorted sizes including a triangular bandage);

(ii) burns dressings (unspecified);

(iii) wound dressings (large and small);

(iv) adhesive dressings (assorted sizes);

(v) adhesive tape;

(vi) adhesive wound closures;

(vii) safety pins;

(viii) safety scissors;

(ix) antiseptic wound cleaner;

(x) disposable resuscitation aid;

(xi) disposable gloves;

(xii) tweezers: splinter;

(xiii) thermometers (non-mercury) and

(xiv) surgical masks

(2) Medications

(i) simple analgesic (including paediatricform);

(ii) antiemetic — non-injectable (including paediatric form;

(iii) nasal decongestant;

(iv) gastrointestinal antacid, in the case of aeroplanes carrying more than 9 passengers;

(v) anti-diarrhoeal medication, in the case of aeroplanes carrying more than 9 passengers; and

(vi) antihistamine (including paediatric form).

(3) Other content. The operator should make the instructions readily available. If an electronic format is available, then all instructions should be kept on the same device. If a paper format is used, then the instructions should be kept in the same kit with the applicable equipment and medication. The instructions should include, as a minimum, the following:

(i) a list of contents in at least two languages (English and one other). This should include information on the effects and side effects of medications carried;

(ii) first-aid handbook, current edition;

(iii) Basic life support instructions cards (summarising and depicting the current algorithm for basic life support); and

(iv) medical incident report form;

(4) Additional equipment. The following additional equipment should be carried on board each aircraft equipped with a first-aid kit, though not necessarily in the first-aid kit. When operating multi-deck aircraft, operators should assess if the additional equipment is needed on each deck. The additional equipment should include, as a minimum:

(i) automated external defibrillator (AED) on all aircraft required to carry at least one cabin crew;

(ii) bag-valve masks (masks in three sizes: one for adults, one for children, and one for infants);

(iii) suitable airway management device (e.g. supraglottic airway devices, oropharyngeal or nasopharyngeal airways);

(iv) eye irrigator;

(v) biohazard disposal bags; and

(vi) basic delivery kit (including sterile umbilical cord scissors and a pair of cord clamps) on all aircraft required to carry at least one cabin crew.

(c) The Universal precaution kit should be for the use of cabin crew in managing incidents of ill health associated with a case of suspected communicable disease, or in the case of illness involving contact with body fluids.

AMC2 CAT.IDE.A.220 First-aid kit & Universal Precaution Kit

MAINTENANCE OF FIRST-AID KITS

To be kept up to date, first-aid kits should be:

(a) inspected periodically to confirm, to the extent possible, that contents are maintained in the condition necessary for their intended use;

(b) replenished at regular intervals, in accordance with instructions contained on their labels, or as circumstances warrant; and

(c) replenished after use in-flight at the first opportunity where replacement items are available.

GM1 CAT.IDE.A.220 First-aid kit

LOCATION

The location of the first-aid kit in the cabin is normally indicated using internationally recognisable signs.

GM2 CAT.IDE.A.220 First-aid kit

STORAGE

As a best practice and wherever practicable, the emergency medical equipment listed under AMC1 CAT.IDE.A.220 should be kept close together.

GM3 CAT.IDE.A.220 First-aid kit

CONTENT OF FIRST-AID KITS

The operator may supplement first-aid kits according to the characteristics of the operation based on a risk assessment. The assessment does not require an approval by the CAAT.

GM4 CAT.IDE.A.220 First-aid kit

LITHIUM BATTERIES

Risks related to the presence of lithium batteries should be assessed. All equipment powered by lithium batteries carried on an aeroplane should comply with the provisions of AMC1 CAT.GEN.MPA.140(f) including applicable technical standards such as (E)TSO-C142.

AMC1 CAT.IDE.A.225 Emergency medical kit

CONTENT OF EMERGENCY MEDICAL KITS

(a) Emergency medical kits should be equipped with appropriate and sufficient medications and instrumentation. However, these kits should be supplemented by the operator according to the characteristics of the operation (scope of operation, flight duration, number and demographics of passengers, number of decks, etc.).

(b) The following should be included in the emergency medical kit:

(1) Equipment

(i) sphygmomanometer — electronic recommended;

(ii) stethoscope;

(iii) syringes and needles;

(iv) intravenous cannulae (a sufficient supply of intravenous cannulae should be available, subject to the amount of intravenous fluids carried on board);

(v) tourniquet;

(vi) disposable gloves;

(vii) needle disposal box;

(viii) one or more urinary catheter(s), appropriate for either sex, and anaesthetic gel;

(ix) aspirator;

(x) blood glucose testing equipment; and

(xi) scalpel;

(xii) pulse oximeter;

(xiii) pneumothorax set.

(2) Instructions: the instructions should contain a list of contents (medications in trade names and generic names) in at least two languages (English and one other).This should include information on the effects and side effects of medications carried. There should also be basic instructions for use of the medications in the kit and guidance for conversion of units for the blood glucose test. The operator should make the instructions readily available. If an electronic format is available, then all instructions should be kept on the same device. If a paper format is used, then the instructions should be kept in the same kit with the applicable equipment and medication.

(3) Medications

(i) coronary vasodilator e.g. glyceriltrinitrate-oral;

(ii) antispasmodic;

(iii) epinephrine/adrenaline 1:1 000;

(iv) adrenocorticoid;

(v) major analgesic;

(vi) diuretic — injectable;

(vii) antihistamine — oral and injectable (including paediatric form);

(viii) sedative/anticonvulsant —oral plus injectable and/or rectal sedative;

(ix) medication for hypoglycaemia (e.g. hypertonic glucose);

(x) antiemetic — injectable;

(xi) antibiotic — injectable form — Ceftriaxone or Cefotaxime;

(xii) bronchial dilator —inhaled (disposable collapsible spacer);

(xiii) IV fluids in appropriate quantity e.g. sodiumchloride 0.9 % (minimum 250 ml); and

(xiv) acetylsalicylic acid — oral — for coronary use;

AMC2 CAT.IDE.A.225 Emergency medical kit

CARRIAGE UNDER SECURE CONDITIONS

The emergency medical kit should be kept either in the flight crew compartment or in another secure location in the cabin that prevents unauthorised access to it.

AMC3 CAT.IDE.A.225 Emergency medical kit

ACCESS TO THE EMERGENCY MEDICAL KIT

(a) When the actual situation on board so requires, the commander should limit access to the emergency medical kit.

(b) Drugs should be administered by medical doctors, qualified nurses, paramedics or emergency medical technicians.

(c) Medical students, student paramedics, student emergency medical technicians or nurses aids should only administer drugs if no person mentioned in (b) is on board the flight and appropriate advice has been received.

(d) Whenever allowed under the operator's national legislation, drugs may be administered by suitably trained persons, other than medical doctors.

(e) Oral drugs should not be denied in medical emergency situations where no medically qualified persons are on board the flight.

AMC4 CAT.IDE.A.225 Emergency medical kit

Maintenance of emergency medical kit

To be kept up to date, the emergency medical kit should be:

(a) inspected periodically to confirm, to the extent possible, that the contents are maintained in the condition necessary for their intended use;

(b) replenished at regular intervals, in accordance with instructions contained on their labels, or as circumstances warrant; and

(c) replenished after use-in-flight at the first opportunity where replacement items are available.

GM1 CAT.IDE.A.225 Emergency medical kit

SECURE LOCATION

'Secure location' refers to a location in the cabin that is not intended for the use by passengers and preferably to which passengers do not have access.

GM2 CAT.IDE.A.225 Emergency medical kit

CONTENT OF EMERGENCY MEDICAL KITS

The operator may supplement emergency medical kits according to the characteristics of the operation based on a risk assessment. The assessment does not require an approval by the CAAT.

GM3 CAT.IDE.A.225 Emergency medical kit

LITHIUM BATTERIES

Risks related to the presence of lithium batteries should be assessed. All equipment powered by lithium batteries carried on an aeroplane should comply with the provisions of AMC1 CAT.GEN.MPA.140(f) including applicable technical standards such as (E)TSO-C142.

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.

AMC1 CAT.IDE.A.230(d) First-aid oxygen

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.

AMC1 CAT.IDE.A.235 Supplemental oxygen — pressurised aeroplanes

DETERMINATION OF OXYGEN

(a) In the determination of the amount of supplemental oxygen required for the routes to be flown, it is assumed that the aeroplane will descend in accordance with the emergency procedures specified in the operations manual, without exceeding its operating limitations, to a flight altitude that will allow the flight to be completed safely (i.e. flight altitudes ensuring adequate terrain clearance, navigational accuracy, hazardous weather avoidance, etc.).

(b) The amount of supplemental oxygen should be determined on the basis of cabin pressure altitude, flight duration and on the assumption that a cabin pressurisation failure will occur at the pressure altitude or point of flight that is most critical from the standpoint of oxygen need.

(c) Following a cabin pressurisation failure, the cabin pressure altitude should be considered to be the same as the aeroplane pressure altitude unless it can be demonstrated to the CAAT that no probable failure of the cabin or pressurisation system will result in a cabin pressure altitude equal to the aeroplane pressure altitude. Under these circumstances, the demonstrated maximum cabin pressure altitude may be used as a basis for determination of oxygen supply.

AMC2 CAT.IDE.A.235 Supplemental oxygen — pressurised aeroplanes

OXYGEN REQUIREMENTS FOR FLIGHT CREW COMPARTMENT SEAT OCCUPANTS AND CABIN CREW IN ADDITION TO THE REQUIRED MINIMUM NUMBER OF CABIN CREW

(a) For the purpose of supplemental oxygen supply, flight crew compartment seat occupants who are:

(1) supplied with oxygen from the flight crew source of oxygen should be considered as flight crew members; and

(2) not supplied with oxygen by the flight crew source of oxygen should be considered as passengers.

(b) Cabin crew members in addition to the minimum number of cabin crew and additional crew members should be considered as passengers for the purpose of supplemental oxygen supply.

GM1 CAT.IDE.A.235(b)(1) Supplemental oxygen — pressurised aeroplanes

QUICK DONNING MASKS

A quick donning mask is a type of mask that:

(a) can be placed on the face from its ready position, properly secured, sealed and supplying oxygen upon demand, with one hand and within 5 seconds and will thereafter remain in position, both hands being free;

(b) can be donned without disturbing eye glasses and without delaying the flight crew member from proceeding with assigned emergency duties;

(c) once donned, does not prevent immediate communication between the flight crew members and other crew members over the aircraft intercommunication system; and

(d) does not inhibit radio communications.

AMC1 CAT.IDE.A.235(c) Supplemental oxygen — pressurised aeroplanes

AEROPLANES WITHOUT AUTOMATIC DEPLOYABLE OXYGEN-DISPENSING UNITS

(a) For operations approved in accordance with Subpart L (SET-IMC) of TCAR OPS Part SPA with aeroplanes first issued with an individual certificate of airworthiness (CofA) after 8 November 1998, operated at pressure altitudes at or below 25 000 ft, and not fitted with automatic deployable oxygen-dispensing units, the flight crew should manage the descent in case of a loss of power in order to ensure that the cabin pressure altitude is not higher that 13 000 ft for more than 4 min.

(b) The operator should specify in the operations manual (OM) the aircraft capability in terms of cabin pressure leak rate in case of engine power loss, as well as the relevant procedures.

GM1 CAT.IDE.A.235(c) Supplemental oxygen — pressurised aeroplanes

AEROPLANES WITHOUT AUTOMATIC DEPLOYABLE OXYGEN-DISPENSING UNITS

For operations approved in accordance with Subpart L (SET-IMC) of TCAR OPS Part SPA, should a loss of engine power occur, it is required that sufficient supplemental oxygen for all occupants is available to allow descent from the maximum certified cruising altitude, performed at the best-range gliding speed and in the best gliding configuration, assuming the maximum cabin pressure leak rate, during the entire flying time when the cabin pressure altitude exceeds 13 000 ft.

In the case of pressurised aeroplanes first issued with an individual certificate of airworthiness (CofA) after 8 November 1998, with a maximum certified cruising altitude above 25 000 ft, and not fitted with automatically deployable oxygen-dispensing units, the amount of supplemental oxygen should be based on a cruising altitude of 25 000 ft as CAT.IDE.A.235(c) limits the operations of such aeroplanes to the aforementioned altitude.

For such single-engined turbine aeroplanes, with the energy source of the pressurisation system being lost (this is at least the case of pressurisation systems relying on bleed air inflow), the cabin pressure altitude increases at a rate dependent upon the pressurisation system design and the cabin pressure leak rate.

Therefore, following an engine failure during such operations, the cabin pressure altitude will remain below 13 000 ft for a certain duration, which should allow the flight crew to descend at the best gliding speed during this period.

The intent of the CAT.IDE.A.235(c) requirement is to ensure that this does not result in any unsafe conditions for the passengers, as the cabin pressure altitude might increase above 13 000 ft, as well as not jeopardise the safety of operations approved in accordance with Subpart L (SET-IMC) of TCAR OPS Part SPA by maximising the chances of reaching an appropriate landing site.

AMC1 CAT.IDE.A.235(e) Supplemental oxygen — pressurised aeroplanes

AEROPLANES NOT CERTIFIED TO FLY ABOVE 25 000 FT

(a) With respect to CAT.IDE.A.235(e), the maximum altitude up to which an aeroplane can operate without a passenger oxygen system being installed and capable of providing oxygen to each cabin occupant, should be established using an emergency descent profile that takes into account the following conditions:

(1) 17 seconds' time delay for pilot's recognition and reaction, including mask donning, for trouble shooting and configuring the aeroplane for the emergency descent (emergency descent data/charts established by the aeroplane manufacturer and published in the aircraft flight manual (AFM), and/or the AFM should be used to ensure uniform application of the option); and

(2) maximum operational speed (V_{MO}) or the airspeed approved in the AFM for emergency descent, (emergency descent data/charts established by the aeroplane manufacturer and published in the AFM, and/or AFM should be used to ensure uniform application of the option), whichever is the less;

(b) On routes where oxygen is necessary to be carried for 10 % of the passengers for the flight time between 10 000 ft and 13 000 ft, the oxygen should be provided either by:

(1) a plug-in or drop-out oxygen system with sufficient outlets and dispensing units uniformly distributed throughout the cabin so as to provide oxygen to each passenger at his/her own discretion when seated on his/her assigned seat; or

(2) portable bottles, when a cabin crew member is required on board such flight.

AMC1 CAT.IDE.A.240 Supplemental oxygen — non-pressurised aeroplanes

AMOUNT OF SUPPLEMENTAL OXYGEN

The amount of supplemental oxygen for sustenance for a particular operation should be determined on the basis of flight altitudes and flight duration, consistent with the operating procedures, including emergency procedures, established for each operation and the routes to be flown, as specified in the operations manual.

AMC1 CAT.IDE.A.245 Crew protective breathing equipment

PROTECTIVE BREATHING EQUIPMENT (PBE)

The supply for PBE for the flight crew members may be provided by the supplemental oxygen required in CAT.IDE.A.235 or CAT.IDE.A.240.

AMC1 CAT.IDE.A.250 Hand fire extinguishers

NUMBER, LOCATION AND TYPE

(a) The number and location of hand fire extinguishers should be such as to provide adequate availability for use, account being taken of the number and size of the passenger compartments, the need to minimise the hazard of toxic gas concentrations and the location of lavatories, galleys, etc. These considerations may result in a number of fire extinguishers greater than the minimum required.

(b) There should be at least one hand fire extinguisher installed in the flight crew compartment and this should be suitable for fighting both flammable fluid and electrical equipment fires. Additional hand fire extinguishers may be required for the protection of other compartments accessible to the crew in flight. Dry chemical fire extinguishers should not be used in the flight crew compartment, or in any compartment not separated by a partition from the flight crew compartment, because of the adverse effect on vision during discharge and, if conductive, interference with electrical contacts by the chemical residues.

(c) Where only one hand fire extinguisher is required in the passenger compartments, it should be located near the cabin crew member's station, where provided.

(d) Where two or more hand fire extinguishers are required in the passenger compartments and their location is not otherwise dictated by consideration of CAT.IDE.A.250(b), an extinguisher should be located near each end of the cabin with the remainder distributed throughout the cabin as evenly as is practicable.

(e) Unless an extinguisher is clearly visible, its location should be indicated by a placard or sign. Appropriate symbols may also be used to supplement such a placard or sign.

AMC1 CAT.IDE.A.255 Crash axe and crowbar

STORAGE OF CRASH AXES AND CROWBARS

Crash axes and crowbars located in the passenger compartment should be stored in a position not visible to passengers.

AMC1 CAT.IDE.A.260 Marking of break-in points

MARKINGS — COLOUR AND CORNERS

(a) The colour of the markings should be red or yellow and, if necessary, should be outlined in white to contrast with the background.

(b) If the corner markings are more than 2 m apart, intermediate lines 9 cm x 3 cm should be inserted so that there is no more than 2 m between adjacent markings.

AMC1 CAT.IDE.A.270 Megaphones

LOCATION OF MEGAPHONES

(a) Where one megaphone is required, it should be readily accessible at the assigned seat of a cabin crew member or crew members other than flight crew.

(b) Where two or more megaphones are required, they should be suitably distributed in the passenger compartment(s) and readily accessible to crew members assigned to direct emergency evacuations.

(c) This does not necessarily require megaphones to be positioned such that they can be physically reached by a crew member when strapped in a cabin crew member's seat.

AMC1 CAT.IDE.A.280 Emergency locator transmitter (ELT)

BATTERIES

(a) All batteries used in ELTs should be replaced (or recharged if the battery is rechargeable) when the equipment has been in use for more than 1 cumulative hour or in the following cases:

(1) Batteries specifically designed for use in ELTs and having an airworthiness release certificate (EASA Form 1 or equivalent) should be replaced (or recharged if the battery is rechargeable) before the end of their useful life in accordance with the maintenance instructions applicable to the ELT.

(2) Standard batteries manufactured in accordance with an industry standard and not having an airworthiness release certificate (EASA Form 1 or equivalent), when used in ELTs should be replaced (or recharged if the battery is rechargeable) when 50 % of their useful life (or for rechargeable, 50 % of their useful life of charge), as established by the battery manufacturer, has expired.

(3) The battery useful life (or useful life of charge) criteria in (1) and (2) do not apply to batteries (such as water-activated batteries) that are essentially unaffected during probable storage intervals.

(b) The new expiry date for a replaced (or recharged) battery should be legibly marked on the outside of the equipment.

AMC2 CAT.IDE.A.280 Emergency locator transmitter (ELT)

TYPES OF ELTs AND GENERAL TECHNICAL SPECIFICATIONS

(a) The ELT required by this provision should be one of the following:

(1) Automatic fixed (ELT(AF)). An automatically activated ELT that is permanently attached to an aircraft and is designed to aid search and rescue (SAR) teams in locating the crash site.

(2) Automatic portable (ELT(AP)). An automatically activated ELT, that is rigidly attached to an aircraft before a crash, but is readily removable from the aircraft after a crash. It functions as an ELT during the crash sequence. If the ELT(AP) does not employ an integral antenna, the aircraft-mounted antenna may be disconnected and an auxiliary antenna (stored on the ELT case) attached to the ELT. The ELT can be tethered to a survivor or a life-raft. This type of ELT is intended to aid SAR teams in locating the crash site or survivor(s).

(3) Automatic deployable (ELT(AD)). An ELT that is rigidly attached to the aircraft before the crash and that is automatically deployed and activated by an impact, and, in some cases, also by water sensors. This type of ELT should float in water and is intended to aid SAR teams in locating the crash site. The ELT(AD) may be either a stand-alone beacon or an inseparable part of a deployable recorder.

(4) Distress tracking ELT (ELT(DT)). An ELT that is designed to be activated upon automatic detection of conditions indicative of a distress situation. This type of ELT is intended to provide information prior to the crash, to aid SAR teams in locating the crash site and/or any survivor(s).

(5) Survival ELT (ELT(S)). An ELT that is removable from an aircraft, stowed so as to facilitate its ready use in an emergency, and manually activated by a survivor. An ELT(S) may be activated manually or automatically (e.g. by water activation). It should be designed either to be tethered to a life-raft or a survivor. A water-activated ELT(S) is not an ELT(AP).

(b) To minimise the possibility of damage in the event of a crash impact, The ELT(AF), ELT(AP), ELT(AD), or ELT(DT) should be rigidly fixed to the aircraft structure, as far aft as practicable, with its antenna and connections arranged so as to maximise the probability of the signal being transmitted after a crash.

(c) Unless an automatic ELT is installed, the ELT(DT) should have capability C (crash survivability) and capability H1 (121.5-MHz homing signal) as specified in EUROCAE ED-62B 'Minimum Operational Performance Standard for Aircraft Emergency Locator Transmitters', dated December 2018, or in any later equivalent standard that is produced by EUROCAE.

(d) Any ELT carried should operate in accordance with the relevant provisions of ICAO Annex 10, Volume III communications systems and should be registered with the national agency responsible for initiating search and rescue or other nominated agency.

GM1 CAT.IDE.A.280 Emergency locator transmitter (ELT)

TERMINOLOGY

(a) An 'automatic ELT' means an ELT(AF), ELT(AP), or ELT(AD). Other types of ELTs are not considered 'automatic ELTs'.

(b) A 'water sensor' means a sensor that detects water immersion, including at low depth.

GM2 CAT.IDE.A.280 Emergency locator transmitter (ELT)

ADDITIONAL GUIDANCE

(a) It is advisable to install automatic ELTs that transmit encoded position data and that meet the operational performance requirements of EUROCAE Document ED-62B, or RTCA DO-204B, or any later equivalent standard.

(b) Guidance material for the inspection of an ELT can be found in FAA Advisory Circular (AC) 91-44A 'Installation and Inspection Procedures for Emergency Locator Transmitters and Receivers', Change 1, dated February 2018.

AMC1 CAT.IDE.A.285 Flight over water

LIFE RAFTS AND EQUIPMENT FOR MAKING DISTRESS SIGNALS

(a) The following should be readily available with each life-raft:

(1) means for maintaining buoyancy;

(2) a sea anchor:

(3) life-lines and means of attaching one life-raft to another;

(4) paddles for life-rafts with a capacity of six or less;

(5) means of protecting the occupants from the elements;

(6) a water-resistant torch;

(7) signalling equipment to make the pyrotechnic distress signals described in ICAO Annex 2, 'Rules of the Air';

(8) 100 g of glucose tablets for each four, or fraction of four, persons that the life-raft is designed to carry;

(9) at least 2 litres of drinkable water provided in durable containers or means of making sea water drinkable or a combination of both; and

(10) first-aid equipment.

(b) As far as practicable, items listed in (a) should be contained in a pack.

AMC1 CAT.IDE.A.285(e)(4) & CAT.IDE.A.305(a)(2) Flight over water & Survival equipment

SURVIVAL ELT

An ELT(AP) may be used to replace one required ELT(S) provided that it meets the ELT(S) requirements. A water-activated ELT(S) is not an ELT(AP).

AMC1 CAT.IDE.A.285(a) Flight over water

ACCESSIBILITY OF LIFE-JACKETS

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.

AMC2 CAT.IDE.A.285(a) Flight over water

ELECTRIC ILLUMINATION OF LIFE-JACKETS

The means of electric illumination should be a survivor locator light as defined in the applicable ETSO issued by the relevant regulatory agency such as EASA or the FAA or equivalent.

GM1 CAT.IDE.A.285(a) Flight over water

SEAT CUSHIONS

Seat cushions are not considered to be flotation devices.

AMC1 CAT.IDE.A.285(f) Flight over water

LOW-FREQUENCY UNDERWATER LOCATING DEVICE

(a) The underwater locating device should be compliant with ETSO-C200 or equivalent.

(b) The underwater locating device should not be installed in wings or empennage.

AMC2 CAT.IDE.A.285(f) Flight over water

ROBUST AND AUTOMATIC MEANS TO LOCATE THE POINT OF END OF FLIGHT AFTER AN ACCIDENT

The 'robust and automatic means to accurately determine, following an accident where the aeroplane is severely damaged, the location of the point of end of flight' should comply with point CAT.GEN.MPA.210.

GM1 CAT.IDE.A.285(f)(2) Flight over water

ROBUST AND AUTOMATIC MEANS TO LOCATE THE POINT OF END OF FLIGHT AFTER AN ACCIDENT

CAT.IDE.A.285(f)(2) refers to means such as required by CAT.GEN.MPA.210 'Location of an aircraft in distress'. The adjective 'robust' in CAT.IDE.A.285 (f)(2) indicates that this means is designed to provide the location of the point of end of flight in non-survivable accident scenarios as well as in survivable accident scenarios.

AMC1 CAT.IDE.A.305 Survival equipment

ADDITIONAL SURVIVAL EQUIPMENT

(a) The following additional survival equipment should be carried when required:

   (1) 2 litres of drinkable water for each 50, or fraction of 50, persons on board provided in durable containers;

   (2) one knife;

(3) first-aid equipment; and

(4) one set of air/ground codes.

(b) In addition, when polar conditions are expected, the following should be carried:

(1) a means for melting snow;

(2) one snow shovel and one ice saw;

(3) sleeping bags for use by 1/3 of all persons on board and space blankets for the remainder or space blankets for all passengers on board; and

(4) one arctic/polar suit for each crew member.

(c) If any item of equipment contained in the above list is already carried on board the aeroplane in accordance with another requirement, there is no need for this to be duplicated.

AMC1 CAT.IDE.A.285(e)(4) & CAT.IDE.A.305(a)(2) Flight over water & Survival equipment

See AMC1 CAT.IDE.A.285(e)(4) earlier in the document..

AMC1 CAT.IDE.A.305(b)(2) Survival equipment

APPLICABLE AIRWORTHINESS STANDARD

The applicable airworthiness standard should be CS-25 or equivalent.

GM1 CAT.IDE.A.305 Survival equipment

SIGNALLING EQUIPMENT

The signalling equipment for making distress signals is described in ICAO Annex 2, Rules of the Air.

GM2 CAT.IDE.A.305 Survival equipment

AREAS IN WHICH SEARCH AND RESCUE WOULD BE ESPECIALLY DIFFICULT

The expression ‘areas in which search and rescue would be especially difficult’ should be interpreted, in this context, as meaning:

(a) areas so designated by the authority responsible for managing search and rescue; or

(b) areas that are largely uninhabited and where:

(1) the authority referred to in (a) has not published any information to confirm whether search and rescue would be or would not be especially difficult; and

(2) the authority referred to in (a) does not, as a matter of policy, designate areas as being especially difficult for search and rescue.

AMC1 CAT.IDE.A.325 Headset

GENERAL

(a) A headset consists of a communication device that includes two earphones to receive and a microphone to transmit audio signals to the aeroplane’s communication system. To comply with the minimum performance requirements, the earphones and microphone should match the communication system’s characteristics and the flight crew compartment environment. The headset should be sufficiently adjustable to fit the pilot’s head. Headset boom microphones should be of the noise cancelling type.

(b) If the intention is to utilise noise cancelling earphones, the operator should ensure that the earphones do not attenuate any aural warnings or sounds necessary for alerting the flight crew on matters related to the safe operation of the aeroplane.

GM1 CAT.IDE.A.325 Headset

GENERAL

The term 'headset' includes any aviation helmet incorporating headphones and microphone worn by a flight crew member.

GM1.CAT.IDE.A.330 Radio communications equipment

Information on the performance-based communication and surveillance (PBCS) concept and guidance material on its implementation are contained in the Performance-based Communication and Surveillance (PBCS) Manual (ICAO Document 9869)

AMC1 CAT.IDE.A.345 Communication and navigation equipment for operations under IFR or under VFR over routes not navigated by reference to visual landmarks

TWO INDEPENDENT MEANS OF COMMUNICATION

Whenever two independent means of communication are required, each system should have an independent antenna installation, except where rigidly supported non-wire antennae or other antenna installations of equivalent reliability are used.

AMC2 CAT.IDE.A.345 Communication and navigation equipment for operations under IFR or under VFR over routes not navigated by reference to visual landmarks

ACCEPTABLE NUMBER AND TYPE OF COMMUNICATION AND NAVIGATION EQUIPMENT

(a) An acceptable number and type of communication and navigation equipment is:

  (1) one VHF omnidirectional radio range (VOR) receiving system, one automatic direction finder (ADF) system, one distance measuring equipment (DME), except that an ADF system need not be installed provided that the use of ADF is not required in any phase of the planned flight;

  (2) one instrument landing system (ILS) or microwave landing system (MLS) where ILS or MLS is required for approach navigation purposes;

  (3) one marker beacon receiving system where a marker beacon is required for approach navigation purposes;

  (4) area navigation equipment when area navigation is required for the route being flown (e.g. equipment required by Part SPA);

  (5) an additional DME system on any route, or part thereof, where navigation is based only on DME signals;

  (6) an additional VOR receiving system on any route, or part thereof, where navigation is based only on VOR signals; and

  (7) an additional ADF system on any route, or part thereof, where navigation is based only on non-directional beacon (NDB) signals.

(b) Aeroplanes may be operated without the navigation equipment specified in (6) and (7) provided they are equipped with alternative equipment. The reliability and the accuracy of alternative equipment should allow safe navigation for the intended route.

(c) The operator conducting extended range operations with two-engined aeroplanes (ETOPS/EDTO) should ensure that the aeroplanes have a communication means capable of communicating with an appropriate ground station at normal and planned contingency altitudes. For ETOPS routes where voice communication facilities are available, voice communications should be provided. For all EDTO/ETOPS operations beyond 180 minutes, reliable communication technology, either voice-based or data link, should be installed. Where voice communication facilities are not available and where voice communication is not possible or is of poor quality, communications using alternative systems should be ensured.

(d) To perform IFR operations without an ADF system installed, the operator should consider the following guidelines on equipment carriage, operational procedures and training criteria.

(1) ADF equipment may only be removed from or not installed in an aeroplane intended to be used for IFR operations when it is not essential for navigation, and provided that alternative equipment giving equivalent or enhanced navigation capability is carried. This may be accomplished by the carriage of an additional VOR receiver or a GNSS receiver approved for IFR operations.

(2) For IFR operations without ADF, the operator should ensure that:

(i) route segments that rely solely on ADF for navigation are not flown;

(ii) ADF/NDB procedures are not flown;

(iii) the minimum equipment list (MEL) has been amended to take account of the non- carriage of ADF;

(iv) the operations manual does not refer to any procedures based on NDB signals for the aeroplanes concerned; and

(v) flight planning and dispatch procedures are consistent with the above mentioned criteria.

(3) The removal of ADF should be taken into account by the operator in the initial and recurrent training of flight crew.

(e) VHF communication equipment, ILS localiser and VOR receivers installed on aeroplanes to be operated in IFR should comply with the following FM immunity performance standards:

(1) ICAO Annex 10, Volume I - Radio Navigation Aids, and Volume III, Part II - Voice Communications Systems; and

(2) acceptable equipment standards contained in EUROCAE Minimum Operational Performance Specifications, documents ED-22B for VOR receivers, ED-23B for VHF communication receivers and ED-46B for LOC receivers and the corresponding Radio Technical Commission for Aeronautics (RTCA) documents DO-186, DO-195 and DO-196.

AMC3 CAT.IDE.A.345 Communication and navigation equipment for operations under IFR or under VFR over routes not navigated by reference to visual landmarks

FAILURE OF A SINGLE UNIT

Required communication and navigation equipment should be installed such that the failure of any single unit required for either communication or navigation purposes, or both, will not result in the failure of another unit required for communications or navigation purposes.

AMC4 CAT.IDE.A.345 Communication and navigation equipment for operations under IFR or under VFR over routes not navigated by reference to visual landmarks

LONG RANGE COMMUNICATION SYSTEMS

(a) The long range communication system should be either a high frequency/HF-system or another two-way communication system if allowed by the relevant airspace procedures.

(b) When using one communication system only, the CAAT may restrict the minimum navigation performance specifications (MNPS) approval to the use of the specific routes.

GM1 CAT.IDE.A.345 Communication and navigation equipment for operations under IFR or under VFR over routes not navigated by reference to visual landmarks

APPLICABLE AIRSPACE REQUIREMENTS

For aeroplanes being operated under European air traffic control, the applicable airspace requirements include the Single European Sky legislation.

GM2 CAT.IDE.A.345 Communication and navigation equipment for operations under IFR or under VFR over routes not navigated by reference to visual landmarks

AIRCRAFT ELIGIBILITY FOR PBN SPECIFICATION NOT REQUIRING SPECIFIC APPROVAL

(a) The performance of the aircraft is usually stated in the AFM.

(b) Where such a reference cannot be found in the AFM, other information provided by the aircraft manufacturer as TC holder, the STC holder or the design organisation having a privilege to approve minor changes may be considered.

(c) The following documents are considered acceptable sources of information:

  (1) AFM, supplements thereto, and documents directly referenced in the AFM;

  (2) FCOM or similar document;

  (3) Service Bulletin or Service Letter issued by the TC holder or STC holder;

  (4) approved design data or data issued in support of a design change approval;

  (5) any other formal document issued by the TC or STC holders stating compliance with PBN specifications, AMC, Advisory Circulars (AC) or similar documents issued by the State of Design; and

  (6) written evidence obtained from the State of Design.

(d) Equipment qualification data, in itself, is not sufficient to assess the PBN capabilities of the aircraft, since the latter depend on installation and integration.

(e) As some PBN equipment and installations may have been certified prior to the publication of the PBN Manual and the adoption of its terminology for the navigation specifications, it is not always possible to find a clear statement of aircraft PBN capability in the AFM. However, aircraft eligibility for certain PBN specifications can rely on the aircraft performance certified for PBN procedures and routes prior to the publication of the PBN Manual.

(f) Below, various references are listed which may be found in the AFM or other acceptable documents (see listing above) in order to consider the aircraft's eligibility for a specific PBN specification if the specific term is not used.

(g) RNAV 5

(1) If a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNAV 5 operations.

(i) B-RNAV;

(ii) RNAV 1;

(iii) RNP APCH;

(iv) RNP 4;

(v) A-RNP;

(vi) AMC 20-4;

(vii) JAA TEMPORARY GUIDANCE MATERIAL, LEAFLET NO. 2 (TGL 2);

(viii) JAA AMJ 20X2;

(ix) FAA AC 20-130A for en route operations;

(x) FAA AC 20-138 for en route operations; and

(xi) FAA AC 90-96.

(h) RNAV 1/RNAV 2

(1) If a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNAV 1/RNAV 2 operations.

(i) RNAV 1;

(ii) PRNAV;

(iii) US RNAV type A;

(iv) FAA AC 20-138 for the appropriate navigation specification;

(v) FAA AC 90-100A;

(vi) JAA TEMPORARY GUIDANCE MATERIAL, LEAFLET NO. 10 Rev1 (TGL 10); and

(vii) FAA AC 90-100.

(2) However, if position determination is exclusively computed based on VOR-DME, the aircraft is not eligible for RNAV 1/RNAV 2 operations.

(i) RNP 1/RNP 2 continental

(1) If a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNP 1/RNP 2 continental operations.

(i) A-RNP;

(ii) FAA AC 20-138 for the appropriate navigation specification; and

(iii) FAA AC 90-105.

(2) Alternatively, if a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above and position determination is primarily based on GNSS, the aircraft is eligible for RNP 1/RNP 2 continental operations. However, in these cases, loss of GNSS implies loss of RNP 1/RNP 2 capability.

(i) JAA TEMPORARY GUIDANCE MATERIAL, LEAFLET NO. 10 (TGL 10) (any revision); and

(ii) FAA AC 90-100.

(j) RNP APCH — LNAV minima

(1) If a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNP APCH — LNAV operations.

(i) A-RNP;

(ii) AMC 20-27;

(iii) AMC 20-28;

(iv) FAA AC 20-138 for the appropriate navigation specification; and

(v) FAA AC 90-105 for the appropriate navigation specification.

(2) Alternatively, if a statement of compliance with RNP 0.3 GNSS approaches in accordance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNP APCH — LNAV operations. Any limitation such as 'within the US National Airspace' may be ignored since RNP APCH procedures are assumed to meet the same ICAO criteria around the world.

(i) JAA TEMPORARY GUIDANCE MATERIAL, LEAFLET NO. 3 (TGL 3);

(ii) AMC 20-4;

(iii) FAA AC 20-130A; and

(iv) FAA AC 20-138.

(k) RNP APCH — LNAV/VNAV minima

(1) If a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNP APCH — LNAV/VNAV operations.

(i) A-RNP;

(ii) AMC 20-27 with Baro VNAV;

(iii) AMC 20-28;

(iv) FAA AC 20-138; and

(v) FAA AC 90-105 for the appropriate navigation specification.

(2) Alternatively, if a statement of compliance with FAA AC 20-129 is found in the acceptable documentation as listed above, and the aircraft complies with the requirements and limitations of EASA SIB 2014-04, the aircraft is eligible for RNP APCH — LNAV/VNAV

operations. Any limitation such as 'within the US National Airspace' may be ignored since RNP APCH procedures are assumed to meet the same ICAO criteria around the world.

(l) RNP APCH — LPV minima

(1) If a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNP APCH — LPV operations.

(i) AMC 20-28;

(ii) FAA AC 20-138 for the appropriate navigation specification; and

(iii) FAA AC 90-107.

(2) For aircraft that have a TAWS Class A installed and do not provide Mode-5 protection on an LPV approach, the DH is limited to 250 ft.

(m) RNAV 10

(1) If a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNAV 10 operations.

(i) RNP 10;

(ii) FAA AC 20-138 for the appropriate navigation specification;

(iii) AMC 20-12;

(iv) FAA Order 8400.12 (or later revision); and

(v) FAA AC 90-105.

(n) RNP 4

(1) If a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNP 4 operations.

(i) FAA AC 20-138B or later, for the appropriate navigation specification;

(ii) FAA Order 8400.33; and

(iii) FAA AC 90-105 for the appropriate navigation specification.

(o) RNP 2 oceanic

(1) If a statement of compliance with FAA AC 90-105 for the appropriate navigation specification is found in the acceptable documentation as listed above, the aircraft is eligible for RNP 2 oceanic operations.

(2) If the aircraft has been assessed eligible for RNP 4, the aircraft is eligible for RNP 2 oceanic.

(p) Special features

(1) RF in terminal operations (used in RNP 1 and in the initial segment of the RNP APCH)

(i) If a statement of demonstrated capability to perform an RF leg, certified in accordance with any of the following specifications or standards, is found in the acceptable documentation as listed above, the aircraft is eligible for RF in terminal operations:

(A) AMC 20-26; and

(B) FAA AC 20-138B or later.

(ii) If there is a reference to RF and a reference to compliance with AC 90-105, then the aircraft is eligible for such operations.

(q) Other considerations

(1) In all cases, the limitations in the AFM need to be checked; in particular, the use of AP or FD which can be required to reduce the FTE primarily for RNP APCH, RNAV 1, and RNP 1.

(2) Any limitation such as 'within the US National Airspace' may be ignored since RNP APCH procedures are assumed to meet the same ICAO criteria around the world.

GM3 CAT.IDE.A.345 Communication and navigation equipment for operations under IFR or under VFR over routes not navigated by reference to visual landmarks

GENERAL

(a) The PBN specifications for which the aircraft complies with the relevant airworthiness criteria are set out in the AFM, together with any limitations to be observed.

(b) Because functional and performance requirements are defined for each navigation specification, an aircraft approved for an RNP specification is not automatically approved for all RNAV specifications. Similarly, an aircraft approved for an RNP or RNAV specification having a stringent accuracy requirement (e.g. RNP 0.3 specification) is not automatically approved for a navigation specification having a less stringent accuracy requirement (e.g. RNP 4).

RNP 4

(c) For RNP 4, at least two LRNSs, capable of navigating to RNP 4, and listed in the AFM, may be operational at the entry point of the RNP 4 airspace. If an item of equipment required for RNP 4 operations is unserviceable, then the flight crew may consider an alternate route or diversion for repairs. For multi-sensor systems, the AFM may permit entry if one GNSS sensor is lost after departure, provided one GNSS and one inertial sensor remain available.

GM1 CAT.IDE.A.345(c) Communication and navigation equipment for operations under IFR or under VFR over routes not navigated by reference to visual landmarks

SHORT HAUL OPERATIONS

The term 'short haul operations' refers to operations not crossing the North Atlantic.

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) (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.A.350 Transponder

SSR TRANSPONDER

(a) The secondary surveillance radar (SSR) transponders of aeroplanes being operated under European air traffic control should comply with any applicable Single European Sky legislation.

(b) If the Single European Sky legislation is not applicable, the SSR transponders should operate in accordance with the relevant provisions of Volume IV of ICAO Annex 10.

AMC1 CAT.IDE.A.355 Management of aeronautical databases

AERONAUTICAL DATABASES

When the operator of an aircraft uses an aeronautical database that supports an airborne navigation application as a primary means of navigation used to meet the airspace usage requirements, the database provider should be a Type 2 DAT provider certified in accordance with the relevant Kingdom of Thailand Civil Aviation Regulation for providers of air traffic management/air navigation services and other air traffic management functions or equivalent standards acceptable to the CAAT i.e. Regulation (EU) 2017/373.

GM1 CAT.IDE.A.355 Management of aeronautical databases

AERONAUTICAL DATABASE APPLICATION

(a) Applications using aeronautical databases for which Type 2 DAT providers should be certified in accordance with Regulation (EU) 2017/373 or other standards acceptable to the CAAT.

GM2 CAT.IDE.A.355 Management of aeronautical databases

TIMELY DISTRIBUTION

The operator should distribute current and unaltered aeronautical databases to all aircraft requiring them in accordance with the validity period of the databases or in accordance with a procedure established in the operations manual if no validity period is defined.

GM3 CAT.IDE.A.355 Management of aeronautical databases

STANDARDS FOR AERONAUTICAL DATABASES AND DAT PROVIDERS

(a) A 'Type 2 DAT provider' is an organisation as defined by Regulation (EU) 2017/373.

GM1 CAT.IDE.A.360 Surveillance Equipment

Information on surveillance equipment is contained in the Aeronautical Surveillance Manual (ICAO Document 9924)

Information on RSP specifications for performance-based surveillance is contained in the Performance-based Communication and Surveillance (PBCS) (ICAO Document 9869)

SECTION 2 - Helicopters

GM1 CAT.IDE.H.100 Instruments and equipment — general

When EUROCAE Standards are referred to in the AMCs to TCAR OPS Part CAT, equivalent standards acceptable to the CAAT may be used to establish compliance.

GM1 CAT.IDE.H.100(a) Instruments and equipment — general

REQUIRED INSTRUMENTS AND EQUIPMENT THAT DO NOT NEED TO BE APPROVED IN ACCORDANCE WITH appropriate initial airworthiness regulation.

The functionality of non-installed instruments and equipment required by this Subpart and that do not need an equipment approval, as listed in CAT.IDE.H.100(a), should be checked against recognised industry standards appropriate to the intended purpose. The operator is responsible for ensuring the maintenance of these instruments and equipment.

GM1 CAT.IDE.H.100(b) Instruments and equipment — general

NOT REQUIRED INSTRUMENTS AND EQUIPMENT THAT DO NOT NEED TO BE APPROVED IN ACCORDANCE WITH initial airworthiness regulation, BUT ARE CARRIED ON A FLIGHT

(a) The provision of this paragraph does not exempt any installed instrument or item of equipment from complying with initial airworthiness regulation. In this case, the installation should be approved as required in initial airworthiness regulation and should comply with the applicable Certification Specifications as required under that Regulation.

(b) The failure of additional non-installed instruments or equipment not required by this Part or the Certification Specifications as required under initial airworthiness regulation or any applicable airspace requirements should not adversely affect the airworthiness and/or the safe operation of the aircraft. Examples may be the following:

(1) portable electronic flight bag (EFB);

(2) portable electronic devices carried by flight crew or cabin crew; and

(3) non-installed passenger entertainment equipment.

GM1 CAT.IDE.H.100(d) Instruments and equipment — general

POSITIONING OF INSTRUMENTS

This requirement implies that whenever a single instrument is required to be installed in a helicopter operated in a multi-crew environment, the instrument needs to be visible from each flight crew station.

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.125 & CAT.IDE.H.130 Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

INTEGRATED INSTRUMENTS

(a) Individual equipment requirements may be met by combinations of instruments or by integrated flight systems or by a combination of parameters on electronic displays, provided that the information so available to each required pilot is not less than the required in the applicable operational requirements, and the equivalent safety of the installation has been shown during type certification approval of the helicopter for the intended type of operation.

(b) The means of measuring and indicating slip, helicopter attitude and stabilised helicopter heading may be met by combinations of instruments or by integrated flight director systems, provided that the safeguards against total failure, inherent in the three separate instruments, are retained.

AMC1 CAT.IDE.H.125(a)(1)(i) & CAT.IDE.H.130(a)(1) Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

MEANS OF MEASURING AND DISPLAYING MAGNETIC HEADING

The means of measuring and displaying magnetic direction should be a magnetic compass or equivalent.

AMC1 CAT.IDE.H.125(a)(1)(ii) & CAT.IDE.H.130(a)(2) Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

MEANS OF MEASURING AND DISPLAYING THE TIME

An acceptable means of compliance is a clock displaying hours, minutes and seconds, with a sweep-second pointer or digital presentation.

AMC1 CAT.IDE.H.125(a)(1)(iii) & CAT.IDE.H.130(b) Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

CALIBRATION OF THE MEANS OF MEASURING AND DISPLAYING PRESSURE ALTITUDE

The instrument measuring and displaying pressure altitude should be of a sensitive type calibrated in feet (ft), with a sub-scale setting, calibrated in hectopascals/millibars, adjustable for any barometric pressure likely to be set during flight.

AMC1 CAT.IDE.H.125(a)(1)(iv) & CAT.IDE.H.130(a)(3) Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

CALIBRATION OF THE INSTRUMENT INDICATING AIRSPEED

The instrument indicating airspeed should be calibrated in knots (kt).

AMC1 CAT.IDE.H.125(a)(1)(vii) & CAT.IDE.H.130(a)(8) Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

OUTSIDE AIR TEMPERATURE

(a) The means of displaying outside air temperature should be calibrated in degrees Celsius.

(b) The means of displaying outside air temperature may be an air temperature indicator that provides indications that are convertible to outside air temperature.

AMC1 CAT.IDE.H.125(b) & CAT.IDE.H.130(h) Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

MULTI-PILOT OPERATIONS — DUPLICATE INSTRUMENTS

Duplicate instruments should include separate displays for each pilot and separate selectors or other associated equipment where appropriate.

GM1 CAT.IDE.H.125(b) Operations under VFR by day — flight and navigational instruments and associated equipment

MULTI-PILOT OPERATIONS

(a) Two pilots are required for the operation if required by the one of the following:

(1) the AFM;

(2) point ORO.FC.200.

MULTI-PILOT OPERATIONS ON A VOLUNTARY BASIS — HELICOPTERS OPERATED UNDER VFR BY DAY

(b) If the AFM permits single-pilot operations, and the operator decides that the crew composition is more than one pilot, then point CAT.IDE.H.125(b) does not apply. However, additional means to display instruments referred to in CAT.IDE.H.125(b) may be required by point CAT.IDE.H.100(d).

GM1 CAT.IDE.H.130(h) Operations under IFR or at night – flight and navigational instruments and associated equipment

MULTI-PILOT OPERATIONS

Two pilots are required for the operation if required by the one of the following:

(a) the AFM;

(b) the operations manual.

AMC1 CAT.IDE.H.125(c)(2) & CAT.IDE.H.130(a)(7) Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

STABILISED HEADING

Stabilised heading should be achieved for VFR flights by a gyroscopic heading indicator, whereas for IFR flights, this should be achieved through a magnetic gyroscopic heading indicator.

AMC1 CAT.IDE.H.125(d) & CAT.IDE.H.130(d) Operations under VFR by day & Operations under IFR or at night operations — flight and navigational instruments and associated equipment

MEANS OF PREVENTING MALFUNCTION DUE TO CONDENSATION OR ICING

The means of preventing malfunction due to either condensation or icing of the airspeed indicating system should be a heated pitot tube or equivalent.

GM1 CAT.IDE.H.125 & CAT.IDE.H.130 Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

See for IDE.H.125 earlier in this document.

AMC1 CAT.IDE.H.125 & CAT.IDE.H.130 Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

See for IDE.H.125 earlier in this document.

AMC1 CAT.IDE.H.125(a)(1)(i) & CAT.IDE.H.130(a)(1) Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

See for IDE.H.125 earlier in this document.

AMC1 CAT.IDE.H.125(a)(1)(ii) & CAT.IDE.H.130(a)(2) Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

See for IDE.H.125 earlier in this document.

AMC1 CAT.IDE.H.125(a)(1)(iii) & CAT.IDE.H.130(b) Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

See for IDE.H.125 earlier in this document.

AMC1 CAT.IDE.H.125(a)(1)(iv) & CAT.IDE.H.130(a)(43) Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

See for IDE.H.125 earlier in this document.

AMC1 CAT.IDE.H.125(a)(1)(vii) & CAT.IDE.H.130(a)(8) Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

See for IDE.H.125 earlier in this document.

GM1 CAT.IDE.H.130(a)(3) Operations under IFR — flight and navigational instruments and associated equipment

ALTIMETERS

Altimeters with counter drum-pointer or equivalent presentation are considered to be less susceptible to misinterpretation for helicopters operating above 10 000 ft.

AMC1 CAT.IDE.H.125(b) & CAT.IDE.H.130(h) Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

See for IDE.H.125 earlier in this document.

AMC1 CAT.IDE.H.125(c)(2) & CAT.IDE.H.130(a)(7) Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

See for IDE.H.125 earlier in this document.

AMC1 CAT.IDE.H.125(d) & CAT.IDE.H.130(d) Operations under VFR by day & Operations under IFR or at night operations — flight and navigational instruments and associated equipment

See for IDE.H.125 earlier in this document.

AMC1 CAT.IDE.H.130(e) Operations under IFR or at night — flight and navigational instruments and associated equipment

MEANS OF INDICATING FAILURE OF THE AIRSPEED INDICATING SYSTEM'S MEANS OF PREVENTING MALFUNCTION DUE TO EITHER CONDENSATION OR ICING

A combined means of indicating failure of the airspeed indicating system's means of preventing malfunction due to either condensation or icing is acceptable provided that it is visible from each flight crew station and that there it is a means to identify the failed heater in systems with two or more sensors.

AMC1 CAT.IDE.H.130(f)(6) Operations under IFR or at night — flight and navigational instruments and associated equipment

ILLUMINATION OF STANDBY MEANS OF MEASURING AND DISPLAYING ATTITUDE

The standby means of measuring and displaying attitude should be illuminated so as to be clearly visible under all conditions of daylight and artificial lighting.

AMC1 CAT.IDE.H.130(i) Operations under IFR or at night — flight and navigational instruments and associated equipment

CHART HOLDER

An acceptable means of compliance with the chart holder requirement is to display a pre-composed chart on an electronic flight bag (EFB).

GM1 CAT.IDE.H.125 & CAT.IDE.H.130 Operations under VFR by day & Operations under IFR or at night — flight and navigational instruments and associated equipment

SUMMARY TABLE

Table 1 Flight and navigational instruments and associated equipment (Note single-pilot operations under IFR or at night are not authorised in the Kingdom of Thailand)

SERIAL		FLIGHTS UNDER VFR		FLIGHTS UNDER IFR OR AT NIGHT	
INSTRUMENT		SINGLE-PILOT	TWO PILOTS REQUIRED	SINGLE-PILOT	TWO PILOTS REQUIRED
(a)		(b)	(c)	(d)	(e)
1	Magnetic direction	1	1	1	1
2	time	1	1	1	1
3	Pressure altitude	1	2	2 Note (1)	2
4	Indicated airspeed	1	2	1	2
5	Vertical speed	1	2	1	2
6	Slip	1	2	1	2
7	Attitude	1 Note (2)	2 Note(2)	1	2
8	Stabilised direction	1 Note (2)	2 Note(2)	1	2
9	Outside air temperature	1	1	1	1
10	Airspeed icing protection	1 Note (3)	2 Note (3)	1	2
INSTRUMENT		SINGLE-PILOT	TWO PILOTS REQUIRED	SINGLE-PILOT	TWO PILOTS REQUIRED
(a)		(b)	(c)	(d)	(e)
11	Airspeed icing protection failure indicating			1 Note (4)	2 Note (4)

SERIAL		FLIGHTS UNDER VFR		FLIGHTS UNDER IFR OR AT NIGHT	
12	Static pressure source			2	2
13	Standby attitude			1 Note (5)	1 Note (5)
14	Chart holder			1 Note (6)	1 Note (6)

Note (1) For single-pilot night operation under VFR, one means of measuring and displaying pressure altitude may be substituted by a means of measuring and displaying radio altitude.

Note (2) Applicable only to helicopters with a maximum certified take-off mass (MCTOM) of more than 3 175 kg; or helicopters operated over water when out of sight of land or when the visibility is less than 1 500 m.

Note (3) Applicable only to helicopters with an MCTOM of more than 3 175 kg, or with an MOPSC of more than 9.

Note (4) The pitot heater failure annunciation applies to any helicopter issued with an individual CofA on or after 1 August 1999. It also applies before that date when: the helicopter has a MCTOM of more than 3 175 kg and an MOPSC of more than 9.

Note (5) For helicopters with an MCTOM of more than 3 175 kg, CS 29.1303(g) may require either a gyroscopic rate-of-turn indicator combined with a slip-skid indicator (turn and bank indicator) or a standby attitude indicator satisfying the requirements. In any case, the original type certification standard should be referred to determine the exact requirement.

Note (6) Applicable only to helicopters operating under IFR.

AMC1 CAT.IDE.H.145 Radio altimeters

AUDIO WARNING DEVICE

(a) The audio warning should be a voice warning.

(b) The audio warning may be provided by a helicopter terrain awareness and warning system (HTAWS).

AMC2 CAT.IDE.H.145 Radio altimeters

RADIO ALTIMETER DISPLAY

The radio altimeter should be of an analogue type display presentation that requires minimal interpretation for both an instantaneous impression of absolute height and rate of change of height.

GM1 CAT.IDE.H.145 Radio altimeters

AUDIO-VOICE-ALERTING DEVICE

(a) To be effective, the voice warning alert should be distinguishable from other warnings and should contain a clear and concise voice message.

(b) The warning format should meet the following conditions:

(1) the warning should be unique (i.e. voice);

(2) it should not be inhibited by any other audio warnings, except by higher priority alerts such as helicopter terrain awareness and warning system (HTAWS); and

(3) the urgency of the warning should be adequate to draw attention but not such as to cause undue annoyance during deliberate descents through the datum height.

(c) The criteria above can be satisfactorily met if the warning format incorporates all of the following features:

(1) a unique tone should precede the voice message; a further tone after the voice may enhance uniqueness and attract more attention without causing undue annoyance;

(2) the perceived tone and voice should be moderately urgent;

(3) the message should be compact as opposed to lengthy provided that the meaning is not compromised, e.g. 'One fifty feet' as opposed to 'One hundred and fifty feet';

(4) an information message is preferable (e.g. 'One hundred feet'); messages such as 'Low height' do not convey the correct impression during deliberate descents through the datum height;

(5) command messages (e.g. 'Pull up, pull up') should not be used unless they relate specifically to height monitoring (e.g. 'Check height'); and

(6) the volume of the warning should be adequate and not variable below an acceptable minimum value.

(d) Every effort should be made to prevent spurious warnings.

(e) The height at which the audio warning is triggered by the radio altimeter should be such as to provide adequate warning for the pilot to take corrective action. It is envisaged that most installations will adopt a height in the range of 100–160 ft. The datum should not be adjustable in flight.

(f) The preset datum height should not be set in a way that it coincides with commonly used instrument approach minima (i.e. 200 ft). Once triggered, the message should sound within 0.5 sec.

(g) The voice warning should be triggered only whilst descending through the preset datum height and be inhibited whilst ascending.

GM2 CAT.IDE.H.145 Radio altimeters

RADIO ALTIMETER DISPLAY

An analogue type display presentation may be, for example, a representation of a dial, ribbon or bar, but not a display that provides numbers only. An analogue type display may be embedded into an electronic flight instrument system (EFIS).

AMC1 CAT.IDE.H.160 Airborne weather detecting equipment

GENERAL

The airborne weather detecting equipment should be an airborne weather radar.

AMC1 CAT.IDE.H.170 Flight crew interphone system

TYPE OF FLIGHT CREW INTERPHONE

The flight crew interphone system should not be of a handheld type.

AMC1 CAT.IDE.H.175 Crew member interphone system

SPECIFICATIONS

The crew member interphone system should:

(a) operate independently of the public address system except for handsets, headsets, microphones, selector switches and signalling devices;

(b) in the case of helicopters where at least one cabin crew member is required, be readily accessible for use at required cabin crew stations close to each separate or pair of floor level emergency exits;

(c) in the case of helicopters where at least one cabin crew member is required, have an alerting system incorporating aural or visual signals for use by flight and cabin crew;

(d) have a means for the recipient of a call to determine whether it is a normal call or an emergency call that uses one or a combination of the following:

(1) lights of different colours;

(2) codes defined by the operator (e.g. different number of rings for normal and emergency calls); or

(3) any other indicating signal specified in the operations manual;

(e) provide a means of two-way communication between the flight crew compartment and each crew member station; and

(f) be readily accessible for use from each required flight crew station in the flight crew compartment.

AMC1 CAT.IDE.H.180 Public address system

SPECIFICATIONS

The public address system should:

(a) operate independently of the interphone systems except for handsets, headsets, microphones, selector switches and signalling devices;

(b) be readily accessible for immediate use from each required flight crew station;

(c) have, for each floor level passenger emergency exit that has an adjacent cabin crew seat, a microphone operable by the seated cabin crew member, except that one microphone may serve more than one exit, provided the proximity of exits allows unassisted verbal communication between seated cabin crew members;

(d) be operable within ten seconds by a cabin crew member at each of those stations;

(e) be audible at all passenger seats, lavatories, cabin crew seats and work stations and any other location or compartment that may be occupied by persons; and

(f) following a total failure of the normal electrical generating system, provide reliable operation for a minimum of ten minutes.

AMC1 CAT.IDE.H.185 Cockpit voice recorder

OPERATIONAL PERFORMANCE REQUIREMENTS

(a) For helicopters first issued with an individual CofA on or after 1 January 2016, the operational performance requirements for cockpit voice recorders (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

(b) 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 No°1 and No°2, or any later equivalent standard produced by EUROCAE.

AMC1.1 CAT.IDE.H.190 Flight data recorder

OPERATIONAL PERFORMANCE REQUIREMENTS FOR HELICOPTERS HAVING AN MCTOM OF MORE THAN 3 175 KG AND FIRST ISSUED WITH AN INDIVIDUAL CofA ON OR AFTER 1 JANUARY 2016 AND BEFORE 1 JANUARY 2023

(a) The operational performance requirements for flight data recorders (FDRs) 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.

(b) The FDR should, with reference to a timescale, record:

(1) the parameters listed in Table 1 below;

(2) the additional parameters listed in Table 2 below, when the information data source for the parameter is used by helicopter systems or is available on the instrument panel for use by the flight crew to operate the helicopter; and

(3) any dedicated parameters related to novel or unique design or operational characteristics of the helicopter as determined bythe relevant regulatory agency such as EASA or the FAA, or equivalent standard acceptable to the CAAT.

(c) The FDR parameters should meet, as far as practicable, the performance specifications (range, sampling intervals, accuracy limits and minimum resolution in read-out) defined in the operational performance requirements and specifications of EUROCAE Document 112, including amendments No 1 and No 2, or any later equivalent standard produced by EUROCAE.

(d) FDR systems for which some recorded parameters do not meet the performance specifications of EUROCAE Document ED-112 may be acceptable tothe relevant regulatory agency such as EASA or the FAA, or equivalent standard acceptable to the CAAT.

Table 1 FDR — all helicopters

No*	Parameter
1	Time or relative time count
2	Pressure altitude
3	Indicated airspeed or calibrated airspeed
4	Heading

No*	Parameter
5	Normal acceleration
6	Pitch attitude
7	Roll attitude
8	Manual radio transmission keying CVR/FDR synchronisation reference
9 9a 9b 9c 9d 9e	Power on each engine Free power turbine speed (N_F) Engine torque Engine gas generator speed (N_G) Flight crew compartment power control position Other parameters to enable engine power to be determined
10 10a 10b	Rotor: Main rotor speed Rotor brake (if installed)
11 11a	Primary flight controls — Pilot input and/or control output position (if applicable) Collective pitch
11b 11c 11d 11e 11f	Longitudinal cyclic pitch Lateral cyclic pitch Tail rotor pedal Controllable stabiliser (if applicable) Hydraulic selection
12	Hydraulics low pressure (each system should be recorded)
13	Outside air temperature
18	Yaw rate or yaw acceleration
20	Longitudinal acceleration (body axis)
21	Lateral acceleration
25	Marker beacon passage

No*	Parameter
26	Warnings — a discrete should be recorded for the master warning, gearbox low oil pressure and stability augmentation system failure. Other 'red' warnings should be recorded where the warning condition cannot be determined from other parameters or from the cockpit voice recorder.
27	Each navigation receiver frequency selection
37	Engine control modes

* The number in the left hand column reflects the serial numbers depicted in EUROCAE Document ED-112

Table 2 Helicopters for which the data source for the parameter is either used by helicopter systems or is available on the instrument panel for use by the flight crew to operate the helicopter

No*	Parameter
14	AFCS mode and engagement status
15	Stability augmentation system engagement (each system should be recorded)
16	Main gear box oil pressure
17	Gear box oil temperature
17a	Main gear box oil temperature
17b	Intermediate gear box oil temperature
17c	Tail rotor gear box oil temperature
19	Indicated sling load force (if signals readily available)
22	Radio altitude
23	Vertical deviation — the approach aid in use should be recorded.
23a	ILS glide path
23b	MLS elevation
23c	GNSS approach path
24	Horizontal deviation — the approach aid in use should be recorded.
24a	ILS localiser
24b	MLS azimuth
24c	GNSS approach path
28	DME 1 & 2 distances
29	Navigation data
29a	Drift angle
29b	Wind speed
29c	Wind direction
29d	Latitude
29e	Longitude
29f	Ground speed
30	Landing gear or gear selector position

No*	Parameter
31	Engine exhaust gas temperature (T_4)
32	Turbine inlet temperature (TIT/ITT)
33	Fuel contents
34	Altitude rate (vertical speed) — only necessary when available from cockpit instruments
35	Ice detection
36	Helicopter health and usage monitor system (HUMS)
36a	Engine data
36b	Chip detector
36c	Track timing
36d	Exceedance discretes
36e	Broadband average engine vibration
38	Selected barometric setting — to be recorded for helicopters where the parameter is displayed electronically
38a	Pilot
38b	Co-pilot
39	Selected altitude (all pilot selectable modes of operation) — to be recorded for the helicopters where the parameter is displayed electronically
40	Selected speed (all pilot selectable modes of operation) — to be recorded for the helicopters where the parameter is displayed electronically
41	Selected Mach (all pilot selectable modes of operation) — to be recorded for the helicopters where the parameter is displayed electronically
42	Selected vertical speed (all pilot selectable modes of operation) — to be recorded for the helicopters where the parameter is displayed electronically
43	Selected heading (all pilot selectable modes of operation) — to be recorded for the helicopters where the parameter is displayed electronically
44	Selected flight path (all pilot selectable modes of operation) — to be recorded for the helicopters where the parameter is displayed electronically
45	Selected decision height (all pilot selectable modes of operation) — to be recorded for the helicopters where the parameter is displayed electronically
46	EFIS display format

No*	Parameter
47	Multi-function/engine/alerts display format
48	Event marker

* The number in the left hand column reflects the serial numbers depicted in EUROCAE Document ED-112

AMC1.2 CAT.IDE.H.190 Flight data recorder

OPERATIONAL PERFORMANCE REQUIREMENTS FOR HELICOPTERS HAVING AN MCTOM OF MORE THAN 3 175 KG AND 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 helicopter systems or is available on the instrument panel for use by the flight crew to operate the helicopter; and

(3) any dedicated parameters related to novel or unique design or operational characteristics of the helicopter as determined by the relevant regulatory agency such as the CAAT, EASA or the FAA.

(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 helicopters

No*	Parameter
1	Time or relative time count
2	Pressure altitude
3	Indicated airspeed or calibrated airspeed
4	Heading
5	Normal acceleration
6	Pitch attitude
7	Roll attitude
8	Manual radio transmission keying CVR/FDR synchronisation reference
9	Power on each engine:
9a	Free power turbine speed (N_F)
9b	Engine torque
9c	Engine gas generator speed (N_G)
9d	Flight crew compartment power control position
9e	Other parameters to enable engine power to be determined
10	Rotor:
10a	Main rotor speed
10b	Rotor brake (if installed)
11	Primary flight controls — pilot input or control output position if it is possible to derive either the control input or the control movement (one from the other) for all modes of operation and flight regimes. Othersie, pilot input and control output position.
11a	Collective pitch
11b	Longitudinal cyclic pitch
11c	Lateral cyclic pitch
11d	Tail rotor pedal
11e	Controllable stabilator (if applicable)
11f	Hydraulic selection
12	Hydraulics low pressure (each system should be recorded)

No*	Parameter
13	Outside air temperature
18	Yaw rate or yaw acceleration
20	Longitudinal acceleration (body axis)
21	Lateral acceleration
25	Marker beacon passage
26	Warnings — including master warning, gearbox low oil pressure and stability augmentation system failure, and other 'red' warnings where the warning condition cannot be determined from other parameters or from the cockpit voice recorder
27	Each navigation receiver frequency selection
37	Engine control modes

* The number in the left-hand column reflects the serial numbers depicted in EUROCAE Document 112A.

Table 2: FDR - Helicopters for which the data source for the parameter is either used by the helicopter systems or is available on the instrument panel for use by the flight crew to operate the helicopter

No*	Parameter
14	AFCS mode and engagement status (showing which systems are engaged and which primary modes are controlling the flight path)
15	Stability augmentation system engagement (each system should be recorded)
16	Main gear box oil pressure
17 17a 17b 17c	Gear box oil temperature: Main gear box oil temperature Intermediate gear box oil temperature Tail rotor gear box oil temperature
19	Indicated sling load force (if signals are readily available)
22	Radio altitude
23 23a	Vertical deviation — the approach aid in use should be recorded: ILS glide path

No*	Parameter
23b 23c	MLS elevation GNSS approach path
24 24a 24b 24c	Horizontal deviation — the approach aid in use should be recorded: ILS localiser MLS azimuth GNSS approach path
28	DME 1 & 2 distances
29 29a 29b 29c 29d 29e 29f	Navigation data: Drift angle Wind speed Wind direction Latitude Longitude Ground speed
30	Landing gear or gear selector position
31	Engine exhaust gas temperature (T_4)
32	Turbine inlet temperature (TIT)/interstage turbine temperature ITT)
33	Fuel contents
34	Altitude rate (vertical speed) — only necessary when available from cockpit instruments
35	Ice detection
36 36a 36b 36c 36d 36e	Helicopter health and usage monitor system (HUMS): Engine data Chip detector Track timing Exceedance discretes Broadband average engine vibration

No*	Parameter
38 38a 38b	Selected barometric setting — to be recorded for helicopters where the parameter is displayed electronically: Pilot Co-pilot
39	Selected altitude (all pilot selectable modes of operation) — to be recorded for the helicopters where the parameter is displayed electronically
40	Selected speed (all pilot selectable modes of operation) — to be recorded for the helicopters where the parameter is displayed electronically
41	Selected Mach (all pilot selectable modes of operation) — to be recorded for the helicopters where the parameter is displayed electronically
42	Selected vertical speed (all pilot selectable modes of operation) — to be recorded for the helicopters where the parameter is displayed electronically
43	Selected heading (all pilot selectable modes of operation) — to be recorded for the helicopters where the parameter is displayed electronically
44	Selected flight path (all pilot selectable modes of operation) — to be recorded for the helicopters where the parameter is displayed electronically
45	Selected decision height (all pilot selectable modes of operation) — to be recorded for the helicopters where the parameter is displayed electronically
46 46a 46b	EFIS display format (showing the display system status): Pilot First officer
47	Multi-function/engine/alerts display format (showing the display system status)
48	Event marker
49 49a 49b 49c	Status of ground proximity warning system (GPWS)/terrain awareness warning system (TAWS)/ground collision avoidance system (GCAS): Selection of terrain display mode including pop-up display status — for helicopters type certified before 1 January 2023, to be recorded only if this does not require extensive modification Terrain alerts, both cautions and warnings, and advisories — for helicopters type certified before 1 January 2023, to be recorded only if this does not require extensive modification On/off switch position – for helicopters type certified before 1 January 2023, to be recorded only if this does not require extensive modification
50	Traffic alert and collision avoidance system (TCAS)/airborne collision avoidance system (ACAS):

No*	Parameter
50a	Combined control — for helicopters type certified before 1 January 2023, to be recorded only if this does not require extensive modification.
50b	Vertical control — for helicopters type certified before 1 January 2023, to be recorded only if this does not require extensive modification.
50c	Up advisory — for helicopters type certified before 1 January 2023, to be recorded only if this does not require extensive modification.
50d	Down advisory — for helicopters type certified before 1 January 2023, to be recorded only if this does not require extensive modification.
50e	Sensitivity level — for helicopters type certified before 1 January 2023, to be recorded only if this does not require extensive modification.
51	Primary flight controls — pilot input forces:
51a	Collective pitch — for helicopters type certified before 1 January 2023, to be recorded only if this does not require extensive modification.
51b	Longitudinal cyclic pitch — for helicopters type certified before 1 January 2023, to be recorded only if this does not require extensive modification
51c	Lateral cyclic pitch — for helicopters type certified before 1 January 2023, to be recorded only if this does not require extensive modification.
51d	Tail rotor pedal — for helicopters type certified before 1 January 2023, to be recorded only if this does not require extensive modification.
52	Computed centre of gravity — for helicopters type certified before 1 January 2023, to be recorded only if this does not require extensive modification
53	Helicopter computed weight — for helicopters 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 numbers depicted in EUROCAE Document 112A.

AMC2 CAT.IDE.H.190 Flight data recorder

LIST OF PARAMETERS TO BE RECORDED FOR HELICOPTERS HAVING AN MCTOM OF MORE THAN 3 175 KG AND FIRST ISSUED WITH AN INDIVIDUAL COFA ON OR AFTER 1 AUGUST 1999 AND BEFORE 1 JANUARY 2016 AND HELICOPTERS HAVING AN MCTOM OF MORE THAN 7 000 KG OR AN MOPSC OF MORE THAN 9 AND FIRST ISSUED WITH AN INDIVIDUAL COFA ON OR AFTER 1 JANUARY 1989 AND BEFORE 1 AUGUST 1999

(a) The FDR should, with reference to a timescale, record:

(1) for helicopters with an MCTOM between 3 175 kg and 7 000 kg the parameters listed in Table 1 below;

(2) for helicopters with an MCTOM of more than 7 000 kg the parameters listed in Table 2 below;

(3) for helicopters equipped with electronic display systems, the additional parameters listed in Table 3 below; and

(4) any dedicated parameters relating to novel or unique design or operational characteristics of the helicopter.

(b) The FDR of helicopters with an MCTOM of more than 7 000 kg does not need to record parameter 19 of Table 2 below, if any of the following conditions are met:

(1) the sensor is not readily available; or

(2) a change is required in the equipment that generates the data.

(c) Individual parameters that can be derived by calculation from the other recorded parameters need not to be recorded, if agreed by the CAAT.

(d) The parameters should meet, as far as practicable, the performance specifications (range, sampling intervals, accuracy limits and resolution in read-out) defined in AMC3 CAT.IDE.H.190.

(e) If recording capacity is available, as many of the additional parameters as possible specified in table II-A.2 of EUROCAE Document ED 112 dated March 2003 should be recorded.

(f) For the purpose of this AMC, a sensor is considered 'readily available' when it is already available or can be easily incorporated.

Table 1 Helicopters with an MCTOM of 7 000 kg or less

No	Parameter
1	Time or relative time count
2	Pressure altitude
3	Indicated airspeed or calibrated airspeed
4	Heading
5	Normal acceleration
6	Pitch attitude
7	Roll attitude
8	Manual radio transmission keying
9	Power on each engine (free power turbine speed and engine torque)/cockpit power control position (if applicable)
10a 10b	Main rotor speed Rotor brake (if installed)
11 11a	Primary flight controls — pilot input and control output position (if applicable) Collective pitch

No	Parameter
11b 11c 11d 11e 11f	Longitudinal cyclic pitch Lateral cyclic pitch Tail rotor pedal Controllable stabiliser Hydraulic selection
13	Outside air temperature
14	Autopilot engagement status
15	Stability augmentation system engagement
26	Warning

Table 2 Helicopters with an MCTOM of more than 7 000 kg

No	Parameter
1	Time or relative time count
2	Pressure altitude
3	Indicated airspeed or calibrated airspeed
4	Heading
5	Normal acceleration
6	Pitch attitude
7	Roll attitude
8	Manual radio transmission keying
9	Power on each engine (free power turbine speed and engine torque)/cockpit power control position (if applicable)
10a 10b	Main rotor speed Rotor brake (if installed)
11 11a 11b	Primary flight controls — pilot input and control output position (if applicable) Collective pitch Longitudinal cyclic pitch

No	Parameter
11c 11d 11e 11f	Lateral cyclic pitch Tail rotor pedal Controllable stabiliser Hydraulic selection
12	Hydraulics low pressure
13	Outside air temperature
14	AFCS mode and engagement status
15	Stability augmentation system engagement
16	Main gear box oil pressure
17	Main gear box oil temperature
18	Yaw rate or yaw acceleration
19	Indicated sling load force (if installed)
20	Longitudinal acceleration (body axis)
21	Lateral acceleration
22	Radio altitude
23	Vertical beam deviation (ILS glide path or MLS elevation)
24	Horizontal beam deviation (ILS localiser or MLS azimuth)
25	Marker beacon passage
26	Warnings
27	Reserved (navigation receiver frequency selection is recommended)
28	Reserved (DME distance is recommended)
29	Reserved (navigation data are recommended)
30	Landing gear or gear selector position

Table 3 Helicopters equipped with electronic display systems

No	Parameter
38	Selected barometric setting (each pilot station)
39	Selected altitude
40	Selected speed
41	Selected Mach
42	Selected vertical speed
43	Selected heading
44	Selected flight path
45	Selected decision height
46	EFIS display format
47	Multi-function/engine/alerts display format

AMC3 CAT.IDE.H.190 Flight data recorder

PERFORMANCE SPECIFICATIONS FOR THE PARAMETERS TO BE RECORDED FOR HELICOPTERS HAVING AN MCTOM OF MORE THAN 3 175 KG AND FIRST ISSUED WITH AN INDIVIDUAL COFA ON OR AFTER 1 AUGUST 1999 AND BEFORE 1 JANUARY 2016 AND HELICOPTERS HAVING AN MCTOM OF MORE THAN 7 000 KG OR AN MOPSC OF MORE THAN 9 AND FIRST ISSUED WITH AN INDIVIDUAL COFA ON OR AFTER 1 JANUARY 1989 AND BEFORE 1 AUGUST 1999

Table 1 Helicopters with an MCTOM of 7 000 kg or less

No	Parameter	Range	Sampling interval in seconds	Accuracy Limits (sensor input compared to FDR read out)	Minimum Resolution in read out	Remarks
1	Time or relative time count					
1a or	Time	24 hours	4	± 0.125 % per hour	1 second	(a) UTC time preferred where available.
1b	Relative Time Count	0 to 4 095	4	± 0.125 % per hour		(b) Counter increments every 4 seconds of system operation.
2	Pressure altitude	-1 000 ft to 20 000 ft	1	±100 ft to ±700 ft Refer to table II.A-2 of EUROCAE Document ED-112	25 ft	
3	Indicated airspeed or calibrated airspeed	As the installed measuring system	1	± 5 % or ± 10 kt, whichever is greater	1 kt	
4	Heading	360 °	1	± 5°	1°	
5	Normal acceleration	- 3 g to + 6 g	0.125	± 0.2 g in addition to a maximum offset of ± 0.3 g	0.01 g	The resolution may be rounded from 0.01 g to 0.05 g, provided that one sample is recorded at full resolution at least every 4 seconds.

No	Parameter	Range	Sampling interval in seconds	Accuracy Limits (sensor input compared to FDR read out)	Minimum Resolution in read out	Remarks
6	Pitch attitude	100 % of usable range	0.5	± 2 degrees	0.8 degree	
7	Roll attitude	± 60 ° or 100 % of usable range from installed system if greater	0.5	± 2 degrees	0.8 degree	.
8	Manual radio transmission keying	Discrete(s)	1	-	-	Preferably each crew member but one discrete acceptable for all transmissions.
9	Power on each engine	Full range	Each engine each second	± 5 %	1 % of full range	Sufficient parameters, e.g. Power Turbine Speed and Engine Torque should be recorded to enable engine power to be determined. A margin for possible overspeed should be provided. Data may
9a	Power turbine speed	Maximum range				
9b	Engine torque	Maximum range				

No	Parameter	Range	Sampling interval in seconds	Accuracy Limits (sensor input compared to FDR read out)	Minimum Resolution in read out	Remarks
9c	Cockpit power control position	Full range or each discrete position	Each control each second	±2 % or sufficient to determine any gated position	2 % of full range	be obtained from cockpit indicators used for aircraft certification. Parameter 9c is required for helicopters with non-mechanically linked cockpit-engine controls
10	Rotor					
10a	Main rotor speed	Maximum range	1	± 5 %	1 % of full range	
10b	Rotor brake	Discrete	1	-		Where available
11	Primary flight controls - Pilot input and/or* control output position					* For helicopters that can demonstrate the capability of deriving either the control input or control movement (one from the other) for all modes of operation and flight regimes, the 'or' applies. For helicopters with non-mechanical control systems
11a	Collective pitch	Full range	0.5	± 3 %	1 % of full range	
11b	Longitudinal cyclic pitch		0.5			
11c	Lateral cyclic pitch		0.5			

No	Parameter	Range	Sampling interval in seconds	Accuracy Limits (sensor input compared to FDR read out)	Minimum Resolution in read out	Remarks
11d	Tail rotor pedal		0.5			the ‘and’ applies. Where the input controls for each pilot can be operated independently, both inputs will need to be recorded.
11e	Controllable stabiliser		0.5			
11f	Hydraulic selection	Discretes	1	-	-	
12	Outside air temperature	Available range from installed system	2	± 2 °C	0.3°C	
13	Autopilot engagement status	Discrete(s)	1			Where practicable, discretes should show which primary modes are controlling the flight path of the helicopter
14	Stability augmentation system engagement	Discrete(s)	1			

No	Parameter	Range	Sampling interval in seconds	Accuracy Limits (sensor input compared to FDR read out)	Minimum Resolution in read out	Remarks
15	Warnings	Discrete(s)	1	-	-	A discrete should be recorded for the master warning, low hydraulic pressure (each system) gearbox low oil pressure and SAS fault status. Other 'red' warnings should be recorded where the warning condition cannot be determined from other parameters or from the cockpit voice recorder.

Table 2 Helicopters with an MCTOM of more than 7 000 kg

N°	Parameter	Range	Sampling interval in seconds	Accuracy Limits (sensor input compared to FDR read out)	Minimum Resolution in read out	Remarks
1	Time or relative time count					
1a or	Time	24 hours	4	± 0.125 % per hour	1 second	(a) UTC time preferred where available.
1b	Relative time count	0 to 4095	4	± 0.125 % per hour		(b) Counter increments every 4 seconds of system operation.
2	Pressure altitude	-1 000 ft to maximum certificated altitude of aircraft +5 000 ft	1	± 100 ft to ± 700 ft Refer to table II-A.3 EUROCAE Document ED-112	5 ft	Should be obtained room the air data computer when installed.
3	Indicated airspeed or calibrated airspeed	As the installed measuring system	1	± 3 %	1 kt	Should be obtained from the air data computer when installed.
4	Heading	360 degrees	1	± 2 degrees	0.5 degree	

N°	Parameter	Range	Sampling interval in seconds	Accuracy Limits (sensor input compared to FDR read out)	Minimum Resolution in read out	Remarks
5	Normal acceleration	-3 g to +6 g	0.125	1 % of range excluding a datum error of 5 %	0.004 g	The recording resolution may be rounded from 0.004 g to 0.01 g provided that one sample is recorded at full resolution at least every 4 seconds
6	Pitch attitude	± 75 degrees	0.5	± 2 degrees	0.5 degree	
7	Roll attitude	± 180 degrees	0.5	± 2 degrees	0.5 degree	.
8	Manual radio transmission Keying and CVR/FDR synchronisation reference	Discrete(s)	1	-	-	Preferably each crew member but one discrete acceptable for all transmissions provided that the replay of a recording made by any required recorder can be synchronised in time with any other required recording to within 1 second.
9	Power on each engine	Full range	Each engine each second	± 2 %	0.2 % of full range	Sufficient parameters e.g. Power Turbine Speed and engine torque should be recorded to enable engine power to be determined. A margin for possible overspeed should be provided.
9a	Free power turbine speed (N_F)	0-130 %				
9b	Engine torque	Full range				

N°	Parameter	Range	Sampling interval in seconds	Accuracy Limits (sensor input compared to FDR read out)	Minimum Resolution in read out	Remarks
9c	Cockpit power control positionl	Full range or each discrete position	Each control each second	± 2 % or sufficient to determine any gated position	2 % of full range	Parameter 9c is required for helicopters with non-mechanically linked cockpit-engine controls
10 10a	Rotor Main rotor speed	50 to 130 %	0.5	2 %	0.3 % of full range	.
10b	Rotor brake	Discrete	1			Where available
11	Primary flight controls - Pilot input and/or* control output position					* For helicopters that can demonstrate the capability of deriving either the control input or control movement (one from the other) for all modes of operation and flight regimes, the 'or' applies. For helicopters with non-mechanical control systems, the 'and' applies. Where the input controls for each pilot can be operated independently, both inputs will need to be recorded.
11a	Collective pitch	Full range	0.5	± 3 % unless higher accuracy is uniquely required	0.5 % of operating range	
11b	Longitudinal cyclic pitch		0.5			
11c	Lateral cyclic pitch		0.5			
11d	Tail rotor pedal		0.5			
11e	Controllable stabiliser		0.5			
11f	Hydraulic selection	Discrete(s)	1	-	-	

N°	Parameter	Range	Sampling interval in seconds	Accuracy Limits (sensor input compared to FDR read out)	Minimum Resolution in read out	Remarks
12	Hydraulics low pressure	Discrete(s)	1	-	-	Each essential system should be recorded.
13	Outside air temperature	-50° to +90°C or available sensor range	2	± 2°C	0.3°C	
14	AFCS mode and engagement status	A suitable combination of discretes	1	-	-	Discretes should show which systems are engaged and which primary modes are controlling the flight path of the helicopter
15	Stability augmentation system engagement	Discrete	1	-	-	
16	Main gearbox oil pressure	As installed	1	As installed	6.895 kN/m² (1 psi)	
17	Main gearbox oil temperature	As installed	2	As installed	1°C	
18	Yaw rate	± 400 degrees/second	0.25	± 1 %	2 degrees per second	An equivalent yaw acceleration is an acceptable alternative.
19	Indicated sling load force	0 to 200 % of maximum certified load	0.5	± 3 % of maximum certified load	0.5 % for maximum certified load	With reasonable practicability if sling load indicator is installed.

N°	Parameter	Range	Sampling interval in seconds	Accuracy Limits (sensor input compared to FDR read out)	Minimum Resolution in read out	Remarks
20	Longitudinal acceleration (body axis)	± 1 g	0.25	±1.5 % of range excluding a datum error of ±5 %	0.004 g	See comment to parameter 5.
21	Lateral acceleration	± 1 g	0.25	±1.5 % of range excluding a datum error of ±5 %	0.004 g	See comment to parameter 5.
22	Radio altitude	-20 ft to +2 500 ft	1	As installed. ± 2 ft or ± 3 % whichever is greater below 500 ft and ± 5 % above 500 ft recommended	1 ft below 500 ft, 1 ft + 0.5 % of full range above 500ft	
23	Vertical beam deviation		1	As installed ± 3 % recommended	0.3 % of full range	Data from both the ILS and MLS systems need not to be recorded at the same time. The approach aid in use should be recorded.
23a	ILS glide path	± 0.22 DDM or available sensor range as installed				
23b	MLS elevation	+0.9 to +30 degrees				
24	Horizontal beam deviation		1	As installed. ± 3 % recommended	0.3 % of full range	See comment to parameter 23

N°	Parameter	Range	Sampling interval in seconds	Accuracy Limits (sensor input compared to FDR read out)	Minimum Resolution in read out	Remarks
24a	ILS localiser	± 0.22 DDM or available sensor range as installed				
24b	MLS azimuth	± 62 degrees				
25	Marker beacon passage	Discrete	1	-	-	One discrete is acceptable for all markers.
26	Warnings	Discretes	1	-	-	A discrete should be recorded for the master warning, gearbox low oil pressure and SAS failure. Other ‘red’ warnings should be recorded where the warning condition cannot be determined from other parameters or from the cockpit voice recorder.
27	Reserved					
28	Reserved					
29	Reserved					
30	Landing gear or gear selector position	Discrete(s)	4	-	-	Where installed.

Table 3 Helicopters equipped with electronic display systems

N°	Parameter	Range	Sampling interval in seconds	Accuracy Limits (sensor input compared to FDR read out)	Minimum Resolution in read out	Remarks
38	Selected barometric setting (each pilot station)	As installed	64	As installed	1 mb	Where practicable, a sampling interval of 4 seconds is recommended.
38a	Pilot					
38b	Co-pilot					
39	Selected altitude	As installed	1	As installed	100 ft	Where capacity is limited, a sampling interval of 64 seconds is permissible.
39a	Manual					
39b	Automatic					
40	Selected speed	As installed	1	As installed	1 kt	Where capacity is limited, a sampling interval of 64 seconds is permissible.
40a	Manual					
40b	Automatic					

N°	Parameter	Range	Sampling interval in seconds	Accuracy Limits (sensor input compared to FDR read out)	Minimum Resolution in read out	Remarks
41	Selected Mach	As installed	1	As installed	0.01	Where capacity is limited, a sampling interval of 64 seconds is permissible.
41a	Manual					
41b	Automatic					
42	Selected vertical speed	As installed	1	As installed	100 ft/min	Where capacity is limited, a sampling interval of 64 seconds is permissible.
42a	Manual					
42b	Automatic					
43	Selected heading	360 degrees	1	As installed	100 ft /min	Where capacity is limited, a sampling interval of 64 seconds is permissible.
44	Selected flight path		1	As installed		
44a	Course/DSTRK				1 degree	
44b	Path angle				0.1 degree	
45	Selected decision height	0-500 ft	64	As installed	1ft	

N°	Parameter	Range	Sampling interval in seconds	Accuracy Limits (sensor input compared to FDR read out)	Minimum Resolution in read out	Remarks
46	EFIS display format	Discrete(s)	4	-	-	Discretes should show the display system status e.g. normal, fail, composite, sector, plan, rose, nav aids, wxr, range, copy
46a	Pilot					
46b	Co-pilot					
47	Multi-function/engine/alerts display format	Discrete(s)	4	-	-	Discretes should show the display system status, e.g. normal, fail, and the identity of the display pages for the emergency procedures and checklists. Information in checklists and procedures need not be recorded.

The term 'where practicable' used in the remarks column of Table 3 means that account should be taken of the following:

(a) if the sensor is already available or can be easily incorporated;

(b) sufficient capacity is available in the flight recorder system;

(c) for navigational data (nav frequency selection, DME distance, latitude, longitude, groundspeed and drift) the signals are available in digital form;

(d) the extent of modification required;

(e) the down-time period; and

(f) equipment software development.

GM1 CAT.IDE.H.190 Flight data recorder

GENERAL

For the purpose of AMC2 CAT.IDE.H.190(b), a sensor is considered 'readily available' when it is already available or can be easily incorporated.

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. The recorded image quality 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 EASA.

(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 EASA for lightweight flight recorders; or

(2) EUROCAE Document ED-112 or any later equivalent standard accepted by EASA 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 CAT.IDE.H.195 Data link recording

GENERAL

(a) The helicopter should be capable of recording the messages as specified in this AMC.

(b) As a means of compliance with CAT.IDE.H.195(a), the recorder on which the data link messages are recorded may be:

(1) the CVR;

(2) the FDR;

(3) a combination recorder when CAT.IDE.H.200 is applicable; or

(4) a dedicated flight recorder. In that case, the operational performance requirements for this recorder 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.

(c) As a means of compliance with CAT.IDE.H.195(a)(2), the operator should enable correlation by providing information that allows an accident investigator to understand what data were provided to the helicopter and, when the provider identification is contained in the message, by which provider.

(d) The timing information associated with the data link communications messages required to be recorded by CAT.IDE.H.195(a)(3) should be capable of being determined from the airborne-based recordings. This timing information should include at least the following:

(1) the time each message was generated;

(2) the time any message was available to be displayed by the crew;

(3) the time each message was actually displayed or recalled from a queue; and

(4) the time of each status change.

(e) The message priority should be recorded when it is defined by the protocol of the data link communication message being recorded.

(f) The expression 'taking into account the system architecture', in CAT.IDE.H.195(a)(3), means that the recording of the specified information may be omitted if the existing source systems involved would require a major upgrade. The following should be considered:

(1) the extent of the modification required;

(2) the down-time period; and

(3) equipment software development.

(g) The intention is that new designs of source systems should include this functionality and support the full recording of the required information.

(h) Data link communications messages that support the applications in Table 1 below should be recorded.

(i) Further details on the recording requirements can be found in the recording requirement matrix in Appendix D.2 of EUROCAE Document ED-93 (Minimum Aviation System Performance Specification for CNS/ATM Recorder Systems, dated November 1998).

Table 1 Applications

Item No	Application Type	Application Description	Required Recording Content
1	Data link initiation	This includes any application used to log on to, or initiate, a data link service. In future air navigation system (FANS)-1/A and air traffic navigation (ATN), these are ATS facilities notification (AFN) and context management (CM), respectively.	C
2	Controller/pilotc ommunication	This includes any application used to exchange requests, clearances, instructions and reports between the flight crew and air traffic controllers. In FANS-1/A and ATN, this includes the controller pilot data link communications (CPDLC) application. CPDLC includes the exchange of oceanic clearances (OCLs) and departure clearances (DCLs).	C
3	Addressed surveillance	This includes any surveillance application in which the ground sets up contracts for delivery of surveillance data. In FANS-1/A and ATN, this includes the automatic dependent surveillance-contract (ADS-C) application.	C, F2
4	Flight information	This includes any application used for delivery of flight information data to specific aeroplanes. This includes for example, data link- automatic terminal information service (D-ATIS), data link- operational terminal information service (D-OTIS), digital weather information services (D-METAR or TWIP), data link flight information service (D-FIS) and Notice to Airmen (D-NOTAM) delivery.	C
5	Aircraft broadcast surveillance	This includes elementary and enhanced surveillance systems, as well as automatic dependent surveillance-broadcast (ADS-B) output data.	M*, F2
6	Airlines operations centre (AOC) data	This includes any application transmitting or receiving data used for AOC purposes (in accordance with the ICAO definition of AOC). Such systems may also process AAC messages, but there is no requirement to record AAC messages	M*
7	Graphics	This includes any application receiving graphical data to be used for operational purposes (i.e. excluding applications that are receiving such things as updates to manuals).	M* F1

GM1 CAT.IDE.H.195 Data link recording

DEFINITIONS AND ACRONYMS

(a) The letters and expressions in Table 1 of AMC1 CAT.IDE.H.195 have the following meaning:

C: Complete contents recorded

M: Information that enables correlation with any associated records stored separately from the helicopter.

*: Applications that are to be recorded only as far as is practicable, given the architecture of the system.

F1: Graphics applications may be considered as AOC data when they are part of a data link communications application service run on an individual basis by the operator itself in the framework of the operational control.

F2: Where parametric data sent by the helicopter, such as Mode S, is reported within the message, it should be recorded unless data from the same source is recorded on the FDR.

(b) The definitions of the applications type in Table 1 of AMC1 CAT.IDE.H.195 are described in Table 1 below.

Table 1 Descriptions of the applications type

Item No	Application Type	Messages	Comments
1	CM		CM is an ATN service
2	AFN		AFN is a FANS 1/A service
3	CPDLC		All implemented up and downlink messages to be recorded
4	ADS-C	ADS-C reports	All contract requests and reports recorded
		Position reports	Only used within FANS 1/A. Only used in oceanic and remote areas.
5	ADS-B	Surveillance data	Information that enables correlation with any associated records stored separately from the helicopter.
6	D-FIS		D-FIS is an ATN service. All implemented up and downlink messages to be recorded
7	TWIP	TWIP messages	Terminal weather information for pilots
8	D-ATIS	ATIS messages	Refer to EUROCAE Document ED-89A dated December 2003. Data Link Application System Document (DLASD) for the 'ATIS' Data Link Service
9	OCL	OCL messages	Refer to EUROCAE Document ED-106A dated March 2004. Data Link Application System Document (DLASD) for 'Oceanic Clearance' Data Link Service
10	DCL	DCL messages	Refer to EUROCAE Document ED-85A dated December 2003. Data Link Application System Document (DLASD) for 'Departure Clearance' Data Link Service
11	Graphics	Weather maps & other graphics	Graphics exchanged in the framework of procedures within the operational control, as specified in Part ORO. Information that enables correlation with any associated records stored separately from the aeroplane.
12	AOC	Aeronautical operational control messages	Messages exchanged in the framework of procedures within the operational control, as specified in Part ORO. Information that enables correlation with any associated records stored separately from the helicopter. Definition in EUROCAE Document ED-112, dated March 2003.

Item No	Application Type	Messages	Comments
13	Surveillance	Downlinked aircraft parameters (DAP)	As defined in ICAO Annex 10 Volume IV (Surveillance systems and ACAS).

AAC aeronautical administrative communications

ADS-B automatic dependent surveillance — broadcast

ADS-C automatic dependent surveillance — contract

AFN aircraft flight notification

AOC aeronautical operational control

ATIS automatic terminal information service

ATSC air traffic service communication

CAP controller access parameters

CPDLC controller pilot data link communications

CM configuration/context management

D-ATIS data link ATIS

D-FIS data link flight information service

DCL departure clearance

FANS Future Air Navigation System

FLIPCY flight plan consistency

OCL oceanic clearance

SAP system access parameters

TWIP terminal weather information for pilots

GM1 CAT.IDE.H.195(a) Data link recording

APPLICABILITY OF THE DATA LINK RECORDING REQUIREMENT

(a) If it is certain that the helicopter cannot use data link communication messages for ATS communications corresponding to any application designated by CAT.IDE.H.195(a)(1), then the data link recording requirement does not apply.

(b) Examples where the helicopter cannot use data link communication messages for ATS communications include but are not limited to the cases where:

(1) the helicopter data link communication capability is disabled permanently and in a way that it cannot be enabled again during the flight;

(2) data link communications are not used to support air traffic service (ATS) in the area of operation of the helicopter; and

(3) the helicopter data link communication equipment cannot communicate with the equipment used by ATS in the area of operation of the helicopter.

AMC1 CAT.IDE.H.200 Flight data and cockpit voice combination recorder

GENERAL

(a) A flight data and cockpit voice combination recorder is a flight recorder that records:

(1) all voice communications and the aural environment required by CAT.IDE.H.185 regarding CVRs; and

(2) all parameters required by CAT.IDE.H.190 regarding FDRs, with the same specifications required by those paragraphs.

(b) In addition, a flight data and cockpit voice combination recorder may record data link communication messages and related information required by CAT.IDE.H.195.

AMC1 CAT.IDE.H.205 Seats, seat safety belts, restraint systems and child restraint devices

CHILD RESTRAINT DEVICES (CRDs)

(a) A CRD is considered to be acceptable if:

(1) it is a 'supplementary loop belt' manufactured with the same techniques and the same materials of the approved safety belts; or

(2) it complies with (b).

(b) Provided the CRD can be installed properly on the respective helicopter seat, the following CRDs are considered acceptable:

(1) CRDs approved for use in aircraft according to the European Technical Standard Order ETSO-C100c on Aviation Child Safety Device (ACSD);

(2) CRDs approved by EASA through a Type Certificate or Supplemental Type Certificate;

(3) Child seats approved for use in motor vehicles on the basis of the technical standard specified in point (i) below. The child seats must be also approved for use in aircraft on the basis of the technical standard specified in either point (ii) or point (iii);

(i) UN Standard ECE R44-04 (or 03), or ECE R129 bearing the respective 'ECE R' label; and

(ii) German 'Qualification Procedure for Child Restraint Systems for Use in Aircraft' (TÜV Doc.: TÜV/958-01/2001) bearing the label 'For Use in Aircraft'; or

(iii) Other technical standard acceptable to the CAAT. The child seat should hold a qualification sign that it can be used in aircraft;

(4) Child seats approved for use in motor vehicles and aircraft according to Canadian CMVSS 213/213.1 bearing the respective label;

(5) Child seats approved for use in motor vehicles and aircraft according to US FMVSS No 213 and bearing on or two labels displaying the following two sentences:

(i) 'THIS CHILD RESTRAINT SYSTEM CONFORMS TO ALL APPLICABLE FEDERAL MOTOR VEHICLE SAFETY STANDARDS'; and

(ii) in red letters 'THIS RESTRAINT IS CERTIFIED FOR USE IN MOTOR VEHICLES AND AIRCRAFT';

(6) Child seat approved for use in motor vehicles and aircraft according to Australia/New Zealand's technical standard AS/NZS 1754:2013 bearing the green part on the label displaying 'For Use in Aircraft'; and

(7) CRDs manufactured and tested according to other technical standards equivalent to those listed above. The device should be marked with an associated qualification sign, which shows the name of the qualification organisation and a specific identification number, related to the associated qualification project. The qualifying organisation should be a competent and independent organisation that is acceptable to the CAAT.

(c) Location

(1) Forward-facing child seats may be installed on both forward-and rearward-facing passenger seats, but only when fitted in the same direction as the passenger seat on which they are positioned. Rearward-facing child seats should only be installed on forward-facing passenger seats. A child seat should not be installed within the radius of action of an airbag unless it is obvious that the airbag is de-activated or it can be demonstrated that there is no negative impact from the airbag.

(2) An infant/child in a CRD should be located as near to a floor level exit as feasible.

(3) An infant/child in a CRD should not hinder evacuation for any passenger.

(4) An infant/child in a CRD should neither be located in the row (where rows are existing) leading to an emergency exit nor located in a row immediately forward or aft of an emergency exit. A window passenger seat is the preferred location. An aisle passenger seat or a cross aisle passenger seat that forms part of the evacuation route to exits is not recommended. Other locations may be acceptable provided the access of neighbour passengers to the nearest aisle is not obstructed by the CRD.

(5) In general, only one CRD per row segment is recommended. More than one CRD per row segment is allowed if the infants/children are from the same family or travelling group provided the infants/children are accompanied by a responsible adult sitting next to them in the sema row segment.

(6) A row segment is the one or more seats side-by-side separated from the next row segment by an aisle.

(d) Installation

(1) CRDs tested and approved for use in aircraft should only be installed on a suitable passenger seat by the method shown in the manufacturer's instructions provided with each CRD and with the type of connecting device they are approved for the installation in aircraft. CRDs designed to be installed only by means of rigid bar lower anchorages (ISOFIX or equivalent) should only be used on passenger seats equipped with such connecting devices and should not be secured by passenger seat lap belt..

(2) All safety and installation instructions must be followed carefully by the responsible person accompanying the infant/chid. Operators should prohibit the use of CRD not installed on the passenger seat according tp the manufacturer's instructions or not approved for use on aircraft.

(3) If a forward-facing child seat with a rigid backrest is to be fastened by a seat lap belt, the restraint device should be fastened when the backrest of the passenger seat on which it rests is in a reclined position. Thereafter, the backrest is to be positioned upright. This procedure ensures better tightening of the child seat on the aircraft seat if the aircraft seat is reclinable.

(4) The buckle of the adult safety belt must be easily accessible for both opening and closing, and must be in line with the seat belt halves (not canted) after tightening.

(5) Forward facing restraint devices with an integral harness must not be installed such that the adult safety belt is secured over the infant.

(e) Operation

(1) Each CRD should remain secured to a passenger seat during all phases of flight unless it is properly stowed when not in use.

(2) Where a child seat is adjustable in recline, it must be in an upright position for all occasions when passenger restraint devices are required.

AMC2 CAT.IDE.H.205 Seats, seat safety belts, restraint systems and child restraint devices

UPPER TORSO RESTRAINT SYSTEM

An upper torso restraint system having two shoulder straps and additional straps is deemed to be compliant with the requirement for restraint systems with two shoulder straps.

SEAT BELT

A seat belt with a diagonal shoulder strap (three anchorage points) is deemed to be compliant with the requirement for a seat belt (two anchorage points).

AMC3 CAT.IDE.H.205 Seats, seat safety belts, restraint systems and child restraint devices

SEATS FOR MINIMUM REQUIRED CABIN CREW

(a) Seats for the minimum required cabin crew members should be located near required floor level emergency exits, except if the emergency evacuation of passengers would be enhanced by seating the cabin crew members elsewhere. In this case, other locations are acceptable. This criterion should also apply if the number of required cabin crew members exceeds the number of floor level emergency exits.

(b) Seats for cabin crew member(s) should be forward or rearward facing within 15° of the longitudinal axis of the helicopter.

AMC1 CAT.IDE.H.220 First-aid kits

CONTENT OF FIRST-AID KITS

(a) First-aid kits should be equipped with appropriate and sufficient medications and instrumentation. However, these kits should be supplemented by the operator according to the characteristics of the operation (scope of operation, flight duration, number and demographics of passengers, etc.).

(b) The following should be included in the first-aid kit:

(1) Equipment

(i) bandages (assorted sizes , including a triangular bandage);

(ii) burns dressings (unspecified);

(iii) wound dressings (large and small);

(iv) adhesive dressings (assorted sizes);

(v) adhesive tape;

(vi) adhesive wound closures;

(vii) safety pins;

(viii) safety scissors;

(ix) antiseptic wound cleaner;

(x) disposable resuscitation aid;

(xi) disposable gloves;

(xii) tweezers: splinter;

(xiii) thermometers (non-mercury); and

(xiv) surgical masks.

(2) Medications

(i) simple analgesic (including paediatric form — if the type of operation does not include transport of children or infants, the paediatric form may not be included);

(ii) antiemetic — non-injectable;

(iii) nasal decongestant;

(iv) gastrointestinal antacid, in the case of helicopters carrying more than 9 passengers;

(v) anti-diarrhoeal medication in the case of helicopters carrying more than 9 passengers; and

(vi) antihistamine (including paediatric form – if the type of operation does not include transport of children or infants, the paediatric form may not be included).

(3) Other content. The operator should make the instructions readily available. If an electronic format is available, then all instructions should be kept on the same device. If a paper format is used, then the instructions should be kept in the same kit with the applicable equipment and medication. The instructions should include, as a minimum, the following:

(i) a list of contents in at least two languages (English and one other). This should include information on the effects and side effects of medications carried;

(ii) first-aid handbook, current edition;

(iii) Basic life support instructions cards (summarising and depicting the current algorithm for basic life support); and

(iv) medical incident report form.

(4) Additional equipment. The following additional equipment should be carried on board each aircraft equipped with a first-aid kit, though not necessarily in the first-aid kit. The additional equipment should include, as a minimum:

(i) automated external defibrillator (AED) on all aircraft required to carry at least one cabin crew;

(ii) bag-valve masks (masks in three sizes: one for adults, one for children, and one for infants). If the type of operation does not include transport of children or infants, those sizes of bag-valve masks may not be included;

(iii) suitable airway management device (e.g. supraglottic airway devices, oropharyngeal or nasopharyngeal airways);

(iv) eye irrigator; and

(v) biohazard disposal bags.

(5) For HEMS operations, where the content of the first-aid kit is included in the medical equipment carried on board, the first-aid kit as described above is no longer required.

AMC2 CAT.IDE.H.220 First-aid kits

MAINTENANCE OF FIRST-AID KITS

To be kept up to date, first-aid kits should be:

(a) inspected periodically to confirm, to the extent possible, that contents are maintained in the condition necessary for their intended use;

(b) replenished at regular intervals, in accordance with instructions contained on their labels, or as circumstances warrant; and

(c) replenished after use-in-flight at the first opportunity where replacement items are available.

GM1 CAT.IDE.H.220 First-aid kit

LOCATION AND USE

The location of the first-aid kit is normally indicated using internationally recognisable signs.

The first-aid kit 'should be readily accessible for use' in helicopter operations should be understood as the first-aid kit being either accessible in flight or immediately after landing.

In some operations, it is not practicable to use the first-aid kit during flight. Therefore, the first-aid kit can be carried in the cargo compartment, where it will be easily accessible for use as soon as the aircraft has landed, when the following conditions are met:

(a) precautionary landing sites are available;

(b) the lack of cabin space is such that movement or use of the first-aid kit is impaired; and

(c) the installation of the first-aid kit in the cabin is not practicable.

GM2 CAT.IDE.H.220 First-aid kit

STORAGE

As a best practise and wherever practicable, the emergency medical equipment listed under AMC1 CAT.IDE.H.220 should be kept close together.

GM3 CAT.IDE.H.220 First-aid kit

CONTENT OF FIRST-AID KITS

The operator may supplement first-aid kits according to the characteristics of the operation based on a risk assessment. The assessment does not require an approval by the CAAT.

GM4 CAT.IDE.H.220 First-aid kit

LITHIUM BATTERIES

Risks related to the presence of lithium batteries should be assessed. All equipment powered by lithium batteries carried on an aeroplane should comply with the provisions of AMC1 CAT.GEN.MPA.140(f) including applicable technical standards such as (E)TSO-C142.

AMC1 CAT.IDE.H.240 Supplemental oxygen — non-pressurised helicopters

DETERMINATION OF OXYGEN

The amount of supplemental oxygen for sustenance for a particular operation should be determined on the basis of flight altitudes and flight duration, consistent with the operating procedures, including emergency, procedures, established for each operation and the routes to be flown as specified in the operations manual.

AMC2 CAT.IDE.H.240 Supplemental oxygen — non-pressurised helicopters

OXYGEN STORAGE AND DISPENSING EQUIPMENT

(a) Supplemental oxygen requirements may be met either by means of either installed or portable equipment.

(b) The use of oxygen dispensers should not prevent the crew from performing their intended tasks, including any radio communications.

(c) The oxygen-dispensing unit may consist of a nasal oxygen cannula.

AMC1 CAT.IDE.H.250 Hand fire extinguishers

NUMBER, LOCATION AND TYPE

(a) The number and location of hand fire extinguishers should be such as to provide adequate availability for use, account being taken of the number and size of the passenger compartments, the need to minimise the hazard of toxic gas concentrations and the location of lavatories, galleys, etc. These considerations may result in a number of fire extinguishers greater than the minimum required.

(b) There should be at least one hand fire extinguisher installed in the flight crew compartment and this should be suitable for fighting both flammable fluid and electrical equipment fires. Additional hand fire extinguishers may be required for the protection of other compartments accessible to the crew in flight. Dry chemical fire extinguishers should not be used in the flight crew compartment, or in any compartment not separated by a partition from the flight crew compartment, because of the adverse effect on vision during discharge and, if conductive, interference with electrical contacts by the chemical residues.

(c) Where only one hand fire extinguisher is required in the passenger compartments, it should be located near the cabin crew member's station, where provided.

(d) Where two or more hand fire extinguishers are required in the passenger compartments and their location is not otherwise dictated by consideration of (a), an extinguisher should be located near each end of the cabin with the remainder distributed throughout the cabin as evenly as is practicable.

(e) Unless an extinguisher is clearly visible, its location should be indicated by a placard or sign. Appropriate symbols may also be used to supplement such a placard or sign.

AMC1 CAT.IDE.H.260 Marking of break-in points

MARKINGS — COLOUR AND CORNERS

(a) The colour of the markings should be red or yellow and, if necessary, should be outlined in white to contrast with the background.

(b) If the corner markings are more than 2 m apart, intermediate lines 9 cm x 3 cm should be inserted so that there is no more than 2 m between adjacent markings.

AMC1 CAT.IDE.H.270 Megaphones

LOCATION OF MEGAPHONES

(a) The megaphone should be readily accessible at the assigned seat of a cabin crew member or crew members other than flight crew.

(b) This does not necessarily require megaphones to be positioned such that they can be physically reached by a crew member when strapped in a cabin crew member's seat.

AMC1 CAT.IDE.H.280 Emergency locator transmitter (ELT)

BATTERIES

(a) All batteries used in ELTs should be replaced (or recharged if the battery is rechargeable) when the equipment has been in use for more than 1 cumulative hour or in the following cases:

(1) Batteries specifically designed for use in ELTs and having an airworthiness release certificate (EASA Form 1 or equivalent) should be replaced (or recharged if the battery is rechargeable) before the end of their useful life in accordance with the maintenance instructions applicable to the ELT.

(2) Standard batteries manufactured in accordance with an industry standard and not having an airworthiness release certificate (EASA Form 1 or equivalent), when used in ELTs should be replaced (or recharged if the battery is rechargeable) when 50 % of their useful

life (or for rechargeable, 50 % of their useful life of charge), as established by the battery manufacturer, has expired.

(3) The battery useful life (or useful life of charge) criteria in (1) and (2) do not apply to batteries (such as water-activated batteries) that are essentially unaffected during probable storage intervals.

(b) The new expiry date for a replaced (or recharged) battery should be legibly marked on the outside of the equipment.

AMC2 CAT.IDE.H.280 Emergency locator transmitter (ELT)

TYPES OF ELTs AND GENERAL TECHNICAL SPECIFICATIONS

(a) The ELT required by this provision should be one of the following:

(1) Automatic Fixed (ELT(AF)). An automatically activated ELT that is permanently attached to an aircraft and is designed to aid search and rescue (SAR) teams in locating the crash site.

(2) Automatic Portable (ELT(AP)). An automatically activated ELT, which is rigidly attached to an aircraft before a crash, but is readily removable from the aircraft after a crash. It functions as an ELT during the crash sequence. If the ELT does not employ an integral antenna, the aircraft-mounted antenna may be disconnected and an auxiliary antenna (stored in the ELT case) attached to the ELT. The ELT can be tethered to a survivor or a life-raft. This type of ELT is intended to aid SAR teams in locating the crash site or survivor(s).

(3) Automatic Deployable (ELT(AD)). An ELT that is rigidly attached to the aircraft before the crash and that is automatically deployed and activated by an impact, and, in some cases, also by water sensors. This type of ELT should float in water and is intended to aid SAR teams in locating the crash site. The ELT(AD) may be either a stand-alone beacon or an inseparable part of a deployable recorder.

(b) To minimise the possibility of damage in the event of crash impact, the automatic ELT should be rigidly fixed to the aircraft structure, as far aft as is practicable, with its antenna and connections arranged so as to maximise the probability of the signal being transmitted after a crash.

(c) Any ELT carried should operate in accordance with the relevant provisions of ICAO Annex 10, Volume III Communications Systems and should be registered with the national agency responsible for initiating search and rescue or other nominated agency.

GM1 CAT.IDE.H.280 Emergency locator transmitter (ELT)

TERMINOLOGY

(a) An ‘automatic ELT’ means an ELT(AF), ELT(AP), or ELT(AD). Other types of ELTs are not considered ‘automatic ELTs’.

(b) A ‘water sensor’ means a sensor that detects water immersion, including at low depth.

GM2 CAT.IDE.H.280 Emergency locator transmitter (ELT)

ADDITIONAL GUIDANCE

(a) It is advisable to install automatic ELTs that transmit encoded position data and that meet the operational performance requirements of EUROCAE Document ED-62B, or RTCA DO-204B, or any later equivalent standard.

(b) Guidance material for the inspection of an ELT can be found in FAA Advisory Circular (AC) 91-44A 'Installation and Inspection Procedures for Emergency Locator Transmitters and Receivers', Change 1, dated February 2018.

AMC1 CAT.IDE.H.290 Life-jackets

ACCESSIBILITY

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 harness fastened.

AMC2 CAT.IDE.H.290(b) Life-jackets

ELECTRIC ILLUMINATION

The means of electric illumination should be a survivor locator light as defined in the applicable ETSO issued by the relevant regulatory agency such as EASA or the FAA.or equivalent.

GM1 CAT.IDE.H.290 Life-jackets

SEAT CUSHIONS

Seat cushions are not considered to be flotation devices.

GM1 CAT.IDE.H.295 Crew survival suits

ESTIMATING SURVIVAL TIME

(a) Introduction

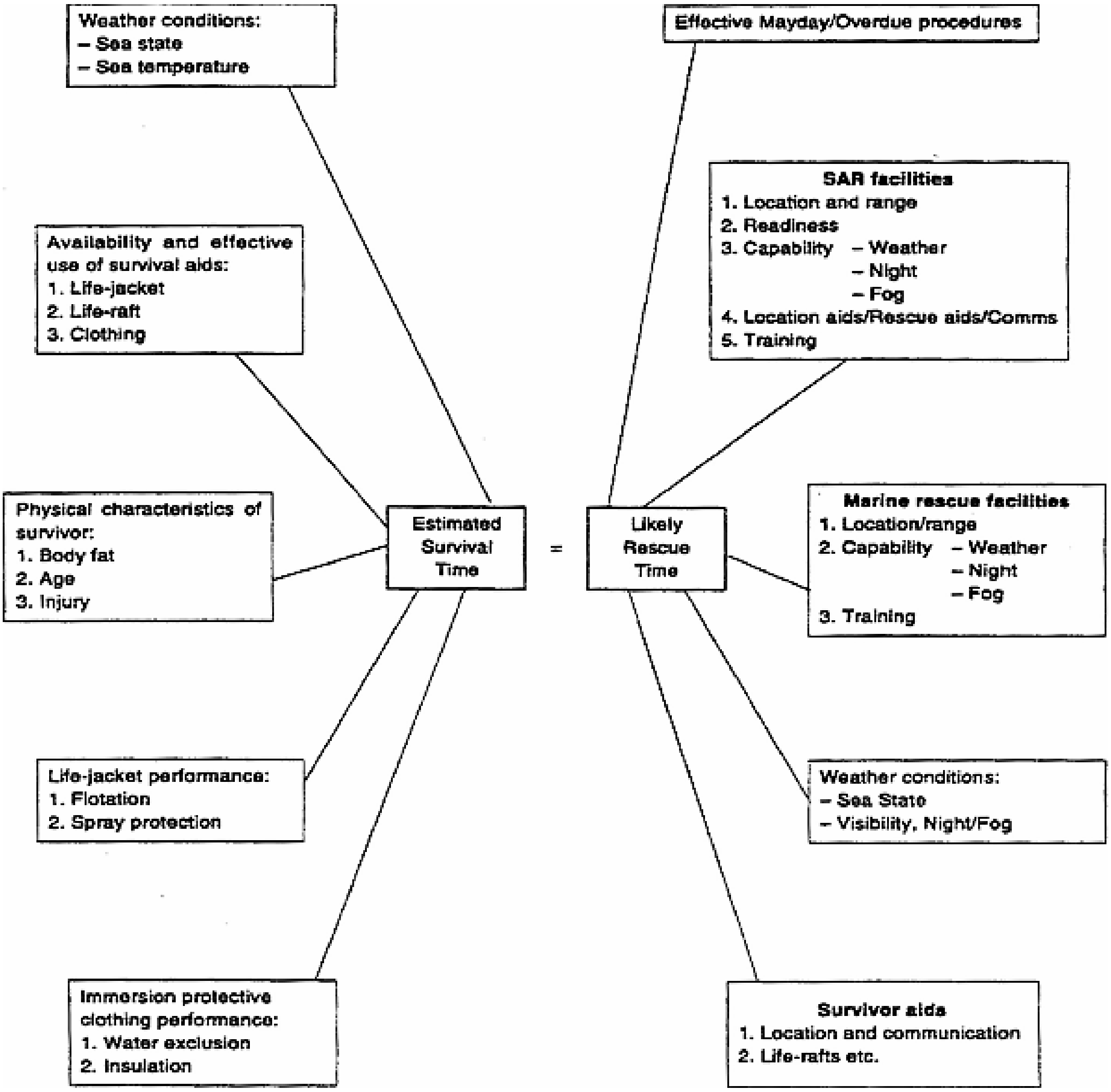
(1) A person accidentally immersed in cold seas (typically offshore Northern Europe) will have a better chance of survival if he/she is wearing an effective survival suit in addition to a life-jacket. By wearing the survival suit, he/she can slow down the rate which his/her body temperature falls and, consequently, protect himself/herself from the greater risk of drowning brought about by incapacitation due to hypothermia.

(2) The complete survival suit system – suit, life-jacket and clothes worn under the suit – should be able to keep the wearer alive long enough for the rescue services to find and recover him/her. In practice the limit is about 3 hours. If a group of persons in the water cannot be rescued within this time they are likely to have become so scattered and separated that location will be extremely difficult, especially in the rough water typical of Northern European sea areas. If it is expected that in water protection could be required for periods greater than 3 hours, improvements should, rather, be sought in the search and rescue procedures than in the immersion suit protection.

(b) Survival times

(1) The aim should be to ensure that a person in the water can survive long enough to be rescued, i.e. the survival time must be greater than the likely rescue time. The factors affecting both times are shown in Figure 1 below. The figure emphasises that survival time is influenced by many factors, physical and human. Some of the factors are relevant to survival in cold water and some are relevant to survival in water at any temperature.

Figure 1 The survival equation



(2) Broad estimates of likely survival times for the thin individual offshore are given in Table 1 below. As survival time is significantly affected by the prevailing weather conditions at the time of immersion, the Beaufort wind scale has been used as an indicator of these surface conditions.

Table 1 Timescale within which the most vulnerable individuals are likely to succumb to the prevailing conditions.

Clothing assembly	Beaufort wind force	Times within which the most vulnerable individuals are likely to drown	
		(water temp 5°c)	(water temp 13°c)
Working clothes	0 – 2	Within ¾ hour	Within 1 ¼ hours
Clothing assembly	Beaufort wind force	Times within which the most vulnerable individuals are likely to drown	
		(water temp 5°c)	(water temp 13°c)
(no immersion suit)	3 – 4	Within ½ hour	Within ½ hour
	5 and above	Significantly less than ½ hour	Significantly less than ½ hour
Immersion suit worn over working clothes (with leakage inside suit)	0 -2	May well exceed 3 hours	May well exceed 3 hours
	3 – 4	Within 2 ¾ hours	May well exceed 3 hours
	5 and above	Significantly less than 2 ¾ hours. May well exceed 1 hour	May well exceed 3 hours

(3) Consideration should also be given to escaping from the helicopter itself should it submerge or invert in the water. In this case, escape time is limited to the length of time the occupants can hold their breath. The breath holding time can be greatly reduced by the effect of cold shock. Cold shock is caused by the sudden drop in skin temperature on immersion, and is characterised by a gasp reflex and uncontrolled breathing. The urge to breathe rapidly becomes overwhelming and, if still submerged, the individual will inhale water resulting in drowning. Delaying the onset of cold shock by wearing an immersion suit will extend the available escape time from a submerged helicopter.

(4) The effects of water leakage and hydrostatic compression on the insulation quality of clothing are well recognised. In a nominally dry system, the insulation is provided by still air trapped within the clothing fibres and between the layers of suit and clothes. It has been observed that many systems lose some of their insulative capacity either because the clothes under the 'waterproof' survival suit get wet to some extent or because of hydrostatic compression of the whole assembly. As a result of water leakage and compression, survival times will be shortened. The wearing of warm clothing under the suit is recommended.

(5) Whatever type of survival suit and other clothing is provided, it should not be forgotten that significant heat loss can occur from the head.

AMC1 CAT.IDE.H.300 Life-rafts, survival ELTs and survival equipment on extended overwater flights

LIFE–RAFTS AND EQUIPMENT FOR MAKING DISTRESS SIGNALS - HELICOPTERS

(a) Each required life-raft should conform to the following specifications:

(1) be of an approved design and stowed so as to facilitate their ready use in an emergency;

(2) be radar conspicuous to standard airborne radar equipment;

(3) when carrying more than one life-raft on board, at least 50 % should be able to be deployed by the crew while seated at their normal station, where necessary by remote control; and

(4) life-rafts that are not deployable by remote control or by the crew should be of such weight as to permit handling by one person. 40 kg should be considered a maximum weight.

(b) Each required life-raft should contain at least the following:

(1) one approved survivor locator light;

(2) one approved visual signalling device;

(3) one canopy (for use as a sail, sunshade or rain catcher) or other mean to protect occupants from the elements;

(4) one radar reflector;

(5) one 20-m retaining line designed to hold the life-raft near the helicopter but to release it if the helicopter becomes totally submerged;

(6) one sea anchor;

(7) one survival kit, appropriately equipped for the route to be flown, which should contain at least the following:

(i) one life-raft repair kit;

(ii) one bailing bucket;

(iii) one signalling mirror;

(iv) one police whistle;

(v) one buoyant raft knife;

(vi) one supplementary means of inflation;

(vii) sea sickness tablets;

(viii) one first-aid kit;

(ix) one portable means of illumination;

(x) 500 ml of pure water and one sea water desalting kit; and

(xi) one comprehensive illustrated survival booklet in an appropriate language.

AMC1 CAT.IDE.H.300(b)(3) & CAT.IDE.H.305(b) Flight over water & Survival equipment

SURVIVAL ELT

(a) The survival ELT (ELT(S)) is an ELT removable from an aircraft, stowed so as to facilitate its ready use in an emergency, and manually activated by a survivor. An ELT(S) may be activated manually or automatically (e.g. by water activation). It should be designed to be tethered either to a life raft or a survivor.

(b) An ELT(AP) may be used to replace one required ELT(S) provided that it meets the ELT(S) requirements. A water-activated ELT(S) is not an ELT(AP).

AMC1 CAT.IDE.H.305 Survival equipment

ADDITIONAL SURVIVAL EQUIPMENT

(a) The following additional survival equipment should be carried when required:

(1) 500 ml of water for each 4, or fraction of 4, persons on board;

(2) one knife;

(3) first-aid equipment; and

(4) one set of air/ground codes.

(b) In addition, when polar conditions are expected, the following should be carried:

(1) a means for melting snow;

(2) one snow shovel and 1 ice saw;

(3) sleeping bags for use by 1/3 of all persons on board and space blankets for the remainder or space blankets for all passengers on board; and

(4) one arctic/polar suit for each crew member.

(c) If any item of equipment contained in the above list is already carried on board the helicopter in accordance with another requirement, there is no need for this to be duplicated.

AMC1 CAT.IDE.H.300(b)(3) & CAT.IDE.H.305(b) Flight over water & Survival equipment

See the AMC for IDE.HE.300.

GM1 CAT.IDE.H.305 Survival equipment

SIGNALLING EQUIPMENT

The signalling equipment for making distress signals is described in ICAO Annex 2, Rules of the Air.

GM2 CAT.IDE.H.305 Survival equipment

AREAS IN WHICH SEARCH AND RESCUE WOULD BE ESPECIALLY DIFFICULT

The expression 'areas in which search and rescue would be especially difficult' should be interpreted, in this context, as meaning:

(a) areas so designated by the authority responsible for managing search and rescue; or

(b) areas that are largely uninhabited and where:

(1) the authority referred to in (a) has not published any information to confirm whether search and rescue would be or would not be especially difficult; and

(2) the authority referred to in (a) does not, as a matter of policy, designate areas as being especially difficult for search and rescue.

GM1 CAT.IDE.H.315 Helicopters certificated for operating on water — Miscellaneous equipment

INTERNATIONAL REGULATIONS FOR PREVENTING COLLISIONS AT SEA

International Regulations for Preventing Collisions at Sea are those that were published by the International Maritime Organisation (IMO) in 1972.

GM1 CAT.IDE.H.320 Landing on water

DESIGN FOR LANDING ON WATER

A helicopter is designed for landing on water if safety provisions at least equivalent to those for ditching (CS 27.801/CS 29.801) are met.

GM2 CAT.IDE.H.320 Landing on water

Sea state should be an integral part of ditching information

AMC1 CAT.IDE.H.320(b) All helicopters on flight over water — ditching

GENERAL

The same considerations of AMC1 SPA.HOFO.165(d) should apply in respect of emergency flotation equipment.

AMC1 CAT.IDE.H.325 Headset

GENERAL

(a) A headset consists of a communication device that includes two earphones to receive and a microphone to transmit audio signals to the helicopter's communication system. To comply with the minimum performance requirements, the earphones and microphone should match the communication system's characteristics and the cockpit environment. The headset should be adequately adjustable in order to fit the pilot's head. Headset boom microphones should be of the noise cancelling type.

(b) If the intention is to utilise noise cancelling earphones, the operator should ensure that the earphones do not attenuate any aural warnings or sounds necessary for alerting the flight crew on matters related to the safe operation of the helicopter.

GM1 CAT.IDE.H.325 Headset

GENERAL

The term 'headset' includes any aviation helmet incorporating headphones and microphone worn by a flight crew member.

GM1.CAT.IDE.H.330 Radio Communication Equipment

Information on the performance-based communication and surveillance (PBCS) concept and guidance material on its implementation are contained in the Performance-based Communication and Surveillance (PBCS) Manual (ICAO Document 9869)

AMC1 CAT.IDE.H.345 Communication and navigation equipment for operations under IFR or under VFR over routes not navigated by reference to visual landmarks

TWO INDEPENDENT MEANS OF COMMUNICATION

Whenever two independent means of communication are required, each system should have an independent antenna installation, except where rigidly supported non-wire antennae or other antenna installations of equivalent reliability are used.

AMC2 CAT.IDE.H.345 Communication and navigation equipment for operations under IFR or under VFR over routes not navigated by reference to visual landmarks

ACCEPTABLE NUMBER AND TYPE OF COMMUNICATION AND NAVIGATION EQUIPMENT

(a) An acceptable number and type of communication and navigation equipment is:

  (1) two VHF omnidirectional radio range (VOR) receiving systems on any route, or part thereof, where navigation is based only on VOR signals;

  (2) two automatic direction finder (ADF) systems on any route, or part thereof, where navigation is based only on non-directional beacon (NDB) signals; and

  (3) area navigation equipment when area navigation is required for the route being flown (e.g. equipment required by Part SPA).

(b) The helicopter may be operated without the navigation equipment specified in (a)(1) and (a)(2) provided it is equipped with alternative equipment. The reliability and the accuracy of alternative equipment should allow safe navigation for the intended route.

(c) VHF communication equipment, instrument landing system (ILS) localiser and VOR receivers installed on helicopters to be operated under IFR should comply with the following FM immunity performance standards:

  (1) ICAO Annex 10, Volume I – Radio Navigation Aids, and Volume III, Part II – Voice Communications Systems; and

  (2) acceptable equipment standards contained in EUROCAE Minimum Operational Performance Specifications, documents ED-22B for VOR receivers, ED-23B for VHF communication receivers and ED-46B for LOC receivers and the corresponding Radio Technical Commission for Aeronautics (RTCA) documents DO-186, DO-195 and DO-196.

AMC3 CAT.IDE.H.345 Communication and navigation equipment for operations under IFR or under VFR over routes not navigated by reference to visual landmarks

FAILURE OF A SINGLE UNIT

Required communication and navigation equipment should be installed such that the failure of any single unit required for either communication or navigation purposes, or both, will not result in the failure of another unit required for communications or navigation purposes.

GM1 CAT.IDE.H.345 Communication and navigation equipment for operations under IFR or under VFR over routes not navigated by reference to visual landmarks

APPLICABLE AIRSPACE REQUIREMENTS

For helicopters being operated under European air traffic control, the applicable airspace requirements include the Single European Sky legislation.

GM2 CAT.IDE.H.345 Communication and navigation equipment for operations under IFR or under VFR over routes not navigated by reference to visual landmarks

AIRCRAFT ELIGIBILITY FOR PBN SPECIFICATION NOT REQUIRING SPECIFIC APPROVAL

(a) The performance of the aircraft is usually stated in the AFM.

(b) Where such a reference cannot be found in the AFM, other information provided by the aircraft manufacturer as TC holder, the STC holder or the design organisation having a privilege to approve minor changes may be considered.

(c) The following documents are considered acceptable sources of information:

(1) AFM, supplements thereto, and documents directly referenced in the AFM;

(2) FCOM or similar document;

(3) Service Bulletin or Service Letter issued by the TC holder or STC holder;

(4) approved design data or data issued in support of a design change approval;

(5) any other formal document issued by the TC or STC holders stating compliance with PBN specifications, AMC, Advisory Circulars (AC) or similar documents issued by the State of Design; and

(6) written evidence obtained from the State of Design.

(d) Equipment qualification data, in itself, is not sufficient to assess the PBN capabilities of the aircraft, since the latter depend on installation and integration.

(e) As some PBN equipment and installations may have been certified prior to the publication of the PBN Manual and the adoption of its terminology for the navigation specifications, it is not always possible to find a clear statement of aircraft PBN capability in the AFM. However, aircraft eligibility for certain PBN specifications can rely on the aircraft performance certified for PBN procedures and routes prior to the publication of the PBN Manual.

(f) Below, various references are listed which may be found in the AFM or other acceptable documents (see listing above) in order to consider the aircraft's eligibility for a specific PBN specification if the specific term is not used.

(g) RNAV 5

(1) If a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNAV 5 operations.

(i) B-RNAV;

(ii) RNAV 1;

(iii) RNP APCH;

(iv) RNP 4;

(v) A-RNP;

(vi) AMC 20-4;

(vii) JAA TEMPORARY GUIDANCE MATERIAL, LEAFLET NO. 2 (TGL 2);

(viii) JAA AMJ 20X2;

(ix) FAA AC 20-130A for en route operations;

(x) FAA AC 20-138 for en route operations; and

(xi) FAA AC 90-96.

(h) RNAV 1/RNAV 2

(1) If a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNAV 1/RNAV 2 operations.

(i) RNAV 1;

(ii) PRNAV;

(iii) US RNAV type A;

(iv) FAA AC 20-138 for the appropriate navigation specification;

(v) FAA AC 90-100A;

(vi) JAA TEMPORARY GUIDANCE MATERIAL, LEAFLET NO. 10 Rev1 (TGL 10); and

(vii) FAA AC 90-100.

(2) However, if position determination is exclusively computed based on VOR-DME, the aircraft is not eligible for RNAV 1/RNAV 2 operations.

(i) RNP 1/RNP 2 continental

(1) If a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNP 1/RNP 2 continental operations.

(i) A-RNP;

(ii) FAA AC 20-138 for the appropriate navigation specification; and

(iii) FAA AC 90-105.

(2) Alternatively, if a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above and position determination is primarily based on GNSS, the aircraft is eligible for RNP 1/RNP 2 continental operations. However, in these cases, loss of GNSS implies loss of RNP 1/RNP 2 capability.

(i) JAA TEMPORARY GUIDANCE MATERIAL, LEAFLET NO. 10 (TGL 10) (any revision); and

(ii) FAA AC 90-100.

(j) RNP APCH — LNAV minima

(1) If a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNP APCH — LNAV operations.

(i) A-RNP;

(ii) AMC 20-27;

(iii) AMC 20-28;

(iv) FAA AC 20-138 for the appropriate navigation specification; and

(v) FAA AC 90-105 for the appropriate navigation specification.

(2) Alternatively, if a statement of compliance with RNP 0.3 GNSS approaches in accordance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNP APCH — LNAV operations. Any limitation such as 'within the US National Airspace' may be ignored since RNP APCH procedures are assumed to meet the same ICAO criteria around the world.

(i) JAA TEMPORARY GUIDANCE MATERIAL, LEAFLET NO. 3 (TGL 3);

(ii) AMC 20-4;

(iii) FAA AC 20-130A; and

(iv) FAA AC 20-138.

(k) RNP APCH — LNAV/VNAV minima

(1) If a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNP APCH — LNAV/VNAV operations.

(i) A-RNP;

(ii) AMC 20-27 with Baro VNAV;

(iii) AMC 20-28;

(iv) FAA AC 20-138; and

(v) FAA AC 90-105 for the appropriate navigation specification.

(2) Alternatively, if a statement of compliance with FAA AC 20-129 is found in the acceptable documentation as listed above, and the aircraft complies with the requirements and limitations of EASA SIB 2014-04[3], the aircraft is eligible for RNP APCH — LNAV/VNAV operations. Any limitation such as 'within the US National Airspace' may be ignored since RNP APCH procedures are assumed to meet the same ICAO criteria around the world.

(l) RNP APCH — LPV minima

(1) If a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNP APCH — LPV operations.

(i) AMC 20-28;

(ii) FAA AC 20-138 for the appropriate navigation specification; and

(iii) FAA AC 90-107.

[3] http://ad.easa.europa.eu/ad/2014-04

(2) For aircraft that have a TAWS Class A installed and do not provide Mode-5 protection on an LPV approach, the DH is limited to 250 ft.

(m) RNAV 10

(1) If a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNAV 10 operations.

(i) RNP 10;

(ii) FAA AC 20-138 for the appropriate navigation specification;

(iii) AMC 20-12;

(iv) FAA Order 8400.12 (or later revision); and

(v) FAA AC 90-105

(n) RNP 4

(1) If a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNP 4 operations.

(i) FAA AC 20-138B or later, for the appropriate navigation specification;

(ii) FAA Order 8400.33; and

(iii) FAA AC 90-105 for the appropriate navigation specification.

(o) RNP 2 oceanic

(1) If a statement of compliance with FAA AC 90-105 for the appropriate navigation specification is found in the acceptable documentation as listed above, the aircraft is eligible for RNP 2 oceanic operations.

(2) If the aircraft has been assessed eligible for RNP 4, the aircraft is eligible for RNP 2 oceanic.

(p) Special features

(1) RF in terminal operations (used in RNP 1 and in the initial segment of the RNP APCH)

(i) If a statement of demonstrated capability to perform an RF leg, certified in accordance with any of the following specifications or standards, is found in the acceptable documentation as listed above, the aircraft is eligible for RF in terminal operations:

(A) AMC 20-26; and

(B) FAA AC 20-138B or later.

(ii) If there is a reference to RF and a reference to compliance with AC 90-105, then the aircraft is eligible for such operations.

(q) Other considerations

(1) In all cases, the limitations in the AFM need to be checked; in particular, the use of AP or FD which can be required to reduce the FTE primarily for RNP APCH, RNAV 1, and RNP 1.

(2) Any limitation such as 'within the US National Airspace' may be ignored since RNP APCH procedures are assumed to meet the same ICAO criteria around the world.

GM3 CAT.IDE.H.345 Communication and navigation equipment for operations under IFR or under VFR over routes not navigated by reference to visual landmarks

GENERAL

(a) The PBN specifications for which the aircraft complies with the relevant airworthiness criteria are set out in the AFM, together with any limitations to be observed.

(b) Because functional and performance requirements are defined for each navigation specification, an aircraft approved for an RNP specification is not automatically approved for all RNAV specifications. Similarly, an aircraft approved for an RNP or RNAV specification having a stringent accuracy requirement (e.g. RNP 0.3 specification) is not automatically approved for a navigation specification having a less stringent accuracy requirement (e.g. RNP 4).

RNP 4

(c) For RNP 4, at least two LRNSs, capable of navigating to RNP 4, and listed in the AFM, may be operational at the entry point of the RNP 4 airspace. If an item of equipment required for RNP 4 operations is unserviceable, then the flight crew may consider an alternate route or diversion for repairs. For multi-sensor systems, the AFM may permit entry if one GNSS sensor is lost after departure, provided one GNSS and one inertial sensor remain available.

AMC1 CAT.IDE.H.350 Transponder

SSR TRANSPONDER

(a) The secondary surveillance radar (SSR) transponders of aircraft being operated under European air traffic control should comply with any applicable Single European Sky legislation.

(b) If the Single European Sky legislation is not applicable, the SSR transponders should operate in accordance with the relevant provisions of Volume IV of ICAO Annex 10.

AMC1 CAT.IDE.H.355 Management of aeronautical databases

AERONAUTICAL DATABASES

When the operator of an aircraft uses an aeronautical database that supports an airborne navigation application as a primary means of navigation used to meet the airspace usage requirements, the database provider should be a Type 2 DAT provider certified in accordance with the relevant Kingdom of Thailand Civil Aviation Regulation for providers of air traffic management/air navigation services and other air traffic management functions or equivalent.

GM1 CAT.IDE.H.355 Management of aeronautical databases

AERONAUTICAL DATABASE APPLICATIONS

(a) Applications using aeronautical databases for which Type 2 DAT providers should be certified in accordance with (ditto)may be found in GM1 DAT.OR.100.

The certification of a Type 2 DAT provider in accordance with the relevant Kingdom of Thailand Civil Aviation Regulation for providers of air traffic management/air navigation services and other air traffic management functions ensures data integrity and compatibility with the certified aircraft application/equipment.

GM2 CAT.IDE.H.355 Management of aeronautical databases

TIMELY DISTRIBUTION

The operator should distribute current and unaltered aeronautical databases to all aircraft requiring them in accordance with the validity period of the databases or in accordance with a procedure established in the operations manual if no validity period is defined.

GM3 CAT.IDE.H.355 Management of aeronautical databases

STANDARDS FOR AERONAUTICAL DATABASES AND DAT PROVIDERS

(a) A 'Type 2 DAT provider' is an organisation as defined in the relevant Kingdom of Thailand Civil Aviation Regulation for providers of air traffic management/air navigation services and other air traffic management functions.

(b) Equivalent to a certified 'Type 2 DAT provider' is defined in any Aviation Safety Agreement between the Kingdom of Thailand and a third country, including any Technical Implementation Procedures, or any Working Arrangements between The Kingdom of Thailand and the competent authority of a third country.

GM1 CAT.IDE.H.360 Surveillance Equipment

Information on surveillance equipment is contained in the Aeronautical Surveillance Manual (ICAO Document 9924)

Information on RSP specifications for performance-based surveillance is contained in the Performance-based Communication and Surveillance (PBCS) (ICAO Document 9869)