STATE OF KUWAIT
Directorate General of Civil Aviation

دولة الكويت
الإدارة العامة للطيران المدني

Date : 2020/02/20 التـــاريـخ :

Ref : 20/265/DDGASD/4 الإشـارة :

REGULATORY CIRCULAR (NO. 2020-13)

Subject:

Notice of Amendment to Kuwait Civil Aviation Safety Regulations KCASR (issue 4).

Purpose:

The purpose of this Regulatory Circular No. **2020-13** is to Amend **KCASR 6 – OPERATION OF AIRCRAFT - PART NCC – Acceptable Means of Compliance (AMC) & Guidance Materials (GM)** (issue 4) .

This Regulatory Circular No. **2020-13** is based on (NPA) No. 2019-31 dated on 11/Dec/2019.

Revisions:

This amendment will be included in revision (2) of KCASR 6 – OPERATION OF AIRCRAFT - PART NCC – Acceptable Means of Compliance (AMC) & Guidance Materials (GM).

Regulatory Requirements:

This amendment shall apply to the following Organizations approved by the Directorate General of Civil Aviation (DGCA) or authorized to operate within the State of Kuwait:

1. Approved Maintenance Organizations (AMO) Holders;
2. Air Navigation Service Providers;
3. Air Operator Certificate (AOC) & Private Operator Certificate (POC) Holders;
4. Airport Operators;
5. Ground Handling Service Providers;
6. Flying Training Organizations;
7. All users of KCASRs.

Effective Date:

This new revision will be in effect from (19/Mar/2020).

Required Action:

All users of KCASR are required to comply with the provisions contained within this amendment from the effective date.

President of Civil Aviation

Eng. Emad F. Al-Jelwi
Deputy Director General For Aviation
Sefety, Air Transport, Civil Aviation
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STATE OF KUWAIT
Directorate General of Civil Aviation

دولة الكويت
الإدارة العامة للطيران المدني

Date : 2020/02/20 التـــاريـخ :

Ref : 20/267/DDGASD/4 الإشـارة :

Deputy Director General for Air Navigation Affairs,
Directorate General of Civil Aviation,
Kuwait.

Sub.: ***Regulatory Circular No. 2020-13.***
Revision Number 02 to Kuwait Civil Aviation Safety Regulations – KCASR 6 – OPERATION OF AIRCRAFT - PART NCC – ACCEPTABLE MEANS OF COMPLIANCE (AMC) & GUIDANCE MATERIALS (GM)

Dear Sir,

Please find enclosed herewith the regulatory circular No. 2020-13 regarding the issuance of ***KCASR 6 – Operation of Aircraft - Part NCC – Acceptable Means of Compliance (AMC) & Guidance Materials (GM).*** This is for your information and distribution to all concerned departments.

Up to date KCASR Parts are published on the DGCA/ASD website (https://kcasr.dgca.gov.kw).

If required, the DGCA/Aviation Safety Department personnel are available to answer your questions on the interpretation and intended implementation of the proposed amendments.

KCASR 6 – Operation of Aircraft - Part NCC – Acceptable Means of Compliance (AMC) & Guidance Materials (GM) will be in effect from the date of issue of the Regulatory Circular.

Yours Sincerely,

Deputy Director General for Aviation Safety
& Air Transport.

Eng. Emad F. Al-Jelwi
Deputy Director General For Aviation
Sefety, Air Transport, Civil Aviation
Security Department

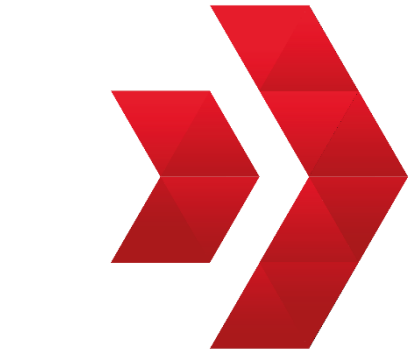
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الطيران المدني
Civil Aviation
State of Kuwait - دولة الكويت

Kuwait Civil Aviation Safety Regulations

KCASR 6 – OPERATION OF AIRCRAFT

PART NCC – ACCEPTABLE MEANS OF COMPLIANCE (AMC) & GUIDANCE MATERIALS (GM)

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Amendment Record

Amendment No	Date of Issue	Remarks
1	June 2018	Part Rename
2	Feb 2020	NPA 2019-31 (EFB)

Control of this Document

DC.1 Introduction

DC.1.1 Pursuant to Law No (30) of the year 1960 and subsequent Ministerial Decisions No (3) of the year 1986, No (18) of the year 1990, and No (3) of the year 1996, based upon that Law and as reflected in the Preamble to the Kuwait Civil Aviation Safety Regulations, Issue 4, Rev.2, August 2019, the President of the Kuwait Directorate General of Civil Aviation is empowered to adopt and amend Kuwait Civil Aviation Safety Regulations. In accordance herewith, the following AMC & GM is hereby established for compliance by all persons concerned. This AMC & GM shall be known as KCASR 6 Part NCC Non-Commercial with Complex Motor-Powered Aircraft AMC & GM and any reference to this title shall mean referring to these regulations governing the requirements to be met for the certification of air operations.

DC.2 Authority for this Regulation

DC.2.1 This KCASR 6 Part NCC Non-Commercial with Complex Motor-Powered Aircraft AMC & GM is issued on the authority of the President of the Kuwait Directorate General of Civil Aviation.

DC.3 Applicability

DC.3.1 This KCASR 6 Part NCC Non-Commercial with Complex Motor-Powered Aircraft AMC & GM is applicable to the aviation industry of the State of Kuwait.

DC.4 Scope

DC.4.1 KCASR 6 Operation of Aircraft AMC & GM contains the acceptable means of compliance and guidance material for the operation of aircraft regulations of the State of Kuwait, and shows compliance with ICAO Annex 6. The AMC & GM are separated into the following parts with cross references between parts where applicable.

- Part ARO Authority Requirements for Air Operations AMC and GM
- Part ORO Organisation Regulations for Air Operations AMC and GM
- Part DEF Definitions AMC and GM
- Part CAT Commercial Air Transport AMC and GM
- Part SPA Specific Approvals AMC and GM
- Part SPO Special Operations AMC and GM
- **Part NCC Non Commercial with Complex Motor-Powered Aircraft AMC and GM**
- Part NCO Non Commercial other than Complex Motor-Powered Aircraft AMC and GM

DC.5 Definitions

DC.5.1 Terms not defined shall have the meaning given to them in the relevant legal instruments or international legal instruments in which they appear, especially as they appear in the Convention and its Annexes.

KCASR 6 Part NCC Non-Commercial with Complex Motor-Powered Aircraft AMC & GM

Subpart A — General requirements

GM1 NCC.GEN.105(e)(2) Crew responsibilities

General

In accordance with 7.g. of Annex IV of the KCASR Basic Regulation, a crew member must not perform duties on board an aircraft when under the influence of psychoactive substances or alcohol or when unfit due to injury, fatigue, medication, sickness or other similar causes. This should be understood as including the following:

(a) effects of deep water diving and blood donation, and allowing for a certain time period between these activities and returning to flying; and

(b) without prejudice to more restrictive national regulations, the consumption of alcohol while on duty or less than 8 hours prior to the commencement of duties, and commencing a flight duty period with a blood alcohol level in excess of 0.2 per thousand.

AMC1 NCC.GEN.105(g) Crew responsibilities

Occurrence Reporting

Whenever a crew member makes use of the applicable reporting systems, a copy of the report should be communicated to the pilot-in-command.

GM1 NCC.GEN.106 Pilot-in-command responsibilities and authority

General

In accordance with 1.c. of Annex IV of the KCASR Basic Regulation, the pilot-in-command is responsible for the operation and safety of the aircraft and for the safety of all crew members, passengers and cargo on board. This would normally be from the time that he/she assumes responsibility for the aircraft and passengers prior to a flight until the passengers are deplaned and escorted out of the operational area of the aerodrome or operating site and he/she relinquishes responsibility for the aircraft at the end of a flight or series of flights. The pilot-in-command's responsibilities and authority should be understood as including at least the following:

(a) the safety of all crew members, passengers and cargo on board, as soon as he/she arrives on board, until he/she leaves the aircraft at the end of the flight; and

(b) the operation and safety of the aircraft:

  (1) for aeroplanes, from the moment it is first ready to move for the purpose of taxiing prior to take-off, until the moment it comes to rest at the end of the flight and the engine(s) used as primary propulsion unit(s) is/are shut down; or

  (2) for helicopters, from the moment the engine(s) are started until the helicopter comes to rest at the end of the flight with the engine(s) shut down and the rotor blades stopped.

GM1 NCC.GEN.106(b) Pilot-in-command responsibilities and authority

Authority to refuse carriage or disembark

This may include:

(a) passengers who have special needs that cannot be provided on the aircraft; or

(b) persons that appear to be under the influence of alcohol or drugs.

AMC1 NCC.GEN.106(c) Pilot-in-command responsibilities and authority

Reporting of hazardous flight conditions

(a) These reports should include any detail which may be pertinent to the safety of other aircraft.

(b) Such reports should be made whenever any of the following conditions are encountered or observed:

(1) severe turbulence;

(2) severe icing;

(3) severe mountain wave;

(4) thunderstorms, with or without hail, that are obscured, embedded, widespread or in squall lines;

(5) heavy dust storm or heavy sandstorm;

(6) volcanic ash cloud; and

(7) unusual and/or increasing volcanic activity or a volcanic eruption.

(c) When other meteorological conditions not listed above, e.g. wind shear, are encountered that, in the opinion of the pilot-in-command, may affect the safety or the efficiency of other aircraft operations, the pilot-in-command should advise the appropriate air traffic services (ATS) unit as soon as practicable.

AMC1 NCC.GEN.106(d) Pilot-in-command responsibilities and authority

Mitigating Measures — Fatigue

The use of additional crew members and/or controlled rest during flight as described in GM1 NCC.GEN.106 (d) may be considered as appropriate fatigue mitigating measures.

GM1 NCC.GEN.106(d) Pilot-in-command responsibilities and authority

Mitigating Measures — Fatigue — Controlled Rest In The Flight Crew Compartment

(a) This Guidance Material (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 cater for this unexpected fatigue, and to regain a high level of alertness, a controlled rest procedure in the flight crew compartment, organised by the pilot-in-command, may be used, if workload permits. ‘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 flight crew compartment 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 extension. 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 pilot-in-command 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 the following criteria:

(1) only one flight crew member at a time should take rest at his/her station; the harness 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) so as 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 during which sole control of the aircraft should not be entrusted to the flight crew member taking controlled rest;

(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) where cabin crew are on board the aircraft, frequent cabin crew checks.

In this case, the pilot-in-command should inform the 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 alert at the end of the period;

(5) there should be a minimum of 20 minutes between two sequential 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; and

(7) controlled rest periods should terminate at least 30 minutes before the top of descent.

AMC1 NCC.GEN.106 (e) Pilot-in-command responsibilities and authority

Violation reporting

If required by the State in which the incident occurs, the pilot-in-command should submit a report on any such violation to the appropriate authority of such State; in that event, the pilot-in-command should also submit a copy of it to the Kuwait DGCA. Such reports should be submitted as soon as possible and normally within 10 days.

GM1 NCC.GEN.120(b)(4) Taxiing of aeroplanes

Skills and knowledge

The person designated by the operator to taxi an aeroplane should possess the following skills and knowledge:

(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 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.

GM1 NCC.GEN.125 Rotor engagement

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, as described in the Implementing Rule;

(2) for maintenance purposes.

(b) Rotor engagement for the purpose of flight: it should be noted that 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 Implementing Rule, however, should 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) Ground runs should not include taxiing the helicopter.

(3) There should be no passengers on board.

(4) Maintenance runs should not include collective increase or autopilot engagement (risk of ground resonance).

AMC1 NCC.GEN.130 Portable electronic devices

General

(a) Scope

This AMC provides means to prevent that portable electronic devices (PEDs) on board aircraft adversely affect the performance of the aircraft's systems and equipment. This AMC addresses operation of PEDs in the different aircraft zones – passenger compartment, flight compartment, and cargo compartments. Furthermore, it addresses the specific case of PEDs qualified and under configuration control by the operator - controlled PEDs (C-PEDs) - for which the operator gives some credit.

(b) Restrictions on the use of PEDs in the passenger compartment

If an operator permits passengers to use PEDs on board its aircraft, procedures should be in place to control their use. The operator should ensure that all crew members and ground personnel are trained to enforce the restrictions on this equipment in line with these procedures.

These procedures should ensure the following:

(1) As the general principle all PEDs (including transmitting PEDs (T-PEDs)) are switched off at the start of the flight when the passengers have boarded and all doors have been closed, until a passenger door has been opened at the end of the flight.

(2) The following exceptions from the general principle may be granted under the responsibility of the operator:

(i) Medical equipment necessary to support physiological functions does not need to be switched off.

(ii) The use of PEDs, excluding T-PEDs, may be permitted during non- critical phases of flight, excluding taxiing.

(iii) T-PEDs may be used during non-critical phases of flight, excluding taxiing, if the aircraft is equipped with a system or otherwise certified allowing the operation of such technology during flight. The restrictions coming from the corresponding aircraft certification as documented in the aircraft flight manual (AFM), or equivalent document(s), stay in force.

(iv) The use of C-PEDs during critical phases of flight, however, may only be permitted if the operator has accounted for this situation in its assessment.

(v) The pilot-in-command may permit the use of any kind of PED when the aircraft is stationary during prolonged departure delays, provided that sufficient time is available to check the passenger compartment before the flight proceeds. Similarly, after landing, the pilot-in- command may authorise the use of any kind of PED in the event of a prolonged delay for a parking/gate position (even though doors are closed and the engines are running).

(3) Announcements should be made during boarding of the aircraft to inform passengers of the restrictions applicable to PEDs (in particular to T-PEDs) before fastening their seat belts.

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

(i) information cards giving safety instructions are provided to the passengers;

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

(iii) crew members should be aware of the proper means to switch off in- seat power supplies used for PEDs.

(5) During boarding and any phase of flight:

(i) appropriate coordination between crew members is defined to deal with interference or other safety problems associated with PEDs;

(ii) passenger use of equipment during the flight is monitored;

(iii) suspect equipment is switched off; and

(iv) particular attention is given to passenger misuse of equipment that could include a built-in transmitting function.

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

(7) Appropriate coordination between crew members should be defined to deal with interference or other safety problems associated with PEDs.

(8) The pilot-in-command may, for any reason and during any phase of flight, require deactivation and stowage of PEDs.

(9) Occurrences of suspected or confirmed interference that have potential safety implications should be reported to the competent authority. Where possible, to assist follow-up and technical investigation, reports should describe the offending device, identify the brand name and model number, its location in the aircraft at the time of the occurrence, interference symptoms and the results of actions taken by the crew.

The cooperation of the device owner should be sought by obtaining contact details.

(10) Special requests to operate a PED or T-PED during any phase of the flight for specific reasons (e.g. for security measures) should be handled properly.

(c) Restrictions on the use of PEDs in the flight compartment

Due to the higher risk of interference and potential for distracting crew from their duties, PEDs should not be used in the flight compartment. However, the operator may allow the use of PEDs, e.g. to assist the flight crew in their duties, if procedures are in place to ensure the following:

(1) The conditions for the use of PEDs in-flight are specified in the operations manual, otherwise they should be switched off and stowed during all phases of flight.

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

(3) During critical phases of flight only those C-PEDs are operated, for which the operator has demonstrated that the radio frequency (RF) interference levels are below those considered acceptable for the specific aircraft environment. Guidance for such test is provided in (e) below.

(4) During pre-flight procedures, e.g. when loading route information into navigation systems or when monitoring fuel loading, no T-PED should be operated. In all other cases, flight crew and other persons on board the aircraft involved in dispatching the aircraft should observe the same restrictions as applicable to passengers.

(5) These restrictions 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.

(d) 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 allow deviation for PEDs for which tests have demonstrated their safe operation. Other precautions, such as transporting in shielded, metal boxes, may also be used to mitigate associated risks.

In case an automated function is used to deactivate a T-PED, the unit should be qualified for safe operation on board the aircraft.

(e) Test methods

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

(1) The radio frequency (RF) emissions of PEDs should meet the levels as defined by EUROCAE ED-14E/RTCA DO 160E Section 21 Category M for operation in the passenger compartment and EUROCAE ED-14E/RTCA DO 160E Section 21 Category H for operation in the cargo bay. Later revisions of those documents may be used for testing. The assessment of intentional transmissions of T- PEDs is excluded from those test standards and needs to be addressed separately.

(2) When the operator intends to allow the operation of T-PEDs, its assessment should follow the principles set out in EUROCAE ED-130.

GM1 NCC.GEN.130 Portable electronic devices

Definitions

(a) Definition and categories of PEDs

PEDs are any kind of electronic device, typically but not limited to consumer electronics, brought on board the aircraft by crew members, passengers, or as part of the cargo and that are not included in the approved aircraft configuration. All equipment that is able to consume electrical energy falls under this definition. The electrical energy can be provided from internal sources as batteries (chargeable or non-rechargeable) or the devices may also be connected to specific aircraft power sources.

PEDs fall into three categories:

(1) Non-intentional transmitters can non-intentionally radiate RF transmissions.

This category includes, but is not limited to, computing equipment, cameras, radio receivers, audio and video reproducers, electronic games and toys. In addition, portable, non-transmitting devices provided to assist crew members in their duties are included in this category. The category is identified as PED.

(2) Intentional transmitters can 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, computer with mobile phone data connection, wireless fidelity (WIFI) 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.

(3) A controlled PED (C-PED) is subject to administrative control by the operator.

This will include, inter alia, tracking the location of the devices to specific aircraft or persons and ensuring that no unauthorised changes are made to the hardware, software or databases. A controlled PED will also be subject to procedures to ensure that it is maintained to the latest amendment state. C-PEDs can be assigned to the category of non-intentional transmitters (PEDs) or intentional transmitters (T-PEDs).

(b) 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 for devices having no transmit capability and operated by coin cells without further deactivation capability, e.g. wrist watches.

GM2 NCC.GEN.130 Portable electronic devices

General

(a) PEDs can pose a risk of interference with electronically operated aircraft systems.

Those systems could range from the electronic engine control, instruments, navigation or communication equipment, autopilots to any other type of avionic equipment on the

aircraft. The interference can result in on-board systems malfunctioning or providing misleading information and communication disturbance. This can also lead to an increased workload for the flight crew work.

(b) Interference may be caused by transmitters being part of the PED's functionality or by unintentional transmissions from the PED. Due to the likely proximity of the PED to any electronically operated aircraft system and the generally limited shielding found in small aircraft, the risk of interference is to be considered higher than for larger aircraft with metal airframes.

(c) During certification of the aircraft, when qualifying the aircraft functions consideration may only have been made of short-term exposure to a high radiating field, with an acceptable mitigating measure being a return to normal function after removal of the threat. This certification assumption may not be true when operating the transmitting PED on board the aircraft.

(d) It has been found that compliance with the electromagnetic compatibility (EMC) Directive 2004/108/EC and related European standards, as indicated by the CE marking, is not sufficient to exclude the existence of interference. A well-known interference is the demodulation of the transmitted signal from GSM (global system for mobile communications) mobile phones leading to audio disturbances in other systems. Similar interferences are difficult to predict during the PED design and protecting the aircraft's electronic systems against the full range of potential interferences is practically impossible. Therefore, not operating PEDs on-board aircraft is the safest option, especially as effects may not be identified immediately but under the most inconvenient circumstances.

GM3 NCC.GEN.130 Portable electronic devices

Fire caused by PEDS

A detailed discussion of fire caused by PEDs can be found in CAA UK CAP 789 edition 2, chapter 31, section 6 Fires in the cabin caused by PEDs3 and CAA PAPER 2003/4, Dealing With In-Flight Lithium Battery Fires in Portable Electronic Devices, M.J. Lain, D.A. Teagle, J. Cullen, V. Dass4.

AMC1 NCC.GEN.131(a) Use of electronic flight bags (EFBs)

HARDWARE

In addition to AMC1 CAT.GEN.MPA.141(a), the following should be considered:

(a) Display characteristics

Consideration should be given to the long-term degradation of a display, as a result of abrasion and ageing. AMC 25-11 (paragraph 3.16a) may be used as guidance to assess luminance and legibility aspects.

Information displayed on the EFB should be legible to the typical user at the intended viewing distance(s) and under the full range of lighting conditions expected in a flight crew compartment, including direct sunlight.

Users should be able to adjust the brightness of an EFB screen independently of the brightness of other displays in the flight crew compartment. In addition, when incorporating an automatic brightness adjustment, it should operate independently for each EFB in the flight crew compartment. Brightness adjustment using software means may be acceptable provided that this operation does not adversely affect the flight crew workload.

Buttons and labels should have adequate illumination for night use. 'Buttons and labels' refers to hardware controls located on the display itself.

All controls should be properly labelled for their intended function, except if no confusion is possible.

The 90-degree viewing angle on either side of each flight crew member's line of sight may be unacceptable for certain EFB applications if aspects of the display quality are degraded at large

viewing angles (e.g. the display colours wash out or the displayed colour contrast is not discernible at the installation viewing angle).

(b) Power source

The design of a portable EFB system should consider the source of electrical power, the

independence of the power sources for multiple EFBs, and the potential need for an independent battery source. A non-exhaustive list of factors to be considered includes:

(1) the possibility to adopt operational procedures to ensure an adequate level of safety (for example, ensure a minimum level of charge before departure);

(2) the possible redundancy of portable EFBs to reduce the risk of exhausted batteries;

(3) the availability of backup battery packs to ensure an alternative source of power.

Battery-powered EFBs that have aircraft power available for recharging the internal EFB batteries are considered to have a suitable backup power source.

For EFBs that have an internal battery power source, and that are used as an alternative for paper documentation that is required by NCC.GEN.140, the operator should either have at least one EFB connected to an aircraft power bus or have established mitigation means and procedures to ensure that sufficient power with acceptable margins will be available during the whole flight

(c) Environmental testing

Environmental testing, in particular testing for rapid decompression, should be performed when the EFB hosts applications that are required to be used during flight following a rapid decompression and/or when the EFB environmental operational range is potentially insufficient with respect to the foreseeable flight crew compartment operating conditions.

The information from the rapid-decompression test of an EFB is used to establish the procedural requirements for the use of that EFB device in a pressurised aircraft. Rapid-decompression testing should follow the EUROCAE ED-14D/RTCA DO-160D (or later revisions) guidelines for rapid decompression testing up to the maximum operating altitude of the aircraft at which the EFB is to be used.

(1) Pressurised aircraft: when a portable EFB has successfully completed rapid-decompression testing, then no mitigating procedures for depressurisation events need to be developed.

When a portable EFB has failed the rapid-decompression testing while turned ON, but successfully completed it when turned OFF, then procedures should ensure that at least one EFB on board the aircraft remains OFF during the applicable flight phases or that it is configured so that no damage will be incurred should rapid

decompression occur in flight at an altitude higher than 10 000 ft above mean sea level (AMSL).

If an EFB system has not been tested or it has failed the rapid-decompression test, then alternate procedures or paper backup should be available.

(2) Non-pressurised aircraft: rapid-decompression testing is not required for an EFB used in a non pressurised aircraft. The EFB should be demonstrated to reliably operate up to the maximum operating altitude of the aircraft. If the EFB cannot be operated at the maximum operating altitude of the aircraft, procedures should be established to preclude operation of the EFB above the maximum demonstrated EFB operating altitude while still maintaining the availability of any required aeronautical information displayed on the EFB.

The results of testing performed on a specific EFB model configuration (as identified by the EFB hardware manufacturer) may be applied to other aircraft installations and these generic environmental tests may not need to be duplicated. The operator should collect and retain:

(1) evidence of these tests that have already been accomplished; or

(2) suitable alternative procedures to deal with the total loss of the EFB system.

Rapid decompression tests do not need to be repeated when the EFB model identification and the battery type do not change.

The testing of operational EFBs should be avoided if possible to preclude the infliction of unknown damage to the unit during testing.

Operators should account for the possible loss or erroneous functioning of the EFB in abnormal environmental conditions.

The safe stowage and the use of the EFB under any foreseeable environmental conditions in the flight crew compartment, including turbulence, should be evaluated.

AMC1 NCC.GEN.131(b) Use of electronic flight bags (EFBs)

SOFTWARE

The same considerations as those in AMC1 CAT.GEN.MPA.141(b), AMC2 CAT.GEN.MPA.141(b) and AMC3

CAT.GEN.MPA.141(b) should apply in respect of EFB software.

AMC1 NCC.GEN.131(b)(1) Use of electronic flight bags (EFBs)

RISK ASSESSMENT

(a) General

Prior to the use of any EFB system, the operator should perform a risk assessment for all type B EFB applications and for the related hardware as part of its hazard identification and risk

management process.

The operator may make use of a risk assessment established by the software developer. However, the operator should ensure that its specific operational environment is taken into account.

The risk assessment should:

(1) evaluate the risks associated with the use of an EFB;

(2) identify potential losses of function or malfunction (with detected and undetected erroneous outputs) and the associated failure scenarios;

(3) analyse the operational consequences of these failure scenarios;

(4) establish mitigating measures; and

(5) ensure that the EFB system (hardware and software) achieves at least the same level of accessibility, usability, and reliability as the means of presentation it replaces.

In considering the accessibility, usability, and reliability of the EFB system, the operator should ensure that the failure of the complete EFB system as well as of individual applications, including corruption or loss of data, and erroneously displayed information, has been assessed and that the risks have been mitigated to an acceptable level.

The operator should ensure that the risk assessments for type B EFB applications are maintained and kept up to date.

When the EFB system is intended to be introduced alongside a paper-based system, only the failures that would not be mitigated by the use of the paper-based system need to be addressed.

In all other cases, a complete risk assessment should be performed.

(b) Assessing and mitigating the risks

Some parameters of EFB applications may depend on entries that are made by flight crew/dispatchers, whereas others may be default parameters from within the system that are subject to an administration process (e.g. the runway line-up allowance in an aircraft performance application). In the first case, mitigation means would mainly concern training and flight crew procedure aspects, whereas in the second case, mitigation means would more likely focus on the EFB administration and data management aspects.

The analysis should be specific to the operator concerned and should address at least the following points:

(1) The minimisation of undetected erroneous outputs from applications and assessment of the worst credible scenario;

(2) Erroneous outputs from the software application including:

(i) a description of the corruption scenarios that were analysed; and

(ii) a description of the mitigation means;

(3) Upstream processes including:

(i) the reliability of root data used in applications (e.g. qualified input data, such as databases produced under ED-76/DO-200A, ‘Standards for Processing Aeronautical Data’);

(ii) the software application validation and verification checks according to appropriate industry standards, if applicable; and

(iii) the independence between application software components, e.g. robust

partitioning between EFB applications and other airworthiness certified software applications;

(4) A description of the mitigation means to be used following the detected failure of an application, or of a detected erroneous output;

(5) The need for access to an alternate power supply in order to ensure the availability of software applications, especially if they are used as a source of required information.

As part of the mitigation means, the operator should consider establishing a reliable alternative means to provide the information available on the EFB system.

The mitigation means could be, for example, one of, or a combination of, the following:

(1) the system design (including hardware and software);

(2) a backup EFB device, possibly supplied from a different power source;

(3) EFB applications being hosted on more than one platform;

(4) a paper backup (e.g. quick reference handbook (QRH)); and

(5) procedural means.

Depending on the outcome of their risk assessment, the operator may also consider performing an operational evaluation test before allowing unrestricted use of its EFB devices and applications.

EFB system design features such as those assuring data integrity and the accuracy of performance

calculations (e.g. 'reasonableness' or 'range' checks) may be integrated in the risk assessment performed by the operator.

(c) Changes

The operator should update its EFB risk assessment based on the planned changes to its EFB system.

However, modifications to the operator's EFB system which:

(1) do not bring any change to the calculation algorithms and/or to the interface of a type B EFB application;

(2) introduce a new type A EFB application or modify an existing one (provided its software classification remains type A);

(3) do not introduce any additional functionality to an existing type B EFB application;

(4) update an existing database necessary to use an existing type B EFB application; or

(5) do not require a change to the flight crew training or operational procedures,

may be introduced by the operator without having to update its risk assessment.

These changes should, nevertheless, be controlled and properly tested prior to use in flight.

The modifications in the following non-exhaustive list are considered to meet these criteria:

(1) operating system updates;

(2) chart or airport database updates;

(3) updates to introduce fixes (patches); and

(4) installation and modification of a type A EFB application.

AMC1 NCC.GEN.131(b)(2) Use of electronic flight bags (EFBs)

EFB ADMINISTRATION

The operator should ensure:

(a) that adequate support is provided to the EFB users for all the applications installed;

(b) that potential security issues associated with the application installed have been checked;

(c) that the hardware and software configuration is appropriately managed and that no unauthorised software is installed.

The operator should ensure that miscellaneous software applications do not adversely impact on the operation of the EFB, and should include miscellaneous software applications in the scope of the EFB configuration management;

(d) that only a valid version of the application software and current data packages are installed on the EFB system; and

(e) the integrity of the data packages used by the applications installed.

AMC2 NCC.GEN.131(b)(2) Use of electronic flight bags (EFBs)

PROCEDURES

The procedures for the administration or the use of the EFB device and the type B EFB application may

be fully or partly integrated in the operations manual.

(a) General

If an EFB system generates information similar to that generated by existing certified systems, procedures should clearly identify which information source will be the primary, which source will be used for backup information, and under which conditions the backup source should be used.

Procedures should define the actions to be taken by the flight crew members when information provided by an EFB system is not consistent with that from other flight crew compartment sources, or when one EFB system shows different information than the other.

In the case of EFB applications providing information which might be affected by Notice(s) to Airmen NOTAMS (e.g. Airport moving map display (AMMD), performance calculation,…), the procedure for the use of these applications should include the handling of the relevant NOTAMS before their use.

(b) Flight crew awareness of EFB software/database revisions

The operator should have a process in place to verify that the configuration of the EFB, including software application versions and, where applicable, database versions, are up to date. Flight crew members should have the ability to easily verify the validity of database versions used on the EFB.

Nevertheless, flight crew members should not be required to confirm the revision dates for other databases that do not adversely affect flight operations, such as maintenance log forms or a list of airport codes. An example of a date-sensitive revision is that applied to an aeronautical chart database. Procedures should specify what actions should be taken if the software applications or databases loaded on the EFB system are outdated.

(c) Workload mitigation and/or control

The operator should ensure that additional workload created by using an EFB system is adequately mitigated and/or controlled. The operator should ensure that, while the aircraft is in flight or moving on the ground, flight crew members do not become preoccupied with the EFB system at the same time. Workload should be shared between flight crew members to ensure ease of use and continued monitoring of other flight crew functions and aircraft equipment. This should be strictly applied in flight and the operator should specify any times when the flight crew members may not use the specific EFB application.

(d) Dispatch

The operator should establish dispatch criteria for the EFB system. The operator should ensure that the availability of the EFB system is confirmed by preflight checks. Instructions to flight crew should clearly define the actions to be taken in the event of any EFB system deficiency.

Mitigation may be in the form of maintenance and/or operational procedures for items such as:

(1) replacement of batteries at defined intervals as required;

(2) ensuring that there is a fully charged backup battery on board;

(3) the flight crew checking the battery charging level before departure; and

(4) the flight crew switching off the EFB in a timely manner when the aircraft power source is lost. In the event of a partial or complete failure of the EFB, specific dispatch procedures should be followed. These procedures should be included either in the minimum equipment list (MEL) or in the operations manual and should ensure an acceptable level of safety.

Particular attention should be paid to establishing specific dispatch procedures allowing to obtain operational data (e.g. performance data) in the event of a failure of an EFB hosting application that provides such calculated data.

When the integrity of data input and output is verified by cross-checking and gross-error checks, the same checking principle should be applied to alternative dispatch procedures to ensure equivalent protection.

(e) Maintenance

Procedures should be established for the routine maintenance of the EFB system and detailing how unserviceability and failures are to be dealt with to ensure that the integrity of the EFB system is preserved. Maintenance procedures should also include the secure handling of updated information and how this information is validated and then promulgated in a timely manner and in a complete format to all users.

As part of the EFB system's maintenance, the operator should ensure that the EFB system batteries are periodically checked and replaced as required.

Should a fault or failure of the system arise, it is essential that such failures are brought to the

immediate attention of the flight crew and that the system is isolated until rectification action is taken. In addition to backup procedures, to deal with system failures, a reporting system should be in place so that the necessary action, either to a particular EFB system or to the whole system, is taken in order to prevent the use of erroneous information by flight crew members.

(f) Security

The EFB system (including any means used for updating it) should be secure from unauthorised intervention (e.g. by malicious software). The operator should ensure that the system is adequately protected at the software level and that the hardware is appropriately managed (e.g.

the identification of the person to whom the hardware is released, protected storage when the

hardware is not in use) throughout the operational lifetime of the EFB system. The operator

should ensure that prior to each flight the EFB operational software works as specified and the EFB operational data is complete and accurate. Moreover, a system should be in place to ensure that the EFB does not accept a data load that contains corrupted contents. Adequate measures should be in place for the compilation and secure distribution of data to the aircraft.

Procedures should be transparent, and easy to understand, to follow and to oversee:

(1) If an EFB is based on consumer electronics (e.g. a laptop) which can be easily removed, manipulated, or replaced by a similar component, then special consideration should be given to the physical security of the hardware;

(2) Portable EFB platforms should be subject to allocation tracking to specific aircraft or

persons;

(3) Where a system has input ports, and especially if widely known protocols are used through these ports or internet connections are offered, then special consideration should be given to the risks associated with these ports;

(4) Where physical media are used to update the EFB system, and especially if widely known types of physical media are used, then the operator should use technologies and/or procedures to assure that unauthorised content cannot enter the EFB system through these media.

The required level of EFB security depends on the criticality of the functions used (e.g. an EFB which only holds a list of fuel prices may require less security than an EFB used for performance calculations).

Beyond the level of security required to assure that the EFB can properly perform its intended functions, the level of security ultimately required depends on the capabilities of the EFB.

(g) Electronic signatures

Some applicable requirements may require a signature when issuing or accepting a document (e.g. load sheet, technical logbook, notification to captain (NOTOC)). In order to be accepted as being equivalent to a handwritten signature, electronic signatures used in EFB applications need, as a minimum, to fulfil the same objectives and should assure the same degree of security as the handwritten or any other form of signature that they are intended to replace. AMC1 NCC.POL.110(c) provides means to comply with the required handwritten signature or its equivalent for mass and balance documentation.

On a general basis, in the case of required signatures, an operator should have in place procedures for electronic signatures that guarantee:

(1) their uniqueness: a signature should identify a specific individual and be difficult to duplicate;

(2) their significance: an individual using an electronic signature should take deliberate and recognisable action to affix their signature;

(3) their scope: the scope of the information being affirmed with an electronic signature should be clear to the signatory and to the subsequent readers of the record, record entry, or document;

(4) their security: the security of an individual's handwritten signature is maintained by ensuring that it is difficult for another individual to duplicate or alter it;

(5) their non-repudiation: an electronic signature should prevent a signatory from denying that they affixed a signature to a specific record, record entry, or document; the more difficult it is to duplicate a signature, the more likely it is that the signature was created by the signatory; and

(6) their traceability: an electronic signature should provide positive traceability to the individual who signed a record, record entry, or any other document.

An electronic signature should retain those qualities of a handwritten signature that guarantee its uniqueness. Systems using either a PIN or a password with limited validity (time wise) may be appropriate in providing positive traceability to the individual who affixed it. Advanced electronic signatures, qualified certificates and secured signature-creation devices needed to create them in the context of the Regulation are typically not required for EFB operations.

AMC3 NCC.GEN.131(b)(2) Use of electronic flight bags (EFBs)

FLIGHT CREW TRAINING

Flight crew members should be given specific training on the use of the EFB system before it is operationally used.

Training should at least include the following:

(a) an overview of the system architecture;

(b) preflight checks of the system;

(c) limitations of the system;

(d) specific training on the use of each application and the conditions under which the EFB may and may not be used;

(e) restrictions on the use of the system, including cases where the entire system or some parts of it are not available;

(f) procedures for normal operations, including cross-checking of data entry and computed information;

(g) procedures to handle abnormal situations, such as a late runway change or a diversion to an alternate aerodrome;

(h) procedures to handle emergency situations;

(i) phases of the flight when the EFB system may and may not be used;

(j) human factors considerations, including crew resource management (CRM), on the use of the EFB;

(k) additional training for new applications or changes to the hardware configuration;

(l) actions following the failure of component(s) of the EFB, including cases of battery smoke or fire; and

(m) management of conflicting information.

AMC4 NCC.GEN.131(b)(2) Use of electronic flight bags (EFBs)

PERFORMANCE AND MASS AND BALANCE APPLICATIONS

(a) General

Performance and mass and balance applications should be based on existing published data found in the AFM or performance manual, and should account for the applicable CAT.POL performance requirements. The applications may use algorithms or data spreadsheets to determine results.

They may have the capability to interpolate within the information contained in the published

data for the particular aircraft but should not extrapolate beyond it.

To protect against intentional and unintentional modifications, the integrity of the database files related to performance and mass and balance (the performance database, airport database, etc.) should be checked by the program before performing any calculations. This check can be run once at the start-up of the application.

Each software version should be identified by a unique version number. The performance and

mass and balance applications should record each computation performed (inputs and outputs) and the operator should ensure that this information is retained for at least 3 months.

The operator should ensure that aircraft performance or mass and balance data provided by the application is correct compared with the data derived from the AFM (e.g. for take-off and landing performance data) or from other reference data sources (e.g. mass and balance manuals or databases, in-flight performance manuals or databases) under a representative cross-check of conditions (e.g. for take-off and landing performance applications: take-off and landing performance data on dry, wet and contaminated runways, with different wind conditions and aerodrome pressure altitudes, etc.).

The operator should define any new roles that the flight crew and, if applicable, the flight

dispatcher, may have in creating, reviewing, and using performance calculations supported by EFB systems.

(b) Testing

The verification of the compliance of a performance or mass and balance application should

include software testing activities performed with the software version candidate for operational use.

The testing can be performed either by the operator or a third party, as long as the testing process

is documented and the responsibilities identified.

The testing activities should include reliability testing and accuracy testing.

Reliability testing should show that the application in its operating environment (operating system (OS) and hardware included) is stable and deterministic, i.e. identical answers are generated each time the process is entered with identical parameters.

Accuracy testing should demonstrate that the aircraft performance or mass and balance computations provided by the application are correct in comparison with data derived from the AFM or other reference data sources, under a representative cross section of conditions (e.g. for take-off and landing performance applications: runway state and slope, different wind conditions and pressure altitudes, various aircraft configurations including failures with a performance impact, etc.).

The verification should include a sufficient number of comparison results from representative calculations throughout the entire operating envelope of the aircraft, considering corner points, routine and break points.

Any difference compared to the reference data that is judged significant should be examined. When differences are due to more conservative calculations or reduced margins that were purposely built into the approved data, this approach should be clearly specified. Compliance with the applicable certification and operational rules needs to be assessed in any case.

The testing method should be described. The testing may be automated when all the required data is available in an appropriate electronic format, but in addition to performing thorough monitoring of the correct functioning and design of the testing tools and procedures, operators are strongly suggested to perform additional manual verification. It could be based on a few scenarios for each chart or table of the reference data, including both operationally representative scenarios and 'corner-case' scenarios.

The testing of a software revision should, in addition, include non-regression testing and testing of any fix or change.

Furthermore, an operator should perform testing related to its customisation of the applications and to any element pertinent to its operation that was not covered at an earlier stage (e.g. airport database verification).

(c) Procedures

Specific care is needed regarding flight crew procedures concerning take-off and landing performance or mass and balance applications. Flight crew procedures should ensure that:

(1) calculations are performed independently by each flight crew member before data outputs are accepted for use;

(2) a formal cross-check is made before data outputs are accepted for use; such cross-checks should utilise the independent calculations described above, together with the output of the same data from other sources on the aircraft;

(3) a gross-error check is performed before data outputs are accepted for use; such gross-error checks may use either a 'rule of thumb' or the output of the same data from other sources on the aircraft; and

(4) in the event of a loss of functionality of an EFB through either the loss of a single

application, or the failure of the device hosting the application, an equivalent level of safety can be maintained; consistency with the EFB risk assessment assumptions should be confirmed.

(d) Training

The training should emphasise the importance of executing all take-off and landing performance or mass and balance calculations in accordance with the SOPs to assure fully independent calculations.

Furthermore, due to the optimisation at different levels brought by performance applications, the flight crew members may be confronted with new procedures and different aircraft behaviour (e.g. the use of multiple flap settings for take-off). The training should be designed and provided accordingly.

Where an application allows the computing of both dispatch results (from regulatory and factored calculations) and other results, the training should highlight the specificities of those results.

Depending on the representativeness of the calculation, the flight crew should be trained on any operational margin that might be required.

The training should also address the identification and the review of default values, if any, and

assumptions about the aircraft status or environmental conditions made by the application.

(e) Specific considerations for mass and balance applications

In addition to the figures, a diagram displaying the mass and its associated centre of gravity (CG) should be provided.

(f) Human-factors-specific considerations

Input and output data (i.e. results) shall be clearly separated from each other. All the information necessary for a given calculation task should be presented together or be easily accessible.

All input and output data should include correct and unambiguous terms (names), units of

measurement (e.g. kg or lb), and when applicable, an index system and a CG-position declaration (e.g. Arm/%MAC). The units should match the ones from the other flight-crew-compartment sources for the same kinds of data.

Airspeeds should be provided in a way that is directly useable in the flight crew compartment

unless the unit clearly indicates otherwise (e.g. Knots Calibrated Air Speed (KCAS)). Any difference between the type of airspeed provided by the EFB application and the type provided by the AFM or flight crew operating manual (FCOM) performance charts should be mentioned in the flight crew guides and training material.

If the landing performance application allows the computation of both dispatch (regulatory,

factored) and other results (e.g. in-flight or unfactored), the flight crew members should be made aware of the computation mode used.

(1) Inputs

The application should allow users to clearly distinguish user entries from default values or entries imported from other aircraft systems.

Performance applications should allow the flight crew to check whether a certain obstacle is included in the performance calculations and/or to include new or revised obstacle information in the performance calculations.

(2) Outputs

All critical assumptions for performance calculations (e.g. the use of thrust reversers, full or reduced thrust/power rating) should be clearly displayed. The assumptions made about any calculation should be at least as clear to the flight crew members as similar information would be on a tabular chart.

All output data should be available in numbers.

The application should indicate when a set of entries results in an unachievable operation (for instance, a negative stopping margin) with a specific message or colour scheme. This should be done in accordance with the relevant provisions on messages and the use of colours.

In order to allow a smooth workflow and to prevent data entry errors, the layout of the calculation outputs should be such that it is consistent with the data entry interface of the aircraft applications in which the calculation outputs are used (e.g. flight management systems).

(3) Modifications

The user should be able to easily modify performance calculations, especially when making last-minute changes.

Calculation results and any outdated input fields should be deleted when:

(i) modifications are entered;

(ii) the EFB is shut down or the performance application is closed; and

(iii) the EFB or the performance application have been in a standby or 'background' mode too long, i.e. such that it is likely that when it is used again, the inputs or outputs will be outdated.

AMC5 NCC.GEN.131(b)(2) Use of electronic flight bags (EFBs)

AIRPORT MOVING MAP DISPLAY (AMMD) APPLICATION WITH OWN-SHIP POSITION

(a) General

An AMMD application should not be used as the primary means of navigation for taxiing and should be only used in conjunction with other materials and procedures identified within the operating concept (see paragraph (e).

When an AMMD is in use, the primary means of navigation for taxiing remains the use of normal procedures and direct visual observation out of the flight-crew-compartment window.

Thus, as recognised in ETSO-C165a, an AMMD application with a display of own-ship position is considered to have a minor safety effect for malfunctions that cause the incorrect depiction of aircraft position (own-ship), and the failure condition for the loss of function is classified as 'no safety effect'.

(b) Minimum requirements

AMMD software that complies with European Technical Standard Order ETSO-C165a is considered to be acceptable.

In addition, the system should provide the means to display the revision number of the software installed.

To achieve the total system accuracy requirements of ETSO-C165a, an airworthiness-approved sensor using the global positioning system (GPS) in combination with a medium-accuracy database compliant with EUROCAE ED-99C/RTCA DO-272C, 'User Requirements for Aerodrome Mapping Information,' (or later revisions) is considered one acceptable means.

Alternatively, the use of non-certified commercial off-the-shelf (COTS) position sources may be acceptable in accordance with AMC6 NCC.GEN.131(b)(2).

(c) Data provided by the AMMD software application developer

The operator should ensure that the AMMD software application developer provides the appropriate data including:

(1) installation instructions or equivalent as per ETSO-C165a Section 2.2 addressing:

(i) the identification of each specific EFB system computing platform (including the hardware platform and the operating system version) with which this AMMD software application and database was demonstrated to be compatible;

(ii) the installation procedures and limitations for each applicable platform (e.g. required memory resources, configuration of Global Navigation Satellite System (GNSS) antenna position);

(iii) the interface description data including the requirements for external sensors providing data inputs; and

(iv) means to verify that the AMMD has been installed correctly and is functioning properly.

(2) Any AMMD limitations, and known installation, operational, functional, or performance issues of the AMMD.

(d) AMMD software installation in the EFB

The operator should review the documents and the data provided by the AMMD developer, and ensure that the installation requirements of the AMMD software in the specific EFB platform and aircraft are addressed. Operators are required to:

perform any verification activities proposed by the AMMD software application developer, as well as identify and perform any additional integration activities that need to be completed;

(e) Operational procedures

Changes to operational procedures of the aircraft (e.g. flight crew procedures) should be documented in the operations manual or user's guide as appropriate. In particular, the documentation should highlight that the AMMD is only designed to assist flight crew members in orienting themselves on the airport surface so as to improve the flight crew members' positional awareness during taxiing and that it is not to be used as the basis for ground manoeuvring.

(f) Training requirements

The operator may use flight crew procedures to mitigate some hazards. These should include limitations on the use of the AMMD function or application. As the AMMD could be a compelling display and the procedural restrictions are a key component of the mitigation, training should be provided in support of an AMMD implementation.

All mitigation means that rely on flight crew procedures should be included in the flight crew training. Details of the AMMD training should be included in the operator's overall EFB training.

AMC6 NCC.GEN.131(b)(2) Use of electronic flight bags (EFBs)

USE OF COMMERCIAL OFF-THE-SHELF (COTS) POSITION SOURCE

COTS position sources may be used for AMMD EFB applications and for EFB applications displaying the own-ship position in-flight when the following considerations are complied with:

(a) Characterisation of the receiver:

The position should originate from an airworthiness approved GNSS receiver, or from a COTS GNSS receiver fully characterised in terms of technical specifications and featuring an adequate number of channels (12 or more).

The EFB application should, in addition to position and velocity data, receive a sufficient number of parameters related to the fix quality and integrity to allow compliance with the accuracy requirements (e.g. the number of satellites and constellation geometry parameters such as dilution of position (DOP), 2D/3D fix).

(b) Installation aspects:

COTS position sources are C-PEDs and their installation and use should follow the requirements of NCC.GEN.130.

If the external COTS position source transmits wirelessly, cybersecurity aspects have to be considered.

(c) Practical evaluation:

As variables can be introduced by the placement of the antennas in the aircraft and the characteristics of the aircraft itself (e.g. heated and/or shielded windshield effects), the tests have to take place on the type of aircraft in which the EFB will be operated, with the antenna positioned at the location to be used in service.

(1) COTS used as a position source for AMMD

The test installation should record the data provided by the COTS position source to the AMMD application.

The analysis should use the recorded parameters to demonstrate that the AMMD requirements are satisfactorily complied with in terms of the total system accuracy (taking into account database errors, latency effects, display errors, and uncompensated antenna offsets) within 50 metres (95 %). The availability should be sufficient to prevent distraction or increased workload due to frequent loss of position.

When demonstrating compliance with the following requirements of DO-257A, the behaviour of the AMMD system should be evaluated in practice:

(i) indication of degraded position accuracy within 1 second (Section 2.2.4 (22)); and

(ii) indication of a loss of positioning data within 5 seconds (Section 2.2.4 (23));

conditions to consider are both a loss of the GNSS satellite view (e.g. antenna failure) and a loss of communication between the receiver and the EFB.

(2) COTS position source used for applications displaying own-ship position in-flight:

Flight trials should demonstrate that the COTS GNSS availability is sufficient to prevent distraction or increased workload due to frequent loss of position.

AMC7 NCC.GEN.131(b)(2) Use of electronic flight bags (EFBs)

CHART APPLICATIONS

The navigation charts that are depicted should contain the information necessary, in an appropriate form, to perform the operation safely. Consideration should be given to the size, resolution and position of the display to ensure legibility whilst retaining the ability to review all the information required to maintain adequate situational awareness. The identification of risks associated with the human–machine interface, as part of the operator's risk assessment, is key to identifying acceptable mitigation means, e.g.:

(a) to establish procedures for reducing the risk of making errors;

(b) to control and mitigate the additional workload related to EFB use;

(c) to ensure the consistency of colour-coding and symbology philosophies between EFB applications and their compatibility with other flight crew compartment applications; and

(d) to consider aspects of crew resource management (CRM) when using an EFB system.

In the case of chart application displaying own-ship position in flight, AMC9 NCC.GEN.131(b)(2) is applicable.

AMC8 NCC.GEN.131(b)(2) Use of electronic flight bags (EFBs)

IN-FLIGHT WEATHER APPLICATIONS

(a) General

An in-flight weather (IFW) application is an EFB function or application enabling the flight crew to access meteorological information. It is designed to increase situational awareness and to support the flight crew when making strategic decisions.

An IFW function or application may be used to access both information required to be on board

(e.g. World Area Forecast Centre (WAFC) data) and supplemental weather information.

The use of IFW applications should be non-safety-critical and not necessary for the performance of the flight. In order for it to be non-safety-critical, IFW data should not be used to support tactical decisions and/or as a substitute for certified aircraft systems (e.g. weather radar).

Any current information from the meteorological data required to be carried on board or from

aircraft primary systems should always prevail over the information from an IFW application.

The displayed meteorological information may be forecasted and/or observed, and may be

updated on the ground and/or in flight. It should be based on data from certified meteorological

services providers or other reliable sources evaluated by the operator.

The meteorological information provided to the flight crew should be as far as possible consistent with the information available to users of ground-based aviation meteorological information (e.g. operations control centre (OCC) staff, flight dispatchers, etc.) in order to establish common situational awareness and to facilitate collaborative decision-making.

(b) Display

Meteorological information should be presented to the flight crew in a format that is appropriate to the content of the information; coloured graphical depiction is encouraged whenever practicable. The IFW display should enable the flight crew to:

(1) distinguish between observed and forecasted weather data;

(2) identify the currency or age and validity time of the weather data;

(3) access the interpretation of the weather data (e.g. the legend);

(4) obtain positive and clear indications of any missing information or data and determine areas of uncertainty when making decisions to avoid hazardous weather; and

(5) be aware of the data-link means status enabling necessary IFW data exchanges.

Meteorological information in IFW applications may be displayed, for example, as an overlay over navigation charts, over geographical maps, or it may be a stand-alone weather depiction (e.g. radar plots, satellite images, etc.).

If meteorological information is overlaid on navigation charts, special consideration should be given to HMI issues in order to avoid adverse effects on the basic chart functions.

In case of display of own-ship position in flight, AMC9 NCC.GEN.131(b)(2) is applicable.

The meteorological information may require reformatting to accommodate, for example, the display size or the depiction technology. However, any reformatting of the meteorological information should preserve both the geo-location and intensity of the meteorological conditions regardless of projection, scaling, or any other types of processing.

(c) Training and procedures

The operator should establish procedures for the use of an IFW application.

The operator should provide adequate training to the flight crew members before using an IFW application. This training should address:

(1) limitations of the use of an IFW application:

(i) acceptable use (strategic planning only);

(ii) information required to be on board; and

(iii) latency of observed weather information and the hazards associated with utilisation of old information;

(2) information on the display of weather data:

(i) type of displayed information (forecasted, observed);

(ii) symbology (symbols, colours); and

(iii) interpretation of meteorological information;

(3) identification of failures and malfunctions (e.g. incomplete uplinks, data-link failures, missing info);

(4) human factors issues:

(i) avoiding fixation; and

(ii) managing workload.

AMC9 NCC.GEN.131(b)(2) Use of electronic flight bags (EFBs)

APPLICATIONS DISPLAYING OWN-SHIP POSITION IN-FLIGHT

(a) Limitations

The display of own-ship position in flight as an overlay to other EFB applications should not be used as a primary source of information to fly or navigate the aircraft.

Except on VFR flights over routes navigated by reference to visual landmark, the display of the own-ship symbol is allowed only in aircraft having a certified navigation display (moving map).

In the specific case of IFW applications, the display of own-ship on such applications is restricted to aircraft equipped with a weather radar.

(b) Position source and accuracy

The display of own-ship position may be based on a certified GNSS or GNSS-based (e.g. GPS/IRS) position from certified aircraft equipment or on a portable COTS position source in accordance with AMC6 NCC.GEN.131(b)(2).

The own-ship symbol should be removed and the flight crew notified if:

(1) the estimated accuracy exceeds 50 meters;

(2) the position data is reported as invalid by the GNSS receiver; or

(3) the position data is not received for 5 seconds.

(c) Charting data considerations

If the map involves raster images that have been stitched together into a larger single map, it should be demonstrated that the stitching process does not introduce distortion or map errors that would not correlate properly with a GNSS-based own-ship symbol.

(d) Human machine interface (HMI)

(1) Interface

The flight crew should be able to unambiguously differentiate the EFB function from avionics functions available in the cockpit, and in particular with the navigation display.

A sufficiently legible text label “AIRCRAFT POSITION NOT TO BE USED FOR NAVIGATION” or equivalent should be continuously displayed by the application if the own-ship position depiction is visible in the current display area over a terminal chart (i.e. SID, STAR, or instrument approach) or a depiction of a terminal procedure.

(2) Display of own-ship symbol

The own-ship symbol should be different from the ones used by certified aircraft systems intended for primary navigation.

If directional data is available, the own-ship symbol may indicate directionality. If direction is not available, the own-ship symbol should not imply directionality.

The colour coding should not be inconsistent with the manufacturer philosophy.

(3) Data displayed

The current map orientation should be clearly, continuously and unambiguously indicated (e.g., Track-up vs North-up).

If the software supports more than one directional orientation for the own-ship symbol (e.g., Track-up vs North-up), the current own-ship symbol orientation should be indicated.

The chart display in track-up mode should not create usability or readability issues. In particular, chart data should not be rotated in a manner that affects readability.

The application zoom levels should be appropriate for the function and content being displayed and in the context of providing supplemental position awareness.

The pilot should be able to obtain information about the operational status of the own-ship function (e.g. active, deactivated, degraded).

During IFR, day-VFR without visual references or night VFR flight, the following parameters' values should not be displayed:

(i) Track/heading;

(ii) Estimated time of arrival (ETA);

(iii) Altitude;

(iv) Geographical coordinates of the current location of the aircraft; and

(v) Aircraft speed.

(4) Controls

If a panning and/or range selection function is available, the EFB application should provide a clear and simple method to return to an own-ship oriented display.

A means to disable the display of the own-ship position should be provided to the flight crew.

(e) Training and procedures

The procedures and training should emphasise the fact that the display of own-ship position on charts or IFW EFB applications should not be used as a primary source of information to fly or navigate the aircraft or as a primary source of weather information.

(1) Procedures:

The following considerations should be addressed in the procedures for the use of charts or IFW EFB application displaying the own-ship position in-flight by the flight crew:

(i) Intended use of the display of own-ship position in-flight on charts or IFW EFB applications;

(ii) Inclusion of the EFB into the regular scan of flight deck systems indications. In particular, systematic cross-check with avionics before being used, whatever the position source; and

(iii) Actions to be taken in case of the identification of a discrepancy between the EFB and avionics.

(2) Training:

Crew members should be trained on the procedures for the use of the application, including the regular cross-check with avionics and the action in case of discrepancy.

GM1 NCC.GEN.131(b)(2) Use of electronic flight bags (EFBs)

IN-FLIGHT WEATHER APPLICATIONS

'Reliable sources' of data used by in-flight weather (IFW) applications are the organisations evaluated by

the operator as being able to provide an appropriate level of data assurance in terms of accuracy and

integrity. It is recommended that the following aspects be considered during that evaluation:

(a) The organisation should have a quality assurance system in place that covers the data source

selection, acquisition/import, processing, validity period check, and the distribution phase;

(b) Any meteorological product provided by the organisation that is within the scope of

meteorological information included in the flight documentation should originate only from authoritative sources or certified providers and should not be transformed or altered, except for the purpose of packaging the data in the correct format.

The organisation's process should provide assurance that the integrity of those products is preserved in the data for use by the IFW application.

GM2 NCC.GEN.131(b)(2) Use of electronic flight bags (EFBs)

USE OF COMMERCIAL OFF-THE-SHELF (COTS) POSITION SOURCE – PRACTICAL EVALUATION

The tests should consist of a statistically relevant sample of taxiing. It is recommended to include taxiing at airports that are representative of the more complex airports typically accessed by the operator.

Taxiing segment samples should include data that is derived from runways and taxiways, and should include numerous turns, in particular of 90 degrees or more, and segments in straight lines at the maximum speed at which the own-ship symbol is displayed. Taxiing segment samples should include parts in areas of high buildings such as terminals. The analysis should include at least 25 inbound and/or outbound taxiing segments between the parking location and the runway.

During the tests, any unusual events (such as observing the own-ship symbol in a location on the map that is notably offset compared to the actual position, the own-ship symbol changing to non-directional when the aircraft is moving, and times when the own-ship symbol disappears from the map display) should be noted. For the test, the pilot should be instructed to diligently taxi on the centre line.

AMC1 NCC.GEN.135 Information on emergency and survival equipment carried

Content of information

The information, compiled in a list, should include, as applicable:

(a) the number, colour and type of life-rafts and pyrotechnics;

(b) details of emergency medical supplies and water supplies; and

(c) the type and frequencies of the emergency portable radio equipment.

AMC1 NCC.GEN.140(a)(3) Documents, manuals and information to be carried

Certificate of Airworthiness

The certificate of airworthiness should be a normal certificate of airworthiness, a restricted certificate of airworthiness or a permit to fly issued in accordance with the applicable airworthiness requirements.

AMC1 NCC.GEN.140(a)(11) Documents, manuals and information to be carried

Current and suitable aeronautical charts

(a) The aeronautical charts carried should contain data appropriate to the applicable air traffic regulations, rules of the air, flight altitudes, area/route and nature of the operation. Due consideration should be given to carriage of textual and graphic representations of:

(1) aeronautical data including, as appropriate for the nature of the operation:

(i) airspace structure;

(ii) significant points, navigation aids (navaids) and air traffic services (ATS) routes;

(iii) navigation and communication frequencies;

(iv) prohibited, restricted and danger areas; and

(v) sites of other relevant activities that may hazard the flight; and

(2) topographical data, including terrain and obstacle data.

(b) A combination of different charts and textual data may be used to provide adequate and current data.

(c) The aeronautical data should be appropriate for the current aeronautical information regulation and control (AIRAC) cycle.

(d) The topographical data should be reasonably recent, having regard to the nature of the planned operation.

AMC1 NCC.GEN.140(a)(12) 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 the International Civil Aviation Organisation's (ICAO) Annex 2. This may be part of the operations manual.

AMC1 NCC.GEN.140 Documents, manuals and information to be carried

General

The documents, manuals and information may be available in a form other than on printed paper. An electronic storage medium is acceptable if accessibility, usability and reliability can be assured.

GM1 NCC.GEN.140(a)(1) Documents, manuals and information to be carried

AFM or equivalent document

'Aircraft flight manual (AFM), or equivalent document' means 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 NCC.GEN.140(a)(9) Documents, manuals and information to be carried

Journey log or equivalent

'Journey log or equivalent' means in this context 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.

GM1 NCC.GEN.140(a)(13) Documents, manuals and information to be carried

Search and rescue information

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

GM1 NCC.GEN.140(a)(19) 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.

GM1 NCC.GEN.145(a) Preservation, production and use of flight recorder recordings

Removal of recorders after a reportable occurrence

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 NCC.GEN.145(b) Preservation, production and use of flight recorder recordings

Operational checks

Whenever a recorder is required to be carried, the operator should:

(a) perform an annual inspection of flight data recorder (FDR) recording and cockpit voice recorder (CVR) recording, unless one or more of the following applies:

(1) Where two solid-state FDRs both fitted with internal built-in-test equipment sufficient to monitor reception and recording of data share the same acquisition unit, a comprehensive recording inspection need only be performed for one FDR. For the second FDR, checking its internal built-in-test equipment is sufficient. The inspection should be performed alternately such that each FDR is inspected once every other year.

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

(i) the aircraft flight data are 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) the integrity of all mandatory flight parameters is verified by the FDM programme; and

(iv) the FDR is solid-state and is fitted with internal built-in-test equipment sufficient to monitor reception and recording of data.

(3) Where two solid-state CVRs are fitted both with internal built-in-test equipment sufficient to monitor reception and recording of data, a comprehensive recording inspection need only to be performed for one CVR. For the second CVR, checking its internal built-in-test equipment is sufficient. The inspection should be performed alternately such that each CVR is inspected once every other year.

(b) perform every 5 years an inspection of the data link recording.

(c) 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 NCC.GEN.145(b) Preservation, production and use of flight recorder recordings

Inspection of the flight recorders recording

(a) The inspection of the FDR recording usually consists of the following:

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

(2) 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) 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.

(3) Retaining the most recent copy of the complete recording file and the corresponding recording inspection report.

(b) The inspection of the CVR recording usually consists of:

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

(2) examining, where practicable and subject to prior approval by the flight crew, a sample of in-flight recording of the CVR for evidence that the signal is acceptable on each channel; 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.

AMC1 NCC.GEN.150(e) Transport of dangerous goods

Dangerous goods accident and incident reporting

(a) Any type of dangerous goods accident or incident, or the finding of:

(1) undeclared or misdeclared dangerous goods in cargo;

(2) forbidden dangerous goods in mail; or

(3) forbidden dangerous goods in passenger or crew baggage, or on the person of a passenger or a crew member should be reported. For this purpose, the Technical Instructions consider that reporting of undeclared and misdeclared dangerous goods found in cargo also applies to 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 contain the following data, where relevant:

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

(2) location and date of flight;

(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 United Nations (UN)/identification (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 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. The criteria for reporting both types of occurrence should be 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:

1. Operator:
2. Date of Occurrence:
3. Local time of occurrence:
4. Flight date:
5. Departure aerodrome:
6. Destination aerodrome:
7. Aircraft type:
8. Aircraft registration:
9. Location of occurrence:
10. Origin of the goods:
11. Description of the occurrence, including details of injury, damage, etc. (if necessary continue on the reverse of this form):
12. Proper shipping name (including the technical name):
13. UN/ID No (when known):
14. Class/Division (when known):
15. Subsidiary risk(s):
16. Packing group:
17. Category (Class 7 only):
18. Type of packaging:
19. Packaging specification marking:
20. No of packages:
21. Quantity (or transport index, if applicable):
22. Name and address of passenger, etc.:
23. Other relevant information (including suspected cause, any action taken):
24. Name and title of person making report:
25. Telephone No:
26. Company:
27. Reporters ref:
28. Address:
29. Signature:
30. Date:

Description of the occurrence (continuation)

Notes for completion of the form:

1. A dangerous goods accident is as defined in Part DEF. For this purpose serious injury is as defined as:

   'serious injury' means an injury which is sustained by a person in an accident and which involves one of the following:

   (a) hospitalisation for more than 48 hours, commencing within 7 days from the date the injury was received;

   (b) a fracture of any bone (except simple fractures of fingers, toes, or nose);

   (c) lacerations which cause severe haemorrhage, nerve, muscle or tendon damage;

   (d) injury to any internal organ;

   (e) second or third degree burns, or any burns affecting more than 5 % of the body surface;

(f) verified exposure to infectious substances or harmful radiation.

2. 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.

3. Copies of all relevant documents and any photographs should be attached to this report.

4. Any further information, or any information not included in the initial report, should be sent as soon as possible to the authorities identified in NCC.GEN.150 (e).

5. Providing it is safe to do so, all dangerous goods, packagings, documents, etc. relating to the occurrence should be retained until after the initial report has been sent to the authorities identified in NCC.GEN.150 (e), and they have indicated whether or not these should continue to be retained.

GM1 NCC.GEN.150 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 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 that 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 competent authority.

(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 operator should ensure that 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 Part SPA, Subpart G.

Subpart B — Operational procedures

AMC1 NCC.OP.100 Use of aerodromes and operating sites

Use of operating sites

(a) The pilot-in-command should have available from a pre-survey or other publication, for each operating site to be used, diagrams or ground and aerial photographs, depiction (pictorial) and description of:

(1) the overall dimensions of the operating 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) provision of control of third parties on the ground (if applicable);

(6) lighting, if applicable;

(7) procedure for activating the operating site in accordance with national regulations, if applicable;

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

(9) site suitability with reference to available aircraft performance.

(b) Where the operator specifically permits operation from sites that are not pre- surveyed, the pilot-in-command should make, from the air, a judgement on the suitability of a site. At least (a)(1) to (a)(6) inclusive and (a)(9) should be considered.

GM1 NCC.OP.100 Use of aerodromes and operating sites

Publications

'Other publication' mentioned in AMC1 NCC.OP.100 refers to publication means, such as:

(a) civil as well as military aeronautical information publication;

(b) visual flight rules (VFR) guides;

(c) commercially available aeronautical publications; and

(d) non-commercially available publications.

AMC1 NCC.OP.110 Aerodrome operating minima — general

Commercially available information

An acceptable method of specifying aerodrome operating minima is through the use of commercially available information.

AMC2 NCC.OP.110 Aerodrome operating minima — general

General

(a) The aerodrome operating minima should not be lower than the values given in NCC.OP.111 or AMC3 NCC.OP.110 (c).

(b) Whenever practical approaches should be flown as stabilised approaches (SAps).

Different procedures may be used for a particular approach to a particular runway.

(c) Whenever practical, non-precision approaches should be flown using the continuous descent final approach (CDFA) technique. Different procedures may be used for a particular approach to a particular runway.

(d) For approaches not flown using the CDFA technique: when calculating the minima in accordance with NCC.OP.111, the applicable minimum runway visual range (RVR) should be increased by 200 m for Category A and B aeroplanes and by 400 m for Category C and D aeroplanes, provided the resulting RVR/converted meteorological visibility (CMV) value does not exceed 5000 m. SAp or CDFA should be used as soon as facilities are improved to allow these techniques.

AMC3 NCC.OP.110 Aerodrome operating minima — general

Take-off operations

(a) General:

(1) Take-off minima should be expressed as visibility (VIS) or RVR limits, taking into account all relevant factors for each aerodrome planned to be used and aircraft characteristics. 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.

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

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

(4) When no reported meteorological visibility or RVR is available, a take-off should only be commenced if the pilot-in-command can determine that the RVR/VIS 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 runway/final approach and take-off area (FATO) and any obstacles.

(c) Required RVR/visibility:

(1) Aeroplanes:

(i) For aeroplanes, the take-off minima specified by the operator should be expressed as RVR/VIS values not lower than those specified in Table 1.A.

(ii) When reported RVR or meteorological visibility is not available, the pilot-in-command should not commence take-off unless he/she can determine that the actual conditions satisfy the applicable take-off minima.

(2) Helicopters:

(i) For helicopters having a mass where it is possible to reject the take-off and land on the FATO in case of the critical engine failure being recognised at or before the take-off decision point (TDP), the operator should specify a RVR/VIS as take-off minima in accordance with Table 1.H.

(ii) For all other cases, the pilot-in-command should operate to take-off minima of 800 m RVR/VIS and remain clear of cloud during the take-off manoeuvre until reaching the performance capabilities of (c)(2)(i).

(iii) Table 5 for converting reported meteorological visibility to RVR should not be used for calculating take-off minima.

Table 1.A: Take-off — aeroplanes

(without low visibility take-off (LVTO) approval)

RVR/VIS

Facilities	RVR/VIS (m)*
Day only: Nil**	500
Day: at least runway edge lights or runway centreline markings Night: at least runway edge lights or runway centreline lights and runway end lights	400

*: The reported RVR/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.

Table 1.H: Take-off — helicopters

(without LVTO approval)

RVR/Visibility

Onshore aerodromes with instrument flight rules (IFR) departure procedures	**RVR/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 centreline marking	400
Runway edge/FATO light, centreline 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.

AMC4 NCC.OP.110 Aerodrome operating minima — general

Criteria for establishing RVR/CMV

(a) In order to qualify for the lowest allowable values of RVR/CMV specified in Table 4.A, the instrument approach should meet at least the following facility requirements and associated conditions:

(1) Instrument approaches with designated vertical profile up to and including 4.5° for Category A and B aeroplanes, or 3.77° for Category C and D aeroplanes, where the facilities are:

(i) instrument landing system (ILS)/microwave landing system (MLS)/GBAS landing system (GLS)/precision approach radar (PAR); or

(ii) approach procedure with vertical guidance (APV); and where the final approach track is offset by not more than 15° for Category A and B aeroplanes or by not more than 5° for Category C and D aeroplanes.

(2) Instrument approach operations flown using the CDFA technique with a nominal vertical profile, up to and including 4.5° for Category A and B aeroplanes, or 3.77° for Category C and D aeroplanes, where the facilities are non-directional beacon (NDB), NDB/distance measuring equipment (DME), VHF omnidirectional radio range (VOR), VOR/DME, localiser (LOC), LOC/DME, VHF direction finder (VDF), surveillance radar approach (SRA) or global navigation satellite system (GNSS)/lateral navigation (LNAV), with a final approach segment of at least 3 NM, which also fulfil the following criteria:

(i) the final approach track is offset by not more than 15° for Category A and B aeroplanes or by not more than 5° for Category C and D aeroplanes;

(ii) the final approach fix (FAF) or another appropriate fix where descent is initiated is available, or distance to threshold (THR) is available by flight management system (FMS)/area navigation (NDB/DME) or DME; and

(iii) the missed approach point (MAPt) is determined by timing, the distance from FAF to THR is ≤ 8 NM.

(3) Instrument approaches where the facilities are NDB, NDB/DME, VOR, VOR/DME, LOC, LOC/DME, VDF, SRA or GNSS/LNAV, not fulfilling the criteria in (a)(2), or with an minimum descent height (MDH) ≥ 1 200 ft.

(b) The missed approach operation, after an approach operation has been flown using the CDFA technique, should be executed when reaching the decision height/altitude (DH/A) or the MAPt, whichever occurs first. The lateral part of the missed approach procedure should be flown via the MAPt unless otherwise stated on the approach chart.

AMC5 NCC.OP.110 Aerodrome operating minima — general

Determination of RVR/CMV/VIS minima for NPA, APV, CAT I - Aeroplanes

(a) The minimum RVR/CMV/VIS should be the highest of the values specified in Table 3 and Table 4.A but not greater than the maximum values specified in Table 4.A, where applicable.

(b) The values in Table 3 should be derived from the formula below:

required RVR/VIS (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 3 up to 3.77° and then remaining constant.

(c) If the approach is flown with a level flight segment at or above MDA/H, 200 m should be added for Category A and B aeroplanes and 400 m for Category C and D aeroplanes to the minimum RVR/CMV/VIS value resulting from the application of Table 3 and Table 4.A.

(d) A RVR of less than 750 m as indicated in Table 3 may be used:

(1) for CAT I operations to runways with full approach lighting system (FALS), runway touchdown zone lights (RTZL) and runway centreline lights (RCLL);

(2) for CAT I operations to runways without RTZL and RCLL when using an approved head-up guidance landing system (HUDLS), or equivalent approved system, or when conducting a coupled approach or flight-director-flown approach to a DH. The ILS should not be published as a restricted facility; and

(3) for APV operations to runways with FALS, RTZL and RCLL when using an approved head-up display (HUD).

(e) Lower values than those specified in Table 3 may be used for HUDLS and auto-land operations if approved in accordance with Part SPA, Subpart E.

(f) The visual aids should comprise standard runway day markings and approach and runway lights as specified in Table 2. The competent authority may approve that RVR values relevant to a basic approach lighting system (BALS) are used on runways where the approach lights are restricted in length below 210 m due to terrain or water, but where at least one cross-bar is available.

(g) For night operations or for any operation where credit for runway and approach lights is required, the lights should be on and serviceable, except as provided for in Table 6.

(h) For single-pilot operations, the minimum RVR/VIS should be calculated in accordance with the following additional criteria:

(1) a RVR of less than 800 m as indicated in Table 3 may be used for CAT I approaches provided any of the following is used at least down to the applicable DH:

(i) a suitable autopilot, coupled to an ILS, MLS or GLS that is not published as restricted; or

(ii) an approved HUDLS, including, where appropriate, enhanced vision system (EVS), or equivalent approved system;

(2) where RTZL and/or RCLL are not available, the minimum RVR/CMV should not be less than 600 m; and

(3) a RVR of less than 800 m as indicated in Table 3 may be used for APV operations to runways with FALS, RTZL and RCLL when using an approved HUDLS, or equivalent approved system, or when conducting a coupled approach to a DH equal to or greater than 250 ft.

Table 2: Approach lighting systems

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

Note: HIALS: high intensity approach lighting system;
MIALS: medium intensity approach lighting system;
ALS: approach lighting system.

Table 3: RVR/CMV vs. DH/MDH

DH or MDH			Class of lighting facility			
			FALS	IALS	BALS	NALS
			See (d), (e), (h) above for RVR < 750/800 m			
Ft			RVR/CMV (m)			
200	-	210	550	750	1 000	1 200
211	-	220	550	800	1 000	1 200
221	-	230	550	800	1 000	1 200
231	-	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

DH or MDH			Class of lighting facility			
			FALS	IALS	BALS	NALS
			See (d), (e), (h) above for RVR < 750/800 m			
Ft			RVR/CMV (m)			
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	2 500
561	-	580	1 900	2 200	2 400	2 600
581	-	600	2 000	2 300	2 500	2 700
601	-	620	2 100	2 400	2 600	2 800
621	-	640	2 200	2 500	2 700	2 900
641	-	660	2 300	2 600	2 800	3 000
661	-	680	2 400	2 700	2 900	3 100
681	-	700	2 500	2 800	3 000	3 200
701	-	720	2 600	2 900	3 100	3 300
721	-	740	2 700	3 000	3 200	3 400
741	-	760	2 700	3 000	3 300	3 500
761	-	800	2 900	3 200	3 400	3 600
801	-	850	3 100	3 400	3 600	3 800
851	-	900	3 300	3 600	3 800	4 000
901	-	950	3 600	3 900	4 100	4 300
951	-	1 000	3 800	4 100	4 300	4 500
1 001	-	1 100	4 100	4 400	4 600	4 900
1 101	-	1 200	4 600	4 900	5 000	5 000
1 201 and above			5 000	5 000	5 000	5 000

Table 4.A: CAT I, APV, NPA - aeroplanes

Minimum and maximum applicable RVR/CMV (lower and upper cut-off limits)

Facility/conditions	RVR/CMV (m)	Aeroplane category			
		A	B	C	D
ILS, MLS, GLS, PAR, GNSS,SBAS, GNSS/VNAV	Min	According to Table 3			
	Max	1 500	1 500	2 400	2 400
NDB, NDB/DME, VOR, VOR/DME, LOC, LOC/DME, VDF, SRA, GNSS/LNAV with a procedure that fulfils the criteria in AMC4 NCC.OP.110(a)(2).	Min	750	750	750	750
	Max	1 500	1 500	2 400	2 400
For NDB, NDB/DME, VOR, VOR/DME, LOC, LOC/DME, VDF, SRA, GNSS/LNAV: — not fulfilling the criteria in AMC4 NCC.OP.110 (a)(2), or — with a DH or MDH ≥ 1 200 ft	Min	1 000	1 000	1 200	1 200
	Max	According to Table 3 if flown using the CDFA technique, otherwise an add-on of 200/400 m applies to the values in Table 3 but not to result in a value exceeding 5 000 m.			

AMC6 NCC.OP.110 Aerodrome operating minima — general

Determination of RVR/CMV/VIS minima for NPA, CAT I — Helicopters

(a) For non-precision approach (NPA) operations the minima specified in Table 4.1.H should apply:

(1) where the missed approach point is within ½ NM of the landing threshold, the approach minima specified for FALS may be used regardless of the length of approach lights available. However, FATO/runway edge lights, threshold lights, end lights and FATO/runway markings are still required;

(2) for night operations, ground lights should be available to illuminate the FATO/runway and any obstacles; and

(3) for single-pilot operations, the minimum RVR is 800 m or the minima in Table 4.2.H, whichever is higher.

(b) For CAT I operations, the minima specified in Table 4.2.H should apply:

(1) for night operations, ground light should be available to illuminate the FATO/runway and any obstacles;

(2) for single-pilot operations, the minimum RVR/VIS should be calculated in accordance with the following additional criteria:

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

(ii) the DH applied should not be less than 1.25 times the minimum use height for the autopilot.

Table 4.1.H : Onshore NPA minima

MDH (ft) *	Facilities vs. RVR/CMV (m) **, ***			
	FALS	IALS	BALS	NALS
250 – 299	600	800	1 000	1 000
300 – 449	800	1 000	1 000	1 000
450 and above	1 000	1 000	1 000	1 000

*: The MDH refers to the initial calculation of MDH. When selecting the associated RVR, there is no need to take account of a rounding up to the nearest 10 ft, which may be done for operational purposes, e.g. conversion to MDA.

**: The tables are only applicable to conventional approaches with a nominal descent slope of not greater than 4°. Greater descent slopes will usually require that visual glide slope guidance (e.g. precision path approach indicator (PAPI)) is also visible at the MDH.

***: FALS comprise FATO/runway markings, 720 m or more of high intensity/medium intensity (HI/MI) approach lights, FATO/runway edge lights, threshold lights and FATO/runway end lights. Lights to be on.

IALS comprise FATO/runway markings, 420 – 719 m of HI/MI approach lights, FATO/runway edge lights, threshold lights and FATO/runway end lights. Lights to be on.

BALS comprise FATO/runway markings, < 420 m of HI/MI approach lights, any length of low intensity (LI) approach lights, FATO/runway edge lights, threshold lights and FATO/runway end lights. Lights to be on.

NALs comprise FATO/runway markings, FATO/runway edge lights, threshold lights, FATO/runway end lights or no lights at all.

Table 4.2.H: Onshore CAT I minima

DH (ft) *	Facilities vs. RVR/CMV (m) **, ***			
	FALS	IALS	BALS	NALS
200	500	600	700	1 000
201 – 250	550	650	750	1 000
251 – 300	600	700	800	1 000
301 and above	750	800	900	1 000

*: The DH refers to the initial calculation of DH. When selecting the associated RVR, there is no need to take account of a rounding up to the nearest 10 ft, which may be done for operational purposes, e.g. conversion to DA.

**: The table is applicable to conventional approaches with a glide slope up to and including 4°.

***: FALS comprise FATO/runway markings, 720 m or more of HI/MI approach lights, FATO/runway edge lights, threshold lights and FATO/runway end lights. Lights to be on.

IALS comprise FATO/runway markings, 420 – 719 m of HI/MI approach lights, FATO/runway edge lights, threshold lights and FATO/runway end lights. Lights to be on.

BALS comprise FATO/runway markings, < 420 m of HI/MI approach lights, any length of LI approach lights, FATO/runway edge lights, threshold lights and FATO/runway end lights. Lights to be on.

NALS comprise FATO/runway markings, FATO/runway edge lights, threshold lights, FATO/runway end lights or no lights at all.

AMC7 NCC.OP.110 Aerodrome operating minima — general

Visual Approach Operations

For a visual approach operation the RVR should not be less than 800 m.

AMC8 NCC.OP.110 Aerodrome operating minima — general

Conversion of Reported Meteorological Visibility to RVR/CMV

(a) A conversion from meteorological visibility to RVR/CMV should not be used:

(1) when reported RVR is available;

(2) for calculating take-off minima; and

(3) for other RVR minima less than 800 m.

(b) If the RVR is reported as being above the maximum value assessed by the aerodrome operator, e.g. ‘RVR more than 1 500 m’, it should not be considered as a reported value for (a)(1).

(c) When converting meteorological visibility to RVR in circumstances other than those in (a), the conversion factors specified in Table 5 should be used.

Table 5 : Conversion of reported meteorological visibility to RVR/CMV

Light elements in operation	RVR/CMV = reported meteorological visibility 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

AMC9 NCC.OP.110 Aerodrome operating minima — general

Effect on landing minima of temporarily failed or downgraded ground equipment

(a) General

These instructions are intended for both pre-flight and in-flight use. It is, however, not expected that the pilot-in-command 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 pilot-in-command'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 6 and, if considered necessary, the approach should be abandoned.

(b) Conditions applicable to Table 6:

(1) multiple failures of runway/FATO lights other than indicated in Table 6 should not be acceptable;

(2) deficiencies of approach and runway/FATO lights are treated separately; and

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

Table 6 : Failed or downgraded equipment — effect on landing minima

Failed or downgraded equipment	Effect on landing minima	
	CAT I	APV, NPA
ILS/MLS standby transmitter	No effect	
Outer marker	No effect if replaced by height check at 1 000 ft	APV — not applicable
		NPA with FAF: no effect unless used as FAF. If the FAF cannot be identified (e.g. no method available for timing of descent), non-precision operations cannot be conducted
Middle marker	No effect	No effect unless used as MAPt
RVR Assessment Systems	No effect	

Failed or downgraded equipment	Effect on landing minima	
	CAT I	APV, NPA
Approach lights	Minima as for NALS	
Approach lights except the last 210 m	Minima as for BALS	
Approach lights except the last 420 m	Minima as for IALS	
Standby power for approach lights	No effect	
Edge lights, threshold lights and runway end lights	Day — no effect Night — not allowed	
Centreline lights	No effect if flight director (F/D), HUDLS or auto-land; otherwise RVR 750 m	No effect
Centreline lights spacing increased to 30 m	No effect	
Touchdown zone lights	No effect if F/D, HUDLS or auto-land; otherwise RVR 750 m	No effect
Taxiway lighting system	No effect	

GM1 NCC.OP.110 Aerodrome operating minima — general

Aircraft categories

(a) Aircraft categories should be based on the indicated airspeed at threshold (V_{AT}), which is equal to the stalling speed (V_{SO}) multiplied by 1.3 or where published 1-g (gravity) stall speed (V_{S1g}) multiplied by 1.23 in the landing configuration at the maximum certified landing mass. If both V_{SO} and V_{S1g} are available, the higher resulting V_{AT} should be used.

(b) The aircraft categories specified in the following table should be used.

Table 1: Aircraft categories corresponding to VAT values

Aircraft category	VAT
A	Less than 91 kt
B	from 91 to 120 kt
C	from 121 to 140 kt
D	from 141 to 165 kt
E	from 166 to 210 kt

GM2 NCC.OP.110 Aerodrome operating minima — general

Continuous Descent Final Approach (CDFA) — Aeroplanes

(a) Introduction

(1) Controlled flight into terrain (CFIT) is a major hazard in aviation. Most CFIT accidents occur in the final approach segment of non-precision approaches; 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. Operators should ensure that the following techniques are adopted as widely as possible, for all 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 any type of NPA operation.

(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 APV operations; and

(viii) when used and the approach is flown in a stabilised manner, CDFA is the safest approach technique for all NPA operations.

(b) CDFA

(1) Continuous descent final approach is defined in Part-DEF to the KCASR 6 regulations on Air Operations.

(2) An approach is only suitable for application of a CDFA technique when it is flown along a nominal vertical profile; a nominal vertical profile is not forming part of the approach procedure design, but can be flown as a continuous descent. The nominal vertical profile information may be published or displayed on the approach chart to the pilot by depicting the nominal slope or range/distance vs. height. Approaches with a nominal vertical profile are considered to be:

(i) NDB, NDB/DME (non-directional beacon/distance measuring equipment);

(ii) VOR (VHF omnidirectional radio range), VOR/DME;

(iii) LOC (localiser), LOC/DME;

(iv) VDF (VHF direction finder), SRA (surveillance radar approach); or

(v) GNSS/LNAV (global navigation satellite system/lateral navigation);

(3) Stabilised approach (SAp) is defined in Part DEF to the KCASR 6 regulations on Air Operations.

(i) 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.

(ii) The control of the flight path, described above as one of the requirements for conducting A SAp, should not be confused with the path requirements for using the CDFA technique. The predetermined path requirements for conducting A SAp are established by the operator and published in the operations manual part B.

(iii) The predetermined approach slope requirements for applying the CDFA technique are 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.

(iv) A SAp will never have any level segment of flight at DA/H or MDA/H, as applicable. This enhances safety by mandating a prompt missed approach procedure manoeuvre at DA/H or MDA/H.

(v) An approach using the CDFA technique will always be flown as a SAp, since this is a requirement for applying CDFA. However, a SAp does not have to be flown using the CDFA technique, for example a visual approach.

GM3 NCC.OP.110 Aerodrome operating minima — general

Take-Off Minima — Helicopters

To ensure sufficient control of the helicopter in IMC, the speed, before entering in IMC, should be above the minimum authorised speed in IMC, V_{mini}. This is a limitation in the AFM. Therefore, the lowest speed before entering in IMC is the highest of V_{toss} (take-off safety speed) and V_{mini}.

As example, V_{toss} is 45 kt and V_{mini} 60 kt. In that case, the take–off minima have to include the distance to accelerate to 60 kt. The take-off distance should be increased accordingly.

AMC1 NCC.OP.111 Aerodrome operating minima — NPA, APV, CAT I operations

NPA flown with the CDFA technique

The DA/DH used should take into account any add-on to the published minima as identified by the operator's management system and specified in the operations manual (aerodrome operating minima).

GM1 NCC.OP.112 Aerodrome operating minima — circling operations with aeroplanes

Supplemental information

(a) The purpose of this Guidance Material is to provide operators with supplemental information regarding the application of aerodrome operating minima in relation to circling approaches.

(b) Conduct of flight — general:

(1) the MDH and obstacle clearance height (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 meteorological visibility; 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 stabilised, but not below MDA/H — the aeroplane should follow the corresponding instrument approach procedure 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 determined by the radio navigation aids, RNAV, RNP, ILS, MLS or GLS 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 external references.

(3) When reaching the published instrument MAPt and the conditions stipulated in (c)(2) are unable to be established by the pilot, a missed approach should be carried out in accordance with that instrument approach procedure.

(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:

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

(ii) to remain within the circling area and in a 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.

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

(1) The aeroplane should remain on the initial instrument approach procedure 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 determined by the radio navigation aids, RNAV, RNP, ILS, MLS or GLS 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 initial 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 touchdown zone.

(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, ILS, MLS or GLS, and before commencing the circling manoeuvre, the published missed approach for the instrument approach should be followed; or

(ii) if the instrument approach procedure is carried out with the aid of an ILS, MLS or a stabilised approach (SAp), the MAPt associated with an ILS or 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 of 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;

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

(v) 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 pilot-in-command 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 pilot-in-command 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.

AMC1 NCC.OP.120 Noise abatement procedures

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 NCC.OP.120 Noise abatement procedures

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 3000 ft AAL.

These two altitudes may be runway specific when the aeroplane flight management system (FMS) has the relevant function that 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 NCC.OP.125 Minimum obstacle clearance altitudes — IFR flights

General

Commercially available information specifying minimum obstacle clearance altitudes may be used.

AMC1 NCC.OP.140 Passenger briefing

Training Programme

(a) The operator may replace the briefing/demonstration 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.

GM1 NCC.OP.145(b) Flight preparation

Operational Flight Plan

(a) Dependent on the length and complexity of the planned flight, an operational flight plan may be completed based on considerations of aircraft performance, other operating limitations and relevant expected conditions on the route to be followed and at the aerodromes/operating sites concerned.

(b) The operational flight plan used and the entries made during flight may 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 (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 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 and, where applicable, take-off and en-route;

(19) initial ATS flight plan clearance and subsequent reclearance;

(20) in-flight replanning calculations; and

(21) relevant meteorological information.

AMC1 NCC.OP.152 Destination alternate aerodromes — helicopters

Offshore Alternate Aerodromes

(a) Weather-permissible offshore alternate aerodromes may be selected and specified subject to the following:

(1) the offshore alternate aerodrome should only be used after passing a point of no return (PNR). Prior to a PNR, onshore alternate aerodromes should be used;

(2) mechanical reliability of critical control systems and critical components should be considered and taken into account when determining the suitability of the alternate aerodrome;

(3) one-engine-inoperative (OEI) performance capability should be attainable prior to arrival at the alternate;

(4) to the extent possible, deck availability should be guaranteed; and

(5) weather information should be reliable and accurate.

(b) Offshore alternate aerodromes should not be used when it is possible to carry enough fuel to have an onshore alternate aerodrome. Offshore alternate aerodromes should not be used in a hostile environment.

(c) The landing technique specified in the AFM following control system failure may preclude the nomination of certain helidecks as alternate aerodromes.

AMC1 NCC.OP.155 Refuelling with passengers embarking, on board or disembarking

Operational Procedures — General

(a) If passengers are on board when refuelling with:

(1) other than aviation gasoline (AVGAS); or

(2) wide-cut type fuel; or

(3) a mixture of these types of fuel, 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 to take place through those aisles and exits intended for emergency evacuation.

(b) The deployment of integral aircraft stairs or the opening of emergency exits as a prerequisite to refuelling is not necessarily required.

Operational Procedures — Aeroplanes

(c) Operational procedures should specify that at least the following precautions are taken:

(1) one qualified person should remain at a specified location during fuelling operations with passengers on board. This qualified person should be capable of handling emergency procedures concerning fire protection and fire- fighting, handling communications and initiating and directing an evacuation;

(2) two-way communication should be established and should remain available by the aeroplane's inter-communication system or other suitable means between the ground crew supervising the refuelling and the qualified personnel on board the aeroplane; the involved personnel should remain within easy reach of the system of communication;

(3) crew members, personnel and passengers should be warned that refuelling will take place;

(4) 'fasten seat belts' signs should be off;

(5) 'no smoking' signs should be on, together with interior lighting to enable emergency exits to be identified;

(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 be prepared for an immediate emergency evacuation;

(8) if the presence of fuel vapour is detected inside the aeroplane, or any other hazard arises during refuelling, fuelling should be stopped immediately;

(9) the ground area beneath the exits intended for emergency evacuation and slide deployment areas, if applicable, should be kept clear at doors where stairs are not in position for use in the event of evacuation; and

(10) provision should be made for a safe and rapid evacuation.

Operational Procedures — Helicopters

(d) Operational procedures should specify that at least the following precautions are taken:

(1) door(s) on the refuelling side of the helicopter remain closed;

(2) door(s) on the non-refuelling side of the helicopter remain open, weather permitting;

(3) fire fighting facilities of the appropriate scale be positioned so as to be immediately available in the event of a fire;

(4) sufficient personnel should be immediately available to move passengers clear of the helicopter in the event of a fire;

(5) sufficient qualified personnel be on board and be prepared for an immediate emergency evacuation;

(6) if the presence of fuel vapour is detected inside the helicopter, or any other hazard arises during refuelling, fuelling should be stopped immediately;

(7) the ground area beneath the exits intended for emergency evacuation be kept clear; and

(8) provision should be made for a safe and rapid evacuation.

GM1 NCC.OP.155 Refuelling with passengers embarking, on board or disembarking

Aircraft refuelling provisions and guidance on safe refuelling practices

Provisions concerning aircraft refuelling are contained in Volume I (Aerodrome Design and Operations) of ICAO Annex 14 (Aerodromes), and guidance on safe refuelling practices is contained in Parts 1 and 8 of the ICAO Airport Services Manual (Doc 9137).

AMC1 NCC.OP.165 Carriage of passengers

Seats that permit direct access to emergency exits

Passengers who occupy seats that permit direct access to emergency exits should appear to be reasonably fit, strong and able to assist the rapid evacuation of the aircraft in an emergency after an appropriate briefing by the crew.

GM1 NCC.OP.165 Carriage of passengers

Meaning of 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.

AMC1 NCC.OP.180 Meteorological conditions

Evaluation of meteorological conditions

Pilots should carefully evaluate the available meteorological information relevant to the proposed flight, such as applicable surface observations, winds and temperatures aloft, terminal and area forecasts, air meteorological information reports (AIRMETs), significant meteorological information (SIGMET) and pilot reports. The ultimate decision whether, when, and where to make the flight rests with the pilot-in-command. Pilots should continue to re-evaluate changing weather conditions.

GM1 NCC.OP.180 Meteorological conditions

Continuation of a flight

In the case of in-flight re-planning, continuation of a flight refers to the point from which a revised flight plan applies.

GM1 NCC.OP.185 Ice and other contaminants — ground procedures

Terminology

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

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

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

(2) mixture of water and Type I fluid if heated to min 60 °C at the nozzle;

(3) Type II fluid;

(4) mixture of water and Type II fluid;

(5) Type III fluid;

(6) mixture of water and Type III fluid;

(7) Type IV fluid;

(8) mixture of water and Type IV fluid.

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

(b) 'Clear ice': a coating of ice, generally clear and smooth, but with some air pockets.

It forms on exposed objects, the temperatures of which are at, below or slightly above the freezing temperature, by the freezing of super-cooled drizzle, droplets or raindrops.

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

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

(e) 'Contamination check': a check of aircraft for contamination to establish the need for de-icing.

(f) 'De-icing fluid': such fluid includes, but is not limited to, the following:

(1) heated water;

(2) Type I fluid;

(3) mixture of water and Type I fluid;

(4) Type II fluid;

(5) mixture of water and Type II fluid;

(6) Type III fluid;

(7) mixture of water and Type III fluid;

(8) Type IV fluid;

(9) mixture of water and Type IV fluid.

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

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

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

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

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

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

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

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

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

Anti-icing codes

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

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

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

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

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

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

GM2 NCC.OP.185 Ice and other contaminants — ground procedures

De-Icing/Anti-Icing — Procedures

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

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

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

(3) 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) The operator's procedures should ensure the following:

(1) When aircraft surfaces are contaminated by ice, frost, slush or snow, they are de-iced prior to take-off, according to the prevailing conditions. Removal of contaminants may be performed with mechanical tools, fluids (including hot water), infrared heat or forced air, taking account of aircraft type-specific provisions.

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

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

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

(3) When freezing precipitation occurs or there is a risk of freezing precipitation occurring that would contaminate the surfaces at the time of take-off, aircraft surfaces should be anti-iced. If both de-icing and anti-icing are required, the procedure may be performed in a one or two-step process, depending upon

weather conditions, available equipment, available fluids and the desired hold-over time (HoT). 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 applied before the first- step fluid freezes, typically within three minutes 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 Type II or Type IV fluid should be considered.

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

(6) During conditions conducive to aircraft icing on the ground or after de-icing and/or anti-icing, an aircraft is not dispatched for departure unless it has been given a contamination check or a post-treatment check by a trained and qualified person. This check should cover all treated surfaces of the aircraft and be performed from points offering sufficient accessibility 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 pilot-in-command 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 pilot-in-command should arrange for 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 retreatment is necessary, any residue of the previous treatment should be removed and a completely new de-icing/anti-icing treatment should be applied.

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

(c) Special operational considerations

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

(2) The use of de-icing/anti-icing fluids should be in accordance with the aircraft manufacturer's documentation. This is particularly important for thickened fluids to assure sufficient flow-off during take-off.

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

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

(5) The limitations or handling procedures resulting from (c)(3) and/or (c)(4) 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 an 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

The operator should publish in the operations manual, 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.

(f) Training

The operator's initial and recurrent de-icing and/or anti-icing training programmes (including communication training) for flight crew and those of its personnel involved in the operation who are involved in de-icing and/or anti-icing 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, the operator should ensure that the contractor complies with the operator's training/qualification procedures, together with any specific procedures in respect of:

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

(2) fluids to be used, including precautions for storage and preparation for use;

(3) specific aircraft requirements (e.g. no-spray areas, propeller/engine de-icing, auxiliary power unit (APU) operation etc.); and

(4) checking and communications procedures.

(h) Special maintenance considerations

(1) General

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

(2) Special considerations regarding residues of dried fluids

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

(i) Dried fluid residues

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

(ii) Re-hydrated fluid residues

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

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

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

GM3 NCC.OP.185 Ice and other contaminants — ground procedures

De-Icing/Anti-Icing — Background Information

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

(a) General

(1) Any deposit of frost, ice, snow or slush on the external surfaces of an aircraft may drastically affect its flying qualities because of reduced aerodynamic lift, increased drag, modified stability and control characteristics. Furthermore, freezing deposits may cause moving parts, such as elevators, ailerons, flap actuating mechanism, etc., to jam and create a potentially hazardous condition. Propeller/engine/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, heavy snow, high wind velocity, fast dropping OAT or any time when freezing precipitation with high water content is present. 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) International Organization for Standardization (ISO) 11075 Aircraft — De-icing/anti-icing fluids — ISO type I;

(iv) ISO 11076 Aircraft — De-icing/anti-icing methods with fluids;

(v) ISO 11077 Aerospace — Self-propelled de-icing/anti-icing vehicles — Functional requirements;

(vi) ISO 11078 Aircraft — De-icing/anti-icing fluids — ISO types II, III and IV;

(vii) Association of European Airlines (AEA) ‘Recommendations for de-icing/anti-icing of aircraft on the ground’;

(viii) AEA ‘Training recommendations and background information for de-icing/anti-icing of aircraft on the ground’;

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

(x) Society of Automotive Engineers (SAE) AS5681 Minimum Operational Performance Specification for Remote On-Ground Ice Detection Systems;

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

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

(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. With this type of fluid, 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 that 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. With this type of fluid, the HoT can be extended by increasing the ratio of fluid in the fluid/water mix.

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

(4) Fluids used for de-icing and/or anti-icing should be acceptable to the operator and the aircraft manufacturer. These fluids normally conform to specifications such as SAE AMS1424, SAE AMS1428 or equivalent. 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 and age.

(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 a 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.

(4) References to usable HoT tables may be found in the AEA ‘Recommendations for de-icing/anti-icing of aircraft on the ground’.

AMC1 NCC.OP.190 Ice and other contaminants — flight procedures

Flight in expected or actual icing conditions

(a) 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 that 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 that should 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, that 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 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 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.

GM1 NCC.OP.215 Ground proximity detection

Guidance material for 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; 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 that 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 the 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; recurrent qualification. Under each of these four areas, the training material has been separated into those items that 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 that 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 global positioning system (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 provide 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 missed approach;

Mode 4: unsafe proximity to terrain; and

Mode 5: descent below ILS glide slope (caution only);

(b) an additional, optional alert mode:

Mode 6: radio altitude call-out (information only); and

(c) TAWS cautions and warnings that 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 is provided, use of predictive TAWS functions is prohibited when altimeter subscale settings display 'QFE' (atmospheric pressure at aerodrome elevation/runway threshold);

(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 missed approach). This will be in accordance with procedures specified by the operator, who will recognise that it may be more desirable that other data is 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 that 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 pilot-in-command 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 workload permits, that the flight crew should notify the air traffic controller of the new position and altitude/flight level and what the pilot-in-command 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:

(a) the aircraft is being operated by day in clear, visual conditions; and

(b) 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 flight simulation training device (FSTD) equipped with TAWS visual and aural displays and inhibit selectors similar in appearance and operation to those in the aircraft that the pilot will fly. The results should be assessed by a flight simulation training 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 orientated 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 ATC unit:

(A) whenever any manoeuvre has caused the aircraft to deviate from an air traffic clearance;

(B) when, following a manoeuvre that has caused the aircraft to deviate from an air traffic clearance, the aircraft has returned to a flight path that complies with the clearance; and/or

(C) when an air traffic control unit issues instructions that, 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 that 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 that 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 that was both appropriate and necessary;

(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 NCC.OP.220 Airborne collision avoidance system (ACAS)

General

(a) The ACAS operational procedures and training programmes established by the operator should take into account this Guidance Material. It incorporates advice contained in:

(1) ICAO Annex 10, Volume IV;

(2) ICAO PANS-OPS, Volume 1;

(3) ICAO PANS-ATM; and

(4) ICAO guidance material 'ACAS Performance-Based Training Objectives' (published under Attachment E of State Letter AN 7/1.3.7.2-97/77).

(b) Additional guidance material on ACAS may be referred to, including information available from such sources as EUROCONTROL.

ACAS Flight Crew Training

(c) During the implementation of ACAS, several operational issues were identified that 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 Guidance Material contains performance-based training objectives for ACAS II flight crew training. Information contained here 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.

(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 that 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 a RA deprives own aircraft of the collision protection provided by own ACAS.

(5) Additionally, in ACAS-ACAS encounters, failure to respond to a 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 a RA vary with altitude. The thresholds are larger at higher altitudes.

(c) A TA occurs from 15 to 48 seconds and a 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 which 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 which 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 10000 ft/min. In addition, the design implementation may result 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 1450 ft AGL.

(b) 'Descend' RAs are inhibited below 1100 ft AGL.

(c) All RAs are inhibited below 1000 ft AGL.

(d) All TA aural annunciations are inhibited below 500 ft AGL.

(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:

(A) 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 the following:

(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.

(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.

(B) 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 ± 1200 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 that 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 that 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 2500 ft/min, an increase rate RA cannot be properly displayed.

(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.

(C) 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 1200 ft, and to some intersecting runways, RAs can be expected. If, for any reason, TA only is not selected and a 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.

(D) 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.

(E) 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 a RA with which they are complying.

(F) 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 a 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. 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 that 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.

(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, crew resource management (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 a 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 a 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 1500 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 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 5 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 2½ 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 2½ 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 1500 ft/min is accomplished in approximately 5 seconds, and of ⅓ g if the change is accomplished in approximately 3 seconds. The change in pitch attitude required to establish a rate of climb or descent of 1500 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: 1000 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 a 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 a RA. As such, it is possible for ACAS to issue a RA against one intruder that results in a manoeuvre towards another intruder that 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.

AMC1 NCC.OP.225 Approach and landing conditions

Landing Distance/FATO Suitability

The in-flight determination of the landing distance/FATO suitability should be based on the latest available meteorological report.

AMC1 NCC.OP.230 Commencement and continuation of approach

Visual references for instrument approach operations

(a) NPA, APV and CAT I operations

At DH or MDH, at least one of the visual references specified below should be distinctly visible and identifiable to the pilot:

(1) elements of the approach lighting system;

(2) the threshold;

(3) the threshold markings;

(4) the threshold lights;

(5) the threshold identification lights;

(6) the visual glide slope indicator;

(7) the touchdown zone or touchdown zone markings;

(8) the touchdown zone lights;

(9) FATO/runway edge lights; or

(10) other visual references specified in the operations manual.

(b) Lower than standard category I (LTS CAT I) operations

At DH, the visual references specified below should be distinctly visible and identifiable to the pilot:

(1) a segment of at least three consecutive lights, being the centreline of the approach lights, or touchdown zone lights, or runway centreline lights, or runway edge lights, or a combination of these; and

(2) this visual reference should include a lateral element of the ground pattern, such as an approach light crossbar or the landing threshold or a barrette of the touchdown zone light unless the operation is conducted utilising an approved HUDLS usable to at least 150 ft.

(c) CAT II or OTS CAT II operations

At DH, the visual references specified below should be distinctly visible and identifiable to the pilot:

(1) a segment of at least three consecutive lights, being the centreline of the approach lights, or touchdown zone lights, or runway centreline lights, or runway edge lights, or a combination of these; and

(2) this visual reference should include a lateral element of the ground pattern, such as an approach light crossbar or the landing threshold or a barrette of the touchdown zone light unless the operation is conducted utilising an approved HUDLS to touchdown.

(d) CAT III operations

(1) For CAT IIIA operations and for CAT IIIB operations conducted either with fail-passive flight control systems or with the use of an approved HUDLS: at DH, a segment of at least three consecutive lights, being the centreline of the approach lights, or touchdown zone lights, or runway centreline lights, or runway edge lights, or a combination of these is attained and can be maintained by the pilot.

(2) For CAT IIIB operations conducted either with fail-operational flight control systems or with a fail-operational hybrid landing system using a DH: at DH, at least one centreline light is attained and can be maintained by the pilot.

(3) For CAT IIIB operations with no DH there is no requirement for visual reference with the runway prior to touchdown.

(e) Approach operations utilising EVS – CAT I operations

(1) At DH or MDH, the following visual references should be displayed and identifiable to the pilot on the EVS:

(i) elements of the approach light; or

(ii) the runway threshold, identified by at least one of the following:

(A) the beginning of the runway landing surface,

(B) the threshold lights, the threshold identification lights; or

(C) the touchdown zone, identified by at least one of the following: the runway touchdown zone landing surface, the touchdown zone lights, the touchdown zone markings or the runway lights.

(2) At 100 ft above runway threshold elevation at least one of the visual references specified below should be distinctly visible and identifiable to the pilot without reliance on the EVS:

(i) the lights or markings of the threshold; or

(ii) the lights or markings of the touchdown zone.

(f) Approach operations utilising EVS – APV and NPA operations flown with the CDFA technique

(1) At DH/MDH, visual references should be displayed and identifiable to the pilot on the EVS image as specified under (a).

(2) At 200 ft above runway threshold elevation, at least one of the visual references specified under (a) should be distinctly visible and identifiable to the pilot without reliance on the EVS.

Subpart C — Aircraft performance and operating limitations

AMC1 NCC.POL.105(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.

(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 NCC.POL.105(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.

(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 should be done either by weighing the aircraft or by calculation.

(c) When weighing an aircraft, normal precautions should be taken, which are 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 2 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 Table 1 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 %

AMC1 NCC.POL.105(c) Mass and balance, loading

Dry operating mass

(a) The dry operating mass should include:

(1) crew and crew baggage;

(2) catering and removable passenger service equipment; and

(3) tank water and lavatory chemicals.

(b) The operator should correct the dry operating mass to account for any additional crew baggage. The position of this additional baggage should be accounted for when establishing the centre of gravity of the aircraft.

(c) The operator should establish a procedure in the operations manual to determine when to select actual or standard masses for crew members.

(d) When determining the actual mass by weighing, crew members' personal belongings and hand baggage should be included. Such weighing should be conducted immediately prior to boarding the aircraft.

AMC1 NCC.POL.105(d) Mass and balance, loading

Mass values for passengers and baggage

(a) The predetermined mass for hand baggage and clothing should be established by the operator on the basis of studies relevant to its 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, provided in Tables 1 and 2 of NCC.POL.105 (e), 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 of NCC.POL.105 (e) 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 of NCC.POL.105 (e) may be used.

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 of NCC.POL.105 (e). Articles such as an overcoat, an umbrella, a small handbag or purse, reading material or a small camera are not considered as hand baggage.

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.

The mass of checked baggage should be checked prior to loading and increased, if necessary.

(e) 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.

(f) 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.

GM1 NCC.POL.105(d) Mass and balance, loading

Adjustment of standard masses

When standard mass values are used, item (e) of AMC1 NCC.POL.105 (d) 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 loading personnel as well as cabin and flight crew 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; 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.

GM1 NCC.POL.105(e) Mass and balance, loading

Reserved

GM1 NCC.POL.105(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 (reciprocating 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

AMC1 NCC.POL.110(a) Mass and balance data and documentation

Contents

The mass and balance documentation should include advice to the pilot-in-command whenever a non-standard method has been used for determining the mass of the load.

AMC2 NCC.POL.110(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 NCC.POL.110(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 NCC.POL.110(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 pilot-in-command should be available on the ground.

GM1 NCC.POL.110(b) Mass and balance data and documentation

On-board integrated mass and balance computer system

An on-board integrated mass and balance computer system may be an aircraft installed system capable of receiving input data either from other aircraft systems or from a mass and balance system on the ground, in order to generate mass and balance data as an output.

GM2 NCC.POL.110(b) Mass and balance data and documentation

Stand-alone computerised mass and balance system

A stand-alone computerised mass and balance system may be a computer, either as part of an electronic flight bag (EFB) system or solely dedicated to mass and balance purposes, requiring input from the user, in order to generate mass and balance data as an output.

AMC1 NCC.POL.125 Take-off — aeroplanes

Take-off mass

The following should be considered for determining the maximum take-off mass:

(a) the pressure altitude at the aerodrome;

(b) the ambient temperature at the aerodrome;

(c) the runway surface condition and the type of runway surface;

(d) the runway slope in the direction of take-off;

(e) not more than 50 % of the reported head-wind component or not less than 150 % of the reported tailwind component; and

(f) the loss, if any, of runway length due to alignment of the aeroplane prior to take- off.

AMC2 NCC.POL.125 Take-off — aeroplanes

Contaminated runway performance data

Wet and contaminated runway performance data, if made available by the manufacturer, should be taken into account. If such data is not made available, the operator should account for wet and contaminated runway conditions by using the best information available.

AMC3 NCC.POL.125 Take-off — aeroplanes

Adequate margin

The adequate margin should be defined in the operations manual.

GM1 NCC.POL.125 Take-off — aeroplanes

Runway surface condition

Operation on runways contaminated with water, slush, snow or ice implies uncertainties with regard to runway friction and contaminant drag and therefore to the achievable performance and control of the aeroplane during take-off or landing, since the actual conditions may not completely match the assumptions on which the performance information is based. In the case of a contaminated runway, the first option for the pilot- in-command is to wait until the runway is cleared. If this is impracticable, he/she may consider a take-off or landing, provided that he/she has applied the applicable performance adjustments, and any further safety measures he/she considers justified under the prevailing conditions. The excess runway length available including the criticality of the overrun area should also be considered.

GM2 NCC.POL.125 Take-off — aeroplanes

Adequate margin

'An adequate margin' is illustrated by the appropriate examples included in Attachment C to ICAO Annex 6, Part I.

AMC1 NCC.POL.135 Landing — aeroplanes

General

The following should be considered to ensure that an aeroplane is able to land and stop, or a seaplane to come to a satisfactorily low speed, within the landing distance available:

(a) the pressure altitude at the aerodrome;

(b) the runway surface condition and the type of runway surface;

(c) the runway slope in the direction of landing;

(d) not more than 50 % of the reported head-wind component or not less than 150 % of the reported tailwind component; and

(e) use of the most favourable runway, in still air;

(f) use of the runway most likely to be assigned considering the probable wind speed and direction and the ground handling characteristics of the aeroplane, and considering other conditions such as landing aids and terrain.

AMC2 NCC.POL.135 Landing — aeroplanes

Allowances

The allowances should be stated in the operations manual.

Subpart D — Instrument Data Equipment

Section 1 — Aeroplanes

GM1 NCC.IDE.A.100(a) Instruments and equipment — general

Applicable airworthiness requirements

The applicable airworthiness requirements for approval of instruments and equipment required by this Part are the following:

(a) Part 21 for:

(1) aeroplanes registered in the State of Kuwait; and

(2) aeroplanes registered outside the State of Kuwait but manufactured or designed by an EU organisation.

(b) Airworthiness requirements of the state of registry for aeroplanes registered, designed and manufactured outside the EU.

GM1 NCC.IDE.A.100(b)&(c) Instruments and equipment — general

Instruments and equipment that do not need to be approved

(a) The provision of this paragraph does not exempt the item of equipment from complying with the applicable airworthiness requirements if the instrument or equipment is installed in the aeroplane. In this case, the installation should be approved as required in the applicable airworthiness requirements and should comply with the applicable airworthiness codes.

(b) The functionality of non-installed instruments and equipment required by this Part that do not need an equipment approval should be checked against recognised industry standards appropriate for the intended purpose. The operator is responsible for ensuring the maintenance of these instruments and equipment.

(c) The failure of additional non-installed instruments or equipment not required by this Part or by the applicable airworthiness requirements or any applicable airspace requirements should not adversely affect the airworthiness and/or the safe operation of the aircraft. Examples are the following:

(1) instruments supplying additional flight information (e.g. stand-alone global positioning system (GPS));

(2) mission dedicated equipment (e.g. radios); and

(3) non-installed passenger entertainment equipment.

GM1 NCC.IDE.A.100(d) Instruments and equipment — general

Positioning of instruments

This requirement implies that whenever a single instrument is required in an aeroplane operated in a multi-crew environment, the instrument needs to be visible from each flight crew station.

GM1 NCC.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 NCC.IDE.A.120&NCC.IDE.A.125 Operations under VFR & operations under IFR — 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. The information so available to each required pilot should not be less than that required in the applicable operational requirements, and the equivalent safety of the installation should be approved during type certification 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 NCC.IDE.A.120 Operations under VFR — 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 NCC.IDE.A.120 (a)(5) & (b)(1)(i) may be:

(a) a turn and slip indicator;

(b) a turn coordinator; or

(c) both an attitude indicator and a slip indicator.

AMC1 NCC.IDE.A.120(a)(1)&NCC.IDE.A.125(a)(1) Operations under VFR & operations under IFR — flight and navigational instruments and associated equipment

Means of measuring and displaying magnetic heading

The means of measuring and displaying magnetic heading should be a magnetic compass or equivalent.

AMC1 NCC.IDE.A.120(a)(2)&NCC.IDE.A.125(a)(2) Operations under VFR & operations under IFR — 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 NCC.IDE.A.120(a)(3)&NCC.IDE.A.125(a)(3) Operations under VFR & operations under IFR — flight and navigational instruments and associated equipment

Calibration of the means for 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.

AMC2 NCC.IDE.A.125(a)(3) Operations under IFR — flight and navigational instruments and associated equipment

Altimeters — IFR or night operations

Except for unpressurised aeroplanes operating below 10000 ft, the altimeters of aeroplanes operating under IFR or at night should have counter drum-pointer or equivalent presentation.

AMC1 NCC.IDE.A.120(a)(4)&NCC.IDE.A.125(a)(4) Operations under VFR & operations under IFR — flight and navigational instruments and associated equipment

Calibration of the instrument indicating airspeed

The instrument indicating airspeed should be calibrated in knots (kt).

AMC1 NCC.IDE.A.120(c)&NCC.IDE.A.125(c) Operations under VFR & operations under IFR — flight and navigational instruments and associated equipment

Multi-pilot operations - duplicate instruments

Duplicate instruments include separate displays for each pilot and separate selectors or other associated equipment where appropriate.

AMC1 NCC.IDE.A.125(a)(9) Operations under IFR — 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 NCC.IDE.A.125(d) Operations under IFR — 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.

AMC1 NCC.IDE.A.125(f) Operations under IFR — 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).

AMC1 NCC.IDE.A.135 Terrain awareness warning system (TAWS)

Excessive downwards glideslope deviation warning for Class A TAWS

The requirement for a Class A TAWS to provide a warning to the flight crew for excessive downwards glideslope deviation should apply to all final approach glideslopes 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 NCC.IDE.A.135 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 equivalent.

AMC1 NCC.IDE.A.145 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 5700 kg and an MOPSC of not more than nine, 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 NCC.IDE.A.155 Flight crew interphone system

Type of flight crew interphone

The flight crew interphone system should not be of a handheld type.

AMC1 NCC.IDE.A.160 Cockpit voice recorder

General

The operational performance requirements for cockpit voice recorders (CVRs) should be those laid down in the European Organisation for Civil Aviation Equipment (EUROCAE) Document ED-112 (Minimum Operational Performance Specification for Crash Protected Airborne Recorder Systems), dated March 2003, including amendments n°1 and 2, or any later equivalent standard produced by EUROCAE.

AMC1 NCC.IDE.A.165 Flight data recorder

Operational performance requirements

(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 n°1 and n°2, or any later equivalent standard produced by EUROCAE.

(b) The flight data recorder 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 (designated ranges, sampling intervals, accuracy limits and minimum resolution in read-out) as defined in the relevant tables of EUROCAE Document ED-112, dated March 2003, including amendments n°1 and 2, or any later equivalent standard produced by EUROCAE.

Table 1: All Aeroplanes

No*	Parameter
1a	Time; or
1b	Relative time count
1c	Global navigation satellite system (GNSS) time synchronization
2	Pressure altitude
3	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	Engine thrust/power:
9a	Parameters required to determine propulsive thrust/power on each engine
9b	Flight crew compartment thrust/power lever position (for aeroplanes with non- mechanically linked flight crew compartment — engine controls)
14	Total or outside air temperature
16	Longitudinal acceleration (body axis)
17	Lateral acceleration
18	Primary flight control surface and primary flight control pilot input (for multiple or split surfaces, a suitable combination of inputs is acceptable instead 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 (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 (and a sensor of each landing gear if installed)

No*	Parameter
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

* The number in the left hand column reflects the serial number depicted in EUROCAE ED-112.

Table 2: 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	Flaps
10a	Trailing edge flap position
10b	Flight crew compartment control selection
11	Slats
11a	Leading edge flap (slat) position
11b	Flight crew compartment control selection
12	Thrust reverse status
13	Ground spoiler and speed brake:
13a	Ground spoiler position
13b	Ground spoiler selection
13c	Speed brake position
13d	Speed brake selection
15	Autopilot, autothrottle, 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	Vertical deviation — (the approach aid in use should be recorded. For auto- land/CAT III operations, each system should be recorded.):
21a	ILS/GPS/GLS glide path
21b	MLS elevation
21c	GNSS approach path/integrated area navigation (IRNAV) vertical deviation
22	Horizontal deviation — (the approach aid in use should be recorded. For auto- land/CAT III operations, each system should be recorded. It is acceptable to arrange them so that at least one is recorded every second):
22a	ILS/GPS/GLS localiser
22b	MLS azimuth

No*	Parameter
22c	GNSS approach path/IRNAV lateral deviation
26	Distance measuring equipment (DME) 1 and 2 distances: Distance to runway threshold (GLS)
26a	Distance to missed approach -
26b	Point (IRNAV/IAN)
28	Ground proximity warning system (GPWS)/TAWS/ground collision avoidance system (GCAS) status:
28a	Selection of terrain display mode, including pop-up display status
28b	Terrain alerts, including cautions and warnings and advisories
28c	On/off switch position
29	Angle of attack
30	Low pressure warning (each system):
30a	Hydraulic pressure
30b	Pneumatic pressure
31	Ground speed
32	Landing gear:
32a	Landing gear
32b	Gear selector position
33	Navigation data:
33a	Drift angle
33b	Wind speed
33c	Wind direction
33d	Latitude
33e	Longitude
33f	GNSS augmentation in use
34	Brakes:
34a	Left and right brake pressure
34b	Left and right brake pedal position
35	Additional engine parameters (if not already recorded in parameter 9 of Table 1 of AMC1 NCC.IDE.A.165 and if the aeroplane is equipped with a suitable data source):
35a	Engine pressure ratio (EPR)
35b	N1
35c	Indicated vibration level
35d	N2
35e	Exhaust gas temperature (EGT)
35f	Fuel flow

No*	Parameter
35g	Fuel cut-off lever position
35h	N3
36	Traffic alert and collision avoidance system (TCAS)/ACAS — a suitable combination of discretes should be recorded to determine the status of the system:
36a	Combined control
36b	Vertical control
36c	Up advisory
36d	Down advisory
36e	Sensitivity level
37	Wind shear warning
38	Selected barometric setting:
38a	Pilot
38b	Co-pilot
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	Selected flight path (All pilot selectable modes of operation) - to be recorded for the aeroplane where the parameter is displayed electronically:
44a	Course/desired track (DSTRK)
44b	Path angle
44c	Coordinates of final approach path (IRNAV/IAN)
45	Selected decision height - to be recorded for the aeroplane where the parameter is displayed electronically
46	Electronic flight instrument system (EFIS) display format:
46a	Pilot
46b	Co-pilot
47	Multi-function/engine/alerts display format
48	AC electrical bus status — each bus
49	DC electrical bus status — each bus

No*	Parameter
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 or 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 60c 60d 60e 60f	Primary navigation system reference: GNSS Inertial navigational system (INS) VHF omnidirectional radio range (VOR)/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
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	Flight crew compartment trim control input position pitch — when mechanical means for control inputs are not available, cockpit display trim positions or trim command should be recorded

No*	Parameter
73	Flight crew compartment trim control input position roll — when mechanical means for control inputs are not available, cockpit display trim positions or trim command should be recorded
74	Flight crew compartment trim control input position yaw — when mechanical means for control inputs are not available, cockpit display trim positions or trim command should be recorded
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 ED-112.

AMC1 NCC.IDE.A.170 Data link recording

General

(a) As a means of compliance with NCC.IDE.A.170 (a) the recorder on which the data link messages are recorded may be:

(1) the CVR;

(2) the FDR;

(3) a combination recorder when NCC.IDE.A.175 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 2, or any later equivalent standard produced by EUROCAE.

(b) As a means of compliance with NCC.IDE.A.170 (a)(2) the operator should enable correlation by providing information that allows an accident investigator to understand what data was provided to the aircraft 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 NCC.IDE.A.170 (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 flight 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’s architecture’, in NCC.IDE.A.170 (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.

(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: Data link recording

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 controllers on the ground. 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 clearances (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 (data link-meteorological aerodrome or aeronautical report (D-METAR) or terminal weather information for pilots (TWIP)), data link flight information service (D-FIS), and Notice to Airmen (electronic NOTAM) delivery.	C
5	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 aeronautical administrative communication (AAC) messages, but there is no requirement to record AAC messages	M*

Item No.	Application Type	Application Description	Required Recording Content
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 NCC.IDE.A.170 Data link recording

General

(a) The letters and expressions in Table 1 of AMC1 NCC.IDE.A.170 have the following meaning:

(1) C: complete contents recorded.

(2) M: information that enables correlation with any associated records stored separately from the aeroplane.

(3) *: applications that are to be recorded only as far as is practicable, given the architecture of the system.

(4) 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.

(5) 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 NCC.IDE.A.170 are described in Table 1 below.

Table 1: Definitions 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. Mainly used in oceanic and remote areas.
5	ADS-B	Surveillance data	Information that enables correlation with any associated records stored separately from the aeroplane.
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

Item No.	Application Type	Messages	Comments
8	D-ATIS	ATIS messages	Refer to EUROCAE ED-89A, dated December 2003: Data Link Application System Document (DLASD) for the 'ATIS' data link service
9	OCL	OCL messages	Refer to EUROCAE ED-106A, dated March 2004: Data Link Application System Document (DLASD) for 'Oceanic Clearance' (OCL) data link service
10	DCL	DCL messages	Refer to EUROCAE ED-85A, dated December 2005: 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 aeroplane. Definition in EUROCAE ED-112, dated March 2003.
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

AMC1 NCC.IDE.A.175 Flight data and cockpit voice combination recorder

General

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.

GM1 NCC.IDE.A.175 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 NCC.IDE.A.160; and

(2) all parameters required by NCC.IDE.A.165, with the same specifications required by NCC.IDE.A.160 and NCC.IDE.A.165.

(b) In addition, a flight data and cockpit voice combination recorder may record data link communication messages and related information required by NCC.IDE.A.170.

AMC1 NCC.IDE.A.180 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 by a competent authority on the basis of a technical standard and marked accordingly.

(2) CRDs approved for use in motor vehicles according to the UN standard ECE R 44, -03 or later series of amendments.

(3) CRDs approved for use in motor vehicles and aircraft according to Canadian CMVSS 213/213.1.

(4) CRDs approved for use in motor vehicles and aircraft according to US FMVSS No 213 and manufactured to these standards on or after February 26, 1985. US approved CRDs manufactured after this date should bear the following labels in red letters:

(i) 'THIS CHILD RESTRAINT SYSTEM CONFORMS TO ALL APPLICABLE FEDERAL MOTOR VEHICLE SAFETY STANDARDS'; and

(ii) 'THIS RESTRAINT IS CERTIFIED FOR USE IN MOTOR VEHICLES AND AIRCRAFT';

(5) CRDs qualified for use in aircraft according to the German 'Qualification Procedure for Child Restraint Systems for Use in Aircraft' (TÜV Doc. TÜV/958-01/2001); and

(6) Devices approved for use in cars, manufactured and tested to 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 competent authority.

(c) Location

(1) Forward facing CRDs 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 CRDs should only be installed on forward facing passenger seats. A CRD may 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 in a CRD should be located as near to a floor level exit as feasible.

(3) An infant in a CRD should not hinder evacuation for any passenger.

(4) An infant 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 are from the same family or travelling group provided the infants are accompanied by a responsible adult sitting next to them.

(6) A row segment is the fraction of a row separated by two aisles or by one aisle and the aeroplane fuselage.

(d) Installation

(1) CRDs should only be installed on a suitable aircraft seat with the type of connecting device they are approved or qualified for e.g. CRDs to be connected by a three point harness only (most rearward facing baby CRDs currently available) should not be attached to an aeroplane seat with a lap belt only; a CRD designed to be attached to a vehicle seat by means of rigid bar lower anchorages (ISO-FIX or US equivalent) only, should only be used on aeroplane seats that are equipped with such connecting devices and should not be attached by the aeroplane seat lap belt. The method of connecting should be the one shown in the manufacturer's instructions provided with each CRD.

(2) All safety and installation instructions should be followed carefully by the responsible adult accompanying the infant. Crew members should prohibit the use of any inadequately installed CRD or not qualified seat.

(3) If a forward facing CRD with a rigid backrest is to be fastened by a 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 CRD on the aircraft seat if the aircraft seat is reclinable.

(4) The buckle of the adult safety belt should be easily accessible for both opening and closing, and should 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 CRD is adjustable in recline, it should be in an upright position for all occasions when passenger restraint devices are required.

AMC2 NCC.IDE.A.180 Seats, seat safety belts, restraint systems and child restraint devices

Upper torso restraint system

An upper torso restraint system having three straps is deemed to be compliant with the requirement for restraint systems with two shoulder straps.

Safety belt

A safety belt with diagonal shoulder strap (three anchorage points) is deemed to be compliant with the requirement for safety belts (two anchorage points).

AMC3 NCC.IDE.A.180 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.

AMC1 NCC.IDE.A.190 First-aid 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 amended 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 FAKs:

(1) Equipment:

(i) bandages (assorted sizes);

(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; and

(xiii) thermometers (non-mercury)

(2) Medications:

(i) simple analgesic (may include liquid form);

(ii) antiemetic;

(iii) nasal decongestant;

(iv) gastrointestinal antacid, in the case of aeroplanes carrying more than nine passengers;

(v) anti-diarrhoeal medication, in the case of aeroplanes carrying more than nine passengers; and

(vi) antihistamine.

(3) Other:

(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) medical incident report form; and

(iv) biohazard disposal bags.

(4) An eye irrigator, although not required to be carried in the FAK, should, where possible, be available for use on the ground.

AMC2 NCC.IDE.A.190 First-aid 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.

AMC1 NCC.IDE.A.195 Supplemental oxygen — pressurised aeroplanes

Determination of oxygen

(a) In the determination of the amount of 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 oxygen should be determined on the basis of cabin pressure altitude and 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 competent authority 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.

GM1 NCC.IDE.A.195(c)(2) 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 NCC.IDE.A.200 Supplemental oxygen — non-pressurised aeroplanes

Determination of oxygen

(a) On routes where the 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 may be provided 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 for the flight.

(b) 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 NCC.IDE.A.205 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 toilets, galleys, etc. These considerations may result in the number of fire extinguishers being 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 NCC.IDE.A.210 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 NCC.IDE.A.215 Emergency locator transmitter (ELT)

ELT batteries

Batteries used in the ELTs should be replaced (or recharged, if the battery is rechargeable) when the equipment has been in use for more than 1 cumulative hour, and also when 50 % of their useful life (or for rechargeable, 50 % of their useful life of charge), as established by the equipment manufacturer, has expired. The new expiry date for the replacement (or recharged) battery should be legibly marked on the outside of the equipment. The battery useful life (or useful life of charge) requirements of this paragraph do not apply to batteries (such as water-activated batteries) that are essentially unaffected during probable storage intervals.

AMC2 NCC.IDE.A.215 Emergency locator transmitter (ELT)

Types of ELT 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 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 ejected, deployed and activated by an impact, and, in some cases, also by hydrostatic sensors. Manual deployment is also provided. This type of ELT should float in water and is intended to aid SAR teams in locating the crash site.

(4) 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.

(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 and should be registered with the national agency responsible for initiating search and rescue or other nominated agency.

AMC1 NCC.IDE.A.220 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.

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 Agency or equivalent.

Risk assessment

(a) When conducting the risk assessment, the pilot-in-command should base his/her decision, as far as is practicable, on the Implementing Rules and AMCs applicable to the operation of the aeroplane.

(b) The pilot-in-command should, for determining the risk, take the following operating environment and conditions into account:

(1) sea state;

(2) sea and air temperatures;

(3) the distance from land suitable for making an emergency landing; and

(4) the availability of search and rescue facilities.

AMC2 NCC.IDE.A.220 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.

GM1 NCC.IDE.A.220 Flight over water

Seat cushions

Seat cushions are not considered to be flotation devices.

AMC1 NCC.IDE.A.230(a)(2) 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 NCC.IDE.A.230(a)(3) Survival equipment

Additional survival equipment

(a) The following additional survival equipment should be carried when required:

(1) 500 ml of water for each four, or fraction of four, 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 of 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 carried.

(c) If any item of equipment contained in the above list is already carried on board the aircraft in accordance with another requirement, there is no need for this to be duplicated.

AMC1 NCC.IDE.A.230(b)(2) Survival equipment

Applicable airworthiness standard

The applicable airworthiness standard should be CS-25 or equivalent.

GM1 NCC.IDE.A.230 Survival equipment

Signalling equipment

The signalling equipment for making distress signals is described in ICAO Annex 2, Rules of the Air.

GM2 NCC.IDE.A.230 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 competent 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 NCC.IDE.A.240 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 adequately adjustable in order to fit the flight crew'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 NCC.IDE.A.240 Headset

General

The term 'headset' includes any aviation helmet incorporating headphones and microphone worn by a flight crew member.

GM1 NCC.IDE.A.245 Radio communication equipment

Applicable airspace requirements

For aeroplanes being operated under European air traffic control, the applicable airspace requirements include the Single European Sky legislation.

AMC1 NCC.IDE.A.255 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 NCC.IDE.A.260 Electronic navigation data management

Electronic navigation data products

(a) When the operator of a complex motor-powered aeroplane uses a navigation database that supports an airborne navigation application as a primary means of navigation, the navigation database supplier should hold a Type 2 letter of acceptance (LoA), or equivalent.

(b) If this airborne navigation application is needed for an operation requiring a specific approval in accordance with Part-SPA, the operator's procedures should be based upon the Type 2 LoA acceptance process.

GM1 NCC.IDE.A.260 Electronic navigation data management

Section 2 — Helicopters

GM1 NCC.IDE.H.100(a) Instruments and equipment — general

Applicable airworthiness requirements

The applicable airworthiness requirements for approval of instruments and equipment required by this Part are the following:

(a) Part-21 for:

(1) helicopters registered in the State of Kuwait; and

(2) helicopters registered outside the State of Kuwait but manufactured or designed by an EU organisation.

(b) Airworthiness requirements of the state of registry for helicopters registered, designed and manufactured outside the EU.

GM1 NCC.IDE.H.100(b)&(c) Instruments and equipment — general

Instruments and equipment that do not need to be approved

(a) The provision of this paragraph does not exempt the item of equipment from complying with the applicable airworthiness requirements if the instrument or equipment is installed in the helicopter. In this case, the installation should be approved as required in the applicable airworthiness requirements and should comply with the applicable airworthiness codes.

(b) The functionality of non-installed instruments and equipment required by this Part that do not need an equipment approval should be checked against recognised industry standards appropriate for the intended purpose. The operator is responsible for ensuring the maintenance of these instruments and equipment.

(c) The failure of additional non-installed instruments or equipment not required by this Part or by the applicable airworthiness requirements or any applicable airspace requirements should not adversely affect the airworthiness and/or the safe operation of the aircraft. Examples are the following:

(1) instruments supplying additional flight information (e.g. stand-alone global positioning system (GPS));

(2) some aerial work equipment (e.g. some mission dedicated radios, wire cutters); and

(3) non-installed passenger entertainment equipment.

GM1 NCC.IDE.H.100(d) Instruments and equipment — general

Positioning of instruments

This requirement implies that whenever a single instrument is required in a helicopter operated in a multi-crew environment, the instrument needs to be visible from each flight crew station.

AMC1 NCC.IDE.H.115 Operating lights

Landing light

The landing light should be trainable, at least in the vertical plane.

AMC1 NCC.IDE.H.120&NCC.IDE.H.125 Operations under VFR & operations under IFR — 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. The information so available to each required pilot should not be less than that required in the applicable operational requirements, and the equivalent safety of the installation should be approved during type certification 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 NCC.IDE.H.120(a)(1)&NCC.IDE.H.125(a)(1) Operations under VFR & operations under IFR — flight and navigational instruments and associated equipment

Means of measuring and displaying magnetic heading

The means of measuring and displaying magnetic heading should be a magnetic compass or equivalent.

AMC1 NCC.IDE.H.120(a)(2)&NCC.IDE.H.125(a)(2) Operations under VFR & operations under IFR — flight and navigational instruments and associated equipment

Means for measuring and displaying the time

An acceptable means of compliance is be a clock displaying hours, minutes and seconds, with a sweep-second pointer or digital presentation.

AMC1 NCC.IDE.H.120(a)(3)&NCC.IDE.H.125(a)(3) Operations under VFR & operations under IFR — flight and navigational instruments and associated equipment

Calibration of the means for 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 NCC.IDE.H.120(a)(4)&NCC.IDE.H.125(a)(4) Operations under VFR & operations under IFR — flight and navigational instruments and associated equipment

Calibration of the instrument indicating airspeed

The instrument indicating airspeed should be calibrated in knots (kt).

AMC1 NCC.IDE.H.120(b)(1)(iii)&NCC.IDE.H.125(a)(8) Operations under VFR & operations under IFR — 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 NCC.IDE.H.125(a)(9) Operations under IFR — 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 NCC.IDE.H.120(c)&NCC.IDE.H.125(c) Operations under VFR & operations under IFR — flight and navigational instruments and associated equipment

Multi-pilot operations — duplicate instruments

Duplicate instruments include separate displays for each pilot and separate selectors or other associated equipment where appropriate.

AMC1 NCC.IDE.H.125(d) Operations under VFR & operations under IFR — 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.

AMC1 NCC.IDE.H.125(f) Operations under IFR — 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).

AMC1 NCC.IDE.H.145 Airborne weather detecting equipment

General

The airborne weather detecting equipment should be an airborne weather radar.

AMC1 NCC.IDE.H.155 Flight crew interphone system

Type of flight crew interphone

The flight crew interphone system should not be of a handheld type.

AMC1 NCC.IDE.H.160 Cockpit voice recorder

General

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 n°1 and 2, or any later equivalent standard produced by EUROCAE.

AMC1 NCC.IDE.H.165 Flight data recorder

Operational performance requirements

(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 n°1 and n°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 recorded by the FDR should meet, as far as practicable, the performance specifications (designated ranges, sampling intervals, accuracy limits and minimum resolution in read-out) defined in EUROCAE ED-112, including amendments n°1 and n°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 to the Kuwait DGCA.

Table 1: FDR parameters — All helicopters

No*	Parameter
1	Time or relative time count
2	Pressure altitude
3	Indicated airspeed
4	Heading
5	Normal acceleration
6	Pitch attitude
7	Roll attitude
8	Manual radio transmission keying CVR/FDR synchronisation reference
9 9a 9b 9c	Power on each engine: Free power turbine speed (NF) Engine torque Engine gas generator speed (NG)
9d	Flight crew compartment power control position

No*	Parameter
9e	Other parameters to enable engine power to be determined
10a	Main rotor speed
10b	Rotor brake (if installed)
11	Primary flight controls — Pilot input and/or control output position (if applicable):
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.)
13	Outside air temperature
18	Yaw rate or yaw acceleration
20	Longitudinal acceleration (body axis)
21	Lateral acceleration
25	Marker beacon passage
26	Warnings — a discrete should be recorded for the master warning, gearbox low oil pressure and stability augmentation system as 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 number depicted in EUROCAE ED-112.

Table 2: FDR parameters — 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

No*	Parameter
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
31	Engine exhaust gas temperature (T4)
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:

No*	Parameter
38a 38b	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	Not used (selected Mach)
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
47	Multi-function/engine/alerts display format
48	Event marker

* The number in the left hand column reflects the serial number depicted in EUROCAE ED-112.

AMC1 NCC.IDE.H.170 Data link recording

General

(a) As a means of compliance with NCC.IDE.H.170, the recorder on which the data link messages are recorded should be:

(1) the CVR;

(2) the FDR;

(3) a combination recorder when NCC.IDE.H.175 is applicable; or

(4) a dedicated flight recorder. In such a 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 n°1 and n°2, or any later equivalent standard produced by EUROCAE.

(b) As a means of compliance with NCC.IDE.H.170 (a)(2), the operator should enable correlation by providing information that allows an accident investigator to understand what data was provided to the aircraft 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 NCC.IDE.H.170 (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 flight 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's architecture', in NCC.IDE.H.170 (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.

(f) Data link communications messages that support the applications in Table 1 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: Data link recording

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 controllers on the ground. 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 clearances (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

Item No.	Application Type	Application Description	Required Recording Content
4	Flight information	This includes any application used for delivery of flight information data to specific helicopters. 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	Broadcast surveillance	This includes elementary and enhanced surveillance systems, as well as automatic dependent surveillance-broadcast (ADS-B) output data.	M*, F2
6	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 NCC.IDE.H.170 Data link recording

General

(a) The letters and expressions in Table 1 of AMC1 NCC.IDE.H.170 have the following meaning:

(1) C: complete contents recorded.

(2) M: information that enables correlation with any associated records stored separately from the helicopter.

(3) *: applications that are to be recorded only as far as is practicable, given the architecture of the system.

(4) 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.

(5) 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 NCC.IDE.H.170 are described in Table 1 below.

Table 1: Definitions 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

Item No.	Application Type	Messages	Comments
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. Mainly 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 ED-89A, dated December 2003: Data Link Application System Document (DLASD) for the 'ATIS' data link service
9	OCL	OCL messages	Refer to EUROCAE ED-106A, dated March 2004: Data Link Application System Document (DLASD) for 'Oceanic Clearance' (OCL) data link service
10	DCL	DCL messages	Refer to EUROCAE ED-85A, dated March 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 helicopter.
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 ED-112, dated March 2003.
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 NCC.IDE.H.175 Flight data and cockpit voice combination recorder

Combination recorders

(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 NCC.IDE.H.160; and

(2) all parameters required by NCC.IDE.H.165, with the same specifications required by NCC.IDE.H.160 and NCC.IDE.H.165.

(b) In addition, a flight data and cockpit voice combination recorder may record data link communication messages and related information required by the NCC.IDE.H.170.

AMC1 NCC.IDE.H.180 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 by a competent authority on the basis of a technical standard and marked accordingly.

(2) CRDs approved for use in motor vehicles according to the UN standard ECE R 44, -03 or later series of amendments.

(3) CRDs approved for use in motor vehicles and aircraft according to Canadian CMVSS 213/213.1.

(4) CRDs approved for use in motor vehicles and aircraft according to US FMVSS No 213 and manufactured to these standards on or after February 26, 1985.

US approved CRDs manufactured after this date should bear the following labels in red letters:

(i) 'THIS CHILD RESTRAINT SYSTEM CONFORMS TO ALL APPLICABLE FEDERAL MOTOR VEHICLE SAFETY STANDARDS'; and

(ii) 'THIS RESTRAINT IS CERTIFIED FOR USE IN MOTOR VEHICLES AND AIRCRAFT';

(5) CRDs qualified for use in aircraft according to the German 'Qualification Procedure for Child Restraint Systems for Use in Aircraft' (TÜV Doc.: TÜV/958-01/2001); and

(6) Devices approved for use in cars, manufactured and tested to 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 competent authority.

(c) Location

(1) Forward facing CRDs 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 CRDs should only be installed on forward facing passenger seats. A CRD may 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 in a CRD should be located as near to a floor level exit as feasible.

(3) An infant in a CRD should not hinder evacuation for any passenger.

(4) An infant 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 are from the same family or travelling group provided the infants are accompanied by a responsible adult sitting next to them.

(6) A row segment is the fraction of a row separated by two aisles or by one aisle and the helicopter fuselage.

(d) Installation

(1) CRDs should only be installed on a suitable helicopter seat with the type of connecting device they are approved or qualified for. E.g., CRDs to be connected by a three point harness only (most rearward facing baby CRDs currently available) should not be attached to a helicopter seat with a lap belt only; a CRD designed to be attached to a vehicle seat by means of rigid bar lower anchorages (ISO-FIX or US equivalent) only, should only be used on helicopter seats that are equipped with such connecting devices and should not be attached by the helicopter seat lap belt. The method of connecting should be the one shown in the manufacturer's instructions provided with each CRD.

(2) All safety and installation instructions should be followed carefully by the responsible person accompanying the infant. Cabin crew should prohibit the use of any inadequately installed CRD or not qualified seat.

(3) If a forward facing CRD with a rigid backrest is to be fastened by a 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 CRD on the aircraft seat if the aircraft seat is reclinable.

(4) The buckle of the adult safety belt should be easily accessible for both opening and closing, and should be in line with the seat belt halves (not canted) after tightening.

(5) Forward facing restraint devices with an integral harness should 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 CRD is adjustable in recline, it should be in an upright position for all occasions when passenger restraint devices are required.

AMC2 NCC.IDE.H.180 Seats, seat safety belts, restraint systems and child restraint devices

Upper torso restraint system

An upper torso restraint system having three straps is deemed to be compliant with the requirement for restraint systems with two shoulder straps.

Safety belt

A safety belt with a diagonal shoulder strap (three anchorage points) is deemed to be compliant with the requirement for safety belts (two anchorage points).

AMC3 NCC.IDE.H.180 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 NCC.IDE.H.190 First-aid kit

Content of first-aid kit

(a) First-aid kits should be equipped with appropriate and sufficient medications and instrumentation. However, these kits should be amended 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 FAKs:

(1) Equipment:

(i) bandages (assorted sizes);

(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; and

(xiii) thermometers (non-mercury).

(2) Medications:

(i) simple analgesic (may include liquid form);

(ii) antiemetic;

(iii) nasal decongestant;

(iv) gastrointestinal antacid, in the case of helicopters carrying more than nine passengers;

(v) anti-diarrhoeal medication in the case of helicopters carrying more than nine passengers; and

(vi) antihistamine.

(3) Other:

(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;

(iii) medical incident report form; and

(iv) biohazard disposal bags.

(4) An eye irrigator, although not required to be carried in the FAK, should, where possible, be available for use on the ground.

AMC2 NCC.IDE.H.190 First-aid 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.

AMC1 NCC.IDE.H.200 Supplemental oxygen — non-pressurised helicopters

Determination of oxygen

The amount of supplemental oxygen required 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 NCC.IDE.H.205 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 toilets, galleys, etc. These considerations may result in the number of fire extinguishers being 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 NCC.IDE.H.210 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 NCC.IDE.H.215 Emergency locator transmitter (ELT)

ELT batteries

Batteries used in the ELTs should be replaced (or recharged, if the battery is rechargeable) when the equipment has been in use for more than 1 cumulative hour, and also when 50% of their useful life (or for rechargeable, 50% of their useful life of charge), as established by the equipment manufacturer, has expired. The new expiry date for the replacement (or recharged) battery should be legibly marked on the outside of the equipment. The battery useful life (or useful life of charge) requirements of this paragraph do not apply to batteries (such as water-activated batteries) that are essentially unaffected during probable storage intervals.

AMC2 NCC.IDE.H.215 Emergency locator transmitter (ELT)

Types of ELT 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 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 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 ejected, deployed and activated by an impact, and, in some cases, also by hydrostatic sensors. Manual deployment is also provided. This type of ELT should float in water and is intended to aid SAR teams in locating the crash site.

(4) 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.

(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 and should be registered with the national agency responsible for initiating search and rescue or other nominated agency.

AMC1 NCC.IDE.H.225(a) 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 restraint system fastened.

AMC1 NCC.IDE.H.225(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 Agency or equivalent.

GM1 NCC.IDE.H.225 Life-jackets

Seat cushions

Seat cushions are not considered to be flotation devices.

GM1 NCC.IDE.H.226 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 should be greater than the likely rescue time. The factors affecting both times are shown in Figure 1. 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 in water at any temperature.

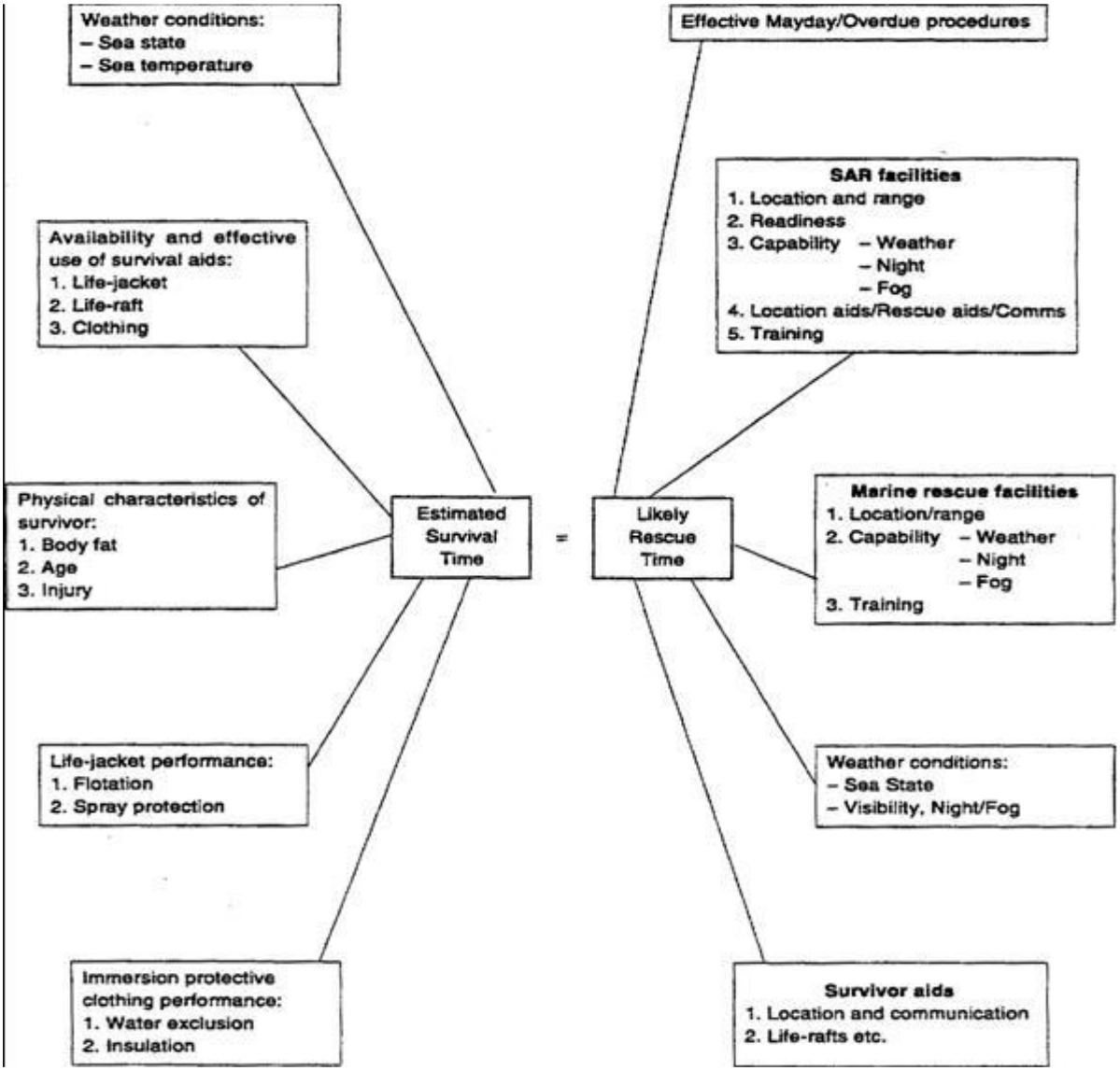


Figure 1: The survival equation

(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 (no immersion suit)	0-2	With ¾ hour	Within 1 ¼ hours
	3-4	With ½ hour	Within ½ hour

Clothing assembly	Beaufort wind force	Times within which the most vulnerable individuals are likely to drown	
		(water temp 5 °C)	(water temp 13 °C)
	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 breath 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 insulating 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 NCC.IDE.H.227 Life-rafts, survival ELTs and survival equipment on extended overwater flights

Life-rafts and equipment for making distress signals

(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 % of the rafts 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 means 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; and

(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 NCC.IDE.H.230 Survival equipment

Additional survival equipment

(a) The following additional survival equipment should be carried when required:

(1) 500 ml of water for each four, or fraction of four, 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 of 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 carried.

(c) If any item of equipment contained in the above list is already carried on board the aircraft in accordance with another requirement, there is no need for this to be duplicated.

AMC2 NCC.IDE.H.230 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).

GM1 NCC.IDE.H.230 Survival equipment

Signalling equipment

The signalling equipment for making distress signals is described in ICAO Annex 2, Rules of the Air.

GM2 NCC.IDE.H.230 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 competent 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 NCC.IDE.H.231 Additional requirements for helicopters conducting offshore operations in a hostile sea area

Installation of the life-raft

(a) Projections on the exterior surface of the helicopter that are located in a zone delineated by boundaries that are 1.22 m (4 ft) above and 0.61 m (2 ft) below the established static water line could cause damage to a deployed life-raft. Examples of projections which need to be considered are aerials, overboard vents, unprotected split-pin tails, guttering and any projection sharper than a three dimensional right angled corner.

(b) While the boundaries specified in (a) are intended as a guide, the total area that should be considered should also take into account the likely behaviour of the life- raft after deployment in all sea states up to the maximum in which the helicopter is capable of remaining upright.

(c) Wherever a modification or alteration is made to a helicopter within the boundaries specified, the need to prevent the modification or alteration from causing damage to a deployed life-raft should be taken into account in the design.

(d) Particular care should also be taken during routine maintenance to ensure that additional hazards are not introduced by, for example, leaving inspection panels with sharp corners proud of the surrounding fuselage surface, or allowing door sills to deteriorate to a point where sharp edges become a hazard.

GM1 NCC.IDE.H.232 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.

AMC1 NCC.IDE.H.235 All helicopters on flight over water - ditching

The same considerations of AMC1 NCC.IDE.H.231 should apply in respect of emergency flotation equipment.

AMC1 NCC.IDE.H.240 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 flight crew compartment environment. The headset should be adequately adjustable in order to fit the flight crew'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 NCC.IDE.H.240 Headset

General

The term 'headset' includes any aviation helmet incorporating headphones and microphone worn by a flight crew member.

GM1 NCC.IDE.H.245 Radio communication equipment

Applicable airspace requirements

For helicopters being operated under European air traffic control, the applicable airspace requirements include the Single European Sky legislation.

AMC1 NCC.IDE.H.255 Transponder

SSR Transponder

(a) The secondary surveillance radar (SSR) transponders of helicopters 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.

Affected Pages from Last Update

#	Page	Para # in Source	Reference Section/Article	Amendmant
1.	1	12		
2.	9	222		[TABLE] 2 Feb 2020 NPA 2019-31 (EFB)
3.	10	310		DC.1.1 Pursuant to Law No (30) of the year 1960 and subsequent Ministerial Decisions No (3) of the year 1986, No (18) of the year 1990, and No (3) of the year 1996, based upon that Law and as reflected in the Preamble to the , Issue ~~3~~4, Rev.~~0~~2, August ~~2013~~2019, the is empowered to adopt and amend . In accordance herewith, the following AMC & GM is hereby established for compliance by all persons concerned. This AMC & GM shall be known as Reg Cir 2020-13 - NPA 2019-31 KCASR 6 Part NCC (AMC&GM) - JJ R_QUALIFICATIONS_11-Feb-2020 and any reference to this title shall mean referring to these regulations governing the requirements to be met for the certification of air operations.
4.	19	484		AMC1 NCC.GEN.131(a) Use of electronic flight bags (EFBs)
5.	19	485		HARDWARE
6.	19	486		In addition to AMC1 CAT.GEN.MPA.141(a), the following should be considered:
7.	19	487	(a)	Display characteristics
8.	19	488	(a)	Consideration should be given to the long-term degradation of a display, as a result of abrasion and ageing. AMC 25-11 (paragraph 3.16a) may be used as guidance to assess luminance and legibility aspects.
9.	19	489	(a)	Information displayed on the EFB should be legible to the typical user at the intended viewing distance(s) and under the full range of lighting conditions expected in a flight crew compartment, including direct sunlight.
10.	19	490	(a)	Users should be able to adjust the brightness of an EFB screen independently of the brightness of other displays in the flight crew compartment. In addition, when incorporating an automatic brightness adjustment, it should operate independently for each EFB in the flight crew compartment. Brightness adjustment using software means may be acceptable provided that this operation does not adversely affect the flight crew workload.
11.	20	491	(a)	Buttons and labels should have adequate illumination for night use. ‘Buttons and labels’ refers to hardware controls located on the display itself.
12.	20	492	(a)	All controls should be properly labelled for their intended function, except if no confusion is possible.
13.	20	493	(a)	The 90-degree viewing angle on either side of each flight crew member’s line of sight may be unacceptable for certain EFB applications if aspects of the display quality are degraded at large
14.	20	494	(a)	viewing angles (e.g. the display colours wash out or the displayed colour contrast is not discernible at the installation viewing angle).
15.	20	495	(b)	Power source
16.	20	496	(b)	The design of a portable EFB system should consider the source of electrical power, the
17.	20	497	(b)	independence of the power sources for multiple EFBs, and the potential need for an independent battery source. A non-exhaustive list of factors to be considered includes:
18.	20	498	(b)	(1) the possibility to adopt operational procedures to ensure an adequate level of safety (for example, ensure a minimum level of charge before departure);

#	Page	Para # in Source	Reference Section/Article	Amendmant
19.	20	499		(2) the possible redundancy of portable EFBs to reduce the risk of exhausted batteries;
20.	20	500		(3) the availability of backup battery packs to ensure an alternative source of power.
21.	20	501		Battery-powered EFBs that have aircraft power available for recharging the internal EFB batteries are considered to have a suitable backup power source.
22.	20	502		For EFBs that have an internal battery power source, and that are used as an alternative for paper documentation that is required by NCC.GEN.140, the operator should either have at least one EFB connected to an aircraft power bus or have established mitigation means and procedures to ensure that sufficient power with acceptable margins will be available during the whole flight
23.	20	503	(c)	Environmental testing
24.	20	504	(c)	Environmental testing, in particular testing for rapid decompression, should be performed when the EFB hosts applications that are required to be used during flight following a rapid decompression and/or when the EFB environmental operational range is potentially insufficient with respect to the foreseeable flight crew compartment operating conditions.
25.	20	505	(c)	The information from the rapid-decompression test of an EFB is used to establish the procedural requirements for the use of that EFB device in a pressurised aircraft. Rapid-decompression testing should follow the EUROCAE ED-14D/RTCA DO-160D (or later revisions) guidelines for rapid decompression testing up to the maximum operating altitude of the aircraft at which the EFB is to be used.
26.	20	507	(c)	(1) Pressurised aircraft: when a portable EFB has successfully completed rapid-decompression testing, then no mitigating procedures for depressurisation events need to be developed.
27.	20	508	(c)	When a portable EFB has failed the rapid-decompression testing while turned ON, but successfully completed it when turned OFF, then procedures should ensure that at least one EFB on board the aircraft remains OFF during the applicable flight phases or that it is configured so that no damage will be incurred should rapid decompression occur in flight at an altitude higher than 10 000 ft above mean sea level (AMSL).
28.	21	509	(c)	If an EFB system has not been tested or it has failed the rapid-decompression test, then alternate procedures or paper backup should be available.
29.	21	510	(c)	(2) Non-pressurised aircraft: rapid-decompression testing is not required for an EFB used in a non pressurised aircraft. The EFB should be demonstrated to reliably operate up to the maximum operating altitude of the aircraft. If the EFB cannot be operated at the maximum operating altitude of the aircraft, procedures should be established to preclude operation of the EFB above the maximum demonstrated EFB operating altitude while still maintaining the availability of any required aeronautical information displayed on the EFB.
30.	21	511	(c)	The results of testing performed on a specific EFB model configuration (as identified by the EFB hardware manufacturer) may be applied to other aircraft installations and these generic environmental tests may not need to be duplicated. The operator should collect and retain:
31.	21	512	(c)	(1) evidence of these tests that have already been accomplished; or
32.	21	513	(c)	(2) suitable alternative procedures to deal with the total loss of the EFB system.
33.	21	514	(c)	Rapid decompression tests do not need to be repeated when the EFB model identification and the battery type do not change.

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34.	21	515	(c)	The testing of operational EFBs should be avoided if possible to preclude the infliction of unknown damage to the unit during testing.
35.	21	516	(c)	Operators should account for the possible loss or erroneous functioning of the EFB in abnormal environmental conditions.
36.	21	517	(c)	The safe stowage and the use of the EFB under any foreseeable environmental conditions in the flight crew compartment, including turbulence, should be evaluated.
37.	21	518		AMC1 NCC.GEN.131(b) Use of electronic flight bags (EFBs)
38.	21	519		SOFTWARE
39.	21	520		The same considerations as those in AMC1 CAT.GEN.MPA.141(b), AMC2 CAT.GEN.MPA.141(b) and AMC3
40.	21	521		CAT.GEN.MPA.141(b) should apply in respect of EFB software.
41.	21	523		AMC1 NCC.GEN.131(b)(1) Use of electronic flight bags (EFBs)
42.	21	524		RISK ASSESSMENT
43.	21	525	(a)	General
44.	21	526	(a)	Prior to the use of any EFB system, the operator should perform a risk assessment for all type B EFB applications and for the related hardware as part of its hazard identification and risk
45.	21	527	(a)	management process.
46.	21	528	(a)	The operator may make use of a risk assessment established by the software developer. However, the operator should ensure that its specific operational environment is taken into account.
47.	22	531	(a)	The risk assessment should:
48.	22	532	(a)	(1) evaluate the risks associated with the use of an EFB;
49.	22	533	(a)	(2) identify potential losses of function or malfunction (with detected and undetected
50.	22	534	(a)	erroneous outputs) and the associated failure scenarios;
51.	22	535		(3) analyse the operational consequences of these failure scenarios;
52.	22	536		(4) establish mitigating measures; and
53.	22	537		(5) ensure that the EFB system (hardware and software) achieves at least the same level of accessibility, usability, and reliability as the means of presentation it replaces.
54.	22	538		In considering the accessibility, usability, and reliability of the EFB system, the operator should ensure that the failure of the complete EFB system as well as of individual applications, including corruption or loss of data, and erroneously displayed information, has been assessed and that the risks have been mitigated to an acceptable level.
55.	22	539		The operator should ensure that the risk assessments for type B EFB applications are maintained and kept up to date.
56.	22	540		When the EFB system is intended to be introduced alongside a paper-based system, only the failures that would not be mitigated by the use of the paper-based system need to be addressed.
57.	22	541		In all other cases, a complete risk assessment should be performed.
58.	22	542	(b)	Assessing and mitigating the risks
59.	22	543	(b)	Some parameters of EFB applications may depend on entries that are made by flight

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60.	22	544	(b)	crew/dispatchers, whereas others may be default parameters from within the system that are subject to an administration process (e.g. the runway line-up allowance in an aircraft performance application). In the first case, mitigation means would mainly concern training and flight crew procedure aspects, whereas in the second case, mitigation means would more likely focus on the EFB administration and data management aspects.
61.	22	545	(b)	The analysis should be specific to the operator concerned and should address at least the following points:
62.	22	546	(b)	(1) The minimisation of undetected erroneous outputs from applications and assessment of the worst credible scenario;
63.	22	547		(2) Erroneous outputs from the software application including:
64.	22	548	(i)	a description of the corruption scenarios that were analysed; and
65.	22	549	(i)(ii)	a description of the mitigation means;
66.	22	550	(i)(ii)	(3) Upstream processes including:
67.	22	551	(i)	the reliability of root data used in applications (e.g. qualified input data, such as
68.	22	552	(i)	databases produced under ED-76/DO-200A, ‘Standards for Processing Aeronautical
69.	22	553	(i)	Data’);
70.	22	554	(i)(ii)	the software application validation and verification checks according to appropriate
71.	22	555	(i)(ii)	industry standards, if applicable; and
72.	22	556	(i)(iii)	the independence between application software components, e.g. robust
73.	23	557	(i)(iii)	partitioning between EFB applications and other airworthiness certified software applications;
74.	23	558	(i)	(4) A description of the mitigation means to be used following the detected failure of an
75.	23	559	(i)	application, or of a detected erroneous output;
76.	23	560	(i)	(5) The need for access to an alternate power supply in order to ensure the availability of software applications, especially if they are used as a source of required information.
77.	23	561	(i)	As part of the mitigation means, the operator should consider establishing a reliable alternative means to provide the information available on the EFB system.
78.	23	562	(i)	The mitigation means could be, for example, one of, or a combination of, the following:
79.	23	563	(i)	(1) the system design (including hardware and software);
80.	23	564	(i)	(2) a backup EFB device, possibly supplied from a different power source;
81.	23	565	(i)	(3) EFB applications being hosted on more than one platform;
82.	23	566	(i)	(4) a paper backup (e.g. quick reference handbook (QRH)); and
83.	23	567	(i)	(5) procedural means.
84.	23	568		Depending on the outcome of their risk assessment, the operator may also consider performing an operational evaluation test before allowing unrestricted use of its EFB devices and applications.
85.	23	569		EFB system design features such as those assuring data integrity and the accuracy of performance

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86.	23	570		calculations (e.g. ‘reasonableness’ or ‘range’ checks) may be integrated in the risk assessment performed by the operator.
87.	23	571	(c)	Changes
88.	23	572	(c)	The operator should update its EFB risk assessment based on the planned changes to its EFB
89.	23	573	(c)	system.
90.	23	574	(c)	However, modifications to the operator’s EFB system which:
91.	23	575	(c)	(1) do not bring any change to the calculation algorithms and/or to the interface of a type B EFB application;
92.	23	576	(c)	(2) introduce a new type A EFB application or modify an existing one (provided its software classification remains type A);
93.	23	577	(c)	(3) do not introduce any additional functionality to an existing type B EFB application;
94.	23	578	(c)	(4) update an existing database necessary to use an existing type B EFB application; or
95.	23	579	(c)	(5) do not require a change to the flight crew training or operational procedures,
96.	23	580		may be introduced by the operator without having to update its risk assessment.
97.	23	581		These changes should, nevertheless, be controlled and properly tested prior to use in flight.
98.	23	582		The modifications in the following non-exhaustive list are considered to meet these criteria:
99.	23	583		(1) operating system updates;
100	23	584		(2) chart or airport database updates;
101	24	585		(3) updates to introduce fixes (patches); and
102	24	586		(4) installation and modification of a type A EFB application.
103	24	588		AMC1 NCC.GEN.131(b)(2) Use of electronic flight bags (EFBs)
104	24	589		EFB ADMINISTRATION
105	24	590		The operator should ensure:
106	24	591	(a)	that adequate support is provided to the EFB users for all the applications installed;
107	24	592	(b)	that potential security issues associated with the application installed have been checked;
108	24	593	(c)	that the hardware and software configuration is appropriately managed and that no unauthorised software is installed.
109	24	594	(c)	The operator should ensure that miscellaneous software applications do not adversely impact on the operation of the EFB, and should include miscellaneous software applications in the scope of the EFB configuration management;
110	24	595	(d)	that only a valid version of the application software and current data packages are installed on the EFB system; and
111	24	596	(e)	the integrity of the data packages used by the applications installed.
112	24	598	(e)	AMC2 NCC.GEN.131(b)(2) Use of electronic flight bags (EFBs)
113	24	599	(e)	PROCEDURES

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11	24	600	(e)	The procedures for the administration or the use of the EFB device and the type B EFB application may
11	24	601	(e)	be fully or partly integrated in the operations manual.
11	24	602	(a)	General
11	24	603	(a)	If an EFB system generates information similar to that generated by existing certified systems, procedures should clearly identify which information source will be the primary, which source will be used for backup information, and under which conditions the backup source should be used.
11	24	604	(a)	Procedures should define the actions to be taken by the flight crew members when information provided by an EFB system is not consistent with that from other flight crew compartment sources, or when one EFB system shows different information than the other.
11	24	605	(a)	In the case of EFB applications providing information which might be affected by Notice(s) to Airmen NOTAMS (e.g. Airport moving map display (AMMD), performance calculation,…), the procedure for the use of these applications should include the handling of the relevant NOTAMS before their use.
12	24	606	(b)	Flight crew awareness of EFB software/database revisions
12	24	607	(b)	The operator should have a process in place to verify that the configuration of the EFB, including software application versions and, where applicable, database versions, are up to date. Flight crew members should have the ability to easily verify the validity of database versions used on the EFB.
12	25	608	(b)	Nevertheless, flight crew members should not be required to confirm the revision dates for other databases that do not adversely affect flight operations, such as maintenance log forms or a list of airport codes. An example of a date-sensitive revision is that applied to an aeronautical chart database. Procedures should specify what actions should be taken if the software applications or databases loaded on the EFB system are outdated.
12	25	609	(c)	Workload mitigation and/or control
12	25	610	(c)	The operator should ensure that additional workload created by using an EFB system is adequately mitigated and/or controlled. The operator should ensure that, while the aircraft is in flight or moving on the ground, flight crew members do not become preoccupied with the EFB system at the same time. Workload should be shared between flight crew members to ensure ease of use and continued monitoring of other flight crew functions and aircraft equipment. This should be strictly applied in flight and the operator should specify any times when the flight crew members may not use the specific EFB application.
12	25	611	(d)	Dispatch
12	25	612	(d)	The operator should establish dispatch criteria for the EFB system. The operator should ensure that the availability of the EFB system is confirmed by preflight checks. Instructions to flight crew should clearly define the actions to be taken in the event of any EFB system deficiency.
12	25	613	(d)	Mitigation may be in the form of maintenance and/or operational procedures for items such as:
12	25	614	(d)	(1) replacement of batteries at defined intervals as required;
12	25	615	(d)	(2) ensuring that there is a fully charged backup battery on board;
13	25	616	(d)	(3) the flight crew checking the battery charging level before departure; and
13	25	617	(d)	(4) the flight crew switching off the EFB in a timely manner when the aircraft power source is lost. In the event of a partial or complete failure of the EFB, specific dispatch procedures should be followed. These procedures should

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				be included either in the minimum equipment list (MEL) or in the operations manual and should ensure an acceptable level of safety.
13	25	618	(d)	Particular attention should be paid to establishing specific dispatch procedures allowing to obtain operational data (e.g. performance data) in the event of a failure of an EFB hosting application that provides such calculated data.
13	25	619	(d)	When the integrity of data input and output is verified by cross-checking and gross-error checks, the same checking principle should be applied to alternative dispatch procedures to ensure equivalent protection.
13	25	620	(e)	Maintenance
13	25	621	(e)	Procedures should be established for the routine maintenance of the EFB system and detailing
13	25	622	(e)	how unserviceability and failures are to be dealt with to ensure that the integrity of the EFB
13	25	623	(e)	system is preserved. Maintenance procedures should also include the secure handling of updated information and how this information is validated and then promulgated in a timely manner and in a complete format to all users.
13	25	624	(e)	As part of the EFB system's maintenance, the operator should ensure that the EFB system
13	25	625	(e)	batteries are periodically checked and replaced as required.
14	25	626	(e)	Should a fault or failure of the system arise, it is essential that such failures are brought to the
14	26	627	(e)	immediate attention of the flight crew and that the system is isolated until rectification action is taken. In addition to backup procedures, to deal with system failures, a reporting system should be in place so that the necessary action, either to a particular EFB system or to the whole system, is taken in order to prevent the use of erroneous information by flight crew members.
14	26	628	(f)	Security
14	26	629	(f)	The EFB system (including any means used for updating it) should be secure from unauthorised intervention (e.g. by malicious software). The operator should ensure that the system is adequately protected at the software level and that the hardware is appropriately managed (e.g.
14	26	630	(f)	the identification of the person to whom the hardware is released, protected storage when the
14	26	631	(f)	hardware is not in use) throughout the operational lifetime of the EFB system. The operator
14	26	632	(f)	should ensure that prior to each flight the EFB operational software works as specified and the EFB operational data is complete and accurate. Moreover, a system should be in place to ensure that the EFB does not accept a data load that contains corrupted contents. Adequate measures should be in place for the compilation and secure distribution of data to the aircraft.
14	26	633	(f)	Procedures should be transparent, and easy to understand, to follow and to oversee:
14	26	634	(f)	(1) If an EFB is based on consumer electronics (e.g. a laptop) which can be easily removed, manipulated, or replaced by a similar component, then special consideration should be given to the physical security of the hardware;
14	26	635	(f)	(2) Portable EFB platforms should be subject to allocation tracking to specific aircraft or
15	26	636	(f)	persons;

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15	26	637	(f)	(3) Where a system has input ports, and especially if widely known protocols are used through these ports or internet connections are offered, then special consideration should be given to the risks associated with these ports;
15	26	638	(f)	(4) Where physical media are used to update the EFB system, and especially if widely known types of physical media are used, then the operator should use technologies and/or procedures to assure that unauthorised content cannot enter the EFB system through these media.
15	26	639	(f)	The required level of EFB security depends on the criticality of the functions used (e.g. an EFB which only holds a list of fuel prices may require less security than an EFB used for performance calculations).
15	26	640	(f)	Beyond the level of security required to assure that the EFB can properly perform its intended functions, the level of security ultimately required depends on the capabilities of the EFB.
15	26	641	(g)	Electronic signatures
15	26	642	(g)	Some applicable requirements may require a signature when issuing or accepting a document (e.g. load sheet, technical logbook, notification to captain (NOTOC)). In order to be accepted as being equivalent to a handwritten signature, electronic signatures used in EFB applications need, as a minimum, to fulfil the same objectives and should assure the same degree of security as the handwritten or any other form of signature that they are intended to replace. AMC1 NCC.POL.110(c) provides means to comply with the required handwritten signature or its equivalent for mass and balance documentation.
15	26	643	(g)	On a general basis, in the case of required signatures, an operator should have in place procedures for electronic signatures that guarantee:
15	27	644	(g)	(1) their uniqueness: a signature should identify a specific individual and be difficult to
15	27	645	(g)	duplicate;
16	27	646	(g)	(2) their significance: an individual using an electronic signature should take deliberate and recognisable action to affix their signature;
16	27	647		(3) their scope: the scope of the information being affirmed with an electronic signature should be clear to the signatory and to the subsequent readers of the record, record entry, or document;
16	27	648		(4) their security: the security of an individual’s handwritten signature is maintained by
16	27	649		ensuring that it is difficult for another individual to duplicate or alter it;
16	27	650		(5) their non-repudiation: an electronic signature should prevent a signatory from denying that they affixed a signature to a specific record, record entry, or document; the more difficult it is to duplicate a signature, the more likely it is that the signature was created by the signatory; and
16	27	651		(6) their traceability: an electronic signature should provide positive traceability to the
16	27	652		individual who signed a record, record entry, or any other document.
16	27	653		An electronic signature should retain those qualities of a handwritten signature that guarantee its uniqueness. Systems using either a PIN or a password with limited validity (time wise) may be appropriate in providing positive traceability to the individual who affixed it. Advanced electronic signatures, qualified certificates and secured signature-creation devices needed to create them in the context of the Regulation are typically not required for EFB operations.
16	27	655		AMC3 NCC.GEN.131(b)(2) Use of electronic flight bags (EFBs)

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169	27	656		FLIGHT CREW TRAINING
170	27	657		Flight crew members should be given specific training on the use of the EFB system before it is operationally used.
171	27	658		Training should at least include the following:
172	27	659	(a)	an overview of the system architecture;
173	27	660	(b)	preflight checks of the system;
174	27	661	(c)	limitations of the system;
175	27	662	(d)	specific training on the use of each application and the conditions under which the EFB may and may not be used;
176	27	663	(e)	restrictions on the use of the system, including cases where the entire system or some parts of it are not available;
177	27	664	(f)	procedures for normal operations, including cross-checking of data entry and computed
178	27	665	(f)	information;
179	27	666	(g)	procedures to handle abnormal situations, such as a late runway change or a diversion to an alternate aerodrome;
180	27	667	(h)	procedures to handle emergency situations;
181	27	668	(i)	phases of the flight when the EFB system may and may not be used;
182	28	669	(j)	human factors considerations, including crew resource management (CRM), on the use of the EFB;
183	28	670	(k)	additional training for new applications or changes to the hardware configuration;
184	28	671	(l)	actions following the failure of component(s) of the EFB, including cases of battery smoke or fire; and
185	28	672	(m)	management of conflicting information.
186	28	674	(m)	AMC4 NCC.GEN.131(b)(2) Use of electronic flight bags (EFBs)
187	28	675	(m)	PERFORMANCE AND MASS AND BALANCE APPLICATIONS
188	28	676	(a)	General
189	28	677	(a)	Performance and mass and balance applications should be based on existing published data found in the AFM or performance manual, and should account for the applicable CAT.POL performance requirements. The applications may use algorithms or data spreadsheets to determine results.
190	28	678	(a)	They may have the capability to interpolate within the information contained in the published
191	28	679	(a)	data for the particular aircraft but should not extrapolate beyond it.
192	28	680	(a)	To protect against intentional and unintentional modifications, the integrity of the database files related to performance and mass and balance (the performance database, airport database, etc.) should be checked by the program before performing any calculations. This check can be run once at the start-up of the application.
193	28	681	(a)	Each software version should be identified by a unique version number. The performance and
194	28	682	(a)	mass and balance applications should record each computation performed (inputs and outputs) and the operator should ensure that this information is retained for at least 3 months.
195	28	683	(a)	The operator should ensure that aircraft performance or mass and balance data provided by the application is correct compared with the data derived

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				from the AFM (e.g. for take-off and landing performance data) or from other reference data sources (e.g. mass and balance manuals or databases, in-flight performance manuals or databases) under a representative cross-check of conditions (e.g. for take-off and landing performance applications: take-off and landing performance data on dry, wet and contaminated runways, with different wind conditions and aerodrome pressure altitudes, etc.).
19	28	684	(a)	The operator should define any new roles that the flight crew and, if applicable, the flight
19	28	685	(a)	dispatcher, may have in creating, reviewing, and using performance calculations supported by EFB systems.
19	28	686	(b)	Testing
19	28	687	(b)	The verification of the compliance of a performance or mass and balance application should
20	28	688	(b)	include software testing activities performed with the software version candidate for operational use.
20	28	689	(b)	The testing can be performed either by the operator or a third party, as long as the testing process
20	28	690	(b)	is documented and the responsibilities identified.
20	28	691	(b)	The testing activities should include reliability testing and accuracy testing.
20	29	692	(b)	Reliability testing should show that the application in its operating environment (operating system (OS) and hardware included) is stable and deterministic, i.e. identical answers are generated each time the process is entered with identical parameters.
20	29	693	(b)	Accuracy testing should demonstrate that the aircraft performance or mass and balance
20	29	694	(b)	computations provided by the application are correct in comparison with data derived from the
20	29	695	(b)	AFM or other reference data sources, under a representative cross section of conditions (e.g. for take-off and landing performance applications: runway state and slope, different wind conditions and pressure altitudes, various aircraft configurations including failures with a performance impact, etc.).
20	29	696	(b)	The verification should include a sufficient number of comparison results from representative
20	29	697	(b)	calculations throughout the entire operating envelope of the aircraft, considering corner points,
21	29	698	(b)	routine and break points.
21	29	699	(b)	Any difference compared to the reference data that is judged significant should be examined.
21	29	700	(b)	When differences are due to more conservative calculations or reduced margins that were
21	29	701	(b)	purposely built into the approved data, this approach should be clearly specified. Compliance with the applicable certification and operational rules needs to be assessed in any case.
21	29	702	(b)	The testing method should be described. The testing may be automated when all the required
21	29	703	(b)	data is available in an appropriate electronic format, but in addition to performing thorough
21	29	704	(b)	monitoring of the correct functioning and design of the testing tools and procedures, operators

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21	29	705	(b)	are strongly suggested to perform additional manual verification. It could be based on a few
21	29	706	(b)	scenarios for each chart or table of the reference data, including both operationally representative scenarios and ‘corner-case’ scenarios.
21	29	707	(b)	The testing of a software revision should, in addition, include non-regression testing and testing of any fix or change.
22	29	708	(b)	Furthermore, an operator should perform testing related to its customisation of the applications
22	29	709	(b)	and to any element pertinent to its operation that was not covered at an earlier stage (e.g. airport database verification).
22	29	710	(c)	Procedures
22	29	711	(c)	Specific care is needed regarding flight crew procedures concerning take-off and landing
22	29	712	(c)	performance or mass and balance applications. Flight crew procedures should ensure that:
22	29	713	(c)	(1) calculations are performed independently by each flight crew member before data outputs are accepted for use;
22	29	714	(c)	(2) a formal cross-check is made before data outputs are accepted for use; such cross-checks should utilise the independent calculations described above, together with the output of the same data from other sources on the aircraft;
22	29	715	(c)	(3) a gross-error check is performed before data outputs are accepted for use; such gross-error checks may use either a ‘rule of thumb’ or the output of the same data from other sources on the aircraft; and
22	29	716	(c)	(4) in the event of a loss of functionality of an EFB through either the loss of a single
22	30	717	(c)	application, or the failure of the device hosting the application, an equivalent level of safety can be maintained; consistency with the EFB risk assessment assumptions should be confirmed.
23	30	718	(d)	Training
23	30	719	(d)	The training should emphasise the importance of executing all take-off and landing performance or mass and balance calculations in accordance with the SOPs to assure fully independent calculations.
23	30	720	(d)	Furthermore, due to the optimisation at different levels brought by performance applications, the flight crew members may be confronted with new procedures and different aircraft behaviour (e.g. the use of multiple flap settings for take-off). The training should be designed and provided accordingly.
23	30	721	(d)	Where an application allows the computing of both dispatch results (from regulatory and factored calculations) and other results, the training should highlight the specificities of those results.
23	30	722	(d)	Depending on the representativeness of the calculation, the flight crew should be trained on any operational margin that might be required.
23	30	723	(d)	The training should also address the identification and the review of default values, if any, and
23	30	724	(d)	assumptions about the aircraft status or environmental conditions made by the application.
23	30	725	(e)	Specific considerations for mass and balance applications
23	30	726	(e)	In addition to the figures, a diagram displaying the mass and its associated centre of gravity (CG) should be provided.

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23	30	727	(f)	Human-factors-specific considerations
24	30	728	(f)	Input and output data (i.e. results) shall be clearly separated from each other. All the information necessary for a given calculation task should be presented together or be easily accessible.
24	30	729	(f)	All input and output data should include correct and unambiguous terms (names), units of
24	30	730	(f)	measurement (e.g. kg or lb), and when applicable, an index system and a CG-position declaration (e.g. Arm/%MAC). The units should match the ones from the other flight-crew-compartment sources for the same kinds of data.
24	30	731	(f)	Airspeeds should be provided in a way that is directly useable in the flight crew compartment
24	30	732	(f)	unless the unit clearly indicates otherwise (e.g. Knots Calibrated Air Speed (KCAS)). Any difference between the type of airspeed provided by the EFB application and the type provided by the AFM or flight crew operating manual (FCOM) performance charts should be mentioned in the flight crew guides and training material.
24	30	733	(f)	If the landing performance application allows the computation of both dispatch (regulatory,
24	30	734	(f)	factored) and other results (e.g. in-flight or unfactored), the flight crew members should be made aware of the computation mode used.
24	30	735	(f)	(1) Inputs
24	30	736	(f)	The application should allow users to clearly distinguish user entries from default values or entries imported from other aircraft systems.
24	30	737	(f)	Performance applications should allow the flight crew to check whether a certain obstacle is included in the performance calculations and/or to include new or revised obstacle information in the performance calculations.
25	31	738	(f)	(2) Outputs
25	31	739	(f)	All critical assumptions for performance calculations (e.g. the use of thrust reversers, full or reduced thrust/power rating) should be clearly displayed. The assumptions made about any calculation should be at least as clear to the flight crew members as similar information would be on a tabular chart.
25	31	740	(f)	All output data should be available in numbers.
25	31	741	(f)	The application should indicate when a set of entries results in an unachievable operation (for instance, a negative stopping margin) with a specific message or colour scheme. This should be done in accordance with the relevant provisions on messages and the use of colours.
25	31	742		In order to allow a smooth workflow and to prevent data entry errors, the layout of the
25	31	743		calculation outputs should be such that it is consistent with the data entry interface of the
25	31	744		aircraft applications in which the calculation outputs are used (e.g. flight management
25	31	745		systems).
25	31	746		(3) Modifications
25	31	747		The user should be able to easily modify performance calculations, especially when making last-minute changes.
26	31	748		Calculation results and any outdated input fields should be deleted when:
26	31	749	(i)	modifications are entered;
26	31	750	(i)(ii)	the EFB is shut down or the performance application is closed; and

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26	31	751	(i)(iii)	the EFB or the performance application have been in a standby or 'background' mode too long, i.e. such that it is likely that when it is used again, the inputs or outputs will be outdated.
26	31	753	(i)(iii)	AMC5 NCC.GEN.131(b)(2) Use of electronic flight bags (EFBs)
26	31	754	(i)(iii)	AIRPORT MOVING MAP DISPLAY (AMMD) APPLICATION WITH OWN-SHIP POSITION
26	31	755	(a)	General
26	31	756	(a)	An AMMD application should not be used as the primary means of navigation for taxiing and
26	31	757	(a)	should be only used in conjunction with other materials and procedures identified within the
26	31	758	(a)	operating concept (see paragraph (e).
27	31	759	(a)	When an AMMD is in use, the primary means of navigation for taxiing remains the use of normal procedures and direct visual observation out of the flight-crew-compartment window.
27	31	760	(a)	Thus, as recognised in ETSO-C165a, an AMMD application with a display of own-ship position is considered to have a minor safety effect for malfunctions that cause the incorrect depiction of aircraft position (own-ship), and the failure condition for the loss of function is classified as 'no safety effect'.
27	31	761	(b)	Minimum requirements
27	31	762	(b)	AMMD software that complies with European Technical Standard Order ETSO-C165a is considered to be acceptable.
27	31	763	(b)	In addition, the system should provide the means to display the revision number of the software installed.
27	32	764	(b)	To achieve the total system accuracy requirements of ETSO-C165a, an airworthiness-approved sensor using the global positioning system (GPS) in combination with a medium-accuracy database compliant with EUROCAE ED-99C/RTCA DO-272C, 'User Requirements for Aerodrome Mapping Information,' (or later revisions) is considered one acceptable means.
27	32	765	(b)	Alternatively, the use of non-certified commercial off-the-shelf (COTS) position sources may be acceptable in accordance with AMC6 NCC.GEN.131(b)(2).
27	32	766	(c)	Data provided by the AMMD software application developer
27	32	767	(c)	The operator should ensure that the AMMD software application developer provides the
27	32	768	(c)	appropriate data including:
28	32	769	(c)	(1) installation instructions or equivalent as per ETSO-C165a Section 2.2 addressing:
28	32	770	(i)	the identification of each specific EFB system computing platform (including the
28	32	771	(i)	hardware platform and the operating system version) with which this AMMD
28	32	772	(i)	software application and database was demonstrated to be compatible;
28	32	773	(i)(ii)	the installation procedures and limitations for each applicable platform (e.g. required
28	32	774	(i)(ii)	memory resources, configuration of Global Navigation Satellite System (GNSS)
28	32	775	(i)(ii)	antenna position);
28	32	776	(i)(iii)	the interface description data including the requirements for external sensors

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28	32	777	(i)(iii)	providing data inputs; and
28	32	778	(i)(iv)	means to verify that the AMMD has been installed correctly and is functioning
29	32	779	(i)(iv)	properly.
29	32	780	(i)	(2) Any AMMD limitations, and known installation, operational, functional, or performance
29	32	781	(i)	issues of the AMMD.
29	32	782	(d)	AMMD software installation in the EFB
29	32	783	(d)	The operator should review the documents and the data provided by the AMMD developer, and ensure that the installation requirements of the AMMD software in the specific EFB platform and aircraft are addressed. Operators are required to:
29	32	784	(d)	perform any verification activities proposed by the AMMD software application developer, as well as identify and perform any additional integration activities that need to be completed;
29	32	785	(e)	Operational procedures
29	32	786	(e)	Changes to operational procedures of the aircraft (e.g. flight crew procedures) should be
29	32	787	(e)	documented in the operations manual or user's guide as appropriate. In particular, the
29	32	788	(e)	documentation should highlight that the AMMD is only designed to assist flight crew members in orienting themselves on the airport surface so as to improve the flight crew members' positional awareness during taxiing and that it is not to be used as the basis for ground manoeuvring.
30	32	789	(f)	Training requirements
30	32	790	(f)	The operator may use flight crew procedures to mitigate some hazards. These should include
30	32	791	(f)	limitations on the use of the AMMD function or application. As the AMMD could be a compelling display and the procedural restrictions are a key component of the mitigation, training should be provided in support of an AMMD implementation.
30	33	792	(f)	All mitigation means that rely on flight crew procedures should be included in the flight crew
30	33	793	(f)	training. Details of the AMMD training should be included in the operator's overall EFB training.
30	33	795	(f)	AMC6 NCC.GEN.131(b)(2) Use of electronic flight bags (EFBs)
30	33	796	(f)	USE OF COMMERCIAL OFF-THE-SHELF (COTS) POSITION SOURCE
30	33	797	(f)	COTS position sources may be used for AMMD EFB applications and for EFB applications displaying the own-ship position in-flight when the following considerations are complied with:
30	33	798	(a)	Characterisation of the receiver:
30	33	799	(a)	The position should originate from an airworthiness approved GNSS receiver, or from a COTS GNSS receiver fully characterised in terms of technical specifications and featuring an adequate number of channels (12 or more).
31	33	800	(a)	The EFB application should, in addition to position and velocity data, receive a sufficient number of parameters related to the fix quality and integrity to allow compliance with the accuracy requirements (e.g. the number of satellites and constellation geometry parameters such as dilution of position (DOP), 2D/3D fix).

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31	33	801	(b)	Installation aspects:
31	33	802	(b)	COTS position sources are C-PEDs and their installation and use should follow the requirements of NCC.GEN.130.
31	33	803	(b)	If the external COTS position source transmits wirelessly, cybersecurity aspects have to be considered.
31	33	804	(c)	Practical evaluation:
31	33	805	(c)	As variables can be introduced by the placement of the antennas in the aircraft and the
31	33	806	(c)	characteristics of the aircraft itself (e.g. heated and/or shielded windshield effects), the tests have to take place on the type of aircraft in which the EFB will be operated, with the antenna positioned at the location to be used in service.
31	33	807	(c)	(1) COTS used as a position source for AMMD
31	33	808	(c)	The test installation should record the data provided by the COTS position source to the
31	33	809	(c)	AMMD application.
32	33	810	(c)	The analysis should use the recorded parameters to demonstrate that the AMMD
32	33	811	(c)	requirements are satisfactorily complied with in terms of the total system accuracy (taking into account database errors, latency effects, display errors, and uncompensated antenna offsets) within 50 metres (95 %). The availability should be sufficient to prevent distraction or increased workload due to frequent loss of position.
32	33	812	(c)	When demonstrating compliance with the following requirements of DO-257A, the
32	33	813	(c)	behaviour of the AMMD system should be evaluated in practice:
32	33	814	(i)	indication of degraded position accuracy within 1 second (Section 2.2.4 (22)); and
32	33	815	(i)(ii)	indication of a loss of positioning data within 5 seconds (Section 2.2.4 (23));
32	33	816	(i)(ii)	conditions to consider are both a loss of the GNSS satellite view (e.g. antenna failure)
32	33	817	(i)(ii)	and a loss of communication between the receiver and the EFB.
32	33	818	(i)(ii)	(2) COTS position source used for applications displaying own-ship position in-flight:
32	34	819	(i)(ii)	Flight trials should demonstrate that the COTS GNSS availability is sufficient to prevent
33	34	820	(i)(ii)	distraction or increased workload due to frequent loss of position.
33	34	822	(i)(ii)	AMC7 NCC.GEN.131(b)(2) Use of electronic flight bags (EFBs)
33	34	823	(i)(ii)	CHART APPLICATIONS
33	34	824	(i)(ii)	The navigation charts that are depicted should contain the information necessary, in an appropriate form, to perform the operation safely. Consideration should be given to the size, resolution and position of the display to ensure legibility whilst retaining the ability to review all the information required to maintain adequate situational awareness. The identification of risks associated with the human–machine interface, as part of the operator's risk assessment, is key to identifying acceptable mitigation means, e.g.:
33	34	825	(a)	to establish procedures for reducing the risk of making errors;
33	34	826	(b)	to control and mitigate the additional workload related to EFB use;

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33	34	827	(c)	to ensure the consistency of colour-coding and symbology philosophies between EFB applications and their compatibility with other flight crew compartment applications; and
33	34	828	(d)	to consider aspects of crew resource management (CRM) when using an EFB system.
33	34	829	(d)	In the case of chart application displaying own-ship position in flight, AMC9 NCC.GEN.131(b)(2) is applicable.
33	34	831	(d)	AMC8 NCC.GEN.131(b)(2) Use of electronic flight bags (EFBs)
34	34	832	(d)	IN-FLIGHT WEATHER APPLICATIONS
34	34	833	(a)	General
34	34	834	(a)	An in-flight weather (IFW) application is an EFB function or application enabling the flight crew to access meteorological information. It is designed to increase situational awareness and to support the flight crew when making strategic decisions.
34	34	835	(a)	An IFW function or application may be used to access both information required to be on board
34	34	836	(a)	(e.g. World Area Forecast Centre (WAFC) data) and supplemental weather information.
34	34	837	(a)	The use of IFW applications should be non-safety-critical and not necessary for the performance of the flight. In order for it to be non-safety-critical, IFW data should not be used to support tactical decisions and/or as a substitute for certified aircraft systems (e.g. weather radar).
34	34	838	(a)	Any current information from the meteorological data required to be carried on board or from
34	34	839	(a)	aircraft primary systems should always prevail over the information from an IFW application.
34	34	840	(a)	The displayed meteorological information may be forecasted and/or observed, and may be
34	34	841	(a)	updated on the ground and/or in flight. It should be based on data from certified meteorological
35	34	842	(a)	services providers or other reliable sources evaluated by the operator.
35	34	843	(a)	The meteorological information provided to the flight crew should be as far as possible consistent with the information available to users of ground-based aviation meteorological information (e.g. operations control centre (OCC) staff, flight dispatchers, etc.) in order to establish common situational awareness and to facilitate collaborative decision-making.
35	34	844	(b)	Display
35	35	845	(b)	Meteorological information should be presented to the flight crew in a format that is appropriate
35	35	846	(b)	to the content of the information; coloured graphical depiction is encouraged whenever
35	35	847	(b)	practicable. The IFW display should enable the flight crew to:
35	35	848	(b)	(1) distinguish between observed and forecasted weather data;
35	35	849	(b)	(2) identify the currency or age and validity time of the weather data;
35	35	850	(b)	(3) access the interpretation of the weather data (e.g. the legend);
35	35	851	(b)	(4) obtain positive and clear indications of any missing information or data and determine
36	35	852	(b)	areas of uncertainty when making decisions to avoid hazardous weather; and

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361	35	853	(b)	(5) be aware of the data-link means status enabling necessary IFW data exchanges.
362	35	854	(b)	Meteorological information in IFW applications may be displayed, for example, as an overlay over navigation charts, over geographical maps, or it may be a stand-alone weather depiction (e.g. radar plots, satellite images, etc.).
363	35	855		If meteorological information is overlaid on navigation charts, special consideration should be
364	35	856		given to HMI issues in order to avoid adverse effects on the basic chart functions.
365	35	857		In case of display of own-ship position in flight, AMC9 NCC.GEN.131(b)(2) is applicable.
366	35	858		The meteorological information may require reformatting to accommodate, for example, the
367	35	859		display size or the depiction technology. However, any reformatting of the meteorological
368	35	860		information should preserve both the geo-location and intensity of the meteorological conditions regardless of projection, scaling, or any other types of processing.
369	35	861	(c)	Training and procedures
370	35	862	(c)	The operator should establish procedures for the use of an IFW application.
371	35	863	(c)	The operator should provide adequate training to the flight crew members before using an IFW application. This training should address:
372	35	864	(c)	(1) limitations of the use of an IFW application:
373	35	865	(i)	acceptable use (strategic planning only);
374	35	866	(i)(ii)	information required to be on board; and
375	35	867	(i)(iii)	latency of observed weather information and the hazards associated with utilisation
376	35	868	(i)(iii)	of old information;
377	35	869	(i)(iii)	(2) information on the display of weather data:
378	35	870	(i)	type of displayed information (forecasted, observed);
379	35	871	(i)(ii)	symbology (symbols, colours); and
380	35	872	(i)(iii)	interpretation of meteorological information;
381	35	873	(i)	(3) identification of failures and malfunctions (e.g. incomplete uplinks, data-link failures,
382	35	874	(i)	missing info);
383	35	875	(i)	(4) human factors issues:
384	35	876	(i)	avoiding fixation; and
385	35	877	(i)(ii)	managing workload.
386	36	879	(i)(ii)	AMC9 NCC.GEN.131(b)(2) Use of electronic flight bags (EFBs)
387	36	880	(i)(ii)	APPLICATIONS DISPLAYING OWN-SHIP POSITION IN-FLIGHT
388	36	881	(a)	Limitations
389	36	882	(a)	The display of own-ship position in flight as an overlay to other EFB applications should not be used as a primary source of information to fly or navigate the aircraft.

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390	36	883	(a)	Except on VFR flights over routes navigated by reference to visual landmark, the display of the own-ship symbol is allowed only in aircraft having a certified navigation display (moving map).
391	36	884	(a)	In the specific case of IFW applications, the display of own-ship on such applications is restricted to aircraft equipped with a weather radar.
392	36	885	(b)	Position source and accuracy
393	36	886	(b)	The display of own-ship position may be based on a certified GNSS or GNSS-based (e.g. GPS/IRS) position from certified aircraft equipment or on a portable COTS position source in accordance with AMC6 NCC.GEN.131(b)(2).
394	36	887	(b)	The own-ship symbol should be removed and the flight crew notified if:
395	36	888	(b)	(1) the estimated accuracy exceeds 50 meters;
396	36	889	(b)	(2) the position data is reported as invalid by the GNSS receiver; or
397	36	890	(b)	(3) the position data is not received for 5 seconds.
398	36	891	(c)	Charting data considerations
399	36	892	(c)	If the map involves raster images that have been stitched together into a larger single map, it
400	36	893	(c)	should be demonstrated that the stitching process does not introduce distortion or map errors
401	36	894	(c)	that would not correlate properly with a GNSS-based own-ship symbol.
402	36	895	(d)	Human machine interface (HMI)
403	36	896	(d)	(1) Interface
404	36	897	(d)	The flight crew should be able to unambiguously differentiate the EFB function from
405	36	898	(d)	avionics functions available in the cockpit, and in particular with the navigation display.
406	36	899	(d)	A sufficiently legible text label “AIRCRAFT POSITION NOT TO BE USED FOR NAVIGATION” or equivalent should be continuously displayed by the application if the own-ship position
407	36	900	(d)	depiction is visible in the current display area over a terminal chart (i.e. SID, STAR, or
408	36	901	(d)	instrument approach) or a depiction of a terminal procedure.
409	36	902	(d)	(2) Display of own-ship symbol
410	36	903	(d)	The own-ship symbol should be different from the ones used by certified aircraft systems
411	36	904	(d)	intended for primary navigation.
412	36	905	(d)	If directional data is available, the own-ship symbol may indicate directionality. If direction
413	36	906	(d)	is not available, the own-ship symbol should not imply directionality.
414	36	907	(d)	The colour coding should not be inconsistent with the manufacturer philosophy.
415	36	908	(d)	(3) Data displayed
416	37	909	(d)	The current map orientation should be clearly, continuously and unambiguously indicated
417	37	910	(d)	(e.g., Track-up vs North-up).

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418	37	911	(d)	If the software supports more than one directional orientation for the own-ship symbol
419	37	912	(d)	(e.g., Track-up vs North-up), the current own-ship symbol orientation should be indicated.
420	37	913	(d)	The chart display in track-up mode should not create usability or readability issues. In
421	37	914	(d)	particular, chart data should not be rotated in a manner that affects readability.
422	37	915	(d)	The application zoom levels should be appropriate for the function and content being
423	37	916	(d)	displayed and in the context of providing supplemental position awareness.
424	37	917	(d)	The pilot should be able to obtain information about the operational status of the own-ship
425	37	918	(d)	function (e.g. active, deactivated, degraded).
426	37	919	(d)	During IFR, day-VFR without visual references or night VFR flight, the following parameters’
427	37	920	(d)	values should not be displayed:
428	37	921	(i)	Track/heading;
429	37	922	(i)(ii)	Estimated time of arrival (ETA);
430	37	923	(i)(iii)	Altitude;
431	37	924	(i)(iv)	Geographical coordinates of the current location of the aircraft; and
432	37	925	(v)	Aircraft speed.
433	37	926		(4) Controls
434	37	927		If a panning and/or range selection function is available, the EFB application should provide
435	37	928		a clear and simple method to return to an own-ship oriented display.
436	37	929		A means to disable the display of the own-ship position should be provided to the flight crew.
437	37	930	(e)	Training and procedures
438	37	931	(e)	The procedures and training should emphasise the fact that the display of own-ship position on charts or IFW EFB applications should not be used as a primary source of information to fly or navigate the aircraft or as a primary source of weather information.
439	37	932	(e)	(1) Procedures:
440	37	933	(e)	The following considerations should be addressed in the procedures for the use of charts or IFW EFB application displaying the own-ship position in-flight by the flight crew:
441	37	934	(i)	Intended use of the display of own-ship position in-flight on charts or IFW EFB
442	37	935	(i)	applications;
443	37	936	(i)(ii)	Inclusion of the EFB into the regular scan of flight deck systems indications. In
444	37	937	(i)(ii)	particular, systematic cross-check with avionics before being used, whatever the
445	37	938	(i)(ii)	position source; and

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44	37	939	(i)(iii)	Actions to be taken in case of the identification of a discrepancy between the EFB
44	37	940	(i)(iii)	and avionics.
44	37	942	(i)	(2) Training:
44	38	943	(i)	Crew members should be trained on the procedures for the use of the application, including
45	38	944	(i)	the regular cross-check with avionics and the action in case of discrepancy.
45	38	946	(i)	GM1 NCC.GEN.131(b)(2) Use of electronic flight bags (EFBs)
45	38	947	(i)	IN-FLIGHT WEATHER APPLICATIONS
45	38	948	(i)	'Reliable sources' of data used by in-flight weather (IFW) applications are the organisations evaluated by
45	38	949	(i)	the operator as being able to provide an appropriate level of data assurance in terms of accuracy and
45	38	950	(i)	integrity. It is recommended that the following aspects be considered during that evaluation:
45	38	951	(a)	The organisation should have a quality assurance system in place that covers the data source
45	38	952	(a)	selection, acquisition/import, processing, validity period check, and the distribution phase;
45	38	953	(b)	Any meteorological product provided by the organisation that is within the scope of
45	38	954	(b)	meteorological information included in the flight documentation should originate only from authoritative sources or certified providers and should not be transformed or altered, except for the purpose of packaging the data in the correct format.
46	38	955		The organisation's process should provide assurance that the integrity of those products is
46	38	956		preserved in the data for use by the IFW application.
46	38	958		GM2 NCC.GEN.131(b)(2) Use of electronic flight bags (EFBs)
46	38	959		USE OF COMMERCIAL OFF-THE-SHELF (COTS) POSITION SOURCE – PRACTICAL EVALUATION
46	38	960		The tests should consist of a statistically relevant sample of taxiing. It is recommended to include taxiing at airports that are representative of the more complex airports typically accessed by the operator.
46	38	961		Taxiing segment samples should include data that is derived from runways and taxiways, and should include numerous turns, in particular of 90 degrees or more, and segments in straight lines at the maximum speed at which the own-ship symbol is displayed. Taxiing segment samples should include parts in areas of high buildings such as terminals. The analysis should include at least 25 inbound and/or outbound taxiing segments between the parking location and the runway.
46	38	962		During the tests, any unusual events (such as observing the own-ship symbol in a location on the map that is notably offset compared to the actual position, the own-ship symbol changing to non-directional when the aircraft is moving, and times when the own-ship symbol disappears from the map display) should be noted. For the test, the pilot should be instructed to diligently taxi on the centre line.
46	99	2547	(A)(Number deleted)	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~~

#	Page	Para # in Source	Reference Section/Article	Amendmant
				~~from one EU operator to another EU operator do not have to be weighed prior to use by the receiving operator, unless the mass and balance cannot be accurately established by calculation.~~
468	101	2597	(A)	Reserved
469	101	2598	(A)	~~Type of flights~~ ~~For the purpose of Table 3 of NCC.POL.105 (c):~~ ~~domestic flight means a flight with origin and destination within the borders of one State.~~ ~~flights within the European region means flights, other than domestic flights, whose origin and destination are within the area specified in item (b).~~ ~~Intercontinental flight means flights beyond the European region with origin and destination in different continents.~~ ~~Flights within the European region are flights conducted within the following area:~~ ~~N7200 E04500~~ ~~N4000 E04500~~ ~~N3500 E03700~~ ~~N3000 E03700~~ ~~N3000 W00600~~ ~~N2700 W00900~~ ~~N2700 W03000~~ ~~N6700 W03000~~ ~~N7200 W01000~~ ~~N7200 E04500~~ ~~as depicted in Figure 1: European region.~~ ~~Figure 1: European region~~ GM1 NCC.POL.105(g) Mass and balance, loading