Brunei Department of Civil Aviation

Negara Brunei Darussalam

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Brunei Aviation Requirements

BAR 6 Part SPO Special Operations – Acceptable Means of Compliance and Guidance Material

NOTES

The content of this document is arranged as follows: The acceptable means of compliance (AMC) appear first, followed by the related and guidance material (GM) paragraph(s).
In case of certification specifications (CS), a CS paragraph is followed by the related GM paragraph.

All elements (i.e. AMC, CS, and GM) are colour-coded and can be identified according to the illustration below.

Acceptable Means of Compliance

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Control of this Document

DC.1 Introduction

DC.1.1 Pursuant to Civil Aviation Order 2006 and the Civil Aviation Regulations 2006 and their subsequent amendments, the following requirements are hereby established for compliance by all persons concerned, the Director of Civil Aviation is empowered to adopt and amend Brunei Aviation Requirements. In accordance herewith, the following requirement is hereby established for compliance by all persons concerned. This requirement shall be known as BAR 6 Part SPO Special Operations – Acceptable Means of Compliance and Guidance Material and any reference to this title shall mean referring to the requirements to be met for civil aviation in Brunei Darussalam.

DC.2 Authority for this Requirement

DC.2.1 This BAR 6 Part SPO Special Operations – Acceptable Means of Compliance and Guidance Material is issued on the authority of the Director of Civil Aviation.

DC.3 Applicability

DC.3.1 This BAR 6 Part SPO Special Operations – Acceptable Means of Compliance and Guidance Material is applicable to the aviation industry of Brunei Darussalam.

DC.4 Scope

DC.4.1 BAR 6 Operation of Aircraft contains the operation of aircraft requirements of Brunei Darussalam, and shows compliance with ICAO Annex 6. The requirements in BAR 6 are separated into the following parts with cross references between parts where applicable.

Part Air Operations Cover Requirement

Part ARO Authority Requirements for Air Operations

Part ORO Organisation Requirements for Air Operations

Part DEF Definitions

Part CAT Commercial Air Transport

Part SPA Specific Approvals

Part SPO Special Operations

Part NCC Non Commercial with Complex Motor-Powered Aircraft

Part NCO Non Commercial other than Complex Motor-Powered Aircraft

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.

Amendment

Amendment Number	Date of Issue	Remarks
V01	1st February 2017	Initial Issue
V02	1st February 2018	First Amendment
V03	1st May 2018	Second Amendment
V04	1st May 2019	Third Amendment
V05	1st December 2019	Fourth Amendment
V06	1st December 2022	Fifth Amendment

Part-SPO Specific Operations

AMC1SPO.GEN.005 Scope

CRITERIA

The operators should consider the following criteria to determine whether an activity falls within the scope of specialised operations:

(a) the aircraft is flown close to the surface to fulfil the mission;

(b) abnormal manoeuvres are performed;

(c) special equipment is necessary to fulfil the mission and which affects the manoeuvrability of the aircraft;

(d) substances are released from the aircraft during the flight where these substances are either harmful or affect the manoeuvrability of the aircraft;

(e) external loads or goods are lifted or towed; or

(f) persons enter or leave the aircraft during flight.

GM1 SPO.GEN.005 Scope

LIST OF SPECIALISED OPERATIONS

(a) Specialised operations include the following activities:

(1) helicopter external loads operations;

(2) helicopter survey operations;

(3) human external cargo operations;

(4) parachute operations and skydiving;

(5) agricultural flights;

(6) aerial photography flights;

(7) glider towing;

(8) aerial advertising flights;

(9) calibration flights;

(10) construction work flights, including stringing power line operations, clearing saw operations;

(11) oil spill work;

(12) avalanche mining operations;

(13) survey operations, including aerial mapping operations, pollution control activity;

(14) news media flights, television and movie flights;

(15) special events flights, including such as flying display and competition flights;

(16) aerobatic flights;

(17) animal herding, animal rescue flights and veterinary dropping flights;

(18) maritime funeral operations;

(19) scientific research flights (other than those under the Civil Aviation Regulations 2006);

(20) cloud seeding; and

(21) sensational flights: flights involving extreme aerobatic manoeuvres carried out for the purpose of allowing the persons on board to experience zero gravity, high G-forces or similar sensations.

(b) For other operations, the operator can apply the criteria specified in AMC1 SPO.GEN.005 to determine whether an activity falls within the scope of specialised operations.

Subpart A - General requirements

GM1 SPO.GEN.100 Competent Authority

DETERMINING THE PLACE WHERE AN OPERATOR IS RESIDING

For the purpose of this requirements, the concept of 'place where the operator is residing' is mainly addressed to a natural person.

The place where the operator resides is the place where the operator complies with his or her tax obligations.

Several criteria can be used to help determining a person's place of residence. These include, for example:

(a) the duration of a person's presence on the territory of the countries concerned;

(b) the person's family status and ties;

(c) the person's housing situation and how permanent it is;

(d) the place where the person pursues professional or non-profit activities;

(e) characteristics of the person's professional activity; and

(f) Member State where the person resides for taxation purposes.

AMC1 SPO.GEN.105(a) Crew Responsibilities

CREW DUTIES – RECORDING OF FLIGHT TIME

The following should apply for the purpose of recording flight time in accordance with AMC2 SPO.OP.230(i) and meeting experience requirements in specialised operations defined in AMC1 ORO.FC.146(f) and AMC1 SPO.SPEC.HESLO.100:

(a) Flight time should be recorded as flight time in a specialised activity if one of the following applies:
  (1) The aircraft has external equipment or is in a configuration that requires the use of a specific SOP.
  (2) A task specialist is on board, or a person indispensable to the mission is being carried in accordance with Article 5(7).
  (3) The crew applies a specific SOP in the course of a specialised activity.

(b) Irrespective of the scope of Part-SPO, if none of the above applies (e.g ferry flights), the flight time should not be recorded as a specialised activity.

(c) The list of specialised operations in GM1 SPO.SPEC.005 may be used for the purpose of (a).

GM1 SPO.GEN.105(e)(2) Crew member responsibilities

GENERAL

In accordance with 7.g. of Annex IV to BAR 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 SPO.GEN.107 Pilot-in-command responsibilities and authority

FLIGHT PREPARATION FOR PBN OPERATIONS

(a) The flight crew should ensure that RNAV 1, RNAV 2, RNP 1 RNP 2, and RNP APCH routes or procedures to be used for the intended flight, including for any alternate aerodromes, are selectable from the navigation database and are not prohibited by NOTAM.

(b) The flight crew should take account of any NOTAMs or operator briefing material that could adversely affect the aircraft system operation along its flight plan including any alternate aerodromes.

(c) When PBN relies on GNSS systems for which RAIM is required for integrity, its availability should be verified during the preflight planning. In the event of a predicted continuous loss of fault detection of more than five minutes, the flight planning should be revised to reflect the lack of full PBN capability for that period.

(d) For RNP 4 operations with only GNSS sensors, a fault detection and exclusion (FDE) check should be performed. The maximum allowable time for which FDE capability is projected to be unavailable on any one event is 25 minutes. If predictions indicate that the maximum allowable FDE outage will be exceeded, the operation should be rescheduled to a time when FDE is available.

(e) For RNAV 10 operations, the flight crew should take account of the RNAV 10 time limit declared for the inertial system, if applicable, considering also the effect of weather conditions that could affect flight duration in RNAV 10 airspace. Where an extension to the time limit is permitted, the flight crew will need to ensure that en route that radio facilities are serviceable before departure, and to apply radio updates in accordance with any AFM limitation.

AMC2 SPO.GEN.107 Pilot-in-command responsibilities and authority

DATABASE SUITABILITY

(a) The flight crew should check that any navigational database required for PBN operations includes the routes and procedures required for the flight.

DATABASE CURRENCY

(b) The database validity (current AIRAC cycle) should be checked before the flight.

(c) Navigation databases should be current for the duration of the flight. If the AIRAC cycle is due to change during flight, the flight crew should follow procedures established by the operator to ensure the accuracy of navigation data, including the suitability of navigation facilities used to define the routes and procedures for the flight.

(d) An expired database may only be used if the following conditions are satisfied:

(1) the operator has confirmed that the parts of the database which are intended to be used during the flight and any contingencies that are reasonable to expect are not changed in the current version;

(2) any NOTAMs associated with the navigational data are taken into account;

(3) maps and charts corresponding to those parts of the flight are current and have not been amended since the last cycle;

(4) any MEL limitations are observed; and

(5) the database has expired by no more than 28 days.

GM1 SPO.GEN.107 Pilot-in-command responsibilities and authority

GENERAL

In accordance with the Civil Aviation Regulations 2006, the pilot-in-command is responsible for the operation and safety of the aircraft and for the safety of all crew members, task specialists and cargo on board. This includes the following:

(a) the safety of all persons 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 flight 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;

(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 SPO.GEN.107(a)(8) Pilot-in-command responsibilities and authority

RECORDING UTILISATION DATA

Where an aircraft conducts a series of flights of short duration — such as a helicopter doing a series of lifts — and the aircraft is operated by the same pilot-in-command, the utilisation data for the series of flights may be recorded in the aircraft technical log or journey log as a single entry.

GM1 SPO.GEN.107(a)(9) Pilot-in-command responsibilities and authority

IDENTIFICATION OF THE SEVERITY OF AN OCCURRENCE BY THE PILOT-IN-COMMAND
The definitions of an accident and a serious incident as well as examples thereof can be found in BAR 13.

AMC1 SPO.GEN.107(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 SPO.GEN.107(e) Pilot-in-command responsibilities and authority — balloons

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 the said State; in that event, the pilot-in-command should also submit a copy of it to the Brunei DCA Such reports should be submitted as soon as possible and normally within 10 days.

AMC1 SPO.GEN.119 Taxiing of aircraft

Procedures for taxiing

Procedures for taxiing should include at least the following:

(a) application of sterile flight deck crew compartment procedures:

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

(c) use of lights;

(d) measures to enhance the situational awareness of the pilot-in-command. The following list of typical items should be adapted by the operator to take into account its operational environment:

(1) the pilot-in-command should have the necessary aerodrome layout charts available;

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

(3) if applicable, all taxi clearances should be heard, and should be understood by the pilot-in-command;

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

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

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

(7) any action, which may disturb the pilot-in-command from the taxi activity, should be avoided or done with the parking brake set.

GM1 SPO.GEN.120 Taxiing of aeroplanes

SAFETY CRITICAL ACTIVITY

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

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

GM1 SPO.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 SPO.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 persons 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 other persons on board.

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

GM2 SPO.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 and 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. These can also lead to an increased workload for the flight crew.

(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 that 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 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.

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

GM1 SPO.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 include the following two categories:

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

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

(b) 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 transmitting capability and are operated by coin cells without further deactivation capability, e.g. wrist watches.

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

ELECTRONIC FLIGHT BAGS (EFBS) — HARDWARE — COMPLEX AIRCRAFT

In addition to AMC1 CAT.GEN.MPA.141(a), the following should be considered: SUITABILITY OF THE HARDWARE — COMPLEX AIRCRAFT

(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 screen brightness of an EFB 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 assure 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 SPO.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 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 if 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.

AMC2 SPO.GEN.131(a) Use of electronic flight bags (EFBs)

ELECTRONIC FLIGHT BAGS (EFBS) — HARDWARE — NON-COMPLEX AIRCRAFT
The same considerations as those in AMC1 NCO.GEN.125 should apply in respect of EFB hardware.

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

ELECTRONIC FLIGHT BAGS (EFBS) — SOFTWARE — COMPLEX AIRCRAFT
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.

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

ELECTRONIC FLIGHT BAGS (EFBS) — SOFTWARE — NON-COMPLEX AIRCRAFT
The same considerations as those in AMC2 NCO.GEN.125 should apply in respect of EFB software.

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

RISK ASSESSMENT — COMPLEX AIRCRAFT

(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.

This risk assessment should be defined before the beginning of the trial period and should be amended accordingly, if necessary, at the end of this trial period. The results of the trial should establish the configuration and use of the system.

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 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; 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 anapplication, 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 its 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. a 'reasonableness' or 'range' check) may be integrated in the risk assessment to be 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 HMI 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.

GM1 SPO.GEN.131(b)(1) Use of electronic flight bags (EFBs)

RISK ASSESSMENT— NON-COMPLEX AIRCRAFT

The operator of non-complex motor-powered aircraft should at least perform the check before the flight actions described in paragraph (b) of AMC2 NCO.GEN.125.

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

EFB ADMINISTRATION — COMPLEX AIRCRAFT

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

PROCEDURES — COMPLEX AIRCRAFT

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 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, etc.), 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, when type B EFB applications that replace paper products are hosted. The operator should ensure that the availability of the EFB system is confirmed by preflight checks. Instructions to the 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 that hosts an application providing 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 that:

(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, that special consideration is given to the physical security of the hardware;
(2) portable EFB platforms are 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, that special consideration is 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, that the operator uses technologies and/or procedures to assure that unauthorised content cannot enter the EFB system through The required level of EFB security depends on the criticality of the functions used (e.g. an EFB that 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 that is 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. GM1 SPO.POL.115 provides guidance related to the required handwritten signature or its equivalent for mass and balance documentation.

On a general basis, in the case of legally 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 should 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 (timewise) 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 Regulation (EU) No 910/20144 are typically not required for EFB operations.

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

FLIGHT CREW TRAINING — COMPLEX AIRCRAFT

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

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);
(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 SPO. GEN.131(b)(2) Use of electronic flight bags (EFBs)

PERFORMANCE AND MASS AND BALANCE APPLICATIONS — COMPLEX AIRCRAFT

(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 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 tests 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 the crew procedures concerning take-off and landing performance or mass and balance applications. The 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 margins 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 data 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 kind 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 results (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 calculation and/or to include new or revised or new obstacle information in the performance calculations.

(2) Outputs

All critical assumptions for performance calculation (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.

The results of calculations and any outdated input fields should be deleted whenever:

(i) modifications are entered;
(ii) the EFB is shut down or the performance application is closed; or
(iii) the EFB or the performance application has been in a standby or 'background' mode for too long, i.e. such that it is likely that when it is used again, the inputs or outputs will be outdated.

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

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

(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 SPO.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 needs 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 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 SPO.GEN.131(b)(2) Use of electronic flight bags (EFBs)

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

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

CHART APPLICATIONS — COMPLEX AIRCRAFT

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 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 to reduce 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 SPO.GEN.131(b)(2) is applicable.

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

IN-FLIGHT WEATHER APPLICATIONS — COMPLEX AIRCRAFT

(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 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 documentation required to be 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), 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 SPO.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 SPO.GEN.131(b)(2) Use of electronic flight bags (EFBs)

APPLICATIONS DISPLAYING OWN-SHIP POSITION IN FLIGHT — COMPLEX AIRCRAFT

(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 SPO.GEN.131(b)(2).

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

(1) the estimated accuracy is not sufficient for the intended operations;
(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

The display of own-ship position is only allowed when the underlying map/chart data is designed using a projection system that is suitable for aeronautical use.

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 reference or night VFR flights, 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 SPO.GEN.131(b)(2) Use of electronic flight bags (EFBs)

IN-FLIGHT WEATHER (IFW) APPLICATIONS — COMPLEX AIRCRAFT

'Reliable sources' of data used by 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) (b) Any meteorological product provided by the organisation that is within the scope of the meteorological information included in the flight documentation as defined in MET.TR.215(e) (Annex V (Definitions of terms used in Annexes II to XIII) to Commission Regulation (EU) 2016/1377) 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 SPO.GEN.131(b)(2) Use of electronic flight bags (EFBs)

USE OF COMMERCIAL OFF-THE-SHELF (COTS) POSITION SOURCE – PRATICAL EVALUATION — COMPLEX AIRCRAFT

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.

GM3 SPO.GEN.131(b)(2) Use of electronic flight bags (EFBs)

APPLICATIONS DISPLAYING OWN-SHIP POSITION IN FLIGHT

The depiction of a circle around the EFB own-ship symbol may be used to differentiate it from the avionics one.

AMC1 SPO.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 SPO.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.

AMC1 SPO.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 SPO.GEN.140(a)(12) 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 SPO.GEN.140(a)(13) Documents, manuals and information to be carried

PROCEDURES AND VISUAL SIGNALS FOR USE BY INTERCEPTING AND INTERCEPTED AIRCRAFT

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

GM1 SPO.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 SPO.GEN.140(a)(9) Documents, manuals and information to be carried

JOURNEY 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 SPO.GEN.140(a)(14) Documents, manuals and information to be carried

SEARCH AND RESCUE INFORMATION

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

AMC1 SPO.GEN.140(a)(18) Documents, manuals and information to be carried

APPROPRIATE METEOROLOGICAL INFORMATION

The appropriate meteorological information should be relevant to the planned operation, as specified in point (a) of point MET.TR.215 of Annex V (Part-MET) to Regulation (EU) 2017/373, and comprise the following:

(a) the meteorological information that is specified in point (e) of point MET.TR.215 of Part-MET; and

(b) supplemental meteorological information:

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

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

GM1 SPO.GEN.140(a)(18) Documents, manuals and information to be carried

DATA FROM CERTIFIED METEOROLOGICAL SERVICE PROVIDERS

In addition to GM1 SPO.GEN.140(a)(18) and in the context of point (b)(1) of AMC1 SPO.GEN.140(a)(18), the operator may consider that any meteorological information that is provided by the organisation within the scope of the meteorological information included in the flight documentation defined in point (e) of point MET.TR.215 of Part-MET should originate only from authoritative sources or certified providers, and should not be transformed or tampered, except for the purpose of presenting the data in the correct format. The organisation's process should provide assurance that the integrity of such service is preserved in the data to be used by both flight crews and operators, regardless of their form.

GM2 SPO.GEN.140(a)(18) Documents, manuals and information to be carried

INFORMATION FROM OTHER RELIABLE SOURCES OF METEOROLOGICAL INFORMATION

In the context of point (b)(2) of AMC1 SPO.GEN.140(a)(18), reliable sources of meteorological information are organisations that are able to provide an appropriate level of data assurance in terms of accuracy and integrity. The operator may consider in the evaluation that the organisation has a quality assurance system in place that covers source selection, acquisition/import, processing, validity period check, and distribution phase of data.

GM3 SPO.GEN.140(a)(18) Documents, manuals and information to be carried

SUPPLEMENTAL METEOROLOGICAL INFORMATION AND SUPPLEMENTARY INFORMATION

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

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

GM1 SPO.GEN.140(a)(20) 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.

STATE CONCERNED WITH THE FLIGHT

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

AMC1 SPO.GEN.145(a) Handling of flight recorder recordings: preservation, production, protection and use

PRESERVATION OF RECORDED DATA FOR INVESTIGATION

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

(b) These procedures should include:

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

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

GM1 SPO.GEN.145(a) Handling of flight recorder recordings: preservation, production, protection and use

REMOVAL OF RECORDERS IN CASE OF AN INVESTIGATION

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

AMC1 SPO.GEN.145(b) Handling of flight recorder recordings: preservation, production, protection and use

INSPECTIONS AND CHECKS OF RECORDINGS

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

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

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

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

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

(ii) the flight recorders share the same flight data acquisition,

a comprehensive inspection of the recording needs only to be performed for one flight recorder position. The inspection of the recordings should be performed alternately so that each flight recorder position is inspected at least every 4 years.

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

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

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

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

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

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

(c) The operator should perform at time intervals not exceeding 2 years, an inspection of the recording of flight recorders other than an FDR, which are installed on an aircraft in order to ensure compliance with SPO.IDE.A.146 or SPO.IDE.H.146.

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

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

AMC1 SPO.GEN.145(f)(1) Handling of flight recorder recordings: preservation, production, protection and use

USE OF AUDIO RECORDINGS FOR MAINTAINING OR IMPROVING SAFETY

(a) The procedure related to the handling of audio recordings from flight recorders and of their transcripts should be documented and signed by all parties (aircraft operator, crew members, maintenance personnel if applicable). This procedure should take into account Regulation (EU) 2016/679 and, as a minimum, define:

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

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

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

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

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

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

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

(b) Each time an audio recording file from a flight recorder is read out under the conditions defined by SPO.GEN.145(f)(1):

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

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

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

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

(c) The person who fulfils the role of a safety manager should also be responsible for the protection and the use of audio recordings from flight recorders and transcripts thereof, as well as for the assessment of issues and their transmission to the manager(s) responsible for the process concerned.

(d) In case a third party is involved in the use of audio recordings from flight recorders, contractual agreements with this third party should, when applicable, cover the aspects enumerated in (a) and (b).

AMC1 SPO.GEN.145(f)(1a) Handling of flight recorder recordings: preservation, production, protection and use

INSPECTION OF AUDIO RECORDINGS FOR ENSURING SERVICEABILITY

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

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

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

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

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

(5) only the accountable manager of the operator and, when identified to comply with ORO.GEN.200, the person fulfilling the role of safety manager, should be entitled to request a copy of the audio recording file.

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

GM1 SPO.GEN.145(b) Handling of flight recorder recordings: preservation, production, protection and use

INSPECTION OF THE FLIGHT RECORDERS' RECORDINGS FOR ENSURING SERVICEABILITY

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

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

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

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

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

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

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

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

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

(b) When performing the inspection of an audio recording from a flight recorder, precautions need to be taken to comply with SPO.GEN.145(f)(1a). The inspection of the audio recording usually consists of:

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

(2) examining samples of in-flight audio recording from the flight recorder for evidence that the signal is acceptable on each channel and in all phases of flight; and

(3) preparing and retaining an inspection report.

(c) The inspection of the DLR recording usually consists of:

(1) Checking the consistency of the data link recording with other recordings for example, during a designated flight, the flight crew speaks out a few data link messages sent and received. After the flight, the data link recording and the CVR recording are compared for consistency.

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

(d) When inspecting images recorded by a flight recorder, precautions need to be taken to comply with SPO.GEN.145(f)(3a). The inspection of such images usually consists of the following:

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

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

(3) preparing and retaining an inspection report.

GM2 SPO.GEN.145(b) Handling of flight recorder recordings: preservation, production, protection and use

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

For the understanding of the terms used in AMC1 SPO.GEN.145(b):

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

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

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

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

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

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

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

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

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

GM3 SPO.GEN.145(b) Handling of flight recorder recordings: preservation, production, protection and use

CVR AUDIO QUALITY

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

AMC1 SPO.GEN.145(f)(3) Handling of flight recorder recordings: preservation, production, protection and use

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

(a) The procedure related to the handling of images of the flight crew compartment that are recorded by a flight recorder should be documented and signed by all parties (aircraft operator, crew members, maintenance personnel if applicable). This procedure should take into account Regulation (EU) 2016/679 and, as a minimum, define the following aspects:

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

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

(3) a retention policy and accountability, including the measures to ensure the security of the image recordings and their protection from misuse;

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

(b) Each time a recording file from a flight recorder and containing images of the flight crew compartment is read out for purposes other than to ensure the serviceability of that flight recorder:

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

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

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

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

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

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

AMC1 SPO.GEN.145(f)(3a) Handling of flight recorder recordings: preservation, production, protection and use

INSPECTION OF IMAGES OF THE FLIGHT CREW COMPARTMENT FOR ENSURING SERVICEABILITY

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

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

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

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

(4) the image recording files and copies thereof should be destroyed not earlier than 2 months and not later than 1 year after completion of the inspection of the image recordings. Images that do not contain any body part of a person may be retained for enhancing this inspection (e.g. for comparing image quality); and
(5) only the accountable manager of the operator and, when identified to comply with ORO.GEN.200, the safety manager should be entitled to request a copy of the image recording files.

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

GM1 SPO.GEN.145(f) Handling of flight recorder recordings: preservation, production, protection and use

FLIGHT CREW COMPARTMENT

If there are no compartments to physically segregate the flight crew from the passengers during the flight, the 'flight crew compartment' in point (f) of SPO.GEN.145 should be understood as the area including:

(a) the flight crew seats;
(b) aircraft and engine controls;
(c) aircraft instruments;
(d) windshield and windows used by the flight crew to get an external view while seated at their duty station; and
(e) circuit breakers accessible by the flight crew while seated at their duty station.

GM1 SPO.GEN.150(a) 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 the Brunei Darussalam; or

(2) an approval to carry dangerous goods in accordance with Part- SPA, Subpart DG 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 Brunei DCA.

(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.

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

DANGEROUS GOODS ACCIDENT AND INCIDENT REPORTING

(a) Any type of dangerous goods incident or accident 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 flight date;

(3) description of the goods;

(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) any other relevant details;

(9) suspected cause of the incident or accident;

(10) action taken;

(11) any other reporting action taken; and

(12) 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:

<table>
<tr><td colspan="3">DANGEROUS GOODS OCCURRENCE REPORT</td><td>DGOR No:</td></tr>
<tr><td>1. Operator:</td><td colspan="2">2. Date of Occurrence:</td><td>3. Local time of occurrence:</td></tr>
<tr><td colspan="2">4. Flight date:</td><td colspan="2">5. Reserved:</td></tr>
<tr><td colspan="2">6. Departure aerodrome:</td><td colspan="2">7. Destination aerodrome:</td></tr>
<tr><td colspan="2">8. Aircraft type:</td><td colspan="2">9. Aircraft registration:</td></tr>
<tr><td colspan="2">10. Location of occurrence:</td><td colspan="2">11. Origin of the goods:</td></tr>
<tr><td colspan="4">12. Description of the occurrence, including details of injury, damage, etc. (if necessary continue on the reverse of this form):</td></tr>
<tr><td colspan="3">13. Proper shipping name (including the technical name):</td><td>14. UN/ID No (when known):</td></tr>
<tr><td>15.Class/Division
(when known):</td><td>16. Subsidiary risk(s):</td><td>17. Packing group:</td><td>18. Category (Class 7 only):</td></tr>
<tr><td>19. Type of packaging:</td><td>20.Packaging specification marking:</td><td>21. No of packages:</td><td>22. Quantity
(or transport index, if applicable):</td></tr>
</table>

DANGEROUS GOODS OCCURRENCE REPORT		DGOR No:
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 means an injury which is sustained by a person in an accident and which involves one of the following:

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

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

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

   (4) injury to any internal organ;

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

   (6) 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 SPO.GEN.150 (e).

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

Subpart B - Operational procedures

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

USE OF OPERATING SITES MOTOR POWERED AIRCRAFT

(a) When defining adequate operating sites for use for the type(s) of aircraft and operation(s) concerned, the operator should take account of the following:

(1) An adequate site is a site that the operator considers to be satisfactory, taking account of the applicable performance requirements and site characteristics.

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

(b) Operating sites that are pre-surveyed should be specifically specified in the operations manual. The operations manual should contain 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 applica ble;

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

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

(c) 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 (b)(1) to (b)(6) inclusive and (b)(9) should be considered. Operations to non-pre-surveyed operating sites by night should not be conducted.

GM1 SPO.OP.101 Altimeter check and settings

ALTIMETER SETTING PROCEDURES

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

(a) 3.2 'Pre-flight operational test';

(b) 3.3 'Take-off and climb';

(c) 3.5 'Approach and landing

AMC1 SPO.OP.110 Aerodrome operating minima — aeroplanes and helicopters

USE OF AN AERODROME AS AN ISOLATED AERODROME

The concept of an isolated aerodrome allows the operator to use aerodromes that would otherwise be impossible or impractical to use with sufficient fuel to fly to the destination aerodrome and then to a destination alternate aerodrome, provided that operational criteria are used to ensure a safe-landing option, for example by specifying a point of no return (PNR). If alternate fuel is carried, the operator is not required to consider the aerodrome as isolated and use the aforementioned operational criteria.

AMC1 SPO.OP.110 Aerodrome operating minima — aeroplanes and helicopters

COMMERCIALLY AVAILABLE INFORMATION

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

AMC2 SPO.OP.110 Aerodrome operating minima — aeroplanes and helicopters

GENERAL

(a) The aerodrome operating minima should not be lower than those specified in AMC5 SPO.OP.110 or AMC4 SPO.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 AMC5 SPO.OP.110, 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 that the resulting RVR/converted meteorological visibility (CMV) value does not exceed 5 000 m. SAp or CDFA should be used as soon as facilities are improved to allow these techniques.

AMC3 SPO.OP.110 Aerodrome operating minima — aeroplanes and helicopters

TAKE-OFF OPERATIONS

(a) General

(1) Take-off minima should be expressed as VIS or RVR limits, taking into account all relevant factors for each aerodrome planned to be used and aircraft characteristics and equipment. Where there is a specific need to see and avoid obstacles on departure 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 the applicable minima for landing at that aerodrome, unless a weather- permissible take-off alternate aerodrome is available.

(3) When the reported VIS is below that required for take-off and RVR is not reported, a take-off should only be commenced if the 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 VIS or RVR is available, a take-off should only be commenced if the pilot-in-command can determine that the visibility 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 efficient guidance to control the aircraft in the event of both a rejected take-off in adverse circumstances and a continued take-off after failure of the critical engine.

(2) For night operations, the prescribed runway lights should be in operation to mark the runway and any obstacles.

TAKE-OFF OPERATIONS WITH HELICOPTERS AND COMPLEX MOTOR-POWERED AEROPLANES

(c) Required RVR or VIS:

(1) Complex motor-powered aeroplanes:

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

(ii) Multi-engined aeroplanes without the performance to comply with the conditions in (c)(1)(i) in the event of a critical engine failure may need to reland immediately and to see and avoid obstacles in the take-off area. Such aeroplanes may be operated to the following take-off minima provided that they are able to comply with the applicable obstacle clearance criteria, assuming engine failure at the specified height:

(A) The take-off minima specified by the operator should be based upon the height from which the one-engine-inoperative (OEI) net take-off flight path can be constructed.

(B) The RVR minima used should not be lower than either of the values specified in Table 1 or Table 2.

(iii) For single-engined complex aeroplane operations, the take-off minima specified by the operator should be expressed as RVR/CMV values not lower than those specified in Table 1 below.

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

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

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

Facilities	**RVR or VIS(m)***
Day only: Nil** Day only: Nil**	500
Day: at least runway edge lights or runway centre line markings Night: at least runway edge lights or runway centre line 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 2

Take off – Aeroplanes (without an LVTO approval)

Assumed engine failure height above the take-off runway versus RVR or VIS

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

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

(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 an RVR or VIS as take-off minima in accordance with Table 3.

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

(iii) For point-in-space (PinS) departures to an initial departure fix (IDF), the take-off minima should be selected to ensure sufficient guidance to see and avoid obstacles and return to the heliport if the flight cannot continue visually to the IDF.

Table 3

Take-off — helicopters (without LVTO approval)

RVR or VIS

Onshore aerodromes or operating sites with instrument flight rules (IFR) departure procedures	**RVR or VIS (m) ****
No light and no markings (day only)	400 or the rejected take- off distance, whichever is the greater
No markings (night)	800
Runway edge/FATO light and 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.

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

AMC4 SPO.OP.110 Aerodrome operating minima — aeroplanes and helicopters

DETERMINATION OF THE DH/MDH FOR INSTRUMENT APPROACH OPERATIONS — AEROPLANES

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

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

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

(3) the system minima specified in Table 4;

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

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

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

(1) the OCH for the category of aircraft;

(2) the published approach procedure MDH where applicable;

(3) the system minimum specified in Table 4;

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

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

DETERMINATION OF THE DH/MDH FOR INSTRUMENT APPROACH OPERATIONS — HELICOPTERS

(C) The DH or MDH should not be lower than the highest of:

(1) the OCH for the category of aircraft;

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

(3) the system minima specified in Table 4;

(4) the lowest DH or MDH permitted for the runway/FATO specified in Table 6 if applicable;

or

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

Table 4

System minima – all aircraft

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

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

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

Table 5

Runway type minima – aeroplanes

Runway type	Lowest DH/MDH (ft)
Precision approach (PA) runway, category I	200
NPA runway	250
Non-instrument runway	Circling minima as shown in table 1 in SPO.OP.112

Table 6

Type of Runway / FATO versus lowest DH/MDH – helicopters

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

Table 6 does not apply to helicopter PinS approaches with instructions to 'proceed VFR'.

(a) In order to qualify for the lowest allowable values of RVR/CMV specified in Table 4.A of AMC7 SPO.OP.110, 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.

AMC7 SPO.OP.110 Aerodrome operating minima – aeroplanes and helicopters

VISUAL APPROACH OPERATIONS

For a visual approach operation, the runway visual range (RVR) should not be less than 800 m.

AMC5 SPO.OP.110 Aerodrome operating minima — aeroplanes and helicopters

DETERMINATION OF RVR OR VIS FOR INSTRUMENT APPROACH OPERATIONS — AEROPLANES

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

(1) the minimum RVR or VIS for the type of runway used according to Table 7;

(2) the minimum RVR determined according to the MDH or DH and class of lighting facility according to Table 8; or

(3) the minimum RVR according to the visual and non-visual aids and on-board equipment used according to Table 9.

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

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

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

(d) The visual aids should comprise standard runway day markings, runway edge lights, threshold lights, runway end lights and approach lights as defined in Table 8.

Table 7

Type of runway versus minimum RVR or VIS – aeroplanes

Type of runway	**Minimum RVR or VIS (m)**
PA runway, category I	RVR 550
NPA runway	RVR 750
Non-instrument runway	VIS according to Table 1 in SPO.OP.112 (Circling minima)

Table 8

RVR versus DH/MDH

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

581	—	600	2 000	2 300	2 400	2 400
601	—	620	2 100	2 400	2 400	2 400
621	—	640	2 200	2 400	2 400	2 400
641	—	660	2 300	2 400	2 400	2 400
661	and above		2 400	2 400	2 400	2 400

Table 9

Visual and non-visual aids and/or on-board equipment versus minimum RVR – aeroplanes

Type of approach	**Facilities**	**Lowest RVR (m)**	
		Multi-pilot operations	**Single-pilot operations**
3D Operations Final approach track offset ≤ 15º for category A and B aeroplanes or ≤ 5º for Category C and D aeroplanes	RTZL and RCLL	no limitation	
	Without RTZL and RCLL but using HUDLS or equivalent system; coupled autopilot or flight director to the DH	no limitation	600 m
	No RTZL and RCLL, not using HUDLS or equivalent system or autopilot to the DH	750 m	800 m
3D Operations	runway touchdown zone lights (RTZL) and runway centre line lights (RCLL) and Final approach track offset > 15o for Category A and B aeroplanes or Final approach track offset > 5 o for Category C and D aeroplanes	800 m	1 000 m
	without RTZL and RCLL but using HUDLS or equivalent system; autopilot or flight director to the DH and Final approach track offset > 15o for Category A and B aeroplanes or Final approach track offset > 5 o for Category C and D aeroplanes	800 m	1 000 m
2D Operations	Final approach track offset < 15° for Category A and B aeroplanes or < 5° for Category C and D aeroplanes	750	800
	Final approach track offset ≥ 15° for Category A and B aeroplanes	1 000	1 000
	Final approach track offset ≥ 5° for Category C and D aeroplanes	1 200	1 200

Table 10

Approach lighting systems – aeroplanes

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

(e) For night operations or for any operation where credit for visual aids is required, the lights should be on and serviceable except as provided for in Table 15.

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

AMC6 SPO.OP.110 Aerodrome operating minima — aeroplanes and helicopters

DETERMINATION OF RVR OR VIS FOR, TYPE A INSTRUMENT APPROACH AND TYPE B CAT I INSTRUMENT APPROACH OPERATIONS – HELICOPTERS

(a) For IFR operations, the RVR or VIS should not be less than the greatest of:
   (1) the minimum RVR or VIS for the type of runway/FATO used according to Table 11;
   (2) the minimum RVR determined according to the MDH or DH and class of lighting facility according to Table 12; or
   (3) for PinS operations with instructions to 'proceed visually', the distance between the MAPt of the PinS and the FATO or its approach light system.

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

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

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

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

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

(f) The visual aids should comprise standard runway day markings, runway edge lights, threshold lights and runway end lights and approach lights as specified in Table 13.

(g) For night operations or for any operation where credit for runway and approach lights as defined in Table 13 is required, the lights should be on and serviceable except as provided for in Table 15.

Table 11

Type of runway/FATO versus minimum RVR – helicopters

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

Table 12

Onshore helicopter instrument approach minima

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

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

Table 13

Approach lighting systems - helicopters

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

AMC8 SPO.OP.110 Aerodrome operating minima — aeroplanes and helicopters

CONVERSION OF VISIBILITY TO CMV – AEROPLANES

The following conditions apply to the use of CMV instead of RVR:

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

(1) to satisfy take-off minima; or

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

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

(c) In order to determine CMV from visibility:

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

(2) for purposes other than flight planning, the conversion factors specified in Table 14 should be used.

Table 14

Conversion of reported VIS to RVR/CMV

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

AMC9 SPO.OP.110 Aerodrome operating minima — aeroplanes and helicopters

EFFECT ON LANDING MINIMA OF TEMPORARILY FAILED OR DOWNGRADED GROUND EQUIPMENT — COMPLEX MOTOR-POWERED AIRCRAFT

(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 15 and, if considered necessary, the approach should be abandoned.

(b) Conditions applicable to Table 15:

(1) multiple failures of runway/FATO lights other than those indicated in Table 15 should not be acceptable;

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

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

Table 15

Failed or downgraded equipment — effect on landing minima

Failed or downgraded equipment	**Effect on landing minima**	
	Type B	**Type A**
Navaid standby transmitter	No effect	
Outer marker (ILS only)	No effect if the required height or glide path can be checked using other means, e.g. DME fix	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), NPA operations cannot be conducted
Middle marker (ILS only)	No effect	No effect unless used as MAPt
RVR Assessment Systems	No effect	

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

AMC10 SPO.OP.110 Aerodrome operating minima — aeroplanes and helicopters

EFFECT ON LANDING MINIMA OF TEMPORARILY FAILED OR DOWNGRADED GROUND EQUIPMENT— OTHER-THAN-COMPLEX MOTOR-POWERED AIRCRAFT

(a) Non-precision approaches requiring a final approach fix (FAF) and/or MAPt should not be conducted where a method of identifying the appropriate fix is not available.

(b) Where approach lighting is partly unavailable, minima should take account of the serviceable length of approach lighting.

GM1 SPO.OP.110 Aerodrome operating minima — aeroplanes and helicopters

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 Table 1 should be used.

Table 16: 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 SPO.OP.110 Aerodrome operating minima — aeroplanes and helicopters

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; and

(vii) the technique affords procedural integration with APV operations.

(b) CDFA

(1) Continuous descent final approach is defined in Part DEF.

(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;

(ii) VOR, VOR/DME;

(iii) LOC, LOC/DME;

(iv) VDF, SRA; and

(v) GNSS/LNAV.

(3) Stabilised approach (SAp) is defined in Part DEF.

(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.

(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 SPO.OP.110 Aerodrome operating minima — aeroplanes and helicopters

ONSHORE AERODROME DEPARTURE PROCEDURES — OPERATIONS WITH NON-COMPLEX HELICOPTERS

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

GM4 SPO.OP.110 Aerodrome operating minima — aeroplanes and helicopters

TAKE-OFF MINIMA — OPERATIONS WITH COMPLEX HELICOPTERS

(a) 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} (velocity take-off safety speed) and V_{mini}.

(b) 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.

GM5 SPO.OP.110 Aerodrome operating minima — aeroplanes and helicopters

APPROACH LIGHTING SYSTEMS – ICAO, FAA

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

Table 17

Approach lighting systems — ICAO and FAA specifications

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

GM6 SPO.OP.110 Aerodrome operating minima - circling operations with aeroplanes

IAPs — SBAS OPERATIONS

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

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

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

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

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

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

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

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

GM7 SPO.OP.110 Aerodrome operating minima - circling operations with aeroplanes

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

The values in Table 8 are derived from the formula below:

RVR (m) = [(DH/MDH (ft) × 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 8 up to 3.77° and then remaining constant. An upper RVR limit of 2 400 m has been applied to the table.

GM8 SPO.OP.110 Aerodrome operating minima - circling operations with aeroplanes

USE OF DH FOR NPAs FLOWN USING THE CONTINUOUS DESCENT FINAL APPROACH (CDFA) TECHNIQUE

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

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

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

- understanding of the CDFA concept including use of the MDA/H as DA/H;
- cockpit procedures that ensure flight on speed, on path, and with proper configuration and energy management;
- cockpit procedures that ensure gradual decision-making; and
- identification of cases where an increase of the DA/H may be necessary because of non-standard circumstances, etc

GM9 SPO.OP.110 Aerodrome operating minima – aeroplane and helicopters

INCREMENTS SPECIFIED BY THE COMPETENT AUTHORITY

Additional increments to the published minima may be specified by the competent authority in order to take into account certain operations, such as downwind approaches, single-pilot operations, or approaches flown not using the CDFA technique.

GM10 SPO.OP.110 Aerodrome operating minima – aeroplane and helicopters

USE OF COMMERCIALLY AVAILABLE INFORMATION

When an operator uses commercially available information to establish aerodrome operating minima, the operator remains responsible for ensuring that the information used is accurate and suitable for its operation, and that the aerodrome operating minima are calculated in accordance with the method specified in Part C of its operations manual.

The operator should apply the procedures in ORO.GEN.205 'Contracted activities'.

GM1 SPO.OP.110(b)(5) Aerodrome operating minima – aeroplane and helicopters

VISUAL AND NON-VISUAL AIDS AND INFRASTRUCTURE

'Visual and non-visual aids and infrastructure' refers to all equipment and facilities required for the procedure to be used for the intended instrument approach operation. This includes but is not limited to lights, markings, ground- or space-based radio aids, etc.

GM1 SPO.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 OCH included in the procedure are referenced to aerodrome elevation;

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(ii) the MAPt.

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

(3) If the divergence point is reached before the required visual reference is acquired, a missed approach should be initiated not later than the MAPt and completed in accordance with the 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 the MDA/H until the threshold of the intended landing runway has been identified and the aeroplane is in a position to continue with a normal rate of descent to land within the TDZ.

(e) Missed approach

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

(i) if the missed approach procedure is required to be flown when the aeroplane is positioned on the instrument approach track and before commencing the circling manoeuvre, the published missed approach for the instrument approach should be followed; or

(ii) if the IAP is carried out with the aid of an ILS, MLS or a SAp, the MAPt associated with an ILS or an 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 to either:

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

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

(iii) the MSA;

(iv) 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 SPO.OP.115 Performance-based navigation — aeroplanes and helicopters

APPROACH FLIGHT TECHNIQUE — AEROPLANES

(a) All approach operations should be flown as SAp operations.

(b) The CDFA technique should be used for NPA procedures.

AMC1 SPO.OP.116 Performance-based navigation — aeroplanes and helicopters

PBN OPERATIONS

For operations where a navigation specification for performance-based navigation (PBN) has been prescribed and no specific approval is required in accordance with SPA.PBN.100, the operator should:

(a) establish operating procedures specifying:

(1) normal, abnormal and contingency procedures;

(2) electronic navigation database management; and

(3) relevant entries in the minimum equipment list (MEL);

(b) specify the flight crew qualification and proficiency constraints and ensure that the training programme for relevant personnel is consistent with the intended operation; and

(c) ensure continued airworthiness of the area navigation system.

AMC2 SPO.OP.116 Performance-based navigation — aeroplanes and helicopters

MONITORING AND VERIFICATION

(a) Preflight and general considerations

(1) At navigation system initialisation, the flight crew should confirm that the navigation database is current and verify that the aircraft position has been entered correctly, if required.

(2) The active flight plan, if applicable, should be checked by comparing the charts or other applicable documents with navigation equipment and displays. This includes confirmation of the departing runway and the waypoint sequence, reasonableness of track angles and distances, any altitude or speed constraints, and, where possible, which waypoints are fly-by and which are fly-over. Where relevant, the RF leg arc radii should be confirmed.

(3) The flight crew should check that the navigation aids critical to the operation of the intended PBN procedure are available.

(4) The flight crew should confirm the navigation aids that should be excluded from the operation, if any.

(5) An arrival, approach or departure procedure should not be used if the validity of the procedure in the navigation database has expired.

(6) The flight crew should verify that the navigation systems required for the intended operation are operational.

(b) Departure

(1) Prior to commencing a take-off on a PBN procedure, the flight crew should check that the indicated aircraft position is consistent with the actual aircraft position at the start of the take-off roll (aeroplanes) or lift-off (helicopters).

(2) Where GNSS is used, the signal should be acquired before the take-off roll (aeroplanes) or lift-off (helicopters) commences.

(3) Unless automatic updating of the actual departure point is provided, the flight crew should ensure initialisation on the runway or FATO by means of a manual runway threshold or intersection update, as applicable. This is to preclude any inappropriate or inadvertent position shift after take-off.

(c) Arrival and approach

(1) The flight crew should verify that the navigation system is operating correctly and the correct arrival procedure and runway (including any applicable transition) are entered and properly depicted.

(2) Any published altitude and speed constraints should be observed.

(3) The flight crew should check approach procedures (including alternate aerodromes if needed) as extracted by the system (e.g. CDU flight plan page) or presented graphically on the moving map, in order to confirm the correct loading and the reasonableness of the procedure content.

(4) Prior to commencing the approach operation (before the IAF), the flight crew should verify the correctness of the loaded procedure by comparison with the appropriate approach charts. This check should include:

(i) the waypoint sequence;

(ii) reasonableness of the tracks and distances of the approach legs and the accuracy of the inbound course; and

(iii) the vertical path angle, if applicable.

(d) Altimetry settings for RNP APCH operations using Baro VNAV

(1) Barometric settings

(i) The flight crew should set and confirm the correct altimeter setting and check that the two altimeters provide altitude values that do not differ more than 100 ft at the most at or before the FAF.

(ii) The flight crew should fly the procedure with:

(A) a current local altimeter setting source available — a remote or regional altimeter setting source should not be used; and

(B) the QNH/QFE, as appropriate, set on the aircraft's altimeters.

(2) Temperature compensation

(i) For RNP APCH operations to LNAV/VNAV minima using Baro VNAV:

(A) the flight crew should not commence the approach when the aerodrome temperature is outside the promulgated aerodrome temperature limits for the procedure unless the area navigation system is equipped with approved temperature compensation for the final approach;

(B) when the temperature is within promulgated limits, the flight crew should not make compensation to the altitude at the FAF; and

(C) since only the final approach segment is protected by the promulgated aerodrome temperature limits, the flight crew should consider the effect of temperature on terrain and obstacle clearance in other phases of flight.

(ii) For RNP APCH operations to LNAV minima, the flight crew should consider the effect of temperature on terrain and obstacle clearance in all phases of flight, in particular on any step-down fix.

(e) Sensor and lateral navigation accuracy selection

(1) For multi-sensor systems, the flight crew should verify, prior to approach, that the GNSS sensor is used for position computation.

(2) Flight crew of aircraft with RNP input selection capability should confirm that the indicated RNP value is appropriate for the PBN operation.

AMC3 SPO.OP.116 Performance-based navigation — aeroplanes and helicopters

MANAGEMENT OF THE NAVIGATION DATABASE

(a) For RNAV 1, RNAV 2, RNP 1, RNP 2, and RNP APCH, the flight crew should neither insert nor modify waypoints by manual entry into a procedure (departure, arrival or approach) that has been retrieved from the database. User-defined data may be entered and used for waypoint altitude/speed constraints on a procedure where said constraints are not included in the navigation database coding.

(b) For RNP 4 operations, the flight crew should not modify waypoints that have been retrieved from the database. User-defined data (e.g. for flex-track routes) may be entered and used.

(c) The lateral and vertical definition of the flight path between the FAF and the missed approach point (MAPt) retrieved from the database should not be revised by the flight crew.

AMC4 SPO.OP.116 Performance-based navigation — aeroplanes and helicopters

DISPLAYS AND AUTOMATION

(a) For RNAV 1, RNP 1, and RNP APCH operations, the flight crew should use a lateral deviation indicator, and where available, flight director and/or autopilot in lateral navigation mode.

(b) The appropriate displays should be selected so that the following information can be monitored:

(1) the computed desired path;

(2) aircraft position relative to the lateral path (cross-track deviation) for FTE monitoring; and

(3) aircraft position relative to the vertical path (for a 3D operation).

(c) The flight crew of an aircraft with a lateral deviation indicator (e.g. CDI) should ensure that lateral deviation indicator scaling (full-scale deflection) is suitable for the navigation accuracy associated with the various segments of the procedure.

(d) The flight crew should maintain procedure centrelines unless authorised to deviate by ATC or demanded by emergency conditions.

(e) Cross-track error/deviation (the difference between the area-navigation-system-computed path and the aircraft-computed position) should normally be limited to ± ½ time the RNAV/RNP value associated with the procedure. Brief deviations from this standard (e.g. overshoots or undershoots during and immediately after turns) up to a maximum of 1 time the RNAV/RNP value should be allowable.

(f) For a 3D approach operation, the flight crew should use a vertical deviation indicator and, where required by AFM limitations, a flight director or autopilot in vertical navigation mode.

(g) Deviations below the vertical path should not exceed 75 ft at any time, or half-scale deflection where angular deviation is indicated, and not more than 75 ft above the vertical profile, or half-scale deflection where angular deviation is indicated, at or below 1 000 ft above aerodrome level. The flight crew should execute a missed approach if the vertical deviation exceeds this criterion unless the flight crew has in sight the visual references required to continue the approach.

AMC5 SPO.OP.116 Performance-based navigation — aeroplanes and helicopters

VECTORING AND POSITIONING

(a) ATC tactical interventions in the terminal area may include radar headings, 'direct to' clearances which bypass the initial legs of an approach procedure, interceptions of an initial or intermediate segments of an approach procedure or the insertion of additional waypoints loaded from the database.

(b) In complying with ATC instructions, the flight crew should be aware of the implications for the navigation system.

(c) 'Direct to' clearances may be accepted to the IF provided that it is clear to the flight crew that the aircraft will be established on the final approach track at least 2 NM before the FAF.

(d) 'Direct to' clearance to the FAF should not be acceptable. Modifying the procedure to intercept the final approach track prior to the FAF should be acceptable for radar-vectored arrivals or otherwise only with ATC approval.

(e) The final approach trajectory should be intercepted no later than the FAF in order for the aircraft to be correctly established on the final approach track before starting the descent (to ensure terrain and obstacle clearance).

(f) 'Direct to' clearances to a fix that immediately precede an RF leg should not be permitted.

(g) For parallel offset operations en route in RNP 4 and A-RNP, transitions to and from the offset track should maintain an intercept angle of no more than 45° unless specified otherwise by ATC.

AMC6 SPO.OP.116 Performance-based navigation — aeroplanes and helicopters

ALERTING AND ABORT

(a) Unless the flight crew has sufficient visual reference to continue the approach operation to a safe landing, an RNP APCH operation should be discontinued if:

(1) navigation system failure is annunciated (e.g. warning flag);

(2) lateral or vertical deviations exceed the tolerances; and

(3) loss of the on-board monitoring and alerting system.

(b) Discontinuing the approach operation may not be necessary for a multi-sensor navigation system that includes demonstrated RNP capability without GNSS in accordance with the AFM.

(c) Where vertical guidance is lost while the aircraft is still above 1 000 ft AGL, the flight crew may decide to continue the approach to LNAV minima, when supported by the navigation system.

AMC7 SPO.OP.116 Performance-based navigation — aeroplanes and helicopters

CONTINGENCY PROCEDURES

(a) The flight crew should make the necessary preparation to revert to a conventional arrival procedure where appropriate. The following conditions should be considered:

(1) failure of the navigation system components including navigation sensors, and a failure effecting flight technical error (e.g. failures of the flight director or autopilot);

(2) multiple system failures affecting aircraft performance;

(3) coasting on inertial sensors beyond a specified time limit; and

(4) RAIM (or equivalent) alert or loss of integrity function.

(b) In the event of loss of PBN capability, the flight crew should invoke contingency procedures and navigate using an alternative means of navigation.

(c) The flight crew should notify ATC of any problem with PBN capability.

(d) In the event of communication failure, the flight crew should continue with the operation in accordance with published lost communication procedures.

AMC8 SPO.OP.116 Performance-based navigation — aeroplanes and helicopters

RNAV 10

(a) Operating procedures and routes should take account of the RNAV 10 time limit declared for the inertial system, if applicable, considering also the effect of weather conditions that could affect flight duration in RNAV 10 airspace.

(b) The operator may extend RNAV 10 inertial navigation time by position updating. The operator should calculate, using statistically-based typical wind scenarios for each planned route, points at which updates can be made, and the points at which further updates will not be possible.

GM1 SPO.OP.116 Performance-based navigation — aeroplanes and helicopters

DESCRIPTION

(a) For both, RNP X and RNAV X designations, the 'X' (where stated) refers to the lateral navigation accuracy (total system error) in NM, which is expected to be achieved at least 95 % of the flight time by the population of aircraft operating within the airspace, route or procedure. For RNP APCH and A-RNP, the lateral navigation accuracy depends on the segment.

(b) PBN may be required on notified routes, for notified procedures and in notified airspace.

RNAV 10

(c) For purposes of consistency with the PBN concept, this Regulation is using the designation 'RNAV 10' because this specification does not include on-board performance monitoring and alerting.

(d) However, it should be noted that many routes still use the designation 'RNP 10' instead of 'RNAV 10'. 'RNP 10' was used as designation before the publication of the fourth edition of ICAO Doc 9613 in 2013. The terms 'RNP 10' and 'RNAV 10' should be considered equivalent.

AMC1 SPO.OP.120 Noise abatement procedures

NADP DESIGN — OPERATIONS WITH COMPLEX MOTOR-POWERED AIRCRAFT

(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 SPO.OP.120 Noise abatement procedures

TERMINOLOGY — OPERATIONS WITH COMPLEX MOTOR-POWERED AEROPLANES

(a) 'Climb profile' means in this context the vertical path of the NADP as it results from the pilot's actions (engine power reduction, acceleration, slats/flaps retraction).

(b) 'Sequence of actions' means the order in which these pilot's actions are done and their timing.

GENERAL

(c) The rule addresses only the vertical profile of the departure procedure. Lateral track has to comply with the standard instrument departure (SID).

EXAMPLE

(d) For a given aeroplane type, when establishing the distant NADP, the operator should choose either to reduce power first and then accelerate, or to accelerate first and then wait until slats/flaps are retracted before reducing power. The two methods constitute two different sequences of actions.

(e) For an aeroplane type, each of the two departure climb profiles may be defined by one sequence of actions (one for close-in, one for distant) and two above aerodrome level (AAL) altitudes/heights. These are:

(1) the altitude of the first pilot's action (generally power reduction with or without acceleration). This altitude should not be less than 800 ft AAL; or

(2) the altitude of the end of the noise abatement procedure. This altitude should usually not be more than 3 000 ft AAL.

(f) 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 SPO.OP.125 Minimum obstacle clearance altitudes — IFR flights

GENERAL

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

AMC1 SPO.OP.131 Fuel/energy scheme — fuel/energy planning and in-flight re-planning policy — aeroplanes and helicopters

AEROPLANES

For the fuel planning policy, the amount of the required usable fuel for a flight should not be less than the sum of the following:

(a) taxi fuel that should take into account the local conditions at the departure aerodrome and the APU consumption;
(b) trip fuel that should include:
  (1) fuel for take-off and climb from the aerodrome elevation to the initial cruising level/altitude, taking into account the expected departure routing;
  (2) fuel from the top of climb to the top of descent, including any step climb/descent;

(3) fuel from the top of descent to the point where the approach procedure is initiated, taking into account the expected arrival routing; and

(4) fuel for making an approach and landing at the destination aerodrome;

(c) contingency fuel that should be:

(1) 5 % of the planned trip fuel or, in the event of in-flight re-planning, 5 % of the trip fuel for the remainder of the flight; or

(2) an amount to fly for 5 minutes at holding speed at 1 500 ft (450 m) above the destination aerodrome in standard conditions,

whichever is higher;

(d) destination alternate fuel that should be:

(1) when the aeroplane is operated with one destination alternate aerodrome:

(i) fuel for a missed approach from the applicable DA/H or MDA/H at the destination aerodrome to the missed-approach altitude, taking into account the complete missed-approach procedure;

(ii) fuel for climb from the missed-approach altitude to the cruising level/altitude, taking into account the expected departure routing;

(iii) fuel for cruising from the top of climb to the top of descent, taking into account the expected routing

(iv) fuel for descent from the top of descent to the point where the approach is initiated, taking into account the expected arrival routing; and

(v) fuel for making an approach and landing at the destination alternate aerodrome;

(2) when the aeroplane is operated with no destination alternate aerodrome, the amount of fuel to hold for 15 minutes at 1 500 ft (450 m) in standard conditions above the destination aerodrome elevation;

(3) when the aerodrome of intended landing is an isolated aerodrome:

(i) for aeroplanes with reciprocating engines, the amount of fuel required to fly either for 45 minutes plus 15 % of the flight time planned for cruising, including the FRF, or for 2 hours, whichever is less; or

(ii) for turbine-engined aeroplanes, the amount of fuel required to fly for 2 hours with normal cruise consumption above the destination aerodrome, including the FRF.

(e) FRF that should not be less than the fuel required to fly:

(1) for 10 minutes at normal cruising altitude under VFR by day, taking off and landing at the same aerodrome/landing site, and always remaining within sight of that aerodrome/landing site;

(2) for 30 minutes at normal cruising altitude for other VFR flights by day; and

(3) for 45 minutes at normal cruising altitude under VFR by night, and under IFR for aeroplanes with reciprocating engines; and

(4) for 30 minutes at holding speed at 1 500 ft (450 m) above the aerodrome elevation in standard conditions, which is calculated according to the estimated mass on arrival under VFR by night and under IFR for turbine-engined aeroplanes,

Note: When the operator follows point (e)(1) for the FRF, the operator should specify in the standard operating procedures (SOPs):

— the type of operation in which such reduced RFR may be used; and

— the methods of reading and calculating the remaining fuel.

(f) additional fuel that should be the amount of fuel that allows the aeroplane to proceed, in the event of an engine failure or loss of pressurisation, from the most critical point along the route to a fuel en route alternate (fuel ERA) aerodrome in the relevant aircraft configuration, hold there for 15 minutes at 1 500 ft (450 m) above the aerodrome elevation in standard conditions, make an approach, and land;

(g) extra fuel if there are anticipated delays or specific operational constraints; and

(h) discretionary fuel, if required by the pilot-in-command.

HELICOPTERS

(i) The FRF should not be less than the fuel required to fly:

(1) for 10 minutes at best-range speed, provided that the helicopter remains within 25 NM of the aerodrome/operating site of departure, under VFR;

(2) for 20 minutes at best-range speed for flights other than the ones referred to in (i)(1) under VFR; and

(3) for 30 minutes at holding speed at 1 500 ft (450 m) above the destination or destination alternate under IFR

(j) If point (i)(1) is used for the FRF, the operator should specify in the SOPs:

(1) the type of operation in which such reduced FRF may be used; and
(2) methods of reading and calculating the remaining fuel.

AMC1 SPO.OP.131(a)(1)(ii) Fuel and oil supply — helicopters

REDUCED RESERVE FUEL

(a) The operator should specify in the SOP:

(1) the type of activity where such reduced reserve fuel may be used; and

(2) methods of reading and calculating the remaining fuel.

(b) Refuelling facilities should be available at the aerodrome/operating site.

AMC1 SPO.OP.135 Safety briefing

TASK SPECIALIST — GENERAL

(a) The purpose of operational briefing is to ensure that task specialists are familiar with all aspects of the operation, including their responsibilities.

(b) Such briefing should include, as appropriate:

(1) behaviour on the ground and in-flight, including emergency procedures;

(2) procedures for boarding and disembarking;

(3) procedures for loading and unloading the aircraft;

(4) use of doors in normal and emergency operations;

(5) use of communication equipment and hand signals;

(6) precautions in case of a landing on sloping ground; and

(7) in addition to the items listed from (b)(1) to (b)(6) before take-off:

(i) location of emergency exits;

(ii) restrictions regarding smoking;

(iii) restrictions regarding the use of portable electronic equipment; and

(iv) stowage of tools and hand baggage.

(c) The briefing may be given as a verbal presentation or by issuing the appropriate procedures and instructions in written form. Before commencement of the flight, their understanding should be confirmed.

AMC1 SPO.OP.152 Destination aerodromes — instrument approach operations

PBN OPERATIONS

(a) When the operator intends to use PBN, the operator should either:

(1) demonstrate that the GNSS is robust against loss of capability;

(2) select an aerodrome as a destination alternate aerodrome only if an IAP that does not rely on a GNSS is available either at that aerodrome or at the destination aerodrome.

GNSS ROBUSTNESS AGAINST LOSS OF CAPABILITY — HELICOPTERS

(b) The operator may demonstrate robustness against the loss of capability of the GNSS if all of the following criteria are met:

(1) SBAS or GBAS are available and used.

(2) The failure of a single receiver or system should not compromise the navigation capability required for the intended instrument approach.

(3) The temporary jamming of all GNSS frequencies should not compromise the navigation capability required for the intended route. The operator should provide a procedure to deal with such cases unless other sensors are available to continue on the intended route.

(4) The duration of a jamming event should be determined as follows:

(i) Considering the average speed and height of a helicopter flight, the duration of a jamming event may be considered to be less than 2 minutes.

(ii) The time needed for the GNSS system to re-start and provide the aircraft position and navigation guidance should also be considered.

(iii) Based on (i) and (ii) above, the operator should establish the duration of the loss of GNSS navigation data due to jamming. This duration should be no less than 3 minutes, and may be no longer than 4 minutes.

(5) The operator should ensure resilience to jamming for the duration determined in (4) above, as follows:

(i) If the altitude of obstacles on both sides of the flight path are higher than the planned altitude for a given segment of the flight, the operator should ensure no excessive drift on either side by relying on navigation sensors such as a inertial systems with performance in accordance with the intended function.

(ii) If (i) does not apply and the operator cannot rely on sensors other than GNSS, the operator should develop a procedure to ensure that a drift from the intended route during the jamming event has no adverse consequences on the safety of the flight. This procedure may involve air traffic services.

(6) The operator should ensure that no space weather event is predicted to disrupt the GNSS reliability and integrity at both the destination and the alternate.

(7) The operator should verify the availability of RAIM for all phases of flight based on GNSS, including navigation to the alternate.

(8) The operator's MEL should reflect the elements in points (b)(1) and (b)(2).

OPERATIONAL CREDITS

(c) To comply with point SPO.OP.153, when the operator intends to use 'operational credits' (e.g. EFVS, SA CAT I, etc.), the operator should select an aerodrome as destination alternate aerodrome only if an approach procedure that does not rely on the same 'operational credit' is available either at that aerodrome or at the destination aerodrome

GM1 SPO.OP.152 Destination aerodromes — instrument approach operations

INTENT OF AMC1

(a) The limitation applies only to destination alternate aerodromes for flights when a destination alternate aerodrome is required. A take-off or en route alternate aerodrome with instrument approach procedures relying on GNSS may be planned without restrictions. A destination aerodrome with all instrument approach procedures relying solely on GNSS may be used without a destination alternate aerodrome if the conditions for a flight without a destination alternate aerodrome are met.

(b) The term 'available' means that the procedure can be used in the planning stage and complies with planning minima requirements.

GM2 SPO.OP.152 Destination aerodromes — instrument approach operations

GNSS ROBUSTNESS AGAINST LOSS OF CAPABILITY — HELICOPTERS

(a) Redundancy of on-board systems ensures that no single on-board equipment failure (e.g. antenna, GNSS receiver, FMS, or navigation display failure) results in the loss of the GNSS capability.

(b) Any shadowing of the GNSS signal or jamming of all GNSS frequencies from the ground is expected to be of a very short duration and affect a very small area. Additional sensors or functions such as inertial coasting may be used during jamming events. Jamming should be considered on all segments of the intended route, including the approach.

(c) The availability of GNSS signals can be compromised if space weather events cause 'loss of lock' conditions and more than one satellite signal may be lost on a given GNSS frequency. Until space weather forecasts are available, the operator may use 'nowcasts' as short-term predictions for helicopter flights of short durations.

(d) SBAS also contributes to mitigate space weather effects, both by providing integrity messages and by correcting ionosphere-induced errors.

(e) Even though SBAS should be available and used, RAIM should remain available autonomously. In case of loss of the SBAS, the route and the approach to the destination or alternate should still be flown with an available RAIM function.

(f) When available, GNSS based on more than one constellation and more than one frequency may provide better integrity and redundancy regarding failures in the space segment of the GNSS, jamming, and resilience to space weather events.

AMC1 SPO.OP.155 Refuelling with persons embarking, on board or disembarking

OPERATIONAL PROCEDURES — AEROPLANES

(a) 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 persons on board. This qualified person should be capable of handling emergency procedures concerning fire protection and firefighting, 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) Flight crew members and task specialists 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) Task specialists should be instructed to unfasten their seat belts and refrain from smoking.

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

(8) The ground area beneath the exits intended for emergency evacuation and slide deployment areas should be kept clear.

(9) Provision should be made for a safe and rapid evacuation.

AMC2 SPO.OP.155 Refuelling with persons embarking, on board or disembarking

OPERATIONAL PROCEDURES — Helicopters

When the helicopter rotors are stopped, the efficiency and speed of task specialists disembarking from and re-embarking on board helicopters is such that disembarking before refuelling and re-embarking after refuelling is the general practice. However, if such operations are needed, the operator should refer to AMC1 SPO.OP.157 and AMC2 SPO.OP.157. Operational procedures to be described in the operations manual (OM) should specify that at least the relevant precautions of the aforementioned AMC are taken.

GM1 SPO.OP.155 Refuelling with persons 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 SPO.OP.157 Refuelling with engine(s) and/or rotors turning — helicopters

OPERATIONAL PROCEDURES – TASK SPECIALISTS ON BOARD

Operational procedures in the OM should specify that at least the following precautions are taken:

(a) all necessary information should be exchanged in advance with the aerodrome operator, operating-site operator, and refuelling operator;
(b) the procedures to be used by crew members should be defined;
(c) the procedures to be used by the operator’s ground operations personnel that may be in charge of refuelling or assisting in emergency evacuations should be described;

(d) the operator's training programmes for crew members and for the operator's ground operations personnel should be described;
(e) the minimum distance between the helicopter turning parts and the refuelling vehicle or installations should be defined when the refuelling takes place outside an aerodrome or at an aerodrome where there are no such limitations;
(f) besides any rescue and firefighting services (RFFSs) that are required to be available by aerodrome regulations, an additional handheld fire extinguisher with the equivalent of 5 kg of dry powder should be immediately available and ready for use;
(g) a means for a two-way communication between the crew and the person in charge of refuelling should be defined and established;
(h) if fuel vapour is detected inside the helicopter, or any other hazard arises, refuelling/defuelling should be stopped immediately;
(i) one pilot should stay at the controls, constantly monitor the refuelling, and be ready to shut off the engines and evacuate at all times; and
(j) any additional precautions should be taken, as determined by the risk assessment

AMC2 SPO.OP.157 Refuelling with engine(s) and/or rotors turning — helicopters

OPERATIONAL PROCEDURES — TASK SPECIALISTS ON BOARD

In addition to AMC1 SPO.OP.157, for refuelling with task specialists on board, operational procedures in the OM should specify that at least the following precautions are taken:

(a) the positioning of the helicopter and the corresponding helicopter evacuation strategy should be defined taking into account the wind as well as the refuelling facilities or vehicles;
(b) on a heliport, the ground area beneath the exits that are intended for emergency evacuation should be kept clear;
(c) an additional task specialist briefing as well as instructions should be defined, and the 'No smoking' signs should be on unless 'No smoking' placards are installed;
(d) interior lighting should be set to enable identification of emergency exits;
(e) the use of doors during refuelling should be defined: doors on the refuelling side should remain closed, while doors on the opposite side should remain unlocked or, weather permitting, open unless otherwise specified in the AFM; and
(f) at least one suitable person or appropriately trained task specialist capable of implementing emergency procedures for firefighting, communications, as well for initiating and directing an evacuation, should remain at a specified location; this person should not be the qualified pilot at the controls or the person performing the refuelling

GM1 SPO.OP.157 Refuelling with engine(s) and/or rotors turning — helicopters

RISK ASSESSMENT

The risk assessment should explain why it is not practical to refuel with the engine(s) and rotors stopped, identify the additional hazards, and describe how the additional risks are controlled. Helicopter offshore operations (HOFO) are typical operations where the benefits should outweigh the risks if mitigation measures are taken.

Guidance on safe refuelling practices is contained in ICAO Doc 9137 Airport Services Manual, Parts 1 and 8.

The operator's risk assessment may include, but not be limited to, the following risks, hazards and mitigation measures:

(a) risk related to refuelling with rotors turning;
(b) risk related to the shutting down of the engines, including the risk of failures during start-up;
(c) environmental conditions, such as wind limitations, displacement of exhaust gases, and blade sailing;
(d) risk related to human factors and fatigue management, especially for single-pilot operations for long periods of time;
(e) risk mitigation, such as the safety features of the fuel installation, rescue and firefighting (RFF) capability, number of personnel members available, ease of emergency evacuation of the helicopter, etc.;
(f) assessment of the use of radio transmitting equipment;
(g) determination of the use of seat belts; and
(h) review of the portable electronic device (PED) policy.

AMC1 SPO.OP.170 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.

AMC2 SPO.OP.170 Meteorological conditions

APPLICATION OF AERODROME FORECASTS (TAF & TREND)

Where a terminal area forecast (TAF) or meteorological aerodrome or aeronautical report (METAR) with landing forecast (TREND) is used as forecast, the following criteria should be used:

(a) From the start of a TAF validity period up to the time of applicability of the first subsequent 'FM...' or 'BECMG' or, if no 'FM' or BECMG' is given, up to the end of the validity period of the TAF, the prevailing weather conditions forecast in the initial part of the TAF should be applied.

(b) From the time of observation of a METAR up to the time of applicability of the first subsequent 'FM' or 'BECMG' or, if no 'FM' or BECMG' is given, up to the end of the validity period of the TREND, the prevailing weather conditions forecast in the METAR should be applied.

(c) Following FM (alone) or BECMG AT, any specified change should be applied from the time of the change.

(d) Following BECMG (alone), BECMG FM, BECMG TL, BECMG FM TL:

(1) in the case of deterioration, any specified change should be applied from the start of the change; and

(2) in the case of improvement, any specified change should be applied from the end of the change.

(e) In a period indicated by TEMPO (alone), TEMPO FM, TEMPO TL, TEMPO FM TL, PROB30/40 (alone):

(1) deteriorations associated with persistent conditions in connection with e.g. haze, mist, fog, dust/sandstorm, continuous precipitation should be applied;

(2) deteriorations associated with transient/showery conditions in connection with short-lived weather phenomena, e.g. thunderstorms, showers may be ignored; and

(3) improvements should in all cases be disregarded.

(f) In a period indicated by PROB30/40 TEMPO:

(1) deteriorations may be disregarded; and

(2) improvements should be disregarded.

Note: Abbreviations used in the context of this AMC are as follows:

FM: from

BECMG: becoming

AT: at

TL: till

TEMPO: temporarily

PROB: probability

GM1 SPO.OP.170 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 SPO.OP.175 Ice and other contaminants — ground procedures

TERMINOLOGY

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

(a) 'Anti-icing': the process of protecting the aircraft to prevent contamination due to existing or expected weather, typically by applying anti-icing fluids on uncontaminated aircraft surfaces.

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

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

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

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

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

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

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

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

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

(h) 'De-icing': the process of eliminating frozen contamination from aircraft surfaces, typically by applying de-icing fluids.

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

(1) Heated water;

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

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

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

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

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

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

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

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

(1) 10°C for a Type I fluid; or

(2) 7°C for Type II, III or IV fluids

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

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

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

ANTI-ICING CODES

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

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

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

GM2 SPO.OP.175 Ice and other contaminants — ground procedures

DE-ICING/ANTI-ICING — PROCEDURES

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

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

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

(3) 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 OAT, as this may affect:

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

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

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

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

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

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

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

(8) The 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 re-treatment or a pre-take-off contamination check to be performed in order to verify that the aircraft's surfaces are free of contamination. Special methods and/or equipment may be necessary to perform this check, especially at night time or in extremely adverse weather conditions. If this check cannot be performed just before take-off, re-treatment should be applied.

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

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

(c) Special operational considerations

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

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

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

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

(5) 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 & LWE systems

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

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

(f) Training

The operator's initial and recurrent de-icing training programmes (including communication training) for flight crew and for other personnel involved in de-icing operations should include additional training if any of the following is introduced:

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

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

(3) a new type of aircraft.

(g) Contracting

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

(1) roles and responsibilities;

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

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

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

(5) different checks to be conducted; and

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

(h) Special maintenance considerations

(1) General

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

(2) Special considerations regarding residues of dried fluids

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

(i) Dried fluid residues

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

(ii) Re-hydrated fluid residues

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

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

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

GM3 SPO.OP.175 Ice and other contaminants — ground procedures

DE-ICING/ANTI-ICING — BACKGROUND INFORMATION

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

(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 snow exceeding certain intensities, high wind velocity, and fast-dropping OAT. No HOT guidelines exist for these conditions.

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

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

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

(iii) SAE AS6285 'Aircraft Ground Deicing/Anti-Icing Processes';

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

(v) SAE AS6332 'Aircraft Ground Deicing/Anti-icing Quality Management';

(vi) SAE ARP6257 'Aircraft Ground De/Anti-Icing Communication Phraseology for Flight and Ground Crews';

(vii) FAA Holdover Time Guidelines

(viii) FAA 8900.xxx series Notice 'Revised FAA-Approved Deicing Program Updates, Winter 20xx-20yy'

(b) Fluids

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

(2) Type II and Type IV fluids contain thickeners which enable the fluid to form a thicker liquidwetting film on surfaces to which it is applied. Generally, this fluid provides a longer HOT than Type I fluids in similar conditions.

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

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

(c) Hold-over protection

(1) Hold-over protection is achieved by a layer of anti-icing fluid remaining on and protecting aircraft surfaces for a period of time. With 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.

AMC1 SPO.OP.176 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 and all other relevant operational personnel require in order to comply with the procedures for dispatch and flight in icing conditions:

(1) 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;

(2) instruction on the operational and performance limitations or margins;

(3) the use of in-flight ice detection, anti-icing and de-icing systems in both normal and abnormal operation; and

(4) instruction on the differing intensities and forms of ice accretion and the consequent action which should be taken.

GM1 SPO.OP.190(b)&(d) Fuel/energy scheme – in-flight fuel/energy management policy

FINAL RESERVE FUEL PROTECTION

To ensure a safe landing, the pilot needs to protect the final reserve fuel (FRF) in accordance with point SPO.OP.131. The objective of the FRF protection is to ensure that a safe landing is made at any aerodrome or operating site when unforeseen circumstances may not allow to safely complete the flight, as originally planned.

When the FRF can no longer be protected, then a fuel emergency needs to be declared, as per point SPO.OP.190(d), and any landing option explored (e.g. for aeroplanes, aerodromes not assessed by the operator, military aerodromes, closed runways), including deviating from rules, operational procedures, and methods in the interest of safety (as per point CAT.GEN.MPA.105(b)).

ICAO Doc 9976 Flight Planning and Fuel Management (FPFM) Manual and the EASA Fuel Manual contain further detailed guidance on the development of a comprehensive in-flight fuel management policy and related procedures.

GM1 SPO.OP.190(c) Fuel/energy scheme – in-flight fuel/energy management policy

‘MINIMUM FUEL’ DECLARATION

The ‘MINIMUM FUEL’ declaration informs the ATC that all planned landing options have been reduced to a specific aerodrome or operating site of intended landing, and for helicopters, that no other landing site is available. It also informs the ATC that any change to the existing clearance may result in landing with less than the planned FRF/energy. This is not an emergency situation but an indication that an emergency situation is possible, should any additional delay occur.

The pilot should not expect any form of priority handling as a result of a ‘MINIMUM FUEL’ declaration. However, the ATC should advise the flight crew of any additional expected delays, as well as coordinate with other ATC units when transferring the control of the aircraft, to ensure that the other ATC units are aware of the flight’s fuel/energy state.

ICAO Doc 9976 Flight Planning and Fuel Management (FPFM) Manual (1st Edition, 2015) and the EASA Fuel Manual contain guidance on declaring ‘MINIMUM FUEL’.

GM1 SPO.OP.200 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:

(iii) 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.

(iv) 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 should also 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 above 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 SPO.OP.205 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 Doc 8168 PANS-OPS, Volume III;

(3) ICAO PANS-ATM.

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

ACAS FLIGHT CREW TRAINING

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

(5) Additionally, in ACAS-ACAS encounters, failure to respond to an RA also restricts the choices available to the other aircraft's ACAS and thus renders the other aircraft's ACAS less effective than if own aircraft were not ACAS equipped.

(B) Advisory thresholds

Objective: to demonstrate knowledge of the criteria for issuing TAs and RAs.

Criteria: the flight crew member should demonstrate an understanding of the methodology used by ACAS to issue TAs and RAs and the general criteria for the issuance of these advisories, including the following:

(a) ACAS advisories are based on time to closest point of approach (CPA) rather than distance. The time should be short and vertical separation should be small, or projected to be small, before an advisory can be issued. The separation standards provided by ATS are different from the miss distances against which ACAS issues alerts.

(b) Thresholds for issuing a TA or 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 10 000 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 1 450 ft AGL.

(b) 'Descend' RAs are inhibited below 1 100 ft AGL.

(c) All RAs are inhibited below 1 000 ft AGL.

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

(e) Altitude and configuration under which 'Climb' and 'Increase Climb' RAs are inhibited. ACAS can still issue 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 ± 1 200 ft.

(c) Non-altitude reporting traffic.

(d) No bearing TAs and RAs.

(e) Off-scale TAs and RAs: the selected range should be changed to ensure that all available information on the intruder is displayed.

(f) TAs: the minimum available display range 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 2 500 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 1 200 ft, and to some intersecting runways, RAs can be expected. If, for any 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 an 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 an RA is issued. Various States have different reporting rules and the material available to the flight crew member should be tailored to the operator's operating environment. 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 an RA pitch display, the pilot flying should consider the likely magnitude of an appropriate pitch change. The pilot monitoring should provide updates on the traffic location shown on the ACAS display, using this information to help visually acquire the intruder.

(B) Proper interpretation of the displayed information. Flight crew members should confirm that the aircraft they have visually acquired is that which has caused the TA to be issued. Use should be made of all information shown on the display, note being taken of the bearing and range of the intruder (amber circle), whether it is above or below (data tag), and its vertical speed direction (trend arrow).

(C) Other available information should be used to assist in visual acquisition, including ATC 'party-line' information, traffic flow in use, etc.

(D) Because of the limitations described, the pilot flying should not manoeuvre the aircraft based solely on the information shown on the ACAS display. No attempt should be made to adjust the current flight path in anticipation of what an RA would advise, except that if own aircraft is approaching its cleared level at a high vertical rate with a TA present, vertical rate should be reduced to less than 1 500 ft/min.

(E) When visual acquisition is attained, and as long as no RA is received, normal right of way rules should be used to maintain or attain safe separation. No unnecessary manoeuvres should be initiated. The limitations of making manoeuvres based solely on visual acquisition, especially at high altitude or at night, or without a definite horizon should be demonstrated as being understood.

(ii) RA responses

Objective: to verify that the pilot properly interprets and responds to RAs.

Criteria: the pilot should demonstrate the following:

(A) Proper response to the RA, even if it is in conflict with an ATC instruction and even if the pilot believes that there is no threat present.

(B) Proper task sharing between the pilot flying and the pilot monitoring. The pilot flying should respond to a corrective RA with appropriate control inputs. The pilot monitoring should monitor the response to the RA and should provide updates on the traffic location by checking the traffic display. Proper 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/sec^2).

(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 1 500 ft/min from level flight will be approximately 6° when the true airspeed (TAS) is 150 kt, 4° at 250 kt, and 2° at 500 kt. (These angles are derived from the formula: 1 000 divided by TAS.)

(F) Recognition of altitude crossing encounters and the proper response to these RAs.

(G) For preventive RAs, the vertical speed needle or pitch attitude indication should remain outside the red area on the RA display.

(H) For maintain rate RAs, the vertical speed should not be reduced. Pilots should recognise that a maintain rate RA may result in crossing through the intruder's altitude.

(I) When the RA weakens, or when the green 'fly to' indicator changes position, the pilot should initiate a return towards the original clearance, and when 'clear of conflict' is annunciated, the pilot should complete the return to the original clearance.

(J) The controller should be informed of the RA as soon as time and workload permit, using the standard phraseology.

(K) When possible, an ATC clearance should be complied with while responding to an RA. For example, if the aircraft can level at the assigned altitude while responding to RA (an 'adjust vertical speed' RA (version 7) or 'level off' (version 7.1), it should be done; the horizontal (turn) element of an ATC instruction should be followed.

(L) Knowledge of the ACAS multi-aircraft logic and its limitations, and that ACAS can optimise separations from two aircraft by climbing or descending towards one of them. For example, ACAS only considers intruders that it considers to be a threat when selecting an RA. As such, it is possible for ACAS to issue an RA against one intruder that results in a manoeuvre towards another intruder 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.

(j) ACAS recurrent training

(1) ACAS recurrent training ensures that flight crew members maintain the appropriate ACAS knowledge and skills. ACAS recurrent training should be integrated into and/or conducted in conjunction with other established recurrent training programmes. An essential item of recurrent training is the discussion of any significant issues and operational concerns that have been identified by the operator. Recurrent training should also address changes to ACAS logic, parameters or procedures and to any unique ACAS characteristics which flight crew members should be made aware of.

(2) It is recommended that the operator's recurrent training programmes using full flight simulators include encounters with conflicting traffic when these simulators are equipped with ACAS. The full range of likely scenarios may be spread over a 2 year period. If a full flight simulator, as described above, is not available, use should be made of an interactive CBT that is capable of presenting scenarios to which pilot responses should be made in real-time.

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LANDING DISTANCE ASSESSMENT – COMPLEX AEROPLANES

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

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

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

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

(v) The in-flight determination of the landing distance should be done is such a way that either:

(1) the landing distance available (LDA) on the intended runway is at least 115 % of the landing distance at the estimated time of landing, determined in accordance with the performance information for the assessment of the landing distance at time of arrival (LDTA); or

(2) if performance information for the assessment of the LDTA is not available, the LDA on the intended runway at the estimated time of landing is at least the landing distance determined at the time of dispatch.

(vi) If performance information for the assessment of the LDTA is available, it should be based on approved data contained in the AFM, or on other data thatis either determined in accordance with the applicable certification standards for aeroplanes or determined by EASA.

(vii) Whenever the runway braking action encountered during the landing roll is not as good as reported by the aerodrome operator in the RCR, the pilot-in-command should notify the air traffic services (ATS) by means of a special air-report (AIREP) as soon as practicable.

LANDING DISTANCE ASSESSMENT— OTHER-THAN-COMPLEX AEROPLANES

(a) The in-flight landing distance assessment should be based on the latest available weather report and, if available, RCR.

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

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

(d) Whenever the runway braking action encountered during the landing roll is not as good as reported by the aerodrome operator in the RCR, the pilot-in-command should notify ATS by means of an AIREP as soon as practicable.

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LANDING DISTANCE — COMPLEX AEROPLANES

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

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

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

The 'aircraft performance' section of the RCR includes an RWYCC, the contaminant type, depth and coverage for each third of the runway.

The determination of the RWYCC is based on the use of the runway condition assessment matrix (RCAM); however, the presentation of the information in the RCAM is appropriate for use by aerodrome personnel trained and competent in assessing the runway condition in a way that is relevant to aircraft performance. While full implementation of the RCAM standard will eventually no longer require the flight crew to derive from various information available to them the appropriate runway condition to be used for the landing performance assessment at the time of arrival, it is desirable that pilots maintain an understanding of the performance effect of various components considered in the assessment.

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

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

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

Runway surface condition	Surface condition descriptor	Depth	Notes	RWYCC
Dry		n/a		6

Wet	Damp (any visible dampness)	3 mm or less	Including wet or contaminated runways below 25 % coverage in each runway third	5
	Wet			
Slippery wet				3
Contaminated	Compacted snow	Any	In cold and dry conditions	4
			Above OAT – 15 °C[3]	3
	Dry snow	3 mm or less		5
		More than 3 mm up to 100 mm	Including when any depth occurs on top of compacted snow	3
		Any	On top of ice	0[2]
	Frost[1]	Any		5
	Ice	Any	In cold and dry conditions	1
	Slush	3 mm or less		5
		More than 3 mm up to 15 mm		2
	Standing water	3 mm or less		5
		More than 3 mm up to 15 mm		2
		Any	On top of ice	0[2]
	Wet ice	Any		0[2]
	Wet snow	3 mm or less		5
		More than 3 mm up to 30 mm	Including when any depth occurs on top of compacted snow	3
		Any	On top of ice	0[2]

Note 1: Under certain conditions, frost may cause the surface to become very slippery.
Note 2: Operations in conditions where less-than-poor braking action prevails are prohibited.
Note 3: The runway surface temperature should preferably be used where available.

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

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

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

When the aerodrome operator is approved for operations on specially prepared winter runways, in accordance with Annex V (Part-ADR.OPS) to Regulation (EU) No 139/2014, the RWYCC of a runway that is contaminated with compacted snow or ice, may be upgraded to RWYCC 4 depending upon a specific treatment of the runway. In such cases, the reason for the upgrade will be specified in the 'situational awareness' section of the RCR.

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RCR, RWYCC and RCAM — COMPLEX AEROPLANES

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

(a) ICAO Doc 9981 'PANS Aerodromes';
(b) ICAO Doc 4444 'PANS ATM';
(c) ICAO Doc 10064 'Aeroplane Performance Manual'; and
(d) ICAO Circular 355 'Assessment, Measurement and Reporting of Runway Surface Conditions'

RUNWAY CONDITION REPORT (RCR) — OTHER-THAN-COMPLEX AEROPLANES

When the aerodrome reports the runway conditions by means of an RCR, the information thereby contained, includes a RWYCC. The determination of the RWYCC is based on the use of the RCAM. The RCAM correlates the RWYCC with the contaminant present on the runway and the braking action.

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

(a) ICAO Doc 9981 'PANS Aerodromes';
(b) ICAO Doc 4444 'PANS ATM';
(c) ICAO Doc 10064 'Aeroplane Performance Manual'; and
(d) ICAO Circular 355 'Assessment, Measurement and Reporting of Runway Surface Conditions'.

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COMPLEX MOTO-POWERED AEROPLANES — PERFORMANCE INFORMATION FOR THE ASSESSMENT OF LDTA

Guidance on performance information for the assessment of the LDTA may be found in:

(a) AMC1 CAT.OP.MPA.303(e) of the AMC & GM to Annex IV (Part CAT) to Regulation (EU) No 965/2012; and
(b) ICAO Doc 10064 'Aeroplane Performance Manual'.

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REPORTING ON RUNWAY BRAKING ACTION — COMPLEX AEROPLANES

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

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

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

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

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

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

Table 1: Association between AIREP and RWYCC

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

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

(a) Good braking action is reported as 'BRAKING ACTION GOOD'.
(b) Good to medium braking action is reported as 'BRAKING ACTION GOOD TO MEDIUM'.
(c) Medium braking action is reported as 'BRAKING ACTION MEDIUM'.
(d) Medium to poor braking action is reported as 'BRAKING ACTION MEDIUM TO POOR'.
(e) Poor braking action is reported as 'BRAKING ACTION POOR'.
(f) Less than poor braking action is reported as 'BRAKING ACTION LESS THAN POOR'.

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

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

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

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

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

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

GM5 SPO.OP.210 Approach and landing conditions - aeroplanes

FLIGHT CREW TRAINING

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

Guidance to develop the content of the training may be found in:

(a) AMC1 CAT.OP.MPA.303 & CAT.OP.MPA.311 of the AMC & GM to Annex IV (Part CAT) to Regulation (EU) No 965/2012, as applicable to the intended operations;
(b) ICAO Doc 10064 'Aeroplane Performance Manual'; and
(c) ICAO Circular 355 'Assessment, Measurement and Reporting of Runway Surface Conditions'.

FLIGHT CREW TRAINING — OTHER-THAN-COMPLEX AEROPLANES

When the aerodrome reports the runway conditions by means of a RCR, flight crew should be trained on the use of the RCR for the assessment of the landing distance, and on reporting braking action using the AIREP format. Guidance to develop the content of the training may be found in:

(a) ICAO Doc 10064 'Aeroplane Performance Manual'; and
(b) ICAO Circular 355 'Assessment, Measurement and Reporting of Runway Surface Conditions'.

AMC1 SPO.OP.211 Approach and landing conditions – helicopters

FATO SUITABILITY

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

AMC1 SPO.OP.215(a) Commencement and continuation of approach

MINIMUM RVR FOR CONTINUATION OF APPROACH – AEROPLANES

(a) The controlling RVR should be the touchdown RVR.

(b) If the touchdown RVR is not reported, then the midpoint RVR should be the controlling RVR.

(c) Where the RVR is not available, CMV should be used, except for the purpose of continuation of an approach in LVO in accordance with AMC8 SPO.OP.110.

AMC1 SPO.OP.215(b) Commencement and continuation of approach

MINIMUM RVR FOR CONTINUATION OF APPROACH — HELICOPTERS

(a) The controlling RVR should be the touchdown RVR.

(b) If the touchdown RVR is not reported, then the midpoint RVR should be the controlling RVR.

GM1 SPO.OP.215 Commencement and continuation of approach

APPLICATION OF RVR OR VIS REPORTS — AEROPLANES

(a) There is no prohibition on the commencement of an approach based on the reported RVR or VIS. The restriction in SPO.OP.215 applies only if the RVR or VIS is reported and applies to the continuation of the approach past a point where the aircraft is 1 000 ft above the aerodrome elevation or in the FAS, as applicable.

APPLICATION OF RVR OR VIS REPORTS — HELICOPTERS

(b) There is no prohibition on the commencement of an approach based on the reported RVR. The restriction in SPO.OP.215 applies to the continuation of the approach past a point where the aircraft is 1 000 ft above the aerodrome elevation or into the FAS, as applicable. The prohibition to continue the approach applies only if the RVR is reported and is below 550m and is below the operating minima. There is no prohibition based on VIS.

(c) If the reported RVR is 550 m or greater, but it is less than the RVR calculated in accordance with AMC5 CAT.OP.MPA.110, a go-around is likely to be necessary since visual reference may not be established at the DH or MDH. Similarly, in the absence of an RVR report, the reported visibility or a digital image may indicate that a go-around is likely. The pilot-in-command should consider available options, based on a thorough assessment of risk, such as diverting to an alternate, before commencing the approach.

APPLICATION OF RVR OR VIS REPORTS — ALL AIRCRAFT

(d) If a deterioration in the RVR or VIS is reported once the aircraft is below 1 000 ft or in the FAS, as applicable, then there is no requirement for the approach to be discontinued. In this situation, the normal visual reference requirements would apply at the DA/H.

(e) Where additional RVR information is provided (e.g. midpoint and stop end), this is advisory; such information may be useful to the pilot in order to determine whether there will be sufficient visual reference to control the aircraft during roll-out and taxi. For operations where the aircraft will be controlled manually during roll-out, Table 1 in AMC1 SPA.LVO.100(a) provides an indication of the RVR that may be required to allow manual lateral control of the aircraft on the runway.

AMC1 SPO.OP.215(c) Commencement and continuation of approach

VISUAL REFERENCES FOR INSTRUMENT APPROACH OPERATIONS

For instrument approach operations Type A and CAT I instrument approach operations Type B, at least one of the visual references specified below should be distinctly visible and identifiable to the pilot at the MDA/H or the DA/H:

(a) elements of the approach lighting system;

(b) the threshold;

(c) the threshold markings;

(d) the threshold lights;

(e) the threshold identification lights;

(f) the visual glide path indicator;

(g) the TDZ or TDZ markings;

(h) the TDZ lights;

(i) FATO/runway edge lights;

(j) for helicopter PinS approaches, the identification beacon light and visual ground reference;

(k) for helicopter PinS approaches, the identifiable elements of the environment defined on the instrument chart;

(l) for helicopter PinS approaches with instructions to 'proceed VFR', sufficient visual cues to determine that VFR criteria are met; or

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

AMC1 SPO.OP.215(f) Commencement and continuation of approach

APPROACHES WITH NO INTENTION TO LAND

The approach may be continued to the DA/H or the MDA/H regardless of the reported RVR or VIS. Such operations should be coordinated with the air traffic services (ATS).

AMC1 SPO.OP.230 Standard operating procedures

DEVELOPMENT OF STANDARD OPERATING PROCEDURES

(a) SOPs should be developed to a standard format in accordance with AMC2 SPO.OP.230 (SOP template) and taking into account the results of the risk assessment process.

(b) SOPs should be based on a systematic risk assessment to ensure that the risks associated with the task are acceptable. The risk assessment should describe the activity in detail, identify the relevant hazards, analyse the causes and consequences of accidental events and establish methods to treat the associated risk.

AMC2 SPO.OP.230 Standard operating procedures

TEMPLATE

(a) Nature and complexity of the activity:

(1) The nature of the activity and exposure. The nature of the flight and the risk exposure (e.g. low height) should be described.

(2) The complexity of the activity. Detail should be provided on how demanding the activity is with regard to the required piloting skills, the crew composition, the necessary level of experience, the ground support, safety and individual protective equipment that should be provided for persons involved.

(3) The operational environment and geographical area. The operational environment and geographical area over which the operation takes place should be described:

(i) congested hostile environment: aircraft performance standard, compliance with rules of the air, mitigation of third party risk;

(ii) mountain areas: altitude, performance, the use/non-use of oxygen with mitigating procedures;

(iii) sea areas: sea state and temperature, risk of ditching, availability of search and rescue, survivability, carriage of safety equipment;

(iv) desert areas: carriage of safety equipment, reporting procedures, search and rescue information; and

(v) other areas.

(5) The application of risk assessment and evaluation. The method of application of (a)(1) to (a)(3) to the particular operation so as to minimise risk should be described. The description should reference the risk assessment and the evaluation on which the procedure is based. The SOPs should:

(i) contain elements relevant to the operational risk management performed during flight;

(ii) contain limitations, where required, such as weather, altitudes, speeds, power margins, masses, landing site size; and

(iii) list functions required to monitor the operation. Special monitoring requirements in addition to the normal functions should be described in the SOPs.

(b) Aircraft and equipment:

(1) The aircraft. The category of aircraft to be used for the activity should be indicated (e.g. helicopter/aeroplane, single/multi-engined, other-than- complex motor-powered/complex motor-powered, classic tail rotor/Fenestron/no tail rotor (NOTAR) equipped). In particular, for helicopters, the necessary level of performance certification (Category A/B) should be specified.

(2) Equipment. All equipment required for the activity should be listed. This includes installed equipment certified in accordance with Part-21 as well as equipment approved in accordance with other officially recognised standards. A large number of activities require, in addition to the standard radio communication equipment, additional air-to-ground communication equipment. This should be listed and the operational procedure should be defined.

(c) Crew members:

(1) The crew composition, including the following, should be specified:

(i) minimum flight crew (according to the appropriate manual); and

(ii) additional flight crew.

(2) In addition, for flight crew members, the following should be specified:

(i) selection criteria (initial qualification, flight experience, experience of the activity);

(ii) initial training (volume and content of the training); and

(iii) recent experience requirement and/or recurrent training (volume and content of the training).

(3) If the operator specifies a crew composition of more than one pilot, the following should apply:

(i) the SOPs should ensure that the pilot flying and pilot monitoring functions are possible from either pilot's seat throughout the flight; and

(ii) the operator should adapt the SOPs to the specified crew composition

The criteria listed in (c)(2)(i) to (c)(2)(iii) should take into account the operational environment and the complexity of the activity and should be detailed in the training programmes.

(d) Task specialists:

(1) Whenever a task specialist is required, his/her function on board should be clearly defined. In addition, the following should be specified:

(i) selection criteria (initial background, experience of the activity);

(ii) initial training (volume and content of the training); and

(iii) recent experience requirement and/or recurrent training (volume and content of the training).

The criteria listed in (d)(1) should take into account the specialisation of the task specialist and should be detailed in the training programmes.

(2) There is a large number of activities for which task specialists are required. This chapter should detail the following for such personnel:

(i) specialisation;

(ii) previous experience; and

(iii) training or briefing.

Briefing or specific training for task specialists referred to in (d)(2) should be detailed in the training programmes.

(e) Performance:

This chapter should detail the specific performance requirements to be applied, in order to ensure an adequate power margin.

(f) Normal procedures:

(1) Operating procedures. The operating procedures to be applied by the flight crew, including the coordination with task specialists.

(2) Ground procedures. The procedures to be applied by the task specialists should be described, e.g. loading/unloading, cargo hook operation.

(g) Emergency procedures:

(1) Operating procedures. The emergency procedures to be applied by the flight crew, the coordination with the task specialist and coordination between the flight crew and task specialists should be described.

(2) Ground procedures. The emergency procedures to be applied by the task specialists (e.g. in the case of a forced landing) should be specified.

(h) Ground equipment:

This chapter should detail the nature, number and location of ground equipment required for the activity, such as:

(1) refuelling facilities, dispenser and storage;

(2) firefighting equipment;

(3) size of the operating site (landing surface, loading/unloading area); and

(4) ground markings.

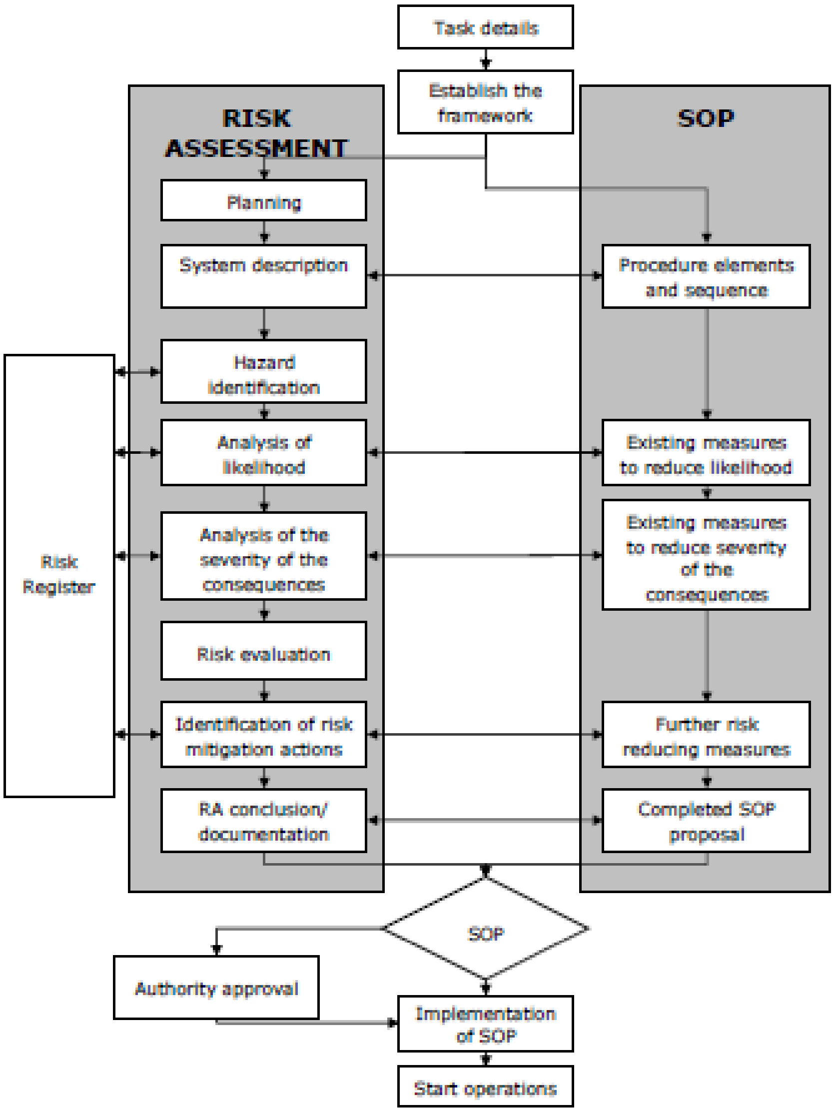
(i) Records:

It should be determined which records specific to the flight(s) are to be kept, such as task details, aircraft registration, pilot-in-command, flight times, weather and any remarks, including a record of occurrences affecting flight safety or the safety of persons or property on the ground.

GM1 SPO.OP.230 Standard operating procedures

TEMPLATE FORMS

Figure 1 — Development of a SOP based on a risk assessment



Template Form A — Risk assessment (RA)

Date: RA of Responsible:
Purpose:
Type of operation and brief description:
Participants, working group:
Preconditions, assumptions and simplifications:
Data used:
Description of the analysis method:
External context:
Regulatory requirements Approvals

Environmental conditions (visibility, wind, turbulence, contrast, light, elevation, etc. unless evident from the SOPs) Stakeholders and their potential interest
Internal context:
Type(s) of aircraft Personnel and qualifications Combination/similarity with other operations/SOPs Other RA used/considered/plugged in
Existing barriers and emergency preparedness:
Monitoring and follow up:
Description of the risk:
Risk evaluation:
Conclusions:

Template Form B — Hazard identification (HI)

Date:........................... HI of ....Responsible:...

Phase of operation	Hazard ref	Hazard	Causes	Existing controls	Controls ref	Comments

Note: Haz ref: A unique number for hazards, e.g. for use in a database

Controls ref: A unique number for the existing controls

Template Form C — Mitigating measures

Date:...........................RA of ....Responsible:...

Phase of operation	Hazard ref	Consequence	Existing mitigation actions	Mitigation ref	L	S	Further mitigation required

Note:

Haz ref: A unique number for hazards, e.g. for use in a database

Mitigation ref: A unique number for the mitigation actions

L: Likelihood

S: Severity

Template register A — risk register

Ref	Operation / Procedure	Ref	Hazard	Ref	Consequences	Mitigation actions	L	S	Monitoring

Note:
L: Likelihood
S: Severity

GM1 SPO.OP.235 EFVS 200 operations

GENERAL

(a) EFVS operations exploit the improved visibility provided by the EFVS to extend the visual segment of an instrument approach. EFVSs cannot be used to extend the instrument segment of an approach and thus the DH for EFVS 200 operations is always the same as for the same approach conducted without EFVS.

(b) Equipment for EFVS 200 operations

(1) In order to conduct EFVS 200 operations, a certified EFVS is used (EFVS-A or EFVS-L). An EFVS is an enhanced vision system (EVS) that also incorporates a flight guidance system and displays the image on a HUD or equivalent display. The flight guidance system will incorporate aircraft flight information and flight symbology.

(2) In multi-pilot operations, a suitable display of EFVS sensory imagery is provided to the pilot monitoring.

(c) Suitable approach procedures

(i) Types of approach operation are specified in AMC1 SPO.OP.235(a)(2).

EFVS 200 operations are used for 3D approach operations. This may include operations based on NPA procedures, approach procedures with vertical guidance and PA procedures including approach operations requiring specific approvals, provided that the operator holds the necessary approvals.

(ii) Offset approaches

Refer to AMC1 SPO.OP.235(a)(2).

(iii) Circling approaches

EFVSs incorporate a HUD or an equivalent system so that the EFVS image of the scene ahead of the aircraft is visible in the pilot's forward external FOV. Circling operations require the pilot to maintain visual references that may not be directly ahead of the aircraft and may not be aligned with the current flight path. EFVSs cannot therefore be used in place of natural visual reference for circling approaches.

(d) Aerodrome operating minima for EFVS 200 operations are determined in accordance with AMC1 SPO.OP.235(a)(8). The performance of EFVSs depends on the technology used and weather conditions encountered. Table 1 'Operations utilising EFVS: RVR reduction' has been developed after an operational evaluation of two different EVSs, both using infrared sensors, along with data and support provided by the FAA. Approaches were flown in a variety of conditions including fog, rain and snow showers, as well as at night to aerodromes located in mountainous terrain. Table 1 contains conservative figures to cater for the expected performance of infrared sensors in the variety of conditions that might be encountered. Some systems may have better capability than those used for the evaluation, but credit cannot be taken for such performance in EFVS 200 operations

(e) The conditions for commencement and continuation of the approach are in accordance with SPO.OP.215.

Pilots conducting EFVS 200 operations may commence an approach and continue that approach below 1 000 ft above the aerodrome or into the FAS if the reported RVR or CMV is equal to or greater than the lowest RVR minima determined in accordance with AMC1 SPO.OP.235(a)(8) and if all the conditions for the conduct of EFVS 200 operations are met.

Should any equipment required for EFVS 200 operations be unserviceable or unavailable, the conditions to conduct EFVS 200 operations would not be satisfied, and the approach should not be commenced. In the event of failure of the equipment required for EFVS 200 operations after the aircraft descends below 1 000 ft above the aerodrome or into the FAS, the conditions of SPO.OP.230 would no longer be satisfied unless the RVR reported prior to commencement of the approach was sufficient for the approach to be flown without the use of EFVS in lieu of natural vision.

(f) EFVS image requirements at the DA/H are specified in AMC1 SPO.OP.235(a)(4).

The requirements for features to be identifiable on the EFVS image in order to continue approach below the DH are more stringent than the visual reference requirements for the same approach flown without EFVS. The more stringent standard is needed because the EFVS might not display the colour of lights used to identify specific portions of the runway and might not consistently display the runway markings. Any visual approach path indicator using colour-coded lights may be unusable.

(g) Obstacle clearance in the visual segment

The 'visual segment' is the portion of the approach between the DH or the MAPt and the runway threshold. In the case of EFVS 200 operations, this part of the approach may be flown using the EFVS image as the primary reference and obstacles may not always be identifiable on an EFVS image. The operational assessment specified in AMC1 SPO.OP.235(a)(2) is therefore required to ensure obstacle clearance during the visual segment.

(h) Visual reference requirements at 200 ft above the threshold For EFVS 200 operations, natural visual reference is required by a height of 200 ft above the runway threshold. The objective of this requirement is to ensure that the pilot will have sufficient visual reference to land. The visual reference should be the same as that required for the same approach flown without the use of EFVS.

Some EFVSs may have additional requirements that have to be fulfilled at this height to allow the approach to continue, such as a requirement to check that elements of the EFVS display remain correctly aligned and scaled to the external view. Any such requirements will be detailed in the AFM and included in the operator's procedures.

(i) Specific approval for EFVS

In order to use EFVS without natural visual reference below 200 ft above the threshold, the operator needs to hold a specific approval in accordance with Part-SPA

(j) Go-around

A go-around will be promptly executed if the required visual references are not maintained on the EFVS image at any time after the aircraft has descended below the DA/H or if the required visual references are not distinctly visible and identifiable using natural vision after the aircraft is below 200 ft. It is considered more likely that an EFVS 200 operation could result in the initiation of a go-around below the DA/H than the equivalent approach flown without EFVS and thus the operational assessment required by AMC1 SPO.OP.235(a)(2) takes into account the possibility of a balked landing.

An obstacle free zone (OFZ) may also be provided for CAT I PA procedures. Where an OFZ is not provided for a CAT I precision approach, this will be indicated on the approach chart. NPA procedures and approach procedures with vertical guidance provide obstacle clearance for the missed approach based on the assumption that a go-around is executed at the MAPt and not below the MDH.

AMC1 SPO.OP.235(a)(1) EFVS 200 operations

EQUIPMENT CERTIFICATION

For EFVS 200 operations, the aircraft should be equipped with an approach system using EFVS-A or a landing system using EFVS-L

AMC1 SPO.OP.235(a)(2) EFVS 200 operations

AERODROMES AND INSTRUMENT PROCEDURES SUITABLE FOR EFVS 200 OPERATIONS

(a) For EFVS 200 operations, the operator should verify the suitability of a runway before authorising EFVS operations to that runway through an operational assessment taking into account the following elements:

(1) the obstacle situation;

(2) the type of aerodrome lighting;

(3) the available IAPs;

(4) the aerodrome operating minima; and

(5) any non-standard conditions that may affect the operations.

(b) EFVS 200 operations should only be conducted as 3D operations, using an IAP in which the final approach track is offset by a maximum of 3 degrees from the extended centre line of the runway.

(c) The IAP should be designed in accordance with PANS-OPS, Volume I (ICAO Doc 8168) or equivalent criteria.

AMC1 SPO.OP.235(a)(3) EFVS 200 operations

INITIAL TRAINING FOR EFVS 200 OPERATIONS

Operators should ensure that flight crew members complete the following conversion training before being authorised to conduct EFVS operations unless credits related to training and checking for previous experience on similar aircraft types are defined in the operational suitability data established in accordance with BAR 8.

(a) A course of ground training including at least the following:

(1) characteristics and limitations of head-up displays (HUDs) or equivalent display systems including information presentation and symbology;

(2) EFVS sensor performance in different weather conditions, sensor limitations, scene interpretation, visual anomalies and other visual effects;

(3) EFVS display, control, modes, features, symbology, annunciations and associated systems and components;

(4) the interpretation of EFVS imagery;

(5) the interpretation of approach and runway lighting systems and display characteristics when using EFVS;

(6) pre-flight planning and selection of suitable aerodromes and approach procedures;

(7) principles of obstacle clearance requirements;

(8) the use and limitations of RVR assessment systems;

(9) normal, abnormal and emergency procedures for EFVS 200 operations;

(10) the effect of specific aircraft/system malfunctions;

(11) human factors aspects of EFVS 200 operations; and

(12) qualification requirements for pilots to obtain and retain approval for EFVS 200 operations.

(b) A course of FSTD training and/or flight training in two phases as follows:

(1) Phase one (EFVS 200 operations with aircraft and all equipment serviceable) — objectives:

(i) understand the operation of equipment required for EFVS 200 operations;

(ii) understand operating limitations of the installed EFVS;

(iii) practise the use of HUD or equivalent display systems;

(iv) practise the set-up and adjustment of EFVS equipment in different conditions (e.g. day and night);

(v) practise the monitoring of automatic flight control systems, EFVS information and status annunciators;

(vi) practise the interpretation of EFVS imagery;

(vii) become familiar with the features needed on the EFVS image to continue approach below the DH;

(viii) practise the identification of visual references using natural vision while using EFVS equipment;

(ix) master the manual aircraft handling relevant to EFVS 200 operations including, where appropriate, the use of the flare cue and guidance for landing;

(x) practise coordination with other crew members; and

(xi) become proficient at procedures for EFVS 200 operations.

(2) Phase one of the training should include the following exercises:

(i) the required checks for satisfactory functioning of equipment, both on the ground and in flight;

(ii) the use of HUD or equivalent display systems during all phases of flight;

(iii) approach using the EFVSs installed on the aircraft to the appropriate DH and transition to visual flight and landing;

(iv) approach with all engines operating using the EFVS, down to the appropriate DH followed by a missed approach, all without external visual reference, as appropriate.

(3) Phase two (EFVS 200 operations with aircraft and equipment failures and degradations) — objectives

(i) understand the effect of known aircraft unserviceabilities including use of the MEL;

(ii) understand the effect of failed or downgraded equipment on aerodrome operating minima;

(iii) understand the actions required in response to failures and changes in the status of the EFVS including HUD or equivalent display systems;

(iv) understand the actions required in response to failures above and below the DH;

(v) practise abnormal operations and incapacitation procedures; and

(vi) become proficient at dealing with failures and abnormal situations during EFVS 200 operations.

(4) Phase two of the training should include the following exercises:

(1) approaches with engine failures at various stages of the approach;

(2) approaches with failures of the EFVS at various stages of the approach, including failures between the DH and the height below which an approach should not be continued if natural visual reference is not acquired, require either:

(A) reversion to head down displays to control missed approach; or

(B) reversion to flight with downgraded or no guidance to control missed approaches from the DH or below, including those which may result in a touchdown on the runway;

(3) incapacitation procedures appropriate to EFVS 200 operations;

(4) failures and procedures applicable to the specific EFVS installation and aircraft type; and

(5) FSTD training, which should include minimum eight approaches.

AMC2 SPO.OP.235(a)(2) EFVS 200 operations

VERIFICATION OF THE SUITABILITY OF RUNWAYS FOR EFVS 200 OPERATIONS

The operational assessment before authorising the use of a runway for EFVS 200 operations may be conducted as follows:

(a) Check whether the runway has been promulgated as suitable for EFVS 200 operations or is certified as a PA category II or III runway by the State of the aerodrome. If this is so, then check whether and where the approach and runway lights installed (notably incandescent or LED lights) are adequate for the EFVS equipment used by the operator.

(b) If the check in point (a) above comes out negative (the runway is not promulgated as EFVS suitable or is not category II or III), then proceed as follows:

(1) For straight-in IAPs, US Standard for Terminal Instrument Procedures (TERPS) may be considered to be acceptable as an equivalent to PANS-OPS. If other design criteria than PANS-OPS or US TERPS are used, the operations should not be conducted.

(2) If an OFZ is established, this will ensure adequate obstacle protection from 960 m before the threshold. If an OFZ is not established or if the DH for the approach is above 250 ft, then check whether there is a visual segment surface (VSS).

(3) VSSs are required for procedures published after 15 March 2007, but the existence of the VSS has to be verified through an aeronautical information publication (AIP), operations manual Part C, or direct contact with the aerodrome. Where the VSS is established, it may not be penetrated by obstacles. If the VSS is not established or is penetrated by obstacles and an OFZ is not established, then the operations should not be conducted. Note: obstacles of a height of less than 50 ft above the threshold may be disregarded when assessing the VSS.

(4) Runways with obstacles that require visual identification and avoidance should not be accepted.

(5) For the obstacle protection of a balked landing where an OFZ is not established, the operator may specify that pilots follow a departure procedure in the event of a balked landing, in which case it is necessary to verify that the aircraft will be able to comply with the climb gradients published for the instrument departure procedures for the expected landing conditions.

(6) Perform an assessment of the suitability of the runway which should include whether the approach and runway lights installed (notably incandescent or LED lights) are adequate for the EFVS equipment used by the operator.

(c) If the AFM stipulates specific requirements for approach procedures, then the operational assessment should verify that these requirements can be met.

AMC2 SPO.OP.235(a)(3) EFVS 200 operations

RECURRENT TRAINING AND CHECKING FOR EFVS 200 OPERATIONS

(a) The operator should ensure that the pilots' competence to perform EFVS 200 operations. To do so, pilots should be trained every 6 months by performing at least two approaches on each type of aircraft operated.

(b) The operator should ensure that the pilots' competence to perform EFVS 200 operations is checked at each required operator proficiency check by performing at least two approaches on each type of aircraft operated, of which one should be flown without natural vision to 200 ft.

AMC3 SPO.OP.235(a)(3) EFVS 200 operations

RECENT EXPERIENCE REQUIREMENTS FOR EFVS 200 OPERATIONS

Pilots should complete a minimum of four approaches using the operator's procedures for EFVS 200 operations during the validity period of the periodic operator proficiency check unless credits related to currency are defined in the operational suitability data established in accordance with BAR 8.

AMC4 SPO.OP.235(a)(3) EFVS 200 operations

DIFFERENCES TRAINING FOR EFVS 200 OPERATIONS

(a) The operator should ensure that the flight crew members authorised to conduct EFVS 200 operations are provided with differences training or familiarisation whenever there is a change to any of the following:

  (1) the technology used in the flight guidance and flight control system;

  (2) the HUD or equivalent display systems;

  (3) the operating procedures.

(b) The differences training should:

  (1) meet the objectives of the appropriate initial training course;

  (2) take into account the flight crew members' previous experience; and

  (3) take into account the operational suitability data established in accordance with BAR 8.

AMC5 SPO.OP.235(a)(3) EFVS 200 operations

TRAINING FOR EFVS 200 OPERATIONS

If a flight crew member is to be authorised to operate as pilot flying and pilot monitoring during EFVS 200 operations, then the flight crew member should complete the required FSTD training for each operating capacity.

GM1 SPO.OP.235(a)(3) EFVS 200 operations

RECURRENT CHECKING FOR EFVS 200 OPERATIONS

In order to provide the opportunity to practise decision-making in the event of system failures and failure to acquire natural visual reference, the recurrent training and checking for EFVS 200 operations is recommended to periodically include different combinations of equipment failures, go-around due to loss of visual reference, and landings.

AMC1 SPO.OP.235(a)(4) EFVS 200 operations

OPERATING PROCEDURES FOR EFVS 200 OPERATIONS

(a) For EFVS 200 operations, the following should apply:

  (1) the pilot flying should use the EFVS throughout the approach;

  (2) in multi-pilot operations, a suitable display of EFVS sensory imagery should be provided to the pilot monitoring;

  (3) the approach between the FAF and the DA/H should be flown using vertical flight path guidance;

  (4) the approach may be continued below the DA/H provided that the pilot can identify on the EFVS image either:

    (i) the approach light system; or

    (ii) both of the following:

      (A) the runway threshold identified by the beginning of the runway landing surface, the threshold lights or the runway end identifier lights; and

      (B) the TDZ identified by the TDZ lights, the TDZ runway markings or the runway lights;

  (5) a missed approach should be executed promptly if the required visual reference is not distinctly visible and identifiable to the pilot without reliance on the EFVS by 200 ft above the threshold.

(b) Operating procedures for EFVS 200 operations should:

  (1) be consistent with the AFM;

  (2) be appropriate to the technology and equipment to be used;

(3) specify the duties and responsibilities of each flight crew member in each relevant phase of flight;

(4) ensure that flight crew workload is managed to facilitate effective decision-making and monitoring of the aircraft; and

(5) deviate to the minimum extent practicable from normal procedures used for routine operations.

(c) Operating procedures should include:

(1) the required checks for the satisfactory functioning of the aircraft equipment, both before departure and in flight;

(2) the correct seating and eye position;

(3) determination of aerodrome operating minima;

(4) the required visual references at the DH;

(5) the action to be taken if natural visual reference is not acquired by 200 ft;

(6) the action to be taken in the event of loss of the required visual reference; and

(7) procedures for balked landing.

(d) Operating procedures for EFVS 200 operations should be included in the operations manual.

AMC1 SPO.OP.235(a)(8) EFVS 200 operations

AERODROME OPERATING MINIMA — EFVS 200 OPERATIONS

When conducting EFVS 200 operations:

(a) the DA/H used should be the same as for operations without EFVS;

(b) the lowest RVR minima to be used should be determined by reducing the RVR presented in:

(1) Table 8 in AMC5 SPO.OP.110 in accordance with Table 1 below for aeroplanes;

(2) Table 12 of AMC6 SPO.OP.110 in accordance with Table 1 below for helicopters;

(c) in case of failed or downgraded equipment, Table 15 in AMC9 SPO.OP.110 should apply.

Table 1

Operations utilising EFVS: RVR reduction

RVR (m) presented in Table 8 in AMC5 SPO.OP.110 or in Table 12 of AMC6 SPO.110	RVR (m) for EFVS 200 operations
550	550
600	550
650	550
700	550
750	550
800	550
900	600
1 000	650
1 100	750
1 200	800
1 300	900
1400	900
1500	1000
1600	1100
1700	1100

1800	1200
1900	1300
2000	1300
2100	1400
2200	1500
2300	1500
2400	1600

AMC1 SPO.OP.235(c) EFVS 200 operations

EVFS 200 WITH LEGACY SYSTEMS UNDER AN APPROVAL

The EVS should be certified before 1 January 2022 as 'EVS with an operational credit'.

GM1 SPO.OP.235(c) EFVS 200 operations

The competent authority referred to in SPO.OP.235 point (c) is the competent authority for the oversight of the operator, as established in ORO.GEN.105.

Subpart C - Aircraft performance and operating limitations

AMC1 SPO.POL.100 Operating Limitations — all aircraft

APPROPRIATE MANUAL

The appropriate manual containing operating limitations may be the AFM or an equivalent document, or the operations manual, if more restrictive.

GM1 SPO.POL.105 Mass and balance

GENERAL — OPERATIONS WITH OTHER THAN -COMPLEX MOTOR-POWERED AIRCRAFT

(a) New aircraft that have been weighed at the factory may be placed into operation without reweighing if the mass records and, balance records have been adjusted for alterations or modifications to the aircraft. Aircraft transferred from one Brunei Darussalam operator to another Brunei Darussalam 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.

(b) The mass and the centre of gravity (CG) position of an aircraft should be revised whenever the cumulative changes to the dry operating mass exceed ± 0.5 % of the maximum landing mass or for aeroplanes the cumulative change in CG position exceeds 0.5 % of the mean aerodynamic chord. This may be done by weighing the aircraft or by calculation. If the AFM requires to record changes to mass and CG position below these thresholds, or to record changes in any case, and make them known to the pilot-in-command, mass and CG position should be revised accordingly and made known to the pilot-in- command.

AMC1 SPO.POL.105(b) Mass and balance

WEIGHING OF AN AIRCRAFT — OPERATIONS WITH COMPLEX MOTOR POWERED AIRCRAFT

(a) New aircraft that have been weighed at the factory may be placed into operation without reweighing if the mass and balance records have been adjusted for alterations or modifications to the aircraft. Aircraft transferred from one Brunei Darussalam operator to another Brunei Darussalam 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.

(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:

(6) checking for completeness of the aircraft and equipment;

(7) determining that fluids are properly accounted for;

(8) ensuring that the aircraft is clean; and

(9) 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 %

CG 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 cargo in the various compartments as compared with the assumed load distribution as well as inaccuracies in the actual mass of cargo.

(4) Deviations of the actual CG of cargo load within individual cargo compartments or cabin sections from the normally assumed mid position.

(5) 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.

(6) Deviations caused by in-flight movement of crew members and task specialist.

(b) Defining and applying operational procedures in order to:

(1) take into account any significant CG travel during flight caused by persons movement; and

(2) take into account any significant CG travel during flight caused by fuel consumption/transfer.

AMC1 SPO.POL.110(a)(1) Mass and balance system — commercial operations with aeroplanes and helicopters and non-commercial operations with complex motor-powered aircraft

DRY OPERATING MASS

The dry operating mass should include:

(a) crew and equipment, and

(b) removable task specialist equipment, if applicable.

AMC1 SPO.POL.110(a)(2) Mass and balance system — commercial operations with aeroplanes and helicopters and non-commercial operations with complex motor-powered aircraft

SPECIAL STANDARD MASSES FOR TRAFFIC LOAD

The operator should use standard mass values for other load items. These standard masses should be calculated on the basis of a detailed evaluation of the mass of the items.

GM1 SPO.POL.110(a)(2) Mass and balance system — commercial operations with aeroplanes and helicopters and non-commercial operations with complex motor-powered aircraft

TRAFFIC LOAD

Traffic load includes task specialists.

AMC1 SPO.POL.110(a)(3) Mass and balance system — commercial operations with aeroplanes and helicopters and non-commercial operations with complex motor-powered aircraft

FUEL LOAD

The mass of the fuel load should be determined by using its actual relative density or a standard relative density.

GM1 SPO.POL.110(a)(3) Mass and balance system — commercial operations with aeroplanes and helicopters and non-commercial operations with complex motor-powered aircraft

FUEL DENSITY

(a) If the actual fuel density is not known, the operator may use standard fuel density values for determining the mass of the fuel load. Such standard values should be based on current fuel density measurements for the airports or areas concerned.

(b) Typical fuel density values are:

(1) Gasoline (piston engine fuel) – 0.71 ;

(2) JET A1 (Jet fuel JP 1) – 0.79 ;

(3) JET B (Jet fuel JP 4) – 0.76 ;

(4) Oil – 0.88.

AMC1 SPO.POL.110(a)(4) Mass and balance system — commercial operations with aeroplanes and helicopters and non-commercial operations with complex motor-powered aircraft

LOADING – STRUCTURAL LIMITS

The loading should take into account additional structural limits such as the floor strength limitations, the maximum load per running metre, the maximum mass per cargo compartment, and/or the maximum seating limits as well as in-flight changes in loading.

GM1 SPO.POL.110(b) Mass and balance system — commercial operations with aeroplanes and helicopters and non-commercial operations with complex motor-powered aircraft

GENERAL

The mass and balance computation may be available in flight planning documents or separate systems and may include standard load profiles.

AMC1 SPO.POL.115 Mass and balance data and documentation — commercial operations with aeroplanes and helicopters and non-commercial operations with complex motor-powered aircraft

GENERAL

(a) The mass and balance documentation should:

(1) enable the pilot-in-command to determine that the load and its distribution are within the mass and balance limits of the aircraft; and

(2) include advice to the pilot-in-command whenever a non-standard method has been used for determining the mass of the load.

(b) The information above may be available in flight planning documents or mass and balance systems.

(c) Any last minute change should be brought to the attention of the pilot-in-command and entered in the flight planning documents containing the mass and balance information and mass and balance systems.

(d) Where mass and balance documentation is generated by a computerised mass and balance system, the operator should verify the integrity of the output data at intervals not exceeding six months.

(e) A copy of the final mass and balance documentation may be sent to aircraft via data link or may be made available to the pilot-in–command by other means for its acceptance.

(f) The person supervising the loading of the aircraft should confirm by hand signature or equivalent that the load and its distribution are in accordance with the mass and balance documentation given to the pilot in command. The pilot-in-command should indicate his acceptance by hand signature or equivalent.

GM1 SPO.POL.115 Mass and balance data and documentation — commercial operations with aeroplanes and helicopters and non-commercial operations with complex motor-powered aircraft

SIGNATURE OR EQUIVALENT

Where a signature by hand is impracticable or it is desirable to arrange the equivalent verification by electronic means, as referred to in AMC1 SPO.POL.115 (f), 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.

AMC1 SPO.POL.115(b) Mass and balance data and documentation — commercial operations with aeroplanes and helicopters and non-commercial operations with complex motor-powered aircraft

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 six 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.

AMC2 SPO.POL.115(b) Mass and balance data and documentation — commercial operations with aeroplanes and helicopters and non-commercial operations with complex motor-powered aircraft

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 SPO.POL.115(b) Mass and balance data and documentation — commercial operations with aeroplanes and helicopters and non-commercial operations with complex motor-powered aircraft

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 ground, in order to generate mass and balance data as an output.

GM2 SPO.POL.115(b) Mass and balance data and documentation — commercial operations with aeroplanes and helicopters and non-commercial operations with complex motor-powered aircraft

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 SPO.POL.130(a) Take-off — complex motor-powered 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.

AMC1 SPO.POL.130(a)(4) Take-off — complex motor-powered 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.

GM1 SPO.POL.130(a)(4) Take-off — complex motor-powered aeroplanes

RUNWAY SURFACE CONDITION

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

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

AMC1 SPO.POL.130(b)(2) Take-off — complex motor-powered aeroplanes

ADEQUATE MARGIN

The adequate margin should be defined in the operations manual.

GM1 SPO.POL.130(b)(2) Take-off — complex motor-powered aeroplanes

ADEQUATE MARGIN

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

AMC1 SPO.POL.140 Landing — complex motor-powered 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;

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

(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 SPO.POL.140 Landing — complex motor-powered aeroplanes

ALLOWANCES

Allowances should be stated in the operations manual.

GM1 SPO.POL.140 Landing – complex motor-powered aeroplanes

WET AND CONTAMINATED RUNWAY DATA

The determination of landing performance data should be based on information provided in the OM on the reported RWYCC. The RWYCC is determined by the aerodrome operator using the RCAM and associated procedures defined in ICAO Doc 9981 'PANS Aerodromes'. The RWYCC is reported through an RCR in the SNOWTAM format in accordance with ICAO Annex 15.

AMC1 SPO.POL.145(a) and (b) Performance and operating criteria — aeroplanes, and AMC1 SPO.POL.146(b)(1) and (2) Performance and operating criteria — helicopters

OPERATIONAL PROCEDURES AND TRAINING PROGRAMME

(a) The operational procedures should be based on the manufacturer's recommended procedures where they exist.

(b) The crew member training programme should include briefing, demonstration or practice, as appropriate, of the operational procedures necessary to minimise the consequences of an engine failure.

AMC1 SPO.POL.146(c) Performance and operating criteria — helicopters

MAXIMUM SPECIFIED MASSES

(a) The operator should establish a procedure to determine maximum specified masses for HIGE and HOGE before each flight or series of flights.

(b) This procedure should take into account ambient temperature at the aerodrome or operating site, pressure altitude and wind conditions data available.

GM1 SPO.POL.146(c) Performance and operating criteria — helicopters

GENERAL

(a) Even when the surface allows a hover in ground effect (HIGE), the likelihood of, for example, dust or blowing snow may necessitate hover out of ground effect (HOGE) performance.

(b) Wind conditions on some sites (particularly in mountainous areas and including downdraft) may require a reduction in the helicopter mass in order to ensure that an out of ground effect hover can be achieved at the operational site in the conditions prevailing.

Subpart D - Instruments, data and equipment

Section 1 - Aeroplanes

GM1 SPO.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) BAR 8 Part 21 for:

(1) aeroplanes registered in the Brunei Darussalam; and

(2) aeroplanes registered outside the Brunei Darussalam 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 SPO.IDE.A.100(b) Instruments and equipment — general

REQUIRED INSTRUMENTS AND EQUIPMENT THAT DO NOT NEED TO BE APPROVED IN ACCORDANCE WITH THE APPLICABLE AIRWORTHINESS REQUIREMENTS

The functionality of non-installed instruments and equipment required by this Subpart and that do not need an equipment approval, as listed in SPO.IDE.A.100 (b), should be checked against recognised industry standards appropriate to the intended purpose. The operator is responsible for ensuring the maintenance of these instruments and equipment.

GM1 SPO.IDE.A.100(c) Instruments and equipment — general

NOT REQUIRED INSTRUMENTS AND EQUIPMENT THAT DO NOT NEED TO BE APPROVED IN ACCORDANCE WITH THE APPLICABLE AIRWORTHINESS REQUIREMENTS, BUT ARE CARRIED ON A FLIGHT

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

(b) 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 aeroplane. Examples may be the following:

(1) portable electronic flight bag (EFB);

(2) portable electronic devices carried by crew members or task specialists; and

(3) non-installed task specialist equipment.

GM1 SPO.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.

AMC1 SPO.IDE.A.105 Minimum equipment for flight

MANAGEMENT OF THE STATUS OF CERTAIN INSTRUMENTS, EQUIPMENT OR FUNCTIONS

The operator should control and retain the status of the instruments, equipment or functions required for the intended operation, that are not controlled for the purpose of continuing airworthiness management.

GM1 SPO.IDE.A.105 Minimum equipment for flight

MANAGEMENT OF THE STATUS OF CERTAIN INSTRUMENTS, EQUIPMENT OR FUNCTIONS

(a) The operator should define responsibilities and procedures to retain and control the status of instruments, equipment or functions required for the intended operation, that are not controlled for the purpose of continuing airworthiness management.

(b) Examples of such instruments, equipment or functions may be, but are not limited to, equipment related to navigation approvals as FM immunity or certain software versions.

GM1 SPO.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 SPO.IDE.A.120 & SPO.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 SPO.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 SPO.IDE.A.120 (b)(1)(i), (b)(1)(ii) may be:

(a) a turn and slip indicator;

(b) a turn co-ordinator; or

(c) both an attitude indicator and a slip indicator.

GM1 SPO.IDE.A.120 Operations under VFR — flight and navigational instruments and associated equipment

SLIP INDICATION

Non-complex motor-powered aeroplanes should be equipped with a means of measuring and displaying slip.

AMC1 SPO.IDE.A.120(a)(1) & SPO.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 direction should be a magnetic compass or equivalent.

AMC1 SPO.IDE.A.120(a)(2) & SPO.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 — COMPLEX MOTOR - POWERED AIRCRAFT

An acceptable means of compliance is a clock displaying hours, minutes and seconds, with a sweep-second pointer or digital presentation.

MEANS OF MEASURING AND DISPLAYING THE TIME — OTHER THAN- COMPLEX MOTOR- POWERED AIRCRAFT

An acceptable means of measuring and displaying the time in hours, minutes and seconds may be a wrist watch capable of the same functions.

AMC1 SPO.IDE.A.120(a)(3) & SPO.IDE.A.125(a)(3) Operations under VFR operations & operations under IFR — flight and navigational instruments and associated equipment

CALIBRATION OF THE MEANS OF MEASURING AND DISPLAYING PRESSURE ALTITUDE

The instrument measuring and displaying barometric altitude should be of a sensitive type calibrated in feet (ft), with a sub-scale setting, calibrated in hectopascals/millibars, adjustable for any barometric pressure likely to be set during flight.

AMC1 SPO.IDE.A.120(a)(4) & SPO.IDE.A.125(a)(4) Operations under VFR & operations under IFR — flight and navigational instruments and associated equipment

CALIBRATION OF THE INSTRUMENT INDICATING AIRSPEED

(a) The instrument indicating airspeed should be calibrated in knots (kts).

(b) In the case of aeroplanes with a maximum certified take-off mass (MCTOM) below 2 000 kg, calibration in kilometres per hour (kph) or in miles per hour (mph) is acceptable when such units are used in the AFM.

AMC1 SPO.IDE.A.120(e) & SPO.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 SPO.IDE.A.120(c) & SPO.IDE.A.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 SPO.IDE.A.120 & SPO.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.

GM1 SPO.IDE.A.125 Operations under IFR — flight and navigational instruments and associated equipment

ALTERNATE SOURCE OF STATIC PRESSURE

Aeroplanes should be equipped with an alternate source of static pressure.

AMC1 SPO.IDE.A.120(a)(1) & SPO.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 direction should be a magnetic compass or equivalent.

AMC1 SPO.IDE.A.120(a)(2) & SPO.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 — COMPLEX MOTOR - POWERED AIRCRAFT

An acceptable means of compliance is a clock displaying hours, minutes and seconds, with a sweep-second pointer or digital presentation.

MEANS OF MEASURING AND DISPLAYING THE TIME — OTHER THAN- COMPLEX MOTOR- POWERED AIRCRAFT

An acceptable means of measuring and displaying the time in hours, minutes and seconds may be a wrist watch capable of the same functions.

AMC1 SPO.IDE.A.120(e) & SPO.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 SPO.IDE.A.125(a)(9) Operations under IFR — flight and navigational instruments and associated equipment

MEANS OF DISPLAYING OUTSIDE AIR TEMPERATURE

GM1 SPO.IDE.A.125(a)(3) Operations under IFR — flight and navigational instruments and associated equipment

ALTIMETERS

Altimeters with counter drum-pointer or equivalent presentation are considered to be less susceptible to misinterpretation for aeroplanes operating above 10 000 ft.

AMC1 SPO.IDE.A.120(a)(4) & SPO.IDE.A.125(a)(4) Operations under VFR & operations under IFR — flight and navigational instruments and associated equipment

CALIBRATION OF THE INSTRUMENT INDICATING AIRSPEED

(a) The instrument indicating airspeed should be calibrated in knots (kts).

(b) In the case of aeroplanes with a maximum certified take-off mass (MCTOM) below 2 000 kg, calibration in kilometres per hour (kph) or in miles per hour (mph) is acceptable when such units are used in the AFM.

AMC1 SPO.IDE.A.120(a)(3) & SPO.IDE.A.125(a)(3) Operations under VFR operations & operations under IFR — flight and navigational instruments and associated equipment

CALIBRATION OF THE MEANS OF MEASURING AND DISPLAYING PRESSURE ALTITUDE

The instrument measuring and displaying pressure altitude should be of a sensitive type calibrated in feet (ft), with a sub-scale setting, calibrated in hectopascals/millibars, adjustable for any barometric pressure likely to be set during flight.

(a) The means of displaying outside air temperature should be calibrated in degrees Celsius.

(b) In the case of aeroplanes with a maximum certified take-off mass (MCTOM) below 2 000 kg, calibration in degrees Fahrenheit is acceptable, when such unit is used in the AFM.

(c) The means of displaying outside air temperature may be an air temperature indicator that provides indications that are convertible to outside air temperature.

AMC1 SPO.IDE.A.120(c) & SPO.IDE.A.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 SPO.IDE.A.125(e)(2) Operations under IFR — flight and navigational instruments and associated equipment

CHART HOLDER

An acceptable means of compliance with the chart holder requirement for complex motor-powered aeroplanes is to display a pre-composed chart on an electronic flight bag (EFB).

AMC1 SPO.IDE.A.130 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 SPO.IDE.A.130 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 SPO.IDE.A.132 Airborne weather detecting equipment — complex motor-powered aeroplanes

GENERAL

The airborne weather detecting equipment should be an airborne weather radar. However, for propeller-driven pressurised aeroplanes with a MCTOM not more than 5 700 kg and an maximum certified seating configuration of not more than nine, other equipment capable of detecting thunderstorms and other potentially hazardous weather conditions, regarded as detectable with airborne weather radar equipment, are also acceptable.

AMC1 SPO.IDE.A.135 Flight crew interphone system

TYPE OF FLIGHT CREW INTERPHONE

The flight crew interphone system should not be of a handheld type.

AMC1 SPO.IDE.A.140 Cockpit voice recorder

GENERAL

(a) 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 n°2, or any later equivalent standard produced by EUROCAE.

(b) The operational performance requirements for equipment dedicated to the CVR should be those laid down in the European Organisation for Civil Aviation Equipment (EUROCAE) Document ED-56A (Minimum Operational Performance Requirements For Cockpit Voice Recorder Systems) dated December 1993, or EUROCAE Document ED-112 (Minimum Operational Performance Specification for Crash Protected Airborne Recorder Systems) dated March 2003, including Amendments n°1 and n°2, or any later equivalent standard produced by EUROCAE.

AMC1 SPO.IDE.A.145 Flight data recorder

OPERATIONAL PERFORMANCE REQUIREMENTS FOR AEROPLANES FIRST ISSUED WITH AN INDIVIDUAL C OF A ON OR AFTER 1 JANUARY 2016 AND BEFORE 1 JANUARY 2023

(a) The operational performance requirements for flight data recorders (FDRs) should be those laid down in EUROCAE Document ED-112 (Minimum Operational Performance Specification for Crash Protected Airborne Recorder Systems) dated March 2003, including amendments No 1 and No 2, or any later equivalent standard produced by EUROCAE.

(b) The 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 (Minimum Operational Performance Specification for Crash Protected Airborne Recorder Systems), dated March 2003, including amendments No 1 and No 2, or any later equivalent standard produced by EUROCAE.

Table 1: All Aeroplanes

No*	Parameter
1a 1b 1c	Time; or Relative time count Global navigation satellite system (GNSS) time synchronisation
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 9a 9b	Engine thrust/power Parameters required to determine propulsive thrust/power on each engine Flight crew compartment thrust/power lever position for aeroplanes with no mechanical link between engine and flight crew compartment))
14	Total or outside air temperature
16	Longitudinal acceleration (body axis)
17	Lateral acceleration
18 18a 18b 18c	Primary flight control surface and 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): Pitch axis Roll axis Yaw axis
19	Pitch trim surface position
23	Marker beacon passage
24	Warnings - in addition to the master warning each ‘red’ warning (including smoke warnings from other compartments) should be recorded when the warning condition cannot be determined from other parameters or from the CVR.
25	Each navigation receiver frequency selection
27	Air–ground status Air - ground status and a sensor of each landing gear if installed

* The number in the left hand column reflects the serial number depicted in EUROCAE ED-112.

Table 2: Aeroplanes for which the data source for the parameter is either used by aeroplane systems or is available on the instrument panel for use by the flight crew to operate the aeroplane

No*	Parameter
10 10a	Flaps Trailing edge flap position

No*	Parameter
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 autoland/Category III operations, each radio altimeter should be recorded.
21	Vertical deviation - the approach aid in use should be recorded. For autoland/ Category III operations, each system should be recorded.
21a	ILS/GPS/GLS glide path
21b	MLS elevation
21c	Integrated approach navigation (IAN)/integrated area navigation (IRNAV), vertical deviation
22	Horizontal deviation — the approach aid in use should be recorded. For autoland/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
22c	GNSS approach path/IRNAV lateral deviation
26	Distance measuring equipment (DME) 1 and 2 distances
26a	Distance to runway threshold(GLS)
26b	Distance to missed approach point (IRNAV/IAN)
28	Ground proximity warning system (GPWS)/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 position
32b	Gear selector position
33	Navigation data:
33a	Drift angle

No*	Parameter
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 SPO.IDE.A.145 and if the aeroplane is equipped with a suitable data source):
35a	Engine pressure ratio (EPR)
35b	N1
35c	Indicated vibration level
35d	N2
35e	Exhaust gas temperature (EGT)
35f	Fuel flow
35g	Fuel cut-off lever position
35h	N3
36	Traffic alert and collision avoidance system (TCAS)/ACAS - a suitable combination of discrete 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

No*	Parameter
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 46a 46b	Electronic flight instrument system (EFIS) display format: Pilot Co-pilot
47	Multi-function/engine/alerts display format
48	AC electrical bus status — each bus
49	DC electrical bus status — each bus
50	Engine bleed valve position
51	Auxiliary power unit (APU) bleed valve position
52	Computer failure — (all critical flight and engine control systems)
53	Engine thrust command
54	Engine thrust target
55	Computed centre of gravity (CG)
56	Fuel quantity in CG trim tank
57	Head-up display in use
58	Para visual display on
59	Operational stall protection, stick shaker and pusher activation
60 60a 60b 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

No*	Parameter
70	Hydraulic pressure — each system
71	Loss of cabin pressure
72	Trim control input position in the flight crew compartment,pitch— when mechanical means for control inputs are not available, displayed trim positions or trim command should be recorded
73	Trim control input position in the flight crew compartment roll— when mechanical means for control inputs are not available, displayed trim positions or trim command should be recorded
74	Trim control input position in the flight crew compartment , yaw- — when mechanical means for control inputs are not available, displayed trim positions or trim command should be recorded
75	All flight control input forces (for fly-by-wire flight control systems, where control surface position is a function of the displacement of the control input device only, it is not necessary to record this parameter):
75a	Control wheel
75b	Control column
75c	Rudder pedal
76	Event marker
77	Date
78	Actual navigation performance (ANP) or estimate of position error (EPE) or estimate of position uncertainty (EPU)

* The number in the left hand column reflects the serial number depicted in EUROCAE ED-112.

AMC2 SPO.IDE.A.145 Flight data recorder

OPERATIONAL PERFORMANCE REQUIREMENTS FOR AEROPLANES FIRST ISSUED WITH AN INDIVIDUAL Cofa ON OR AFTER 1 JANUARY 2023

(a) The operational performance requirements for flight data recorders (FDRs) should be those laid down in EUROCAE Document 112A (Minimum Operational Performance Specification for Crash Protected Airborne Recorder Systems) dated September 2013, or any later equivalent standard produced by EUROCAE.

(b) The FDR should, with reference to a timescale, record:

(1) the list of parameters in Table 1 below;

(2) the additional parameters listed in Table 2 below, when the information data source for the parameter is used by aeroplane systems or is available on the instrument panel for use by the flight crew to operate the aeroplane; and

(3) any dedicated parameters related to novel or unique design or operational characteristics of the aeroplane as determined by the Agency.

(c) The parameters to be recorded should meet the performance specifications (range, sampling intervals, accuracy limits and resolution in read-out) as defined in the relevant tables of EUROCAE Document 112A, or any later equivalent standard produced by EUROCAE.

Table 1: FDR — all aeroplanes

No*	Parameter
1a	Time; or
1b	Relative time count
1c	Global navigation satellite system (GNSS) time synchronisation

2	Pressure altitude (including altitude values displayed on each flight crew member's primary flight display), unless the aeroplane is type certified before 1 January 2023 and recording the values displayed at the captain position or the first officer position would require extensive modification)
3	Indicated airspeed or calibrated airspeed (including values of indicated airspeed or calibrated airspeed displayed on each flight crew member's primary flight display, unless the aeroplane is type certified before 1 January 2023 and recording the values displayed at the captain position or the first officer position would require extensive modification)
4	Heading (primary flight crew reference) — when true or magnetic heading can be selected, the primary heading reference, a discrete indicating selection should be recorded
5	Normal acceleration
6	Pitch attitude — pitch attitude values displayed on each flight crew member's primary flight display should be recorded, unless the aeroplane is type certified before 1 January 2023 and recording the values displayed at the captain position or the first officer position would require extensive modification.
7	Roll attitude — roll attitude values displayed on each flight crew member's primary flight display should be recorded, unless the aeroplane is type certified before 1 January 2023 and recording the values displayed at the captain position or the first officer position would require extensive modification.
8	Manual radio transmission keying and CVR/FDR synchronisation reference
9 9a 9b	Engine thrust/power: Parameters required to determine propulsive thrust/power on each engine, in both normal and reverse thrust Flight crew compartment thrust/power lever position (for aeroplanes with non-mechanically linked engine controls in the flight crew compartment)
14	Total or outside air temperature
16	Longitudinal acceleration (body axis)
17	Lateral acceleration
18 18a 18b 18c	Primary flight control surface and/or primary flight control pilot input (For aeroplanes with control systems in which the movement of a control surface will back drive the pilot's control, 'or' applies. For aeroplanes with control systems in which the movement of a control surface will not back drive the pilot's control, 'and' applies. For multiple or split surfaces, a suitable combination of inputs is acceptable in lieu of recording each surface separately. For aeroplanes that have a flight control break-away capability that allows either pilot to operate the controls independently, record both inputs): Pitch axis Roll axis Yaw axis
19	Pitch trim surface position
23	Marker beacon passage
24	Warnings — in addition to the master warning, each 'red' warning that cannot be determined from other parameters or from the CVR and each smoke warning from other compartments should be recorded.
25	Each navigation receiver frequency selection
27	Air-ground status . Air–ground status and a sensor of each landing gear if installed

* The number in the left-hand column reflects the serial number depicted in EUROCAE Document 112A.

Table 2: FDR — Aeroplanes for which the data source for the parameter is either used by the aeroplane systems or is available on the instrument panel for use by the flight crew to operate the aeroplane

No*	Parameter
10 10a 10b	Flaps: Trailing edge flap position Flight crew compartment control selection
11 11a 11b	Slats: Leading edge flap (slat) position Flight crew compartment control selection
12	Thrust reverse status
13 13a 13b 13c 13d	Ground spoiler and speed brake: Ground spoiler position Ground spoiler selection Speed brake position Speed brake selection
15	Autopilot, autothrottle and automatic flight control system (AFCS): mode and engagement status (showing which systems are engaged and which primary modes are controlling the flight path and speed of the aircraft)
20	Radio altitude. For auto-land/category III operations, each radio altimeter should be recorded.
21 21a 21b 21c	Vertical deviation — the approach aid in use should be recorded. For auto-land/category III operations, each system should be recorded: ILS/GPS/GLS glide path MLS elevation Integrated approach navigation (IAN)/Integrated Area Navigation (IRNAV), vertical deviation
22 22a 22b 22c	Horizontal deviation — the approach aid in use should be recorded. For autoland/category III operations, each system should be recorded: LS/GPS/GLS localiser MLS azimuth Integrated approach navigation (IAN) /Integrated Area Navigation IRNAV lateral deviation, vertical deviation
26 26a 26b	Distance measuring equipment (DME) 1 and 2 distances: Distance to runway threshold (GLS) Distance to missed approach point (IRNAV/IAN)
28 28a 28b 28c	Ground proximity warning system (GPWS)/terrain awareness warning system (TAWS)/ground collision avoidance system (GCAS) status — a suitable combination of discretes unless recorder capacity is limited in which case a single discrete for all modes is acceptable: Selection of terrain display mode, including pop-up display status Terrain alerts, including cautions and warnings and advisories On/off switch position

29	Angle of attack
30 30a 30b	Low pressure warning (each system): Hydraulic pressure Pneumatic pressure
31	Ground speed
32 32a 32b	Landing gear: Landing gear position Gear selector position
33 33a 33b 33c 33d 33e 33f	Navigation data: Drift angle Wind speed Wind direction Latitude Longitude GNSS augmentation in use
34 34a 34b	Brakes: Left and right brake pressure Left and right brake pedal position
35 35a 35b 35c 35d 35e 35f 35g 35h 35i	Additional engine parameters (if not already recorded in Parameter 9 of Table 1, and if the aeroplane is equipped with a suitable data source): Engine pressure ratio (EPR) N1 Indicated vibration level N2 Exhaust gas temperature (EGT) Fuel flow Fuel cut-off lever position N3 Engine fuel metering valve position (or equivalent parameter from the system that directly controls the flow of fuel into the engine) — for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification.
36 36a 36b 36c 36d 36e	Traffic alert and collision avoidance system (TCAS)/airborne collision avoidance system (ACAS) — a suitable combination of discretes should be recorded to determine the status of the system: Combined control Vertical control Up advisory Down advisory Sensitivity level

37	Wind shear warning
38 38a 38b	Selected barometric setting — to be recorded for the aeroplane where the parameter is displayed electronically: Pilot selected barometric setting Co-pilot selected barometric setting
39	Selected altitude (all pilot selectable modes of operation) — to be recorded for the aeroplane where the parameter is displayed electronically
40	Selected speed (all pilot selectable modes of operation) — to be recorded for the aeroplane where the parameter is displayed electronically
41	Selected Mach (all pilot selectable modes of operation) — to be recorded for the aeroplane where the parameter is displayed electronically
42	Selected vertical speed (all pilot selectable modes of operation) — to be recorded for the aeroplane where the parameter is displayed electronically
43	Selected heading (all pilot selectable modes of operation) — to be recorded for the aeroplane where the parameter is displayed electronically
44 44a 44b 44c	Selected flight path (all pilot selectable modes of operation) — to be recorded for the aeroplane where the parameter is displayed electronically: Course/desired track (DSTRK) Path angle Coordinates of final approach path (IRNAV/IAN)
45	Selected decision height — to be recorded for the aeroplane where the parameter is displayed electronically
46 46a 46b	Electronic flight instrument system (EFIS) display format, showing the display system status: Pilot Co-pilot
47	Multi-function/engine/alerts display format, showing the display system status
48	Alternating current (AC) electrical bus status — each bus
49	Direct current (DC) electrical bus status — each bus
50	Engine bleed valve(s) position
51	Auxiliary power unit (APU) bleed valve(s) position
52	Computer failure — all critical flight and engine control systems
53	Engine thrust command
54	Engine thrust target
55	Computed centre of gravity (CG)
56	Fuel quantity in CG trim tank

57	Head-up display in use
58	Paravisual display on
59	Operational stall protection, stick shaker and pusher activation
60 60a 60b 60c 60d 60e 60f	Primary navigation system reference: GNSS Inertial navigational system (INS) VHF omnidirectional radio range (VOR)/distance measuring equipment (DME) MLS Loran C ILS
61	Ice detection
62	Engine warning — each engine vibration
63	Engine warning — each engine over temperature
64	Engine warning — each engine oil pressure low
65	Engine warning — each engine overspeed
66	Yaw trim surface position
67	Roll trim surface position
68	Yaw or sideslip angle
69	De-icing and/or anti-icing systems selection
70	Hydraulic pressure — each system
71	Loss of cabin pressure
72	Trim control input position in the flight crew compartment, pitch — when mechanical means for control inputs are not available, displayed trim position or trim command should be recorded
73	Trim control input position in the flight crew compartment, roll — when mechanical means for control inputs are not available, displayed trim position or trim command should be recorded.
74	Trim control input position in the flight crew compartment, yaw — when mechanical means for control inputs are not available, displayed trim position or trim command should be recorded.
75 75a 75b 75c	All flight control input forces (for fly-by-wire flight control systems, where control surface position is a function of the displacement of the control input device only, it is not necessary to record this parameter): Control wheel input forces Control column input forces Rudder pedal input forces
76	Event marker
77	Date

78	Actual navigation performance (ANP) or estimate of position error (EPE) or estimate of position uncertainty (EPU)
79	Cabin pressure altitude — for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification
80	Aeroplane computed weight — for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification
81	Flight director command:
81a	Left flight director pitch command — for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification
81b	Left flight director roll command — for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification
81c	Right flight director pitch command — for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification
81d	Right flight director roll command — for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification
81e	
82	Vertical speed — for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification

* The number in the left-hand column reflects the serial number depicted in EUROCAE Document 112A.

AMC1 SPO.IDE.A.146 Data link recording

OPERATIONAL PERFORMANCE REQUIREMENTS

(a) If the flight recorder records flight data, it should record at least the following parameters:
- (1) relative time count,
- (2) pitch attitude or pitch rate,
- (3) roll attitude or roll rate,
- (4) heading (magnetic or true) or yaw rate,
- (5) latitude,
- (6) longitude,
- (7) positioning system: estimated error (if available),
- (8) pressure altitude or altitude from a positioning system,
- (9) time,
- (10) ground speed,
- (11) positioning system: track (if available),
- (12) normal acceleration,
- (13) longitudinal acceleration,
- (14) lateral acceleration.

(b) If the flight recorder records images, it should capture views of the main instrument displays at the pilot station, or at both pilot stations when the aeroplane is certified for operation with a minimum crew of two pilots. The recorded image quality should allow reading the following indications during most of the flight:
- (1) magnetic heading,
- (2) time,
- (3) pressure altitude,
- (4) indicated airspeed,
- (5) vertical speed,
- (6) turn and slip,
- (7) attitude,
- (8) Mach number (if displayed),
- (9) stabilised heading, and
- (10) tachometer indication or equivalent indication of propulsive thrust or power.

(c) If the flight recorder records a combination of images and flight data, each flight parameter listed in (a) should be recorded as flight data or by means of images.

(d) The flight parameters listed in (a), which are recorded as flight data, should meet the performance specifications (range, sampling intervals, accuracy limits and resolution in read-out) as defined in the relevant table of EUROCAE Document ED-112 'Minimum Operational Performance Specification for Crash Protected Airborne Recorder Systems', dated March 2003, or EUROCAE Document ED-155 'Minimum Operational Performance Specification for Lightweight Flight Recording Systems', dated July 2009, or any later equivalent standard accepted by EASA.

(e) The operational performance requirements for the flight recorder should be those laid down in:
  (1) EUROCAE Document ED-155 or any later equivalent standard accepted by EASA for lightweight flight recorders; or
  (2) EUROCAE Document ED-112 or any later equivalent standard accepted by EASA for crashprotected flight recorders.

GM1 SPO.IDE.A.146 Lightweight flight recorder

ADDITIONAL USEFUL INFORMATION

(a) Experience has shown the usefulness, for analysing incidents and for training purposes, of recording additional information. In particular, cockpit audio and information on the handling of the aircraft (such as position of flight controls, position of engine controls, fuel and oil indications, aircraft configuration selection), and an external view are very useful for such purposes. To capture such information, simple equipment such as an integrated microphone and integrated camera may be sufficient.
(b) If the flight recorder includes optional capabilities such as described in (a), their recording duration is recommended to be at least 2 hours.
(c) If the flight recorder is capable of acquiring flight parameters from some aircraft system, it is advised to give priority to the flight parameters listed in Annex II-B to EUROCAE Document ED-155 or the flight parameters listed in Annex II-A to EUROCAE Document ED-112. Indeed, these flight parameters were selected based on their relevance in many safety investigations.

GM2 SPO.IDE.A.146 Lightweight flight recorder

INSTALLATION OF CAMERAS

When cameras are installed for the purpose of SPO.IDE.A.146, it is advised to install them so that they do not capture images of head and shoulders of the flight crew members whilst seated in their normal operating position.

GM3 SPO.IDE.A.146 Lightweight flight recorder

RECORDING ACCURACY OF ATTITUDE RATE PARAMETERS

In the case of attitude rate parameters (pitch rate parameter, yaw rate parameter, roll rate parameter), the accuracy limit specified in EUROCAE Document ED-155, dated July 2009, was found to be unclear. Therefore, the following additional guidance is provided:

(a) If the attitude rate parameter is provided by an approved system of the aeroplane, accuracy greater than as provided by this system is not expected for this attitude rate parameter.
(b) If the attitude rate parameter is provided by a dedicated gyroscope, it is advisable that the gyroscope meets the following performance:
  (1) errors caused by linear accelerations less than ±3°/sec (equivalent to ±1% of 300°/sec recording range) for all combinations of parameter values and linear acceleration values in the respective ranges [-300°/sec; +300°/sec] and [-3g; +6g];
  (2) errors caused by to temperature less than ±5°/sec for all combinations of parameter values and temperature values in the respective ranges [-300°/sec; +300°/sec] and [-40°C; +85°C];
  (3) angular random walk of the gyroscope equal to or less than 2°/sqrt(hour); and
  (4) bias stability of the gyroscope significantly less than 360°/hour (for instance, 50°/hour).

GM1 SPO.IDE.A.146(e) Lightweight flight recorder

FUNCTION TO MODIFY IMAGE AND AUDIO RECORDINGS

The purpose of the function modifying image and audio recordings is to allow the flight crew to protect their privacy by making such recordings inaccessible using normal techniques. The activation of this function is subject to the approval of the pilot-in-command (refer to SPO.GEN.107). However, the equipment manufacturer or a safety investigation authority might still be able to retrieve these recordings using special techniques.

AMC1 SPO.IDE.A.150 Data link recording

GENERAL

(a) As a means of compliance with SPO.IDE.A.150 (a) the recorder on which the data link messages are recorded may be:

  (1) the CVR;

  (2) the FDR;

  (3) a combination recorder when SPO.IDE.A.155 is applicable; or

(4) a dedicated flight recorder. In that case, the operational performance requirements for this recorder should be those laid down in EUROCAE Document ED-112 (Minimum Operational Performance Specification for Crash Protected Airborne Recorder Systems), dated March 2003, including amendments No°1 and No 2, or any later equivalent standard produced by EUROCAE.

(b) As a means of compliance with SPO.IDE.A.150 (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 SPO.IDE.A.150 (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 SPO.IDE.A.150 (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

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 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*
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 SPO.IDE.A.150 Data link recording

GENERAL

(a) The letters and expressions in Table 1 of AMC1 SPO.IDE.A.150 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 SPO.IDE.A.150 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
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

GM1 SPO.IDE.A.150(a) Data link recording

APPLICABILITY OF THE DATA LINK RECORDING REQUIREMENT

(a) If it is certain that the aeroplane cannot use data link communication messages for ATS communications corresponding to any application designated by SPO.IDE.A.150(a)(1), then the data link recording requirement does not apply.

(b) Examples where the aeroplane cannot use data link communication messages for ATS communications include but are not limited to the cases where:

(1) the aeroplane data link communication capability is disabled permanently and in a way that it cannot be enabled again during the flight;

(2) data link communications are not used to support air traffic service (ATS) in the area of operation of the aeroplane; and

(3) the aeroplane data link communication equipment cannot communicate with the equipment used by ATS in the area of operation of the aeroplane.

AMC1 SPO.IDE.A.155 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 SPO.IDE.A.155 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 SPO.IDE.A.140; and

(2) all parameters and specifications required by SPO.IDE.A.145, with the same specifications required by SPO.IDE.A.140 and SPO.IDE.A.145.

(b) In addition a flight data and cockpit voice combination recorder may record data link communication messages and related information required by SPO.IDE.A.150.

AMC1 SPO.IDE.A.160 Seats, seat safety belts and restraint systems

UPPER TORSO RESTRAINT SYSTEM FOR OTHER-THAN-COMPLEX MOTOR-POWERED AEROPLANES

(a) The following systems are deemed to be compliant with the requirement for an upper torso restraint system:

(1) A seat belt with a diagonal shoulder strap;

(2) A restraint system having a seat belt and two shoulder straps that may be used independently;

(3) A restraint system having a seat belt, two shoulder straps and additional straps that may be used independently.

(b) The use of the upper torso restraint independently from the use of the seat belt is intended as an option for the comfort of the occupant of the seat in those phases of flight where only the seat belt is required to be fastened. A restraint system including a seat belt and an upper torso restraint that both remain permanently fastened is also acceptable.

UPPER TORSO RESTRAINT SYSTEM FOR COMPLEX MOTOR-POWERED AEROPLANES

(a) A restraint system, including a seat belt, two shoulder straps and additional straps is deemed to be compliant with the requirement for restraint systems with two shoulder straps.

(b) An upper torso restraint system which restrains permanently the torso of the occupant is deemed to be compliant with the requirement for an upper torso restraint system incorporating a device that will automatically restrain the occupant's torso in the event of rapid deceleration.

(c) The use of the upper torso restraint independently from the use of the seat belt is intended as an option for the comfort of the occupant of the seat in those phases of flight where only the seat belt is required to be fastened. A restraint system including a seat belt and an upper torso restraint that both remain permanently fastened is also acceptable.

SEAT BELT

A seat belt with a diagonal shoulder strap (three anchorage points) is deemed to be compliant with the requirement for a seat belt (two anchorage points).

GM1 SPO.IDE.A.160 Seats, seat safety belts, restraint systems

EMERGENCY LANDING DYNAMIC CONDITIONS

Emergency landing dynamic conditions are defined in 23.562 of CS-23 or equivalent and in 25.562 of CS-25 or equivalent.

AMC1 SPO.IDE.A.165 First-aid kit

CONTENT OF FIRST-AID KITS — OTHER-THAN-COMPLEX MOTOR-POWERED AEROPLANES

(a) First-aid kits (FAKs) should be equipped with appropriate and sufficient medications and instrumentation. However, these kits should be supplemented by the operator according to the characteristics of the operation (scope of operation, flight duration, number and demographics of passengers, etc.).

(b) The following should be included in the FAKs:

(1) bandages (assorted sizes, including a triangular bandage),

(2) burns dressings (large and small),

(3) wound dressings (large and small),

(4) adhesive dressings (assorted sizes),

(5) antiseptic wound cleaner,

(6) safety scissors,

(7) disposable gloves,

(8) disposable resuscitation aid, and

(9) surgical masks.

AMC2 SPO.IDE.A.165 First-aid kit

CONTENT OF FIRST-AID KITS — COMPLEX MOTOR-POWERED AEROPLANES

(a) First-aid kits should be equipped with appropriate and sufficient medications and instrumentation. However, these kits should be supplemented by the operator according to the characteristics of the operation (scope of operation, flight duration, number and demographics of persons on board etc.).

(b) The following should be included in the FAKs:

(1) Equipment:

(i) bandages (assorted sizes, including a triangular bandage);

(ii) burns dressings (unspecified);

(iii) wound dressings (large and small);

(iv) adhesive dressings (assorted sizes);

(v) adhesive tape;

(vi) adhesive wound closures;

(vii) safety pins;

(viii) safety scissors;

(ix) antiseptic wound cleaner;

(x) disposable resuscitation aid;

(xi) disposable gloves;

(xii) tweezers: splinter;

(xiii) thermometers (non-mercury); and

(xiv) surgical masks.

(2) Medications:

(i) simple analgesic;

(ii) antiemetic – non-injecable;

(iii) nasal decongestant;

(iv) gastrointestinal antacid, in the case of aeroplanes carrying more than nine persons;

(v) anti-diarrhoeal medication, in the case of aeroplanes carrying more than nine persons; and

(vi) antihistamine.

(3) Other content. The operator should make the instructions readily available. If an electronic format is available, then all instructions should be kept on the same device. If a paper format is used, then the instructions should be kept in the same kit with the applicable equipment and medication. The instructions should include, as a minimum, the following:

(i) a list of contents in at least two languages (English and one other). This should include information on the effects and side effects of medications carried;

(ii) first-aid handbook, current edition;

(iii) Basic life support instructions cards (summarising and depicting the current algorithm for basic life support);

(iv) medical incident report form; and

(v) biohazard disposal bags; and

(vi) bag-valve masks for adults.

(4) Additional equipment. The operators should carry additional equipment based on a risk assessment that considers the specificities and the nature of their specialised operations:

(i) automated external defibrillator (AED);

(ii) suitable airway management device (e.g. supraglottic airway devices, oropharyngeal or nasopharyngeal airways); and

(iii) eye irrigator.

AMC3 SPO.IDE.A.165 First-aid kit

MAINTENANCE OF FIRST-AID KIT

To be kept up to date, the first-aid kit should be:

(a) inspected periodically to confirm, to the extent possible, that contents are maintained in the condition necessary for their intended use;

(b) replenished at regular intervals, in accordance with instructions contained on their labels, or as circumstances warrant; and

(c) replenished after use in-flight at the first opportunity where replacement items are available.

GM1 SPO.IDE.A.165 First-aid kit

LOCATION

The location of the first-aid kit in the cabin is normally indicated using internationally recognisable signs.

GM2 SPO.IDE.A.165 First-aid kit

STORAGE

As a best practice and wherever practicable, the emergency medical equipment listed under AMC2 SPO.IDE.A.165 should be kept close together.

GM3 SPO.IDE.A.165 First-aid kit

CONTENT OF FIRST-AID KITS

The operator may supplement first-aid kits according to the characteristics of the operation based on a risk assessment. The assessment does not require an approval by the competent authority.

GM4 SPO.IDE.A.165 First-aid kit

LITHIUM BATTERIES

Risks related to the presence of lithium batteries should be assessed. All equipment powered by lithium batteries carried on an aeroplane should comply with the provisions of AMC1 CAT.GEN.MPA.140(f) including applicable technical standards such as (E)TSO-C142.

AMC1 SPO.IDE.A.170 Supplemental oxygen — pressurised aeroplanes

DETERMINATION OF OXYGEN

(a) In the determination of oxygen for the routes to be flown, it is assumed that the aeroplane will descend in accordance with the emergency procedures specified in the AFM, 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, 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 Brunei DCA 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 SPO.IDE.A.170(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 SPO.IDE.A.175 Supplemental oxygen — non-pressurised aeroplanes

DETERMINATION OF OXYGEN

(a) In the determination of oxygen for the routes to be flown, it is assumed that the aeroplane will descend in accordance with the emergency procedures specified in the AFM, 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.

AMC1 SPO.IDE.A.180 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 cabin 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 flight crew or task specialist 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 cabin compartments, it should be located near the task specialist's station, where provided.

(d) Where two or more hand fire extinguishers are required in the cabin 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 SPO.IDE.A.185 Marking of break-in points

COLOUR AND CORNERS' MARKING

(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 SPO.IDE.A.190 Emergency locator transmitter (ELT)

BATTERIES

(a) All batteries used in ELTs or PLBs should be replaced (or recharged, if the battery is rechargeable) when the equipment has been in use for more than 1 cumulative hour or in the following cases:

   (1) Batteries specifically designed for use in ELTs and having an airworthiness release certificate (EASA Form 1 or equivalent) should be replaced (or recharged, if the battery is rechargeable) before the end of their useful life in accordance with the maintenance instructions applicable to the ELT.

   (2) Standard batteries manufactured in accordance with an industry standard and not having an airworthiness release certificate (EASA Form 1 or equivalent), when used in ELTs should be replaced (or recharged, if the battery is rechargeable) when 50 % of their useful life (or for rechargeable, 50 % of their useful life of charge), as established by the battery manufacturer, has expired.

(3) All batteries used in PLBs should be replaced (or recharged, if the battery is rechargeable) when 50 % of their useful life (or for rechargeable, 50 % of their useful life of charge), as established by the battery manufacturer, has expired.

(4) The battery useful life (or useful life of charge) criteria in (1),(2) and (3) do not apply to batteries (such as water-activated batteries) that are essentially unaffected during probable storage intervals.

(b) The new expiry date for a replaced (or recharged) battery should be legibly marked on the outside of the equipment.

AMC2 SPO.IDE.A.190 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 to be tethered to a life-raft or a survivor. A water-activated ELT(S) is not an ELT(AP).

(b) To minimise the possibility of damage in the event of 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.

AMC3 SPO.IDE.A.190 Emergency locator transmitter (ELT)

PLB TECHNICAL SPECIFICATIONS

(a) A personal locator beacon (PLB) should have a built-in GNSS receiver with a cosmicheskaya sistyema poiska avariynich sudov — search and rescue satellite- aided tracking (COSPAS-SARSAT) type approval number. However, devices with a COSPAS-SARSAT with a number belonging to series 700 are excluded as this series of numbers identifies the special-use beacons not meeting all the technical requirements and all the tests specified by COSPAS-SARSAT.

(b) Any PLB carried should be registered with the national agency responsible for initiating search and rescue or other nominated agency.

AMC4 SPO.IDE.A.190 Emergency locator transmitter (ELT)

BRIEFING ON PLB USE

When a PLB is carried by a task specialist, he/she should be briefed on its characteristics and use by the pilot-in-command before the flight.

GM1 SPO.IDE.A.190 Emergency locator transmitter (ELT)

TERMINOLOGY

(a) An ELT is a generic term describing equipment that broadcasts distinctive signals on designated frequencies and, depending on application, may be activated by impact or may be manually activated.

(b) A PLB is an emergency beacon other than an ELT that broadcasts distinctive signals on designated frequencies, is standalone, portable and is manually activated by the survivors.

GM2 SPO.IDE.A.190 Emergency locator transmitter (ELT)

MAXIMUM CERTIFIED SEATING CONFIGURATION

The maximum certified seating configuration does not include flight crew seats.

AMC2 SPO.IDE.A.195 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 SPO.IDE.A.195 Flight over water

SEAT CUSHIONS

Seat cushions are not considered to be flotation devices.

AMC1 SPO.IDE.A.200 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 persons on board; and

  (4) one arctic/polar suit for each crew member

(c) If any item of equipment contained in the above list is already carried on board the aircraft in accordance with another requirement, there is no need for this to be duplicated.

AMC1 SPO.IDE.A.200(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 SPO.IDE.A.200(b)(2) Survival equipment

APPLICABLE AIRWORTHINESS STANDARD

The applicable airworthiness standard should be CS-25 or equivalent.

GM1 SPO.IDE.A.200 Survival equipment

SIGNALLING EQUIPMENT

The signalling equipment for making distress signals is described in ICAO Annex 2, Rules of the Air.

GM2 SPO.IDE.A.200 Survival equipment

AREAS IN WHICH SEARCH AND RESCUE WOULD BE ESPECIALLY DIFFICULT

The expression 'areas in which search and rescue would be especially difficult' should be interpreted, in this context, as meaning:

(a) areas so designated by the authority responsible for managing search and rescue; or

(b) areas that are largely uninhabited and where:

 (1) the authority referred to in (a) not published any information to confirm whether search and rescue would be or would not be especially difficult; and

 (2) the authority referred to in (a) does not, as a matter of policy, designate areas as being especially difficult for search and rescue.

GM1 SPO.IDE.A.205 Individual protective equipment

TYPES OF INDIVIDUAL PROTECTIVE EQUIPMENT

Personal protective equipment should include, but is not limited to: flying suits, gloves, helmets, protective shoes, etc.

AMC1 SPO.IDE.A.210 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 SPO.IDE.A.210 Headset

GENERAL

The term 'headset' includes any aviation helmet incorporating headphones and microphone worn by a flight crew member.

AMC1 SPO.IDE.A.215 & SPO.IDE.A.220 Radio communication equipment & Navigation equipment

PERFORMANCE-BASED COMMUNICATION AND SURVEILLANCE (PBCS) OPERATIONS For operations in airspaces where required communication performance (RCP) and required surveillance performance (RSP) for PBCS have been prescribed, the operator should:

(a) ensure that communication and surveillance equipment meet the prescribed RCP and RSP specifications respectively, as shown by an AFM statement or equivalent.

(b) ensure that operational constraints are reflected in the MEL;

(c) establish and include in the OM:

 (1) normal, abnormal and contingency procedures;

 (2) the flight crew qualification and proficiency constraints; and

 (3) a training programme for relevant personnel consistent with the intended operations;

(d) ensure continued airworthiness of the communication equipment and surveillance equipment in accordance with the appropriate RCP and RSP specifications respectively;

(e) ensure that the contracted communication service provider (CSP) for the airspace being flown complies with the required RCP and RSP specifications as well as monitoring, recording and notification requirements; and

(f) participate to monitoring programmes established in the airspace being flown in order to:

   (1) submit the relevant reports of observed communication and surveillance performance respectively; and

   (2) establish a process for immediate corrective action in case a non-compliance with the appropriate RCP or RSP specifications is detected.

GM1 SPO.IDE.A.215 Radio communication equipment

APPLICABLE AIRSPACE REQUIREMENTS

For aeroplanes being operated under Brunei Darussalam air traffic control, the applicable airspace requirements.

GM1 SPO.IDE.A.215 & SPO.IDE.A.220 Radio communication equipment & Navigation equpment

PBCS OPERATIONS — GENERAL

Detailed guidance material on PBCS operations may be found in the following documents:

(a) ICAO Doc 9869 'Performance-based Communication and Surveillance (PBCS) Manual'
(b) ICAO Doc 10037 'Global Operational Data Link (GOLD) Manual'

PBCS OPERATIONS — AIRCRAFT ELIGIBILITY

(a) The aircraft eligibility for compliance with the required RCP/RSP specifications should be demonstrated by the aircraft manufacturer or equipment supplier and be specific to each individual aircraft or the combination of the aircraft type and the equipment. The demonstrated compliance with specific RCP/RSP specifications may be documented in one of the following documents:
   (1) the type certificate (TC);
   (2) the supplemental type certificate (STC);
   (3) the aeroplane flight manual (AFM) or AFM Supplement; or
   (4) a compliance statement from the manufacturer or the holder of the design approval of the data link installation, approved by the State of Design.
(b) In addition to the indication of compliance with specific RCP/RSP specifications, the aircraft manufacturer or equipment supplier should document any associated operating limitations, information and procedures in the AFM or other appropriate documents.

PBCS OPERATIONS — MEL ENTRIES

(a) The operator should amend the MEL, in accordance with the items identified by the aircraft manufacturer or equipment supplier in the master minimum equipment list (MMEL) or MMEL supplement, in relation to PBCS capability, to address the impact of losing an associated system/subsystem on data link operational capability.
(b) As an example, equipment required in current FANS 1/A-capable aircraft, potentially affecting RCP and RSP capabilities, may be the following:
   (1) VHF, SATCOM, or HFDL1 radios, as applicable;
   (2) ACARS management unit (MU)/communications management unit (CMU);
   (3) flight management computer (FMC) integration; and
   (4) printer, if procedures require its use.

PBCS OPERATIONS — OPERATING PROCEDURES

The operator should establish operating procedures for the flight crew and other relevant personnel, such as but not limited to, flight dispatchers and maintenance personnel. These procedures should cover the usage of PBCS-relevant systems and include as a minimum:

(a) pre-flight planning requirements including MEL consideration and flight plan filing;
(b) actions to be taken in the data link operation, to include specific RCP/RSP required cases;
(c) actions to be taken for the loss of data link capability while in and prior to entering the airspace requiring specific RCP/RSP specifications. Examples may be found in ICAO Doc 10037;
(d) problem reporting procedures to the local/regional PBCS monitoring body or central reporting body as applicable; and
(e) compliance with specific regional requirements and procedures, if applicable.

PBCS OPERATIONS — QUALIFICATION AND TRAINING

(a) The operator should ensure that flight crew and other relevant personnel such as flight dispatchers and maintenance personnel are proficient with PBCS operations. A separate training programme is not required if data link communication is integrated in the current training programme. However, the operator should ensure that the existing training programme incorporates a basic PBCS concept and requirements for flight crew and other personnel that have direct impact on overall data link performance required for the provisions of ATS such as reduced separation.

(b) The elements covered during the training should be as a minimum:
  (1) Flight crew
    (i) Data link communication system theory relevant to operational use;
    (ii) AFM limitations;
    (iii) Normal pilot response to data link communication messages;
    (iv) Message elements in the message set used in each environment;
    (v) RCP/RSP specifications and their performance requirements;
    (vi) Implementation of performance-based reduced separation with associated RCP/RSP specifications or other possible performance requirements associated with their routes;
    (vii) Other ATM operations involving data link communication services;
    (viii) Normal, non-normal and contingency procedures; and
    (ix) Data link communication failure/problem and reporting.

    Note (1) If flight crew has already been trained on data link operations, additional training only on PBCS is required, addressing a basic concept and requirements that have direct impact on overall data link performance required for provisions of ATS (e.g. reduced separation).

    Note (2) Training may be provided through training material and other means that simulate the functionality.

  (2) Dispatchers/flight operations officers
    (i) Proper use of data link and PBCS flight plan designators;
    (ii) Air traffic service provider's separation criteria and procedures relevant to RCP/RSP specifications;
    (iii) MEL remarks or exceptions based on data link communication;
    (iv) Procedures for transitioning to voice communication and other contingency procedures related to the operation in the event of abnormal behavior of the data link communication;
    (v) Coordination with the ATS unit related to, or following a special data link communication exceptional event (e.g. log-on or connection failures); and
    (vi) Contingency procedures to transition to a different separation standard when data link communication fails.
  (3) Engineering and maintenance personnel
    (i) Data link communication equipment including its installation, maintenance and modification;
    (ii) MEL relief and procedures for return to service authorisations; and
    (iii) Correction of reported non-performance of data link system.

PBCS OPERATIONS — CONTINUED AIRWORTHINESS

(a) The operator should ensure that aircraft systems are properly maintained to continue to meet the applicable RCP/RSP specifications.
(b) The operator should ensure that the following elements are documented and managed appropriately:
  (1) configuration and equipment list detailing the pertinent hardware and software components for the aircraft/fleet(s) applicable to the specific RCP/RSP operation;
  (2) configuration control for subnetwork, communication media and routing policies; and
  (3) description of systems including display and alerting functions (including message sets).

PBCS OPERATIONS — CSP COMPLIANCE

(a) The operator should ensure that their contracted CSPs notify the ATS units of any failure condition that may have an impact on PBCS operations. Notification should be made to all relevant ATS units regardless of whether the CSP has a contract with them.
(b) The operator may demonstrate the compliance of their contracted CSP through service level agreements (SLAs)/contractual arrangements for data link services or through a joint agreement among PBCS stakeholders such as a Memorandum of Understanding (MOU) or a PBCS Charter.

PBCS OPERATIONS — PBCS CHARTER

A PBCS charter has been developed by PBCS stakeholders and is available as an alternative to SLAs in order to validate the agreement between the operator and the CSP for compliance with RCP/RSP required for PBCS operations. The charter is hosted on the website www.FANS-CRA.com where operators and CSPs can subscribe.

PBCS OPERATIONS — PARTICIPATION IN MONITORING PROGRAMMES

(a) The operator should establish a process to participate in local or regional PBCS monitoring programmes and provide the following information, including any subsequent changes, to monitoring bodies:
  (1) operator name;
  (2) operator contact details; and

(3) other coordination information as applicable, including appropriate information means for the CSP/SSP service fail notification.

(b) The process should also address the actions to be taken with respect to problem reporting and resolution of deficiencies, such as:

(1) reporting problems identified by the flight crew or other personnel to the PBCS monitoring bodies associated with the route of flight on which the problem occurred

(2) disclosing operational data in a timely manner to the appropriate PBCS monitoring bodies when requested for the purposes of investigating a reported problem

(3) investigating and resolving the cause of the deficiencies reported by the PBCS monitoring bodies.

AMC1 SPO.IDE.A.220 Navigation equipment

NAVIGATION WITH VISUAL REFERENCE TO LANDMARKS — OTHER-THAN-COMPLEX AEROPLANES

Where other-than-complex aeroplanes, with the surface in sight, can proceed according to the ATS flight plan by navigation with visual reference to landmarks, no additional equipment is needed to comply with SPO.IDE.A.220 (a)(1).

GM1 SPO.IDE.A.220 Navigation equipment

AIRCRAFT ELIGIBILITY FOR PBN SPECIFICATION NOT REQUIRING SPECIFIC APPROVAL

(a) The performance of the aircraft is usually stated in the AFM.

(b) Where such a reference cannot be found in the AFM, other information provided by the aircraft manufacturer as TC holder, the STC holder or the design organisation having a privilege to approve minor changes may be considered.

(c) The following documents are considered acceptable sources of information:

(1) AFM, supplements thereto, and documents directly referenced in the AFM;

(2) FCOM or similar document;

(3) Service Bulletin or Service Letter issued by the TC holder or STC holder;

(4) approved design data or data issued in support of a design change approval;

(5) any other formal document issued by the TC or STC holders stating compliance with PBN specifications, AMC, Advisory Circulars (AC) or similar documents issued by the State of Design; and

(6) written evidence obtained from the State of Design.

(d) Equipment qualification data, in itself, is not sufficient to assess the PBN capabilities of the aircraft, since the latter depend on installation and integration.

(e) As some PBN equipment and installations may have been certified prior to the publication of the PBN Manual and the adoption of its terminology for the navigation specifications, it is not always possible to find a clear statement of aircraft PBN capability in the AFM. However, aircraft eligibility for certain PBN specifications can rely on the aircraft performance certified for PBN procedures and routes prior to the publication of the PBN Manual.

(f) Below, various references are listed which may be found in the AFM or other acceptable documents (see listing above) in order to consider the aircraft's eligibility for a specific PBN specification if the specific term is not used.

(g) RNAV 5

(1) If a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNAV 5 operations.

(i) B-RNAV;

(ii) RNAV 1;

(iii) RNP APCH;

(iv) RNP 4;

(v) A-RNP;

(vi) AMC 20-4;

(vii) JAA TEMPORARY GUIDANCE MATERIAL, LEAFLET NO. 2 (TGL 2);

(viii) JAA AMJ 20X2;

(ix) FAA AC 20-130A for en route operations;

(x) FAA AC 20-138 for en route operations; and

(xi) FAA AC 90-96.

(h) RNAV 1/RNAV 2

(1) If a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNAV 1/RNAV 2 operations.

(i) RNAV 1;

(ii) PRNAV

(iii) US RNAV type A;

(iv) FAA AC 20-138 for the appropriate navigation specification;

(v) FAA AC 90-100A;

(vi) JAA TEMPORARY GUIDANCE MATERIAL, LEAFLET NO. 10 Rev1 (TGL 10); and

(vii) FAA AC 90-100.

(2) However, if position determination is exclusively computed based on VOR-DME, the aircraft is not eligible for RNAV 1/RNAV 2 operations.

(i) RNP 1/RNP 2 continental

(1) If a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNP 1/RNP 2 continental operations.

(i) A-RNP;

(ii) FAA AC 20-138 for the appropriate navigation specification; and

(iii) FAA AC 90-105.

(2) Alternatively, if a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above and position determination is primarily based on GNSS, the aircraft is eligible for RNP 1/RNP 2 continental operations. However, in these cases, loss of GNSS implies loss of RNP 1/RNP 2 capability.

(i) JAA TEMPORARY GUIDANCE MATERIAL, LEAFLET NO. 10 (TGL 10) (any revision); and

(ii) FAA AC 90-100.

(j) RNP APCH — LNAV minima

(1) If a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNP APCH — LNAV operations.

(i) A-RNP;

(ii) AMC 20-27;

(iii) AMC 20-28;

(iv) FAA AC 20-138 for the appropriate navigation specification; and

(v) FAA AC 90-105 for the appropriate navigation specification.

(2) Alternatively, if a statement of compliance with RNP 0.3 GNSS approaches in accordance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNP APCH — LNAV operations. Any limitation such as 'within the US National Airspace' may be ignored since RNP APCH procedures are assumed to meet the same ICAO criteria around the world.

(i) JAA TEMPORARY GUIDANCE MATERIAL, LEAFLET NO. 3 (TGL 3);

(ii) AMC 20-4;

(iii) FAA AC 20-130A; and

(iv) FAA AC 20-138.

(k) RNP APCH — LNAV/VNAV minima

(1) If a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNP APCH — LNAV/VNAV operations.

(i) A-RNP;

(ii) AMC 20-27 with Baro VNAV;

(iii) AMC 20-28;

(iv) FAA AC 20-138; and

(v) FAA AC 90-105 for the appropriate navigation specification.

(2) Alternatively, if a statement of compliance with FAA AC 20-129 is found in the acceptable documentation as listed above, and the aircraft complies with the requirements and limitations of EASA SIB 2014-041, the aircraft is eligible for RNP APCH — LNAV/VNAV operations. Any limitation such as 'within the US National Airspace' may be ignored since RNP APCH procedures are assumed to meet the same ICAO criteria around the world.

(l) RNP APCH — LPV minima

(1) If a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNP APCH — LPV operations.

(i) AMC 20-28;

(ii) FAA AC 20-138 for the appropriate navigation specification; and

(iii) FAA AC 90-107.

(2) For aircraft that have a TAWS Class A installed and do not provide Mode-5 protection on an LPV approach, the DH is limited to 250 ft.

(m) RNAV 10

(1) If a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNAV 10 operations.

(i) RNP 10;

(ii) FAA AC 20-138 for the appropriate navigation specification;

(iii) AMC 20-12;

(iv) FAA Order 8400.12 (or later revision); and

(v) FAA AC 90-105.

(n) RNP 4

(1) If a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNP 4 operations.

(i) FAA AC 20-138B or later, for the appropriate navigation specification;

(ii) FAA Order 8400.33; and

(iii) FAA AC 90-105 for the appropriate navigation specification.

(o) RNP 2 oceanic

(1) If a statement of compliance with FAA AC 90-105 for the appropriate navigation specification is found in the acceptable documentation as listed above, the aircraft is eligible for RNP 2 oceanic operations.

(2) If the aircraft has been assessed eligible for RNP 4, the aircraft is eligible for RNP 2 oceanic.

(p) Special features

(1) RF in terminal operations (used in RNP 1 and in the initial segment of the RNP APCH)

(i) If a statement of demonstrated capability to perform an RF leg, certified in accordance with any of the following specifications or standards, is found in the acceptable documentation as listed above, the aircraft is eligible for RF in terminal operations:

(A) AMC 20-26; and

(B) FAA AC 20-138B or later.

(ii) If there is a reference to RF and a reference to compliance with AC 90-105, then the aircraft is eligible for such operations.

(q) Other considerations

(1) In all cases, the limitations in the AFM need to be checked, in particular the use of AP or FD which can be required to reduce the FTE primarily for RNP APCH, RNAV 1, and RNP 1.

(2) Any limitation such as 'within the US National Airspace' may be ignored since RNP APCH procedures are assumed to meet the same ICAO criteria around the world.

GM2 SPO.IDE.A.220 Navigation equipment

GENERAL

(a) The PBN specifications for which the aircraft complies with the relevant airworthiness criteria are set out in the AFM, together with any limitations to be observed.

(b) Because functional and performance requirements are defined for each navigation specification, an aircraft approved for an RNP specification is not automatically approved for all RNAV specifications. Similarly, an aircraft approved for an RNP or RNAV specification having a stringent accuracy requirement (e.g. RNP 0.3 specification) is not automatically approved for a navigation specification having a less stringent accuracy requirement (e.g. RNP 4).

RNP 4

(c) For RNP 4, at least two LRNSs, capable of navigating to RNP 4, and listed in the AFM, may be operational at the entry point of the RNP 4 airspace. If an item of equipment required for RNP 4 operations is unserviceable, then the flight crew may consider an alternate route or diversion for repairs. For multisensor systems, the AFM may permit entry if one GNSS sensor is lost after departure, provided one GNSS and one inertial sensor remain available.

AMC1 SPO.IDE.A.225 Transponder

GENERAL

(a) The secondary surveillance radar (SSR) transponders of aeroplanes being operated under Brunei Darussalam air traffic control should comply with applicable Brunei Darussalam legislation.

(b) If the Brunei Darussalam legislation is not applicable, the SSR transponders should operate in accordance with the relevant provisions of Volume IV of ICAO Annex 10.

AMC1 SPO.IDE.A.230 Management of aeronautical databases

AERONAUTICAL DATABASES

When the operator of an aircraft uses an aeronautical database that supports an airborne navigation application as a primary means of navigation used to meet the airspace usage requirements, the database provider should be a Type 2 DAT provider certified in accordance with Regulation (EU) 2017/373 or equivalent.

GM1 SPO.IDE.A.230 Management of aeronautical databases

AERONAUTICAL DATABASE APPLICATIONS

(a) Applications using aeronautical databases for which Type 2 DAT providers should be certified in accordance with Regulation (EU) 2017/373 may be found in GM1 DAT.OR.100.

(b) The certification of a Type 2 DAT provider in accordance with Regulation (EU) 2017/373 ensures data integrity and compatibility with the certified aircraft application/equipment.

GM2 SPO.IDE.A.230 Management of aeronautical databases

TIMELY DISTRIBUTION

The operator should distribute current and unaltered aeronautical databases to all aircraft requiring them in accordance with the validity period of the databases or in accordance with a procedure established in the operations manual if no validity period is defined.

GM3 SPO.IDE.A.230 Management of aeronautical databases

STANDARDS FOR AERONAUTICAL DATABASES AND DAT PROVIDERS

(a) A 'Type 2 DAT provider' is an organisation as defined in Article 2(5)(b) Regulation (EU) 2017/373.

(b) Equivalent to a certified 'Type 2 DAT provider' is defined in any Aviation Safety Agreement between the European Union and a third country, including any Technical Implementation Procedures, or any Working Arrangements between EASA and the Brunei DCA.

Section 2 - Helicopters

GM1 SPO.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 helicopters registered in the Brunei Darussalam; and

(b) Airworthiness requirements of the state of registry for helicopters registered outside the State of Brunei.

GM1 SPO.IDE.H.100(b) Instruments and equipment — general

REQUIRED INSTRUMENTS AND EQUIPMENT THAT DO NOT NEED TO BE APPROVED IN ACCORDANCE WITH THE APPLICABLE AIRWORTHINESS REQUIREMENTS

The functionality of non-installed instruments and equipment required by this Subpart and that do not need an equipment approval, as listed in SPO.IDE.H.100 (b), should be checked against recognised industry standards appropriate to the intended purpose. The operator is responsible for ensuring the maintenance of these instruments and equipment.

GM1 SPO.IDE.H.100(c) Instruments and equipment — general

NOT REQUIRED INSTRUMENTS AND EQUIPMENT THAT DO NOT NEED TO BE APPROVED IN ACCORDANCE WITH THE APPLICABLE AIRWORTHINESS REQUIREMENTS, BUT ARE CARRIED ON A FLIGHT

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

(b) 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 helicopter. Examples may be the following:

  (1) portable electronic flight bag (EFB);

  (2) portable electronic devices carried by crew members or task specialists; and

  (3) non-installed task specialists equipment.

GM1 SPO.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 SPO.IDE.H.105 Minimum equipment for flight

MANAGEMENT OF THE STATUS OF CERTAIN INSTRUMENTS, EQUIPMENT OR FUNCTIONS

The operator should control and retain the status of the instruments, equipment or functions required for the intended operation, that are not controlled for the purpose of continuing airworthiness management.

GM1 SPO.IDE.H.105 Minimum equipment for flight

MANAGEMENT OF THE STATUS OF CERTAIN INSTRUMENTS, EQUIPMENT OR FUNCTIONS

(a) The operator should define responsibilities and procedures to retain and control the status of instruments, equipment or functions required for the intended operation, that are not controlled for the purpose of continuing airworthiness management.

(b) Examples of such instruments, equipment or functions may be, but are not limited to, equipment related to navigation approvals as FM immunity or certain software versions.

AMC1 SPO.IDE.H.115 Operating lights

LANDING LIGHT

The landing light should be trainable, at least in the vertical plane, or optionally be an additional fixed light or lights positioned to give a wide spread of illumination.

AMC1 SPO.IDE.H.120(d) Operations under VFR — flight and navigational instruments and associated equipment

MULTI-PILOT OPERATIONS

Two pilots should be considered to be required by the operation if multi-pilot operations are required by one of the following:

(a) the AFM;

(b) at night, the operations manual.

GM1 SPO.IDE.H.120(d) Operations under VFR — flight and navigational instruments and associated equipment

MULTI-PILOT OPERATIONS ON A VOLUNTARY BASIS – HELICOPTERS OPERATED BY DAY UNDER VFR

If the AFM permits single-pilot operations, and the operator decides that the crew composition is more than one pilot for day VFR operations only, then point SPO.IDE.H.120(d) does not apply. Additional displays, including those referred to in SPO.IDE.H.120(d), may be required under point SPO.IDE.H.100(e).

AMC1 SPO.IDE.H.125(c) Operations under IFR — flight and navigational instruments and associated equipment

MULTI-PILOT OPERATIONS

Two pilots should be considered to be required by the operation if multi-pilot operations are required by one of the following:

(a) the AFM;

(b) at night, the operations manual.

AMC1 SPO.IDE.H.120(d) & SPO.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 SPO.IDE.H.120(b)(1)(iii) & SPO.IDE.H.125(a)(8) Operations under VFR & operations under IFR — flight and navigational instruments and associated equipment

STABILISED HEADING

Stabilised direction should be achieved for VFR flights by a gyroscopic direction indicator, whereas for IFR flights, this should be achieved through a magnetic gyroscopic direction indicator.

AMC1 SPO.IDE.H.120(b)(3) & SPO.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 SPO.IDE.H.120(a)(4) & SPO.IDE.H.125(a)(4) Operations under VFR & operations under IFR — flight and navigational instruments and associated equipment

CALIBRATION OF THE INSTRUMENT INDICATING AIRSPEED

(a) The instrument indicating airspeed should be calibrated in knots (kt).

(b) In the case of helicopters with an MCTOM below 2 000 kg, calibration in kilometres (km) per hour or in miles per hour (mph) is acceptable when such units are used in the AFM.

AMC1 SPO.IDE.H.120(a)(5) Operations under VFR — flight and navigational instruments and associated equipment

SLIP

For other-than-complex helicopters the means of measuring and displaying slip may be a slip string for operations under VFR.

AMC1 SPO.IDE.H.120(a)(1) & SPO.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 direction should be a magnetic compass or equivalent.

AMC1 SPO.IDE.H.120(a)(2) & SPO.IDE.H.125(a)(2) Operations under VFR & operations under IFR — flight and navigational instruments and associated equipment

MEANS OF MEASURING AND DISPLAYING THE TIME — COMPLEX MOTOR-POWERED AIRCRAFT

An acceptable means of compliance is a clock displaying hours, minutes and seconds, with a sweep-second pointer or digital presentation.

MEANS OF MEASURING AND DISPLAYING THE TIME — OTHER-THAN-COMPLEX MOTOR-POWERED AIRCRAFT

An acceptable means of measuring and displaying the time in hours, minutes and seconds may be a wrist watch capable of the same functions.

AMC1 SPO.IDE.H.120(a)(3) & SPO.IDE.H.125(a)(3) Operations under VFR & operations under IFR — flight and navigational instruments and associated equipment

CALIBRATION OF THE MEANS OF MEASURING AND DISPLAYING PRESSURE ALTITUDE

The instrument measuring and displaying pressure altitude should be of a sensitive type calibrated in feet (ft), with a sub-scale setting, calibrated in hectopascals/millibars, adjustable for any barometric pressure likely to be set during flight.

AMC1 SPO.IDE.H.120 & SPO.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, 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 turn and 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 SPO.IDE.H.120 & SPO.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, 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 turn and 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 SPO.IDE.H.120(a)(1) & SPO.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 direction should be a magnetic compass or equivalent.

AMC1 SPO.IDE.H.120(a)(2) & SPO.IDE.H.125(a)(2) Operations under VFR & operations under IFR — flight and navigational instruments and associated equipment

MEANS OF MEASURING AND DISPLAYING THE TIME — COMPLEX MOTOR-POWERED AIRCRAFT

An acceptable means of compliance is a clock displaying hours, minutes and seconds, with a sweep-second pointer or digital presentation.

MEANS OF MEASURING AND DISPLAYING THE TIME — OTHER-THAN-COMPLEX MOTOR-POWERED AIRCRAFT

An acceptable means of measuring and displaying the time in hours, minutes and seconds may be a wrist watch capable of the same functions.

AMC1 SPO.IDE.H.120(a)(3) & SPO.IDE.H.125(a)(3) Operations under VFR & operations under IFR — flight and navigational instruments and associated equipment

CALIBRATION OF THE MEANS OF MEASURING AND DISPLAYING PRESSURE ALTITUDE

The instrument measuring and displaying pressure altitude should be of a sensitive type calibrated in feet (ft), with a sub-scale setting, calibrated in hectopascals/millibars, adjustable for any barometric pressure likely to be set during flight.

GM1 SPO.IDE.H.125(a)(3) Operations under IFR — flight and navigational instruments and associated equipment

ALTIMETERS

Altimeters with counter drum-pointer or equivalent presentation are considered to be less susceptible to misinterpretation for helicopters operating above 10 000 ft.

AMC1 SPO.IDE.H.120(a)(4) & SPO.IDE.H.125(a)(4) Operations under VFR & operations under IFR — flight and navigational instruments and associated equipment

CALIBRATION OF THE INSTRUMENT INDICATING AIRSPEED

(a) The instrument indicating airspeed should be calibrated in knots (kt).

(b) In the case of helicopters with an MCTOM below 2 000 kg, calibration in kilometres (km) per hour or in miles per hour (mph) is acceptable when such units are used in the AFM.

AMC1 SPO.IDE.H.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) In the case of helicopters with a maximum certified take-off mass (MCTOM) below 2000 kg, calibration in degrees Fahrenheit is acceptable, when such unit is used in the AFM.

(c) The means of displaying outside air temperature may be an air temperature indicator that provides indications that are convertible to outside air temperature.

AMC1 SPO.IDE.H.120(d) & SPO.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 SPO.IDE.H.120(b)(1)(iii) & SPO.IDE.H.125(a)(8) Operations under VFR & operations under IFR — flight and navigational instruments and associated equipment

STABILISED HEADING

Stabilised direction should be achieved for VFR flights by a gyroscopic direction indicator, whereas for IFR flights, this should be achieved through a magnetic gyroscopic direction indicator.

AMC1 SPO.IDE.H.120(b)(3) & SPO.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 SPO.IDE.H.125(f)(2) Operations under IFR — flight and navigational instruments and associated equipment

CHART HOLDER

An acceptable means of compliance with the chart holder requirement would be to display a pre-composed chart on an electronic flight bag (EFB).

AMC1 SPO.IDE.H.132 Airborne weather detecting equipment — complex motor-powered helicopters

GENERAL

The airborne weather detecting equipment should be an airborne weather radar.

AMC1 SPO.IDE.A.135 Flight crew interphone system

TYPE OF FLIGHT CREW INTERPHONE

The flight crew interphone system should not be of a handheld type.

AMC1 SPO.IDE.H.140 Cockpit voice recorder

GENERAL

(a) The operational performance requirements for cockpit voice recorders (CVRs) should be those laid down in EUROCAE Document ED-112 (Minimum Operational Performance Specification for Crash Protected Airborne Recorder Systems March 2003, including Amendments No°1 and 2, or any later equivalent standard produced by EUROCAE.

(b) The operational performance requirements for equipment dedicated to the CVR should be those laid down in the European Organisation for Civil Aviation Equipment (EUROCAE) Document ED-56A (Minimum Operational Performance Requirements For Cockpit Voice Recorder Systems) dated December 1993, or EUROCAE Document ED-112 (Minimum Operational Performance Specification for Crash Protected Airborne Recorder Systems) dated March 2003, including Amendments n°1 and n°2 , or any later equivalent standard produced by EUROCAE.

AMC1 SPO.IDE.A.145 Flight data recorder

OPERATIONAL PERFORMANCE REQUIREMENTS FOR AEROPLANES FIRST ISSUED WITH AN INDIVIDUAL C OF A ON OR AFTER 1 JANUARY 2016 AND BEFORE 1 JANUARY 2023

(a) The operational performance requirements for flight data recorders (FDRs) should be those laid down in EUROCAE Document ED-112 (Minimum Operational Performance Specification for Crash Protected Airborne Recorder Systems) dated March 2003, including amendments No 1 and No 2, or any later equivalent standard produced by EUROCAE.

(b) The 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 (Minimum Operational Performance Specification for Crash Protected Airborne Recorder Systems), dated March 2003, including amendments No 1 and No 2, or any later equivalent standard produced by EUROCAE.

Table 1: All Aeroplanes

No*	Parameter
1a 1b 1c	Time; or Relative time count Global navigation satellite system (GNSS) time synchronisation
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 9a 9b	Engine thrust/power Parameters required to determine propulsive thrust/power on each engine Flight crew compartment thrust/power lever position for aeroplanes with no mechanical link between engine and flight crew compartment))
14	Total or outside air temperature
16	Longitudinal acceleration (body axis)
17	Lateral acceleration
18 18a 18b 18c	Primary flight control surface and 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): Pitch axis Roll axis Yaw axis
19	Pitch trim surface position
23	Marker beacon passage
24	Warnings - in addition to the master warning each 'red' warning (including smoke warnings from other compartments) should be recorded when the warning condition cannot be determined from other parameters or from the CVR.
25	Each navigation receiver frequency selection
27	Air–ground status Air - ground status and a sensor of each landing gear if installed

* The number in the left hand column reflects the serial number depicted in EUROCAE ED-112.

Table 2: Aeroplanes for which the data source for the parameter is either used by aeroplane systems or is available on the instrument panel for use by the flight crew to operate the aeroplane

No*	Parameter
10 10a	Flaps Trailing edge flap position

No*	Parameter
10b	Flight crew compartment control selection
11 11a 11b	Slats Leading edge flap (slat) position Flight crew compartment control selection
12	Thrust reverse status
13 13a 13b 13c 13d	Ground spoiler and speed brake: Ground spoiler position Ground spoiler selection Speed brake position Speed brake selection
15	Autopilot, autothrottle, automatic flight control system (AFCS) mode and engagement status
20	Radio altitude. For autoland/Category III operations, each radio altimeter should be recorded.
21 21a 21b 21c	Vertical deviation - the approach aid in use should be recorded. For autoland/ Category III operations, each system should be recorded. ILS/GPS/GLS glide path MLS elevation Integrated approach navigation (IAN)/integrated area navigation (IRNAV), vertical deviation
22 22a 22b 22c	Horizontal deviation — the approach aid in use should be recorded. For autoland/CAT III operations, each system should be recorded. It is acceptable to arrange them so that at least one is recorded every second). ILS/GPS/GLS localiser MLS azimuth GNSS approach path/IRNAV lateral deviation
26 26a 26b	Distance measuring equipment (DME) 1 and 2 distances Distance to runway threshold(GLS) Distance to missed approach point (IRNAV/IAN)
28 28a 28b 28c	Ground proximity warning system (GPWS)/TAWS/ground collision avoidance system (GCAS) status: Selection of terrain display mode, including pop-up display status Terrain alerts, including cautions and warnings and advisories On/off switch position
29	Angle of attack
30 30a 30b	Low pressure warning (each system): Hydraulic pressure Pneumatic pressure
31	Ground speed
32 32a 32b	Landing gear: Landing gear position Gear selector position
33 33a	Navigation data: Drift angle

No*	Parameter
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 SPO.IDE.A.145 and if the aeroplane is equipped with a suitable data source):
35a	Engine pressure ratio (EPR)
35b	N1
35c	Indicated vibration level
35d	N2
35e	Exhaust gas temperature (EGT)
35f	Fuel flow
35g	Fuel cut-off lever position
35h	N3
36	Traffic alert and collision avoidance system (TCAS)/ACAS - a suitable combination of discrete 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

No*	Parameter
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 46a 46b	Electronic flight instrument system (EFIS) display format: Pilot Co-pilot
47	Multi-function/engine/alerts display format
48	AC electrical bus status — each bus
49	DC electrical bus status — each bus
50	Engine bleed valve position
51	Auxiliary power unit (APU) bleed valve position
52	Computer failure — (all critical flight and engine control systems)
53	Engine thrust command
54	Engine thrust target
55	Computed centre of gravity (CG)
56	Fuel quantity in CG trim tank
57	Head-up display in use
58	Para visual display on
59	Operational stall protection, stick shaker and pusher activation
60 60a 60b 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

No*	Parameter
70	Hydraulic pressure — each system
71	Loss of cabin pressure
72	Trim control input position in the flight crew compartment,pitch— when mechanical means for control inputs are not available, displayed trim positions or trim command should be recorded
73	Trim control input position in the flight crew compartment roll— when mechanical means for control inputs are not available, displayed trim positions or trim command should be recorded
74	Trim control input position in the flight crew compartment , yaw- — when mechanical means for control inputs are not available, displayed trim positions or trim command should be recorded
75	All flight control input forces (for fly-by-wire flight control systems, where control surface position is a function of the displacement of the control input device only, it is not necessary to record this parameter):
75a	Control wheel
75b	Control column
75c	Rudder pedal
76	Event marker
77	Date
78	Actual navigation performance (ANP) or estimate of position error (EPE) or estimate of position uncertainty (EPU)

* The number in the left hand column reflects the serial number depicted in EUROCAE ED-112.

AMC2 SPO.IDE.A.145 Flight data recorder

OPERATIONAL PERFORMANCE REQUIREMENTS FOR AEROPLANES FIRST ISSUED WITH AN INDIVIDUAL Cofa ON OR AFTER 1 JANUARY 2023

(a) The operational performance requirements for flight data recorders (FDRs) should be those laid down in EUROCAE Document 112A (Minimum Operational Performance Specification for Crash Protected Airborne Recorder Systems) dated September 2013, or any later equivalent standard produced by EUROCAE.

(b) The FDR should, with reference to a timescale, record:

(1) the list of parameters in Table 1 below;

(2) the additional parameters listed in Table 2 below, when the information data source for the parameter is used by aeroplane systems or is available on the instrument panel for use by the flight crew to operate the aeroplane; and

(3) any dedicated parameters related to novel or unique design or operational characteristics of the aeroplane as determined by the Agency.

(c) The parameters to be recorded should meet the performance specifications (range, sampling intervals, accuracy limits and resolution in read-out) as defined in the relevant tables of EUROCAE Document 112A, or any later equivalent standard produced by EUROCAE.

Table 1: FDR — all aeroplanes

No*	Parameter
1a	Time; or
1b	Relative time count
1c	Global navigation satellite system (GNSS) time synchronisation
2	Pressure altitude (including altitude values displayed on each flight crew member’s primary flight display)

3	Indicated airspeed or calibrated airspeed (including values of indicated airspeed or calibrated airspeed displayed on each flight crew member's primary flight display)
4	Heading (primary flight crew reference) — when true or magnetic heading can be selected, the primary heading reference, a discrete indicating selection should be recorded
5	Normal acceleration
6	Pitch attitude — pitch attitude values displayed on each flight crew member's primary flight display should be recorded, unless the aeroplane is type certified before 1 January 2023 and recording the values displayed at the captain position or the first officer position would require extensive modification.
7	Roll attitude — roll attitude values displayed on each flight crew member's primary flight display should be recorded, unless the aeroplane is type certified before 1 January 2023 and recording the values displayed at the captain position or the first officer position would require extensive modification.
8	Manual radio transmission keying and CVR/FDR synchronisation reference
9 9a 9b	Engine thrust/power: Parameters required to determine propulsive thrust/power on each engine, in both normal and reverse thrust Flight crew compartment thrust/power lever position (for aeroplanes with non-mechanically linked engine controls in the flight crew compartment)
14	Total or outside air temperature
16	Longitudinal acceleration (body axis)
17	Lateral acceleration
18 18a 18b 18c	Primary flight control surface and/or primary flight control pilot input (For aeroplanes with control systems in which the movement of a control surface will back drive the pilot's control, 'or' applies. For aeroplanes with control systems in which the movement of a control surface will not back drive the pilot's control, 'and' applies. For multiple or split surfaces, a suitable combination of inputs is acceptable in lieu of recording each surface separately. For aeroplanes that have a flight control break-away capability that allows either pilot to operate the controls independently, record both inputs): Pitch axis Roll axis Yaw axis
19	Pitch trim surface position
23	Marker beacon passage
24	Warnings — in addition to the master warning, each 'red' warning that cannot be determined from other parameters or from the CVR and each smoke warning from other compartments should be recorded.
25	Each navigation receiver frequency selection
27	Air-ground status . Air–ground status and a sensor of each landing gear if installed

* The number in the left-hand column reflects the serial number depicted in EUROCAE Document 112A.

Table 2: FDR — Aeroplanes for which the data source for the parameter is either used by the aeroplane systems or is available on the instrument panel for use by the flight crew to operate the aeroplane

No*	Parameter

10 10a 10b	Flaps: Trailing edge flap position Flight crew compartment control selection
11 11a 11b	Slats: Leading edge flap (slat) position Flight crew compartment control selection
12	Thrust reverse status
13 13a 13b 13c 13d	Ground spoiler and speed brake: Ground spoiler position Ground spoiler selection Speed brake position Speed brake selection
15	Autopilot, autothrottle and automatic flight control system (AFCS): mode and engagement status (showing which systems are engaged and which primary modes are controlling the flight path and speed of the aircraft)
20	Radio altitude. For auto-land/category III operations, each radio altimeter should be recorded.
21 21a 21b 21c	Vertical deviation — the approach aid in use should be recorded. For auto-land/category III operations, each system should be recorded: ILS/GPS/GLS glide path MLS elevation Integrated approach navigation (IAN)/Integrated Area Navigation (IRNAV), vertical deviation
22 22a 22b 22c	Horizontal deviation — the approach aid in use should be recorded. For autoland/category III operations, each system should be recorded: LS/GPS/GLS localiser MLS azimuth Integrated approach navigation (IAN) /Integrated Area Navigation IRNAV lateral deviation, vertical deviation
26 26a 26b	Distance measuring equipment (DME) 1 and 2 distances: Distance to runway threshold (GLS) Distance to missed approach point (IRNAV/IAN)
28 28a 28b 28c	Ground proximity warning system (GPWS)/terrain awareness warning system (TAWS)/ground collision avoidance system (GCAS) status — a suitable combination of discretes unless recorder capacity is limited in which case a single discrete for all modes is acceptable: Selection of terrain display mode, including pop-up display status Terrain alerts, including cautions and warnings and advisories On/off switch position
29	Angle of attack
30 30a 30b	Low pressure warning (each system): Hydraulic pressure Pneumatic pressure

31	Ground speed
32 32a 32b	Landing gear: Landing gear position Gear selector position
33 33a 33b 33c 33d 33e 33f	Navigation data: Drift angle Wind speed Wind direction Latitude Longitude GNSS augmentation in use
34 34a 34b	Brakes: Left and right brake pressure Left and right brake pedal position
35 35a 35b 35c 35d 35e 35f 35g 35h 35i	Additional engine parameters (if not already recorded in Parameter 9 of Table 1, and if the aeroplane is equipped with a suitable data source): Engine pressure ratio (EPR) N1 Indicated vibration level N2 Exhaust gas temperature (EGT) Fuel flow Fuel cut-off lever position N3 Engine fuel metering valve position (or equivalent parameter from the system that directly controls the flow of fuel into the engine) — for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification.
36 36a 36b 36c 36d 36e	Traffic alert and collision avoidance system (TCAS)/airborne collision avoidance system (ACAS) — a suitable combination of discretes should be recorded to determine the status of the system: Combined control Vertical control Up advisory Down advisory Sensitivity level
37	Wind shear warning
38	Selected barometric setting — to be recorded for the aeroplane where the parameter is displayed electronically: Pilot selected barometric setting

38a 38b	Co-pilot selected barometric setting
39	Selected altitude (all pilot selectable modes of operation) — to be recorded for the aeroplane where the parameter is displayed electronically
40	Selected speed (all pilot selectable modes of operation) — to be recorded for the aeroplane where the parameter is displayed electronically
41	Selected Mach (all pilot selectable modes of operation) — to be recorded for the aeroplane where the parameter is displayed electronically
42	Selected vertical speed (all pilot selectable modes of operation) — to be recorded for the aeroplane where the parameter is displayed electronically
43	Selected heading (all pilot selectable modes of operation) — to be recorded for the aeroplane where the parameter is displayed electronically
44 44a 44b 44c	Selected flight path (all pilot selectable modes of operation) — to be recorded for the aeroplane where the parameter is displayed electronically: Course/desired track (DSTRK) Path angle Coordinates of final approach path (IRNAV/IAN)
45	Selected decision height — to be recorded for the aeroplane where the parameter is displayed electronically
46 46a 46b	Electronic flight instrument system (EFIS) display format, showing the display system status: Pilot Co-pilot
47	Multi-function/engine/alerts display format, showing the display system status
48	Alternating current (AC) electrical bus status — each bus
49	Direct current (DC) electrical bus status — each bus
50	Engine bleed valve(s) position
51	Auxiliary power unit (APU) bleed valve(s) position
52	Computer failure — all critical flight and engine control systems
53	Engine thrust command
54	Engine thrust target
55	Computed centre of gravity (CG)
56	Fuel quantity in CG trim tank
57	Head-up display in use
58	Paravisual display on
59	Operational stall protection, stick shaker and pusher activation

60 60a 60b 60c 60d 60e 60f	Primary navigation system reference: GNSS Inertial navigational system (INS) VHF omnidirectional radio range (VOR)/distance measuring equipment (DME) MLS Loran C ILS
61	Ice detection
62	Engine warning — each engine vibration
63	Engine warning — each engine over temperature
64	Engine warning — each engine oil pressure low
65	Engine warning — each engine overspeed
66	Yaw trim surface position
67	Roll trim surface position
68	Yaw or sideslip angle
69	De-icing and/or anti-icing systems selection
70	Hydraulic pressure — each system
71	Loss of cabin pressure
72	Trim control input position in the flight crew compartment, pitch — when mechanical means for control inputs are not available, displayed trim position or trim command should be recorded
73	Trim control input position in the flight crew compartment, roll — when mechanical means for control inputs are not available, displayed trim position or trim command should be recorded.
74	Trim control input position in the flight crew compartment, yaw — when mechanical means for control inputs are not available, displayed trim position or trim command should be recorded.
75 75a 75b 75c	All flight control input forces (for fly-by-wire flight control systems, where control surface position is a function of the displacement of the control input device only, it is not necessary to record this parameter): Control wheel input forces Control column input forces Rudder pedal input forces
76	Event marker
77	Date
78	Actual navigation performance (ANP) or estimate of position error (EPE) or estimate of position uncertainty (EPU)
79	Cabin pressure altitude — for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification

80	Aeroplane computed weight — for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification
81	Flight director command:
81a	Left flight director pitch command — for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification
81b	Left flight director roll command — for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification
81c	Right flight director pitch command — for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification
81d	Right flight director roll command — for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification
81e	
82	Vertical speed — for aeroplanes type certified before 1 January 2023, to be recorded only if this does not require extensive modification

* The number in the left-hand column reflects the serial number depicted in EUROCAE Document 112A.

AMC1 SPO.IDE.H.146 Lightweight flight recorder

OPERATIONAL PERFORMANCE REQUIREMENTS

(a) If the flight recorder records flight data, it should record at least the following parameters:
  (1) relative time count,
  (2) pitch attitude or pitch rate,
  (3) roll attitude or roll rate,
  (4) heading (magnetic or true) or yaw rate,
  (5) latitude,
  (6) longitude,
  (7) positioning system: estimated error (if available),
  (8) pressure altitude or altitude from a positioning system,
  (9) time,
  (10) ground speed,
  (11) positioning system: track (if available),
  (12) normal acceleration,
  (13) longitudinal acceleration, and
  (14) lateral acceleration.

(b) If the flight recorder records images, it should capture views of the main instrument displays at the pilot station, or at both pilot stations when the helicopter is certified for operation with a minimum crew of two pilots. The recorded image quality should allow reading the following indications during most of the flight:
  (1) magnetic or true heading,
  (2) time (if presented on the front instrument panel),
  (3) pressure altitude,
  (4) indicated airspeed,
  (5) vertical speed,
  (6) slip,
  (7) OAT,
  (8) attitude (if displayed),
  (9) stabilised heading (if displayed), and
  (10) main rotor speed.

(c) If the flight recorder records a combination of images and flight data, each flight parameter listed in (a) should be recorded as flight data or by means of images.

(d) The flight parameters listed in (a), which are recorded as flight data, should meet the performance specifications (range, sampling intervals, accuracy limits and resolution in read-out) as defined in the relevant table of EUROCAE Document ED-112 'Minimum Operational Performance Specification for Crash Protected Airborne Recorder Systems', dated March 2003, or EUROCAE Document ED-155 'Minimum Operational Performance Specification for Lightweight Flight Recording Systems', dated July 2009, or any later equivalent standard accepted by EASA.

(e) The operational performance requirements for the flight recorder should be those laid down in:

(1) EUROCAE Document ED-155 or any later equivalent standard accepted by EASA for lightweight flight recorders; or

(2) EUROCAE Document ED-112 or any later equivalent standard accepted by EASA for crashprotected flight recorders.

GM1 SPO.IDE.H.146 Lightweight flight recorder

ADDITIONAL USEFUL INFORMATION

Refer to GM1 SPO.IDE.A.146.

GM2 SPO.IDE.H.146 Lightweight flight recorder

INSTALLATION OF CAMERAS

Refer to GM2 SPO.IDE.A.146.

GM3 SPO.IDE.H.146 Lightweight flight recorder

RECORDING ACCURACY OF ATTITUDE RATE PARAMETERS

Refer to GM3 SPO.IDE.A.146.

GM1 SPO.IDE.H.146(e) Lightweight flight recorder

FUNCTION TO MODIFY IMAGE AND AUDIO RECORDINGS

Refer to GM1 SPO.IDE.A.146(e).

GM1 SPO.IDE.A.150 Data link recording

GENERAL

(a) The letters and expressions in Table 1 of AMC1 SPO.IDE.A.150 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 SPO.IDE.A.150 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

Item No	Application Type	Messages	Comments
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 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

GM1 SPO.IDE.A.150(a) Data link recording

APPLICABILITY OF THE DATA LINK RECORDING REQUIREMENT

(a) If it is certain that the aeroplane cannot use data link communication messages for ATS communications corresponding to any application designated by SPO.IDE.A.150(a)(1), then the data link recording requirement does not apply.

(b) Examples where the aeroplane cannot use data link communication messages for ATS communications include but are not limited to the cases where:

(1) the aeroplane data link communication capability is disabled permanently and in a way that it cannot be enabled again during the flight;

(2) data link communications are not used to support air traffic service (ATS) in the area of operation of the aeroplane; and

(3) the aeroplane data link communication equipment cannot communicate with the equipment used by ATS in the area of operation of the aeroplane.

GM1 SPO.IDE.H.155 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 SPO.IDE.H.140; and

(2) all parameters and specifications required by SPO.IDE.H.145, with the same specifications required by SPO.IDE.H.140 and SPO.IDE.H.145.

(b) In addition, a flight data and cockpit voice combination recorder may record data link communication messages and related information required by SPO.IDE.H.150.

AMC2 SPO.IDE.H.160 Seats, seat safety belts and restraint systems

UPPER TORSO RESTRAINT SYSTEM

The following systems are deemed to be compliant with the requirement for an upper torso restraint system:

(a) For other-than-complex helicopters, a seat belt with a diagonal shoulder strap;

(b) For all helicopters, a restraint system having a seat belt and two shoulder straps that may be used independently.

(c) For all helicopters, a restraint system having a seat belt, two shoulder straps and additional straps that may be used independently.

SEAT BELT

A seat belt with a diagonal shoulder strap (three anchorage points) is deemed to be compliant with the requirement for a seat belt (two anchorage points).

AMC1 SPO.IDE.H.165 First-aid kit

CONTENT OF FIRST-AID KITS — OTHER-THAN-COMPLEX MOTOR-POWERED HELICOPTERS

(a) First-aid kits should be equipped with appropriate and sufficient medications and instrumentation. However, these kits should be supplemented by the operator according to the characteristics of the operation (scope of operation, flight duration, number and demographics of persons on board, etc.).

(b) The following should be included in the FAKs:

(1) bandages (assorted sizes, including a triangular bandage),

(2) burns dressings (large and small),

(3) wound dressings (large and small),

(4) adhesive dressings (assorted sizes),

(5) antiseptic wound cleaner,

(6) safety scissors,

(7) disposable gloves,

(8) disposable resuscitation aid, and

(9) surgical masks.

AMC2 SPO.IDE.H.165 First-aid kit

CONTENT OF FIRST-AID KITS — COMPLEX MOTOR-POWERED HELICOPTERS

(a) First-aid kits should be equipped with appropriate and sufficient medications and instrumentation. However, these kits should be supplemented by the operator according to the characteristics of the operation (scope of operation, flight duration, number and demographics of persons on board etc.).

(b) The following should be included in the FAKs:

(1) Equipment:

(i) bandages (assorted sizes, including a triangular bandage);

(ii) burns dressings (unspecified);

(iii) wound dressings (large and small);

(iv) adhesive dressings (assorted sizes);

(v) adhesive tape;

(vi) adhesive wound closures;

(vii) safety pins;

(viii) safety scissors;

(ix) antiseptic wound cleaner;

(x) disposable resuscitation aid;

(xi) disposable gloves;

(xii) tweezers: splinter;

(xiii) thermometers (non-mercury); and

(xiv) surgical masks.

(2) Medications:

(i) simple analgesic;

(ii) antiemetic – non-injectable;

(iii) nasal decongestant;

(iv) gastrointestinal antacid, in the case of helicopters carrying more than nine persons;

(v) anti-diarrhoeal medication in the case of helicopters carrying more than nine persons; and

(vi) antihistamine.

(3) Other content. The operator should make available instructions either in a paper-based or an electronic format. If an electronic format is available, then all instructions should be kept on the same device. If a paper format is used, then the instructions should be kept in the same kit with the applicable equipment and medication. The instructions should include, as a minimum, the following:

(i) a list of contents in at least two languages (English and one other). This should include information on the effects and side effects of medications carried;

(ii) first-aid handbook, current edition;

(iii) Basic life support instructions cards (summarising and depicting the current algorithm for basic life support);

(iv) medical incident report form;

(v) biohazard disposal bags; and

(vi) bag-valve masks for adults.

(4) Additional equipment. The operators should carry additional equipment based on an assessment that considers the specificities and the nature of their specialised operations:

(i) automated external defibrillator (AED);

(ii) suitable airway management device (e.g. supraglottic airway devices, oropharyngeal and nasopharyngeal airways); and

(iii) eye irrigator.

AMC3 SPO.IDE.H.165 First-aid kit

MAINTENANCE OF FIRST-AID KIT

To be kept up to date, the first-aid kit should be:

(a) inspected periodically to confirm, to the extent possible, that contents are maintained in the condition necessary for their intended use;

(b) replenished at regular intervals, in accordance with instructions contained on their labels, or as circumstances warrant; and

(c) replenished after use in-flight at the first opportunity where replacement items are available.

GM1 SPO.IDE.H.165 First-aid kit

LOCATION AND USE

The location of the first-aid kit is normally indicated using internationally recognisable signs.

The first-aid kit 'should be readily accessible for use' in helicopter operations should be understood as the firstaid kit being either accessible in flight or immediately after landing.

In some operations it is not practicable to use the first-aid kit during flight. Therefore, the first-aid kit can be carried in the cargo compartment, where it will be easily accessible for use as soon as the aircraft has landed, when the following conditions are met:

(a) precautionary landing sites are available;

(b) the lack of cabin space is such that movement or use of the first-aid kit is impaired; and

(c) the installation of the first-aid kit in the cabin is not practicable

GM2 SPO.IDE.H.165 First-aid kit

STORAGE

As a best practice and wherever practicable, the emergency medical equipment listed under AMC2 SPO.IDE.H.165 should be kept close together.

GM3 SPO.IDE.H.165 First-aid kit

CONTENT OF FIRST-AID KITS

The operator may supplement first-aid kits according to the characteristics of the operation based on a risk assessment. The assessment does not require an approval by the competent authority.

GM4 SPO.IDE.H.165 First-aid kit

LITHIUM BATTERIES

Risks related to the presence of lithium batteries should be assessed. All equipment powered by lithium batteries carried on an aeroplane should comply with the provisions of AMC1 CAT.GEN.MPA.140(f) including applicable technical standards such as (E)TSO-C142.

AMC1 SPO.IDE.H.175 Supplemental oxygen — non-pressurised helicopters

DETERMINATION OF OXYGEN

The amount of oxygen should be determined on the basis of cabin pressure altitude 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 AFM.

AMC1 SPO.IDE.H.180 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 cabin 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 flight crew or task specialist 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 cabin compartments, it should be located near the task specialist's station, where provided.

(d) Where two or more hand fire extinguishers are required in the cabin 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 SPO.IDE.H.185 Marking of break-in points

COLOUR AND CORNERS' MARKING

(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 SPO.IDE.H.190 Emergency locator transmitter (ELT)

BATTERIES

(a) All batteries used in ELTs or PLBs should be replaced (or recharged if the battery is rechargeable) when the equipment has been in use for more than 1 cumulative hour or in the following cases:

  (1) Batteries specifically designed for use in ELTs and having an airworthiness release certificate (Brunei DCA Form 1 or equivalent) should be replaced (or recharged, if the battery is rechargeable) before the end of their useful life in accordance with the maintenance instructions applicable to the ELT.

  (2) Standard batteries manufactured in accordance with an industry standard and not having an airworthiness release certificate (Brunei DCA Form 1 or equivalent), when used in ELTs should be replaced (or recharged if the battery is rechargeable) when 50 % of their useful life (or for rechargeable, 50 % of their useful life of charge), as established by the battery manufacturer, has expired.

  (3) All batteries used in PLBs should be replaced (or recharged, if the battery is rechargeable) when 50 % of their useful life (or for rechargeable 50 % of their useful life of charge), as established by the battery manufacturer, has expired.

  (4) The battery useful life (or useful life of charge) criteria in (1),(2) and (3) do not apply to batteries (such as water-activated batteries) that are essentially unaffected during probable storage intervals.

(b) The new expiry date for a replaced (or recharged) battery should be legibly marked on the outside of the equipment.

AMC2 SPO.IDE.H.190 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 to be tethered to a life-raft or a survivor. A water-activated ELT(S) is not an ELT(AP).

(b) To minimise the possibility of damage in the event of 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.

AMC3 SPO.IDE.H.190 Emergency locator transmitter (ELT)

PLB TECHNICAL SPECIFICATIONS

(a) A personal locator beacon (PLB) should have a built-in GNSS receiver with a cosmicheskaya sistyema poiska avariynich sudov — search and rescue satellite- aided tracking (COSPAS-SARSAT) type approval number. However, devices with a COSPAS-SARSAT with a number belonging to series 700 are excluded as this series of numbers identifies the special-use beacons not meeting all the technical requirements and all the tests specified by COSPAS-SARSAT.

(b) Any PLB carried should be registered with the national agency responsible for initiating search and rescue or other nominated agency.

AMC4 SPO.IDE.H.190 Emergency locator transmitter (ELT)

BRIEFING ON PLB USE

When a PLB is carried by a task specialist, he/she should be briefed on its characteristics and use by the pilot-in-command before the flight.

GM1 SPO.IDE.H.190 Emergency locator transmitter (ELT)

TERMINOLOGY

(a) An ELT is a generic term describing equipment that broadcasts distinctive signals on designated frequencies and, depending on application, may be activated by impact or may be manually activated.

(b) A PLB is an emergency beacon other than an ELT that broadcasts distinctive signals on designated frequencies, is standalone, portable and is manually activated by the survivors.

GM2 SPO.IDE.H.190 Emergency locator transmitter (ELT)

MAXIMUM CERTIFIED SEATING CONFIGURATION

The maximum certified seating configuration does not include flight crew seats.

AMC1 SPO.IDE.H.195 Flight over water — other-than-complex motor-powered helicopters

ACCESSIBILITY OF LIFE-JACKETS

The life-jacket, if not worn, should be accessible from the seat or station of the person for whose use it is provided, with a safety belt or a restraint system fastened.

MEANS OF ILLUMINATION FOR LIFE-JACKETS

The means of electric illumination should be a survivor locator light as defined in the applicable ETSO issued by Brunei DCA 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 regulations and AMCs applicable to the operation of the helicopter.

(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.

GM1 SPO.IDE.H.195 Flight over water — other-than-complex motor-powered helicopters

SEAT CUSHIONS

Seat cushions are not considered to be flotation devices.

AMC1 SPO.IDE.H.197 Life-jackets — complex motor-powered helicopters

ACCESSIBILITY OF LIFE-JACKETS

The life-jacket, if not worn, should be accessible from the seat or station of the person for whose use it is provided, with a safety belt or a restraint system fastened.

MEANS OF ILLUMINATION FOR LIFE-JACKETS

The means of electric illumination should be a survivor locator light as defined in the applicable ETSO issued by Brunei DCA or equivalent.

GM1 SPO.IDE.H.197 Life-jackets – complex motor-powered helicopters

SEAT CUSHIONS

Seat cushions are not considered to be flotation devices.

GM1 SPO.IDE.H.198 Survival suits — complex motor-powered helicopters

ESTIMATING SURVIVAL TIME

(a) Introduction

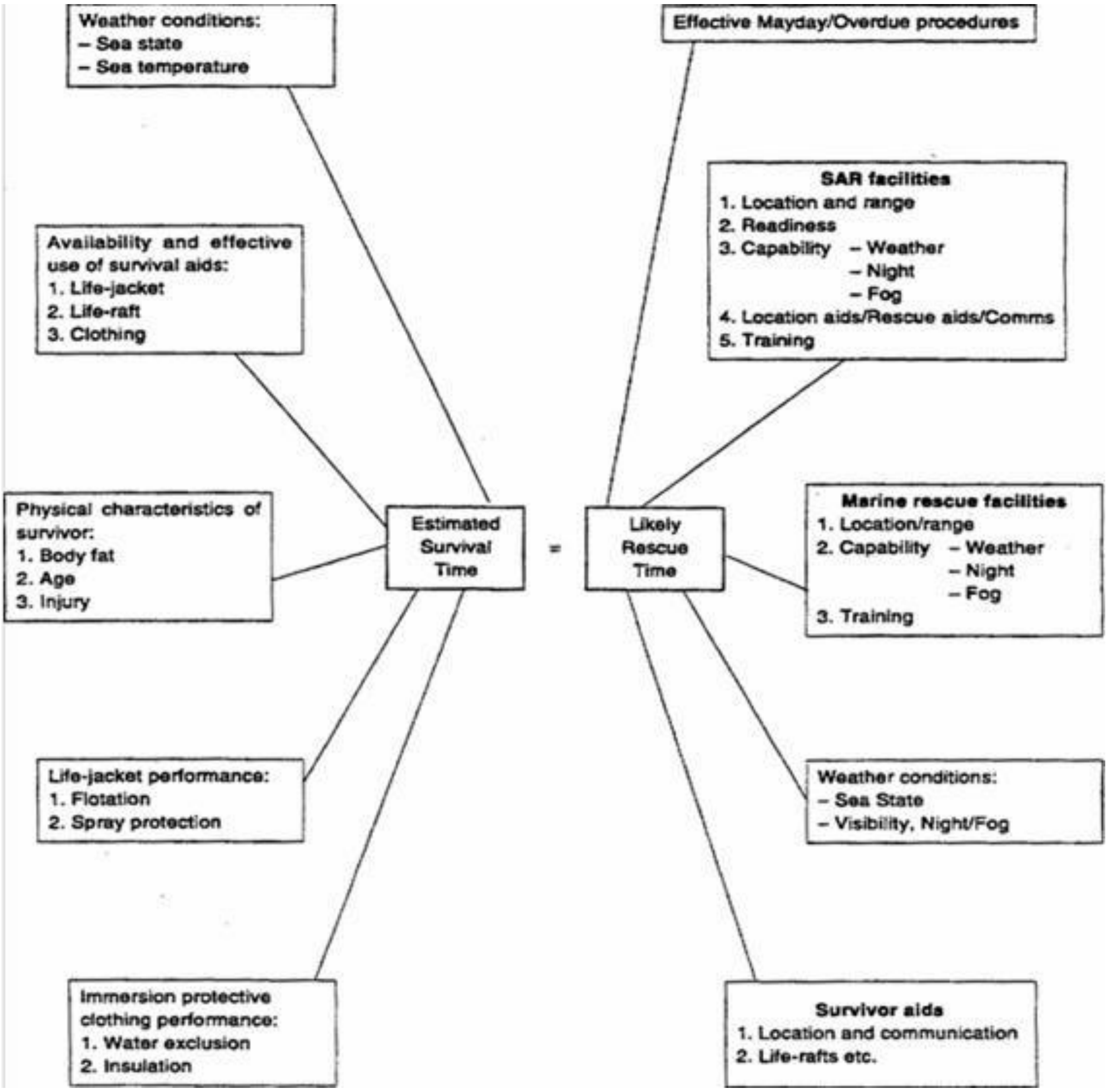
(1) A person accidentally immersed in cold seas (typically offshore Northern Europe) will have a better chance of survival if he/she is wearing an effective survival suit in addition to a life-jacket. By wearing the survival suit, he/she can slow down the rate which his/her body temperature falls and, 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	Within ¾ hour	Within 1¼ hours
	3 – 4	Within ½ hour	Within ½ hour
	5 and above	Significantly less than ½ hour	Significantly less than ½ hour
Immersion suit worn over	0 -2	May well exceed 3 hours	May well exceed 3 hours
Working clothes (with leakage inside suit)	3 – 4	Within 2 ¾ hours	May well exceed 3 hours
	5 and above	Significantly less than 2¾ 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 SPO.IDE.H.199 Life-rafts, survival ELTs and survival equipment on extended overwater flights – complex motor-powered helicopters

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 mean to protect occupants from the elements;

(4) one radar reflector;

(5) one 20 m retaining line designed to hold the life-raft near the helicopter but to release it if the helicopter becomes totally submerged;

(6) one sea anchor; 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 SPO.IDE.H.200 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 persons on board; and

(4) one arctic/polar suit for each crew member.

(c) If any item of equipment contained in the above list is already carried on board the aircraft in accordance with another requirement, there is no need for this to be duplicated.

AMC1 SPO.IDE.H.200(b) 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 SPO.IDE.H.200 Survival equipment

SIGNALLING EQUIPMENT

The signalling equipment for making distress signals is described in ICAO Annex 2, Rules of the Air.

GM2 SPO.IDE.H.200 Survival equipment

AREAS IN WHICH SEARCH AND RESCUE WOULD BE ESPECIALLY DIFFICULT

The expression 'areas in which search and rescue would be especially difficult' should be interpreted, in this context, as meaning:

(a) areas so designated by the authority responsible for managing search and rescue; or

(b) areas that are largely uninhabited and where:

(1) the authority referred to in (a) has not published any information to confirm whether search and rescue would be or would not be especially difficult; and

(2) the authority referred to in (a) does not, as a matter of policy, designate areas as being especially difficult for search and rescue.

GM1 SPO.IDE.H.202 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 SPO.IDE.H.203 All helicopters on flights over water — ditching

EMERGENCY FLOTATION EQUIPMENT

The same considerations of AMC1 SPA.HOFO.165(d) should apply in respect of emergency flotation equipment.

GM1 SPO.IDE.H.205 Individual protective equipment

TYPES OF INDIVIDUAL PROTECTIVE EQUIPMENT

Personal protective equipment should include, but is not limited to: flying suits, gloves, helmets, protective shoes, etc.

AMC1 SPO.IDE.H.210 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 SPO.IDE.H.210 Headset

GENERAL

The term ‘headset’ includes any aviation helmet incorporating headphones and microphone worn by a flight crew member.

GM1 SPO.IDE.H.215 Radio communication equipment

APPLICABLE AIRSPACE REQUIREMENTS

For helicopters being operated under Brunei Darussalam air traffic control, the applicable airspace requirements.

AMC1 SPO.IDE.H.220 Navigation equipment

NAVIGATION WITH VISUAL REFERENCE TO LANDMARKS — OTHER-THAN-COMPLEX HELICOPTERS

Where other-than-complex helicopters, with the surface in sight, can proceed according to the ATS flight plan by navigation with visual reference to landmarks, no additional equipment is needed to comply with SPO.IDE.H.220 (a)(1).

GM1 SPO.IDE.H.220 Navigation equipment

AIRCRAFT ELIGIBILITY FOR PBN SPECIFICATION NOT REQUIRING SPECIFIC APPROVAL

(a) The performance of the aircraft is usually stated in the AFM.

(b) Where such a reference cannot be found in the AFM, other information provided by the aircraft manufacturer as TC holder, the STC holder or the design organisation having a privilege to approve minor changes may be considered.

(c) The following documents are considered acceptable sources of information:

(1) AFM, supplements thereto, and documents directly referenced in the AFM;

(2) FCOM or similar document;

(3) Service Bulletin or Service Letter issued by the TC holder or STC holder;

(4) approved design data or data issued in support of a design change approval;

(5) any other formal document issued by the TC or STC holders stating compliance with PBN specifications, AMC, Advisory Circulars (AC) or similar documents issued by the State of Design; and

(6) written evidence obtained from the State of Design.

(d) Equipment qualification data, in itself, is not sufficient to assess the PBN capabilities of the aircraft, since the latter depend on installation and integration.

(e) As some PBN equipment and installations may have been certified prior to the publication of the PBN Manual and the adoption of its terminology for the navigation specifications, it is not always possible to find a clear statement of aircraft PBN capability in the AFM. However, aircraft eligibility for certain PBN specifications can rely on the aircraft performance certified for PBN procedures and routes prior to the publication of the PBN Manual.

(f) Below, various references are listed which may be found in the AFM or other acceptable documents (see listing above) in order to consider the aircraft’s eligibility for a specific PBN specification if the specific term is not used.

(g) RNAV 5

(1) If a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNAV 5 operations.

(i) B-RNAV;

(ii) RNAV 1;

(iii) RNP APCH;

(iv) RNP 4;

(v) A-RNP;

(vi) AMC 20-4;

(vii) JAA TEMPORARY GUIDANCE MATERIAL, LEAFLET NO. 2 (TGL 2)

(viii) JAA AMJ 20X2;

(ix) FAA AC 20-130A for en route operations;

(x) FAA AC 20-138 for en route operations; and

(xi) FAA AC 90-96.

(h) RNAV 1/RNAV 2

(1) If a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNAV 1/RNAV 2 operations.

(i) RNAV 1;

(ii) PRNAV;

(iii) US RNAV type A;

(iv) FAA AC 20-138 for the appropriate navigation specification;

(v) FAA AC 90-100A;

(vi) JAA TEMPORARY GUIDANCE MATERIAL, LEAFLET NO. 10 Rev1 (TGL 10);

(vii) FAA AC 90-100.

(2) However, if position determination is exclusively computed based on VOR-DME, the aircraft is not eligible for RNAV 1/RNAV 2 operations.

(i) RNP 1/RNP 2 continental

(1) If a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNP 1/RNP 2 continental operations.

(i) A-RNP;

(ii) FAA AC 20-138 for the appropriate navigation specification; and

(iii) FAA AC 90-105.

(2) Alternatively, if a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above and position determination is primarily based on GNSS, the aircraft is eligible for RNP 1/RNP 2 continental operations. However, in these cases, loss of GNSS implies loss of RNP 1/RNP 2 capability.

(i) JAA TEMPORARY GUIDANCE MATERIAL, LEAFLET NO. 10 (TGL 10) (any revision); and

(ii) FAA AC 90-100.

(j) RNP APCH — LNAV minima

(1) If a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNP APCH LNAV operations.

(i) A-RNP;

(ii) AMC 20-27;

(iii) AMC 20-28;

(iv) FAA AC 20-138 for the appropriate navigation specification; and

(v) FAA AC 90-105 for the appropriate navigation specification.

(2) Alternatively, if a statement of compliance with RNP 0.3 GNSS approaches in accordance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNP APCH — LNAV operations. Any limitation such as 'within the US National Airspace' may be ignored since RNP APCH procedures are assumed to meet the same ICAO criteria around the world.

(i) JAA TEMPORARY GUIDANCE MATERIAL, LEAFLET NO. 3 (TGL 3);

(ii) AMC 20-4;

(iii) FAA AC 20-130A; and

(iv) FAA AC 20-138.

(k) RNP APCH — LNAV/VNAV minima

(1) If a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNP APCH — LNAV/VNAV operations.

(i) A-RNP;

(ii) AMC 20-27 with Baro VNAV;

(iii) AMC 20-28;

(iv) FAA AC 20-138; and

(v) FAA AC 90-105 for the appropriate navigation specification.

(2) Alternatively, if a statement of compliance with FAA AC 20-129 is found in the acceptable documentation as listed above, and the aircraft complies with the requirements and limitations of EASA SIB 2014-042, the aircraft is eligible for RNP APCH — LNAV/VNAV operations. Any limitation such as 'within the US National Airspace' may be ignored since RNP APCH procedures are assumed to meet the same ICAO criteria around the world.

(l) RNP APCH — LPV minima

(1) If a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNP APCH — LPV operations.

(i) AMC 20-28;

(ii) FAA AC 20-138 for the appropriate navigation specification; and

(iii) FAA AC 90-107.

(2) For aircraft that have a TAWS Class A installed and do not provide Mode-5 protection on an LPV approach, the DH is limited to 250 ft.

(m) (m) RNAV 10

(1) If a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNAV 10 operations.

(i) RNP 10;

(ii) FAA AC 20-138 for the appropriate navigation specification;

(iii) AMC 20-12;

(iv) FAA Order 8400.12 (or later revision); and

(v) FAA AC 90-105.

(n) RNP 4

(1) If a statement of compliance with any of the following specifications or standards is found in the acceptable documentation as listed above, the aircraft is eligible for RNP 4 operations.

(i) FAA AC 20-138B or later, for the appropriate navigation specification;

(ii) FAA Order 8400.33; and

(iii) FAA AC 90-105 for the appropriate navigation specification.

(o) RNP 2 oceanic

(1) If a statement of compliance with FAA AC 90-105 for the appropriate navigation specification is found in the acceptable documentation as listed above, the aircraft is eligible for RNP 2 oceanic operations.

(2) If the aircraft has been assessed eligible for RNP 4, the aircraft is eligible for RNP 2 oceanic.

(p) Special features

(1) RF in terminal operations (used in RNP 1 and in the initial segment of the RNP APCH)

(i) If a statement of demonstrated capability to perform an RF leg, certified in accordance with any of the following specifications or standards, is found in the acceptable documentation as listed above, the aircraft is eligible for RF in terminal operations:

(A) AMC 20-26;

(B) FAA AC 20-138B or later.

(ii) If there is a reference to RF and a reference to compliance with AC 90-105, then the aircraft is eligible for such operations.

(q) Other considerations

(1) In all cases, the limitations in the AFM need to be checked, in particular the use of AP or FD which can be required to reduce the FTE primarily for RNP APCH, RNAV 1, and RNP 1.

(2) Any limitation such as 'within the US National Airspace' may be ignored since RNP APCH procedures are assumed to meet the same ICAO criteria around the world.

GM2 SPO.IDE.H.220 Navigation equipment

GENERAL

(a) The PBN specifications for which the aircraft complies with the relevant airworthiness criteria are set out in the AFM, together with any limitations to be observed.

(b) Because functional and performance requirements are defined for each navigation specification, an aircraft approved for an RNP specification is not automatically approved for all RNAV specifications. Similarly, an aircraft approved for an RNP or RNAV specification having a stringent accuracy requirement (e.g. RNP 0.3 specification) is not automatically approved for a navigation specification having a less stringent accuracy requirement (e.g. RNP 4).

RNP 4

(c) For RNP 4, at least two LRNSs, capable of navigating to RNP 4, and listed in the AFM, may be operational at the entry point of the RNP 4 airspace. If an item of equipment required for RNP 4 operations is unserviceable, then the flight crew may consider an alternate route or diversion for repairs. For multisensor systems, the AFM may permit entry if one GNSS sensor is lost after departure, provided one GNSS and one inertial sensor remain available.

AMC1 SPO.IDE.H.225 Transponder

GENERAL

(a) The SSR transponders of helicopters being operated under Brunei Darussalam air traffic control should comply with any applicable legislation.

(b) If the legislation is not applicable, the SSR transponders should operate in accordance with the relevant provisions of Volume IV of ICAO Annex 10.

AMC1 SPO.IDE.H.230 Management of aeronautical databases

AERONAUTICAL DATABASES

When the operator of an aircraft uses an aeronautical database that supports an airborne navigation application as a primary means of navigation used to meet the airspace usage requirements, the database provider should be a Type 2 DAT provider certified in accordance with Regulation (EU) 2017/373 or equivalent.

GM1 SPO.IDE.H.230 Management of aeronautical databases

AERONAUTICAL DATABASE APPLICATIONS

(a) Applications using aeronautical databases for which Type 2 DAT providers should be certified in accordance with Regulation (EU) 2017/373 may be found in GM1 DAT.OR.100.

(b) The certification of a Type 2 DAT provider in accordance with Regulation (EU) 2017/373 ensures data integrity and compatibility with the certified aircraft application/equipment.

GM2 SPO.IDE.H.230 Management of aeronautical databases

TIMELY DISTRIBUTION

The operator should distribute current and unaltered aeronautical databases to all aircraft requiring them in accordance with the validity period of the databases or in accordance with a procedure established in the operations manual if no validity period is defined.

GM3 SPO.IDE.H.230 Management of aeronautical databases

STANDARDS FOR AERONAUTICAL DATABASES AND DAT PROVIDERS

(a) A 'Type 2 DAT provider' is an organisation as defined in Article 2(5)(b) of Regulation (EU) 2017/373.

(b) Equivalent to a certified 'Type 2 DAT provider' is defined in any Aviation Safety Agreement between the European Union and a third country, including any Technical Implementation Procedures, or any Working Arrangements between EASA and the Brunei DCA.

Subpart E - Specific requirements

Section 1 - Helicopter external sling load operations (HESLO)

AMC1 SPO.SPEC.HESLO.100 Standard operating procedures

STANDARD OPERATING PROCEDURES

(a) Before conducting any HESLO, the operator should develop its SOPs taking into account the elements below.

(b) Nature and complexity of the activity

(1) Nature of the activity and exposure:

Helicopter flights for the purpose of transporting external loads by different means, e.g. under slung, external pods or racks. These operations are usually performed at a low height.

(2) Complexity of the activity:

The complexity of the activity varies with the size and the shape of the load, the length of the rope and characteristics of the pick-up and drop-off zones, the time per load cycle, etc.

Table 1: HESLO types

HESLO 1:	short line, 20 metres (m) or less
HESLO 2:	long line, more than 20 m
HESLO 3:	Specialised sling load, such as: Logging, insulators and pullers, traverse mounting, spinning of fibre cable, ice and snow removal from power lines, sawing, geophysical surveys, cable laying onto the ground or into ditches, avalanche control, landslide control.
HESLO 4:	Advanced sling load such as: tower erecting, wire stringing, disassembly of masts and towers.

(3) Operational environment and geographical area:

HESLO may be performed over any geographical area. Special attention should be given to:

(i) hostile and congested;

(ii) mountains;

(iii) sea;

(iv) jungle;

(v) desert; and

(vi) polar;

(vii) lakes and river canyons; and

(viii) environmentally sensitive areas (e.g. national parks, noise sensitive areas).

(c) Equipment

(1) The helicopter may be equipped with:

(i) additional mirror(s); and/or video camera(s);

(ii) a bubble window;

(iii) supplementary hook(s) or multi-hook device(s); and

(iv) load data recorder (lifts, weights, torques, power, forces, shocks and electrical activities).

(2) When conducting single-pilot vertical reference operations with no assistance of a task specialist or other crew member, additional engine monitoring in the pilot line of vision or an audio warning system is recommended.

(3) All additional equipment used, e.g. ropes, cables, mechanical hooks, swivel hooks, nets, buckets, chainsaws, baskets, containers, should be manufactured according to applicable rules or recognised standards. The operator should be responsible for maintaining the serviceability of this equipment.

(4) Adequate radio communication equipment (e.g. VHF, UHF, FM) should be installed and serviceable in the helicopter for co-ordination with the task specialists involved in the operation.

(5) Task specialists involved in the operation should be equipped with hand-held communication equipment, protective helmets with integrated earphones and microphones , and the relevant personal protective equipment.

(d) Crew members

(1) Crew composition:

(i) The minimum flight crew as stated in the approved AFM. For operational or training purposes, an additional crew member may assist the pilot-in- command (PIC) in a single-pilot operation In such a case:

(A) procedures are in place for a crew member to monitor the flight, especially during the departure, approach and HESLO cycle, to ensure that a safe flight path is maintained; and

(B) when a task specialist is tasked with assisting the pilot, the procedures according to which this assistance is taking place should be clearly defined.

(ii) For safety and/or operational purposes, task specialists should be instructed by the operator to fulfil specified tasks.

(2) Pilot training for HESLO

Before acting as unsupervised PIC, the pilot should demonstrate to the operator that he/she has the required skills and knowledge.

(i) Theoretical knowledge for HESLO 1:

(A) content of the operations manual (OM) including the relevant SOP;

(B) AFM (limitations, performance, mass and balance, abnormal and emergency procedures, etc.);

(C) procedures (e.g. short line, long line, construction, wire stringing or cable laying flying techniques, as required for the operation);

(D) load and site preparation including load rigging techniques and external load procedures;

(E) special equipment used in the operation;

(F) training in human factor principles; and

(G) hazards and dangers.

(ii) Theoretical knowledge for other HESLO levels should include the elements listed in point (i) above where additional knowledge to that of HESLO 1 is needed for the adequate HESLO level.

(iii) Practical training defined in the operator’s training programme:

(A) Flight instruction provided by a HESLO instructor; and

(B) Flight under the supervision of a HESLO instructor. The supervision should take place during HESLO missions, from inside the helicopter and on-site.

For the purpose of this AMC, a HESLO mission is defined as a flight or series of flights from point A to point B on a particular day and for commercial specialised operations, for a particular client.

(3) Pilot experience

(i) Prior to commencing training:

(A) 10 hours flight experience on the helicopter type; .

(B) For HESLO 2: At least 100 HESLO cycles;

(C) For HESLO 3: At least 500 HESLO cycles; and

(D) For HESLO 4: At least 1 000 flight hours on helicopters and 2 000 HESLO cycles, including experience as unsupervised PIC in HESLO 2 or HESLO 3.

(ii) Before acting as PIC under the supervision of a HESLO instructor:

(A) For HESLO 1: At least 5 hours and 50 HESLO cycles flight instruction;

(B) For HESLO 2: In addition to HESLO 1 training, at least 2 hours and 20 HESLO cycles flight instruction with a long line of more than 20 metres.

(C) For HESLO 3 and 4: A number of HESLO cycles flight instruction, as relevant to the activity to be performed and the required skills.

(iii) Before acting as unsupervised PIC:

(A) For HELSO 1, 300 hours helicopter flight experience as PIC; and

(B) For HESLO 1: At least 8 hours, 80 HESLO cycles and 5 HESLO missions;

(C) For HESLO 2: At least 5 hours, 50 HESLO cycles and 5 HESLO missions with long line of more than 20 metres;

(D) For HESLO 3 and 4: A number of HESLO missions under the supervision of a HESLO instructor, as relevant to the activity to be performed and the required skills;

(E) For HESLO 3 and 4, hours on the helicopter type, performing HESLO 1 and 2 operations.

(F) At least 20 hours gained in an operational environment similar to the environment of intended operation (desert, sea, jungle, mountains, etc.).

(4) Pilot proficiency: Before acting as unsupervised PIC, pilot proficiency has been assessed as sufficient for the intended operations and environment under the relevant HESLO type, by a HESLO instructor nominated by the operator.

(5) Pilot recurrent training and checking at least every two years:

(i) review of the load rigging techniques;

(ii) external load procedures;

(iii) review of the applicable flying techniques; and

(iv) review of human factor principles.

(v) A pilot who has performed 20 hours of relevant HESLO within the past 12 months may not need any further flight training other than in accordance with Part-ORO and Part-FCL.

(e) Task specialists

Before acting as task specialist, he/she should demonstrate to the operator that he/she has been trained appropriately and has the required skill and knowledge.

(1) Initial training

(i) The initial training of task specialists should include at least:

(A) behaviour in a rotor turning environment and training in ground safety and emergency procedures;

(B) procedures including load rigging, usage and conservation (replacement) of LLD;

(C) helicopter marshalling signals;

(D) radio communication;

(E) selection and preparation of pick-up and drop-off sites, dangers on working places (downwash, loose goods, third people);

(F) handling and safety of the third party;

(G) relevant training for the helicopter type;

(H) duties and responsibilities as described in the appropriate manual;

(I) perception and classification of flight obstacles (none, critical, danger), measures for safety; and

(J) human factor principles; and

(K) for task specialists seated in the cockpit and whose tasks are to assist the pilot, the relevant CRM training elements as specified in ORO.FC.115.

(ii) The individual safety equipment appropriate to the operational environment and complexity of the activity should be described in the appropriate manual.

(6) Recurrent training

(i) The annual recurrent training should include the items listed in the initial training as described in (e)(1) above.

(ii) The operator should establish a formal qualification list for each task specialist.

(iii) The operator should establish a system of record keeping that allows adequate storage and reliable traceability of:

(A) the initial and recurrent training;

(B) Qualifications (qualification list).

(7) Briefing of task specialists

Briefings on the organisation and coordination between the flight crew and task specialists involved in the operation should take place prior to each operation. These briefings should include at least the following:

(i) location and size of pick-up and drop-off site, operating altitude;

(ii) location of refuelling site and procedures to be applied; and

(iii) load sequence, danger areas, performance and limitations, emergency procedures.

(iv) for a task specialist who has not received the relevant elements of CRM training as specified in ORO.FC.115, the operator's crew coordination concept including relevant elements of CRM.

(8) Responsibility of task specialists operating on the ground:

(i) Task specialists operating on the ground are responsible for the safe organisation of the ground operation, including:

(A) adequate selection and preparation of the pick-up and drop-off points and load rigging;

(B) appropriate communication and assistance to the flight crew and other task specialists; and

(C) access restriction on the pick-up and drop-off site.

(ii) If more than one task specialist is required for a task, one should be nominated as leading the activities. He/she should act as the main link between the flight crew and other task specialist(s) involved in the operation and is responsible for:

(A) task specialist coordination and activities on the ground; and

(B) the safety of the working area (loading and fuelling).

(f) HESLO instructor

The HESLO instructor should be assigned by the operator on the basis of the following:

(1) the HESLO instructor for pilots should:

(i) be suitably qualified as determined by the operator and have a minimum experience of 500 hours HESLO:

(ii) have at least 10 hours HESLO experience as unsupervised PIC in the appropriate HESLO level on which instruction, supervision and proficiency assessments are to be provided; and

(iii) have attended the 'teaching and learning' part of the flight instructor or type rating instructor training, or have prior experience as an aerial work instructor subject to national rules

(2) the HESLO instructor for task specialists should be suitably qualified as determined by the operator and have at least 2 years of experience in HESLO operations.

(g) Performance

(1) Power margins for HESLO operations:

(i) HESLO 1 and 2

The mass of the helicopter should not exceed the maximum mass specified in accordance with SPO.POL.146(c)(1) at the pick-up or drop- off site, whichever is higher, as stated in the appropriate manual.

(ii) HESLO 3 and 4

The mass of the helicopter should not exceed the maximum mass specified in accordance with SPO.POL.146(c)(1) at the pick-up or drop- off site, whichever is higher, as stated in the appropriate manual, and in the case of construction (montage) operations, reduced by 10% of the mass of the sling load capacity.

(h) Normal procedures

(1) Operating procedures:

HESLO should be performed in accordance with the appropriate manual and appropriate operating procedures. These procedures should include, for each type of operation:

(i) crew individual safety equipment (e.g. helmet, fire retardant suits);

(ii) crew responsibilities;

(iii) crew coordination and communication;

(iv) selection and size of pick-up and drop-off sites;

(v) selection of flight routes;

(vi) fuel management in the air and on the ground;

(vii) task management; and

(viii) third party risk management.

(2) Ground procedures:

The operator should specify appropriate procedures, including:

(i) use of ground equipment;

(ii) load rigging;

(iii) size and weight assessment of loads;

(iv) attachment of suitably prepared loads to the helicopter;

(v) two-way radio communication procedures;

(vi) selection of suitable pick-up and drop-off sites;

(vii) safety instructions for task specialists operating on the ground;

(viii) helicopter performances information;

(ix) fuel management on the ground;

(x) responsibility, organisation and task management of other personnel on the ground involved in the operation;

(xi) third party risk management; and

(xii) environmental protection.

(i) Emergency procedures

(1) Operating procedures for the flight crew:

In addition to the emergency procedures published in the AFM or OM, the operator should ensure that the flight crew:

(i) is familiar with the appropriate emergency procedures;

(ii) has appropriate knowledge of the emergency procedures for personnel on the ground involved in the operation; and

(iii) reports emergencies as specified in the AFM or OM.

(2) Ground procedures:

The operator should ensure that the task specialist on the ground involved in the operation:

(i) is familiar with the appropriate emergency procedures;

(ii) has appropriate knowledge of the flight crew emergency procedures;

(iii) reports emergencies as specified in the AFM or OM; and

(iv) prevents, as far as possible, environmental pollution.

(j) Ground equipment

The operator should specify the use of ground equipment, such as fuel trucks, cables, strops etc. in the AFM or OM, including at least:

(1) minimum size of the operating site;

(2) surface condition;

(3) positioning of ground equipment on the operating site;

(4) fuel handling;

(5) environment protection plan; and

(6) location and use of fire suppression equipment.

GM1 SPO.SPEC.HESLO.100 Standard operating procedures

PILOT INITIAL TRAINING

The table below summarises minimum training standards.

Table 1: Training minimum standards

HESLO 1	CPL(H) or ATPL(H) PPL(H) only for non-commercial operations Minimum 10 hours on type Type rating completed HESLO ground instruction completed Task specialist syllabus reviewed HESLO 1 flight instruction completed: Minimum 5 hours/50 HESLO cycles HESLO 1 flights under supervision completed Minimum experience 8 hours/80 HESLO cycles/5 HESLO missions Minimum 300 hours PIC(H) HESLO 1 proficiency
HESLO 2	CPL(H) or ATPL(H) PPL(H) only for non-commercial operations HESLO level 1 completed Type rating completed Minimum 10 hours PIC on type HESLO 2 ground instruction completed Task specialist syllabus reviewed Minimum 100 HESLO cycles HESLO 2 flight instruction completed: Minimum 2 hours/20 HESLO cycles with long line HESLO 2 flights under supervision completed Minimum experience 5 hours/50 HESLO 2 cycles/5 HESLO 2 missions HESLO 2 proficiency
HESLO 3	CPL(H) or ATPL(H)

	PPL(H) only for non-commercial operations HESLO level 1 completed to 20m Min. 500 HESLO cycles Type rating completed Minimum 10 hours PIC on type HESLO 3 ground instruction completed Task specialist syllabus reviewed Practical Task specialist training for logging HESLO 3 flight instruction completed HESLO 3 flights under supervision completed HESLO 3 proficiency
HESLO 4	CPL(H) or ATPL(H) PPL(H) only for non-commercial operations Minimum 1 000 hours (H) HESLO level 2 or 3 completed Minimum 2 000 HESLO cycles Type rating completed Minimum 10 hours PIC on type HESLO 4 ground instruction completed Practical load preparation training HESLO 4 flight instruction completed HESLO 4 flights under supervision completed HESLO 4 proficiency

HESLO ground instruction, HESLO flight training, HESLO flights under supervision and HESLO proficiency assessments may be combined with the operator's conversion course.

Section 2 - Human external cargo operations (HEC)

AMC1 SPO.SPEC.HEC.100 Standard operating procedures

STANDARD OPERATING PROCEDURES

(a) Before conducting any HEC operations, the operator should develop its SOPs taking into account the elements below.

(b) Nature and complexity of the activity

(1) Nature of the activity and exposure:

HEC operations are usually performed at a low height.

(2) Complexity of the activity:

(vii) The complexity of the activity varies with the length of the rope and characteristics of the pick-up and drop-off zones, etc.

Table 1: HEC levels

HEC 1:	Sling or cable length is less or equal to 25 m
HEC 2:	Sling or cable length is greater than 25m

(3) Operational environment and geographical area:

HEC may be performed over any geographical area. Special attention should be given to:

(i) hostile congested and non-congested environment;

(ii) mountains;

(iii) sea;

(iv) jungle;

(v) desert;

(vi) arctic;

(vii) lakes and river canyons; and

(viii) environmentally sensitive areas (e.g. national parks, noise sensitive areas).

(c) Equipment

(1) The helicopter may be equipped with and/or video camera(s);

(i) additional mirror(s);

(ii) a bubble window;

(iii) supplementary hook(s) or multi-hook device(s); and

(iv) load data recorder (lifts, weights, torques, power, forces, shocks and electrical activities).

(2) When conducting single-pilot vertical reference operations with no assistance of a task specialist or other crew member, additional engine monitoring in the pilot line of vision or an audio warning system is recommended.

(3) Adequate radio communication equipment (e.g. VHF, UHF, FM) should be installed in the helicopter for co-ordination with the task specialist involved in the operation.

(4) Task specialists involved in the operation should be equipped with hand-held communication equipment, protective helmets with integrated earphones and microphones as well as personal protective equipment.

(d) Crew members

(1) Crew composition:

(i) The minimum flight crew is stated in the approved AFM. For operational or training purposes, an additional qualified crew member may assist the PIC in a single-pilot operation. In such a case:

(A) procedures are in place for a member of the flight crew to monitor the flight, especially during the departure, approach and HEC operations, to ensure that a safe flight path is maintained; and

(B) when a task specialist is tasked with assisting the pilot, the procedures according to which this assistance is taking place should be clearly defined.

(ii) For safety and/or operational purposes, a task specialist may be required by the operator to fulfil the task (e.g. to establish vertical reference or to operate the release safety device for the belly rope).

(2) Pilot initial training:

Before acting as PIC, the pilot should demonstrate to the operator that he/she has the required skills and knowledge, as follows:

(i) Theoretical knowledge:

(A) load rigging techniques;

(B) external load procedures;

(C) site organisation and safety measures;

(D) short line, long line, construction, wire stringing or cable laying flying techniques, as required for the operation.

(ii) Pilot experience prior to commencing the training:

(A) 10 hours flight experience on the helicopter type;

(B) type rating completed;

(C) HESLO type 1 or 2 completed;

(D) relevant experience in the field of operation;

(E) training in human factor principles; and

(F) ground instruction completed (marshaller syllabus).

(iii) Pilot experience prior to commencing unsupervised HEC flights:

(A) HEC flight instruction completed.

(B) 1 000 hours helicopter flight experience as PIC.

(C) for mountain operations, 500 hours of flight experience as PIC in mountain operations.

(D) for HEC 2, HESLO type 2 completed.

(3) Pilot proficiency prior to commencing unsupervised HEC flights:

Pilot proficiency has been assessed as sufficient for the intended operations and environment under the relevant HEC level, by a HEC instructor nominated by the operator.

(4) Pilot recurrent training and checking at least every two years:

(i) review of the sling technique;

(ii) external load procedures;

(iii) training in human factor principles; and

(iv) review of the applicable flying techniques, which should take place during a training flight if the pilot has not performed HEC or HHO operations within the past 24 months.

(5) Conditions of HEC instruction:

(i) Maximum sling length according to the level applicable:

(A) 1 task specialist (with radio) at pickup point;

(B) 1 task specialist (with radio) at drop off point/on the line;

(C) helicopter fitted with cargo mirror/bubble window;

(D) flight instruction DC/: Cycles DC/minimum 10 cycles which of 5 Human Cargo Sling; and

(E) flight instruction solo with onsite supervision/Cycles solo/minimum 10 cycles.

(ii) HEC instructor:

The HEC instructor should be assigned by the operator on the basis of the following:

(A) the HEC instructor for pilots should:

- have a minimum experience of 100 cycles in HEC operations at HEC levels equal to or greater than that on which instruction, supervision and proficiency assessments are to be provided; and

- have attended the 'teaching and learning' part of the flight instructor or type rating instructor training, or have prior experience as an aerial work instructor subject to national rules

(B) the HEC instructor for task specialists should be suitably qualified as determined by the operator and have at least 2 years of experience in HEC operations as a task specialist.

(e) Task specialists

Before acting as task specialists, they should demonstrate to the operator that they have been appropriately trained and have the required skills and knowledge including training on human factor principles.

(1) Task specialists should receive training relevant to their tasks including:

(i) fitting and removal of system; and

(ii) normal procedure.

For task specialists in charge of assisting the pilot, the relevant CRM training elements as specified in AMC1.ORO.FC.115.

(2) Briefings

Briefings on the organisation and coordination between flight crew and task specialist involved in the operation should take place prior to each operation. These briefings should include at least the following:

(i) location and size of pick-up and drop-off site, operating altitude;

(ii) location of refuelling site and procedures to be applied;

(iii) load sequence, danger areas, performance and limitations, emergency procedures; and

(iv) for task specialists who have not received the relevant elements of CRM training as specified in AMC1.ORO.FC.115, the operator's crew coordination concept including relevant elements of crew resource management.

(3) Recurrent training

(i) The annual recurrent training should include the items listed in the initial training as described in (e)(1) above.

(ii) The operator should establish a formal qualification list for each task specialist.

(iii) The operator should establish a system of record keeping that allows adequate storage and reliable traceability of:

(A) the initial and recurrent training;

(B) qualifications (qualification list).

(f) Performance

HEC should be performed with the following power margins: the mass of the helicopter should not exceed the maximum mass specified in accordance with SPO.POL.146 (c)(1).

(g) Normal procedures

(1) Operating procedures:

HEC should be performed in accordance with the AFM. Operating procedures should include, for each type of operation:

(i) Crew individual safety equipment (e.g. helmet, fire retardant suits);

(ii) crew responsibilities;

(iii) crew coordination and communication;

(iv) selection and size of pick-up and drop-off sites;

(v) selection of flight routes;

(vi) fuel management in the air and on the ground;

(vii) task management; and

(viii) third party risk management.

(2) Ground procedures:

The operator should specify appropriate procedures, including:

(i) use of ground equipment;

(ii) load rigging;

(iii) size and weight assessment of loads;

(iv) attachment of suitably prepared loads to the helicopter;

(v) two-way radio communication procedures;

(vi) selection of suitable pick-up and drop-off sites;

(vii) safety instructions for ground task specialists or other persons required for the safe conduct of the operation;

(viii) helicopter performances information;

(ix) fuel management on the ground;

(x) responsibility and organisation of the personnel on the ground involved in the operation;

(xi) task management of personnel on the ground involved in the operation;

(xii) third party risk management; and

(xiii) environmental protection.

(h) Emergency procedures

(1) Operating procedures:

In addition to the emergency procedures published in the AFM or OM, the operator should ensure that the flight crew:

(i) is familiar with the appropriate emergency procedures;

(ii) has appropriate knowledge of the emergency procedures for personnel on the ground involved in the operation; and

(iii) reports emergencies as specified in the AFM or OM.

(2) Ground procedures:

The operator should ensure that the task specialist on the ground involved in the operation:

(i) is familiar with the appropriate emergency procedures;

(ii) has appropriate knowledge of the emergency procedures for personnel on the ground involved in the operation;

(iii) reports emergencies as specified in the AFM or OM; and

(iv) prevents, as far as possible, environmental pollution.

AMC1 SPO.SPEC.HEC.105(b) Specific HEC equipment

AIRWORTHINESS APPROVAL FOR HEC EQUIPMENT

(a) Hoist or cargo hook installations that have been certificated according to any of the following standards should be considered to satisfy the airworthiness criteria for HEC operations:

(1) CS 27.865 or CS 29.865;

(2) JAR 27 Amendment 2 (27.865) or JAR 29 Amendment 2 (29.865) or later;

(3) FAR 27 Amendment 36 (27.865) or later — including compliance with CS 27.865(c)(6); or

(4) FAR 29 Amendment 43 (29.865) or later.

(b) Hoist or cargo hook installations that have been certified prior to the issuance of the airworthiness criteria for HEC as defined in (a) may be considered as eligible for HEC provided that following a risk assessment either:

(1) the service history of the hoist or cargo hook installation is found satisfactory to the Brunei DCA; or

(2) for hoist or cargo hook installations with an unsatisfactory service history, additional substantiation to allow acceptance by the Brunei DCA should be provided by the hoist or cargo hook installation certificate holder (type certificate (TC) or supplemental type certificate (STC)) on the basis of the following requirements:

(i) The hoist or cargo hook installation should withstand a force equal to a limit static load factor of 3.5, or some lower load factor, not less than 2.5, demonstrated to be the maximum load factor expected during hoist operations, multiplied by the maximum authorised external load.

(ii) The reliability of the primary and back up quick release systems at helicopter level should be established and failure mode and effect analysis at equipment level should be available. The assessment of the design of the primary and back up quick release systems should consider any failure that could be induced by a failure mode of any other electrical or mechanical rotorcraft system.

(iii) The appropriate manual should contain one-engine-inoperative (OEI) hover performance data or single engine failures procedures for the weights, altitudes, and temperatures throughout the flight envelope for which hoist or cargo hook operations are accepted.

(iv) Information concerning the inspection intervals and retirement life of the hoist or cargo hook cable should be provided in the instructions for continued airworthiness.

Section 3 - Parachute operations (PAR)

Section 4 - Aerobatic flights (ABF)

Section 4 - Maintenance check flights (MCFs)

GM1 SPO.SPEC.MCF.105 Flight programme

DOCUMENTATION WHEN DEVELOPING A FLIGHT PROGRAMME

When developing a flight programme, the operator should consider the applicable documentation available from the type certificate holder or other valid documentation such as the Flight Safety Foundation Functional Check Flight Compendium.

AMC1 SPO.SPEC.MCF.110 Maintenance check flight manual

CONTENTS OF THE MAINTENANCE CHECK FLIGHT MANUAL

The items to be covered in the manual for a 'Level A' maintenance check flight (MCF) with complex motor-powered aircraft should be as follows:

(a) General considerations:

  (1) conditions requiring a MCF (e.g. heavy maintenance);

  (2) appropriate maintenance release before the MCF;

  (3) flight authorisation by the operator;

  (4) process to develop a flight programme and procedures;

  (5) relevant procedures to document MCFs in the aircraft records; and

  (6) policy for the determination of a 'Level A' or 'Level B' MCF.

(b) Aircraft status:

  (1) requirements for the status of the aircraft prior to departure (e.g. MEL, CDL and multiple defects) for the purpose of conducting an MCF;

  (2) fuel loading, if applicable;

  (3) mass and balance, if applicable; and

  (4) specific test and safety equipment.

(c) Crew selection and other persons on board:

  (1) qualifications;

  (2) experience and recency;

  (3) training; and

  (4) persons on board.

(d) Briefings:

  (1) briefing participants;

  (2) specific pre-flight briefing topics:

    (i) aircraft status,

    (ii) summary of maintenance,

    (iii) flight programme, specific procedures and limitations,

    (iv) crew members' responsibilities and coordination, and

    (v) documents on board;

  (3) information to ATC; and

  (4) post-flight briefing.

(e) Contents of the flight programme and procedures: the flight programme should be thoroughly developed by the operator using applicable current data. It should contain the checks to be performed in-flight and may include 'read and do' checklists where practicable. The following items should be included in the overall procedure:

(1) in-flight briefings;

(2) limits (not to be exceeded);

(3) specific entry conditions;

(4) task-sharing and call-outs;

(5) potential risks and contingency plans;

(6) information to additional crew; and

(7) adequate available airspace and coordination with ATC.

(f) External conditions:

(1) weather and light conditions;

(2) terrain;

(3) ATC, airspace; and

(4) airport (runway, equipment)/operating site.

(g) Documentation:

(1) specific documentation on board;

(2) in-flight recordings;

(3) results of the MCF and related data; and

(4) accurate recording of the required maintenance actions after the flight.

GM1 SPO.SPEC.MCF.115 and SPO.SPEC.MCF.120 Flight crew requirements for a "Level A" maintenance check flight & Flight crew training course for Level A maintenance check flights

DEFINITION OF AIRCRAFT CATEGORY

In respect of the term 'aircraft category' used in the context of point (a) of SPO.SPEC.MCF.115 and point (c) of SPO.SPEC.MCF.120, it should be understood as 'category of aircraft' as defined in BAR 1.

AMC1 SPO.SPEC.MCF.120 Flight crew training course

COURSE CONSIDERATIONS

(a) The training course stipulated in point (a) of SPO.SPEC.MCF.120 should comprise ground training followed by a demonstration in a simulator or aircraft of the techniques for the checks in flight and failure conditions. In a demonstration performed in an aircraft, the trainer should not simulate a failure condition that could induce a safety risk.

(b) The ground training should cover the specified training syllabus (see AMC2 SPO.SPEC.MCF.120).

(c) The flight demonstration should include the techniques for the most significant checks covered in the ground training. As part of this demonstration, the pilots under training should be given the opportunity to conduct checks themselves under supervision.

(d) The ground training and flight demonstration should be provided by experienced flight crew with test or MCF experience. Flight demonstrations should be instructed by any of the following persons:

(1) a type rating instructor currently authorised by the operator to conduct MCFs; or

(2) a pilot assigned by an aircraft manufacturer and experienced in conducting pre-delivery check flights; or

(3) a pilot holding a flight test rating.

(e) Upon successful completion of the training, a record should be kept and a training certificate issued to the trainee.

AMC2 SPO.SPEC.MCF.120 Flight crew training course

COURSE SYLLABUS

In the case of aeroplanes and helicopters, the training course syllabus should include the following subjects:

(a) Legal aspects: regulations concerning MCFs.

(b) Organisation of MCFs: crew composition, persons on board, definition of tasks and responsibilities, briefing requirements for all participants, decision-making, ATC, development of a flight programme.

(c) Environmental conditions: weather and light requirements for all flight phases.

(d) Flight preparation: aircraft status, weight and balance, flight profile, airfield limitations, list of checks.

(e) Equipment and instrumentation: on-board access to various parameters.

(f) Organisation on board: CRM, crew coordination and response to emergency situations.

(g) Ground checks and engine runs: review of checks and associated techniques.

(h) Taxi and rejected take-off: specifications and techniques.

(i) Techniques for checks of various systems:

   (1) **aeroplanes:** flight controls, high-speed and low-speed checks, autopilot and autothrottle, depressurisation, hydraulic, electricity, air conditioning, APU, fuel, anti-icing, navigation, landing gear, engine parameters and relight, air data systems.

   (2) **helicopters:** flight controls, engine power topping, track and balance, high-wind start, autopilot, performance measurement, hydraulic, electricity, air conditioning, APU, fuel, anti-icing, navigation, landing gear, engine checks and relight, autorotation, air data systems.

(j) Review of failure cases specific to these checks.

(k) Post-flight analysis

GM1 SPO.SPEC.MCF.125 Crew composition and persons on board

TASK SPECIALIST’S ASSIGNED DUTIES, EQUIPMENT AND TRAINING

(a) The operator should ensure that the task specialist is trained and briefed as necessary to assist the flight crew, including performing functions such as but not limited to:

   (1) assistance on ground for flight preparation;

   (2) reading of a MCF checklist; and

   (3) monitoring and recording of relevant aircraft or systems’ parameters.

(b) If a task specialist’s assigned duties are not directly related to the flight operation but to the MCF (e.g. reporting from the cabin on a certain vibration or noise), the required training and briefing should be adequate to this function.

(c) The task specialist should be trained as necessary in crew coordination procedures and emergency procedures and be appropriately equipped.

(d) Only personnel (crew and task specialists) essential for the completion of the flight should be on board.