NOTICE OF PROPOSED AMENDMENT (NPA) NO 2009-02B

DRAFT OPINIONS OF THE EUROPEAN AVIATION SAFETY AGENCY,

FOR A COMMISSION REGULATION establishing the implementing rules for air operations of Community operators

and

DRAFT DECISIONS OF THE EXECUTIVE DIRECTOR OF THE EUROPEAN AVIATION SAFETY AGENCY on

acceptable means of compliance, certification specifications and guidance material related to the implementing rules for air operations of Community operators

"Implementing Rules for Air Operations of Community Operators"

B. Draft Opinion and Decision Part-OPS

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NOTE: This NPA contains the draft Opinion on the Implementing Rules for Air Operations of Community Operators, the Subparts related to Air Operations of the draft Opinion on the Implementing Rules for Organisation Requirements, the Subparts related to Air Operations of the draft Opinion on the Implementing Rules for Authority Requirements and the related draft Decisions (AMC, CS and GM). The NPA is split into seven separate NPAs (2009-02**A**, 2009-02**B**, 2009-02**C**, 2009-02**D**, 2009-02**E**, 2009-02**F** AND 2009-02**G**) as indicated in the Table of Reference below. The documents are published in the Comment-Response Tool (CRT) available at http://hub.easa.europa.eu/crt/.

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I. Draft Opinion Part – Air Operations (Part-OPS)

Subpart A - General operating and flight rules
Section I - General Requirements

OPS.GEN.001 Competent authority

For the purpose of this subpart, the competent authority shall be:

(a) for the oversight of non-commercial operations of non-complex motor-powered aircraft, the authority designated by the Member State where the aircraft is registered; and

(b) for the oversight of commercial operations and non-commercial operations of complex motor-powered aircraft, the authority designated by the Member State where the operator has its principle place of business.

OPS.GEN.005 Scope

This subpart establishes the requirements to be met by an operator to ensure that air operations are conducted in compliance with Article 8 in conjunction with Annex IV to Regulation (EC) No 216/2008 (Essential requirements for air operations).

OPS.GEN.010 Definitions

(a) For the purpose of this subpart, the following definitions shall apply:

(1) '3% En-Route Alternate (ERA) aerodrome' means an ERA aerodrome selected for the purpose of reducing contingency fuel to 3%.

(2) 'Acceptance Check List' means a document used to assist in carrying out a check on the external appearance of packages of dangerous goods and their associated documents to determine that all appropriate requirements have been met.

(3) 'Adequate aerodrome' means an aerodrome on which the aircraft can be operated, taking account of the applicable performance requirements and runway characteristics.

(4) 'Adult' means a person of an age of 12 years and over.

(5) 'Aerodrome' means any area on land, water or man made structure or vessel, especially adapted for the landing, taking-off and manoeuvring of aircraft;

(6) 'Aeroplane' means an engine-driven fixed-wing aircraft heavier than air that is supported in flight by the dynamic reaction of the air against its wings;

(7) 'Aircraft' means a machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface;

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

(9) 'Category A with respect to helicopters' means multi-engine helicopters designed with engine and system isolation features specified in CS-27/29 or equivalent and Helicopter Flight Manual performance information based on a critical engine failure concept which assures adequate designated surface area and adequate performance capability for continued safe flight in the event of an engine failure.

(10) 'Category B with respect to helicopters' means single-engine or multiengine helicopters which do not fully meet all Category A standards. Category B helicopters have no guaranteed stay-up ability in the event of engine failure and unscheduled landing is assumed.

(11) ‘Cloud base’ means the height of the base of the lowest observed or forecast cloud element in the vicinity of an aerodrome or operating site or within a specified area of operations, normally measured above aerodrome elevation or, in the case of offshore operations, above mean sea level.

(12) ‘Congested area’ means in relation to a city, town or settlement, any area which is substantially used for residential, commercial or recreational purposes.

(13) ‘Contaminated runway’ means a runway of which more than 25% of the runway surface area (whether in isolated areas or not) within the required length and width being used is covered by the following:

(i) Surface water more than 3 mm (0.125 in) deep, or by slush, or loose snow, equivalent to more than 3 mm (0.125 in) of water;

(ii) Snow which has been compressed into a solid mass which resists further compression and will hold together or break into lumps if picked up (compacted snow); or

(iii) Ice, including wet ice.

(14) ‘Controlled flight’ means any flight which is subject to an air traffic control clearance.

(15) ‘Critical phases of flight’ means the take-off run, the take-off flight path, the final approach, the landing including the landing roll, the go-around and any other phases of flight as determined by the pilot-in-command. For helicopters, ‘critical phases of flight’ includes in addition taxiing.

(16) ‘D’ means the largest dimension of the helicopter when the rotors are turning.

(17) ‘Dangerous goods’ means articles or substances which are capable of posing a risk to health, safety, property or the environment and which are shown in the list of dangerous goods in the Technical Instructions or which are classified according to those Instructions.

(18) ‘Dangerous Goods Transport Document’ means a document which is specified by the Technical Instructions. It is completed by the person who offers dangerous goods for air transport and contains information about those dangerous goods.

(19) ‘Defined point after take-off (DPATO)’ means the point, within the take-off and initial climb phase, before which the helicopter’s ability to continue the flight safely, with the critical power unit inoperative, is not assured and a forced landing may be required.

(20) ‘De-icing’ means the procedure by which frost, ice, snow or slush is removed from an aircraft in order to provide uncontaminated surfaces.

(21) ‘Disruptive passenger’ means a passenger who fails to respect the rules of conduct on board an aircraft or to comply with the instructions of crew members.

(22) ‘DR’ means the horizontal distance that the helicopter has travelled from the end of the take-off distance available.

(23) ‘Dry operating mass’ means the total mass of the aircraft ready for a specific type of operation, excluding usable fuel and traffic load. The dry operating mass includes:

(i) crew and crew baggage;

(ii) catering and removable passenger service equipment; and

(iii) tank water and lavatory chemicals.

(24) ‘Dry runway’ means a runway which is neither wet nor contaminated, and includes those paved runways which have been specially prepared with grooves

or porous pavement and maintained to retain 'effectively dry' braking action even when moisture is present.

(25) 'Elevated FATO' means a FATO which is at least 3 metres above the surrounding surface.

(26) 'Enhanced Vision System (EVS)' shall mean an electronic means of displaying a real-time image of the external scene through the use of imaging sensors;

(27) 'En-Route Alternate (ERA) Aerodrome' means an adequate aerodrome along the route, which may be required at the planning stage.

(28) 'Final Approach and Take-Off Area (FATO)' means a defined area for helicopter operations, over which the final phase of the approach manoeuvre to hover or land is completed, and from which the take-off manoeuvre is commenced. In the case of helicopters operating in performance Class 1, the defined area includes the rejected take-off area available.

(29) 'Ground emergency service personnel' shall mean any ground emergency service personnel (such as policemen, firemen, etc.) involved with Helicopter Emergency Medical Service (HEMS) and whose tasks are to any extent pertinent to helicopter operations;

(30) 'Helicopter Emergency Medical Service (HEMS) flight' shall mean a flight by a helicopter operating under a HEMS approval, the purpose of which is to facilitate emergency medical assistance, where immediate and rapid transportation is essential, by carrying:

(i) medical personnel; or

(ii) medical supplies (equipment, blood, organs, drugs); or

(iii) ill or injured persons and other persons directly involved.

(31) 'Helicopter Hoist Operations (HHO) Flight' shall mean a flight by a helicopter operating under an HHO approval, the purpose of which is to facilitate the transfer of persons and/or cargo by means of a helicopter hoist;

(32) 'Helideck' means a FATO located on a floating or fixed offshore structure.

(33) 'HEMS dispatch centre' shall mean a place where, if established, the coordination or control of the HEMS flight takes place. It may be located in a HEMS operating base;

(34) 'HEMS operating base' shall mean an aerodrome at which the HEMS crew members and the HEMS helicopter may be on stand-by for HEMS operations;

(35) 'HEMS operating site' shall mean a site selected by the pilot-in-command during a HEMS flight for Helicopter Hoist Operations, landing and take off;

(36) 'HHO Offshore' shall mean a flight by a helicopter operating under a HHO approval, the purpose of which is to facilitate the transfer of persons and/or cargo by means of a helicopter hoist from or to a vessel or structure in a sea area or to the sea itself;

(37) 'HHO Passenger' shall mean a person who is to be transferred by means of a helicopter hoist;

(38) 'HHO Site' shall mean a specified area at which a helicopter performs a hoist transfer;

(39) 'Hold-over Time (HoT)' means the estimated period of time for which an anti-icing fluid is expected to prevent the formation of frost or ice and the accumulation of snow on the treated surfaces of an aircraft on the ground in the prevailing ambient conditions.

(40) 'Hoist Cycle' shall mean one down-and-up cycle of the hoist hook for the purpose of the setting of crew qualifications;

(41) Hostile environment:

(i) An environment in which:

(A) A safe forced landing cannot be accomplished because the surface is inadequate; or

(B) The helicopter occupants cannot be adequately protected from the elements; or

(C) Search and rescue response/capability is not provided consistent with anticipated exposure; or

(D) There is an unacceptable risk of endangering persons or property on the ground.

(ii) In any case, the following areas shall be considered hostile:

(A) For overwater operations, the open sea areas North of 45N and South of 45S designated by the Authority of the State concerned; and

(B) those parts of a congested area without adequate safe forced landing areas.

(42) 'Infant' means a person under the age of 24 months.

(43) 'Landing distance available (LDA)' means the length of the runway which is declared available by the competent authority of the aerodrome and suitable for the ground run of an aeroplane landing.

(44) 'Landplane' means a fixed wing aircraft which is designed for taking off and landing on land and includes amphibians operated as landplanes.

(45) 'Local operations' means flights operations conducted within a local and defined geographical area which:

(i) start and end on the same day;

(ii) are conducted by day under VFR; and

(iii) are navigated over routes by reference to visual landmarks.

(46) 'Low Visibility Procedures (LVP)' shall mean procedures applied at an aerodrome for the purpose of ensuring safe operations during low visibility conditions, for which a specific approval is required;

(47) 'Low Visibility Take-Off (LVTO)' shall mean a take-off where the Runway Visual Range (RVR) is less than 400 m;

(48) 'Maximum passenger seating configuration' means the maximum passenger seating capacity of an individual aircraft established for operational purposes, excluding crew seats. This may be lower than the maximum certificated passenger seating configuration of the aircraft.

(49) 'Night' means the period between 30 minutes after sunset until 30 minutes before sunrise, determined at surface level.

(50) 'Night Vision Goggles (NVG)' shall mean a head-mounted, binocular, light intensification appliance that enhances the ability to maintain visual surface references at night;

(51) 'Night Vision Imaging System (NVIS)' shall mean the integration of all elements required to successfully and safely use NVGs while operating a helicopter. The system includes as a minimum: NVGs, NVIS lighting, helicopter components

(such as radio altimeter, visual warning system and audio warning system), training and continuing airworthiness;

(52) 'Non-hostile environment' means an environment in which:

(i) A safe forced landing can be accomplished;

(ii) The helicopter occupants can be protected from the elements;

(iii) Search and rescue response/capability is provided consistent with the anticipated exposure; and

(iv) those parts of a congested area with adequate safe forced landing areas shall be considered non-hostile.

(53) 'NVIS Flight' shall mean a flight under night VMC with the flight crew using NVGs in a helicopter operating under an NVIS approval;

(54) 'Offshore operations' means operations which routinely have a substantial proportion of the flight conducted over sea areas to or from offshore locations. Such operations include, but are not limited to, support of offshore oil, gas and mineral exploitation and sea-pilot transfer.

(55) 'Operating site' means a site selected by the operator or pilot-in-command for landing, take-off and/or hoist operations.

(56) 'Performance Class 1' means that, in the event of failure of the critical power unit, the helicopter is able to land within the rejected take-off distance available or safely continue the flight to an appropriate landing area, depending on when the failure occurs.

(57) 'Performance Class 2' means that, in the event of failure of the critical power unit, performance is available to enable the helicopter to safely continue the flight, except when the failure occurs early during the take-off manoeuvre or late in the landing manoeuvre, in which cases a forced landing may be required.

(58) 'Performance Class 3' means that, in the event of a power unit failure at any time during the flight, a forced landing may be required in a multi-engined helicopter and will be required in a single-engined helicopter.

(59) 'Powered sailplane' means an aircraft, equipped with one or more engines having, with engine(s) inoperative, the characteristics of a sailplane.

(60) 'Principal place of business' means the head office or registered office of a Community operator in the Member State within which the principal financial functions and operational control, including continued airworthiness management, of the Community operator are exercised.

(61) 'Public Interest Site' means a site, used exclusively for operations in the public interest;

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

(63) 'Safe forced landing' means an unavoidable landing or ditching with a reasonable expectancy of no injuries to persons in the aircraft or on the surface.

(64) 'Seaplane' means a fixed wing aircraft which is designed for taking off and landing on water and includes amphibians operated as seaplanes.

(65) 'Series of flights' means consecutive flights, which begin and end:

(i) within a 24 hours period;

(ii) at the same aerodrome/operating site; and

(iii) with the same pilot-in-command of the aircraft.

(66) 'Sailplane' means a heavier-than-air aircraft that is supported in flight by the dynamic reaction of the air against its fixed lifting surfaces, the free flight of which does not depend on an engine;

(67) 'Screen height' means a height selected by the (Supplemental) Type certificate holder at 50 ft, or another value from 35 to 50 ft.

(68) 'Special VFR flight' means a VFR flight cleared by air traffic control to operate within a control zone in meteorological conditions below VMC.

(69) 'Standard Category I' means a precision instrument approach and landing using ILS, MLS or PAR with a decision height not lower than 200 ft and with a runway visual range (RVR) not less than 550 m for aeroplanes and 500 m for helicopters.

(70) 'Take-off alternate' means an alternate aerodrome at which an aircraft can land should this become necessary shortly after take-off and it is not possible to use the aerodrome of departure.

(71) 'Take-off distance available (TODA)' means the length of the take-off run available plus the length of the clearway available.

(72) 'Take-off run available (TORA)' means the length of runway which is declared available by the competent authority and suitable for the ground run of an aeroplane taking off.

(73) 'Take-off distance required helicopters (TODRH)' means the horizontal distance required from the start of the take-off to the point at which Take-off safety speed (V_{TOSS}), a selected height and a positive climb gradient are achieved, following failure of the critical power unit being recognised at TDP, the remaining power units within approved operating limits.

(74) 'Take-off mass' means the mass, including everything and everyone carried at the commencement of the take-off for helicopters and take-off run for aeroplanes.

(75) 'Take-off flight path' means the vertical and horizontal path, with the critical power-unit inoperative, from a specified point in the take-off to 1000 ft above the surface.

(76) 'Traffic load' means the total mass of passengers, persons other than crew members, baggage, cargo and carry-on specialist equipment, including any ballast.

(77) 'V_1' means the maximum speed in the take-off at which the pilot must take the first action (e.g. apply brakes, reduce thrust, deploy speed brakes) to stop the aeroplane within the accelerate-stop distance. V_1 also means the minimum speed in the take-off, following a failure of the critical engine at V_{EF}, at which the pilot can continue the take-off and achieve the required height above the take-off surface within the take-off distance.

(78) 'V_{EF}' means the speed at which the critical engine is assumed to fail during takeoff.

(79) 'Wet runway' means a runway of which the surface is covered with water, or equivalent, less than specified by the 'contaminated runway' definition or when there is sufficient moisture on the runway surface to cause it to appear reflective, but without significant areas of standing water.

OPS.GEN.015 Pilot-in-command responsibilities and authority

ALL AIRCRAFT

(a) The pilot-in-command shall be responsible for:

(1) the initiation, continuation, termination or diversion of a flight, when involved in non-commercial operations with other than complex motor-powered aircraft;

(2) compliance with all operational procedures and checklists;

(3) not commencing a flight unless he/she has confirmed that all operational limitations referred to in paragraph 2.a.3. of Annex IV to Regulation (EC) No 216/2008 (Essential requirements for air operations), can be complied with;

(4) not commencing nor continuing a flight beyond the nearest suitable aerodrome or landing site when flight crew members' capacity to perform functions is significantly reduced from causes such as fatigue, sickness or lack of oxygen;

(5) admission to the cockpit or, in the case of balloons, the pilot compartment;

(6) deciding, in accordance with the Configuration Deviation List (CDL) or Minimum Equipment List (MEL), as applicable, whether or not to accept an aircraft for flight with unserviceable equipment; and

(7) recording utilisation data, and all known or suspected defects in the aircraft at the termination of the flight, in the aircraft log book or journey log book for the aircraft.

(b) The pilot-in-command has the authority to refuse carriage of or disembark any person or cargo that may represent a potential hazard to the safety of the aircraft or its occupants.

(c) The pilot-in-command shall, as soon as possible, report to the appropriate Air Traffic Services (ATS) unit any hazardous flight conditions encountered that are likely to affect the safety of other aircraft.

(d) Notwithstanding the provision of OPS.GEN.015(a)(4), in a multi-crew operation the pilot-in-command may continue a flight beyond the nearest suitable aerodrome when adequate mitigating procedures are in place.

BALLOONS

(e) The pilot-in-command shall in addition to paragraphs (a), (b), (c) and (d) be responsible for:

(1) the pre-flight briefing of those persons assisting in the inflation and deflation of the envelope;

(2) notwithstanding OPS.GEN.130, ensuring that no person is smoking on board or within the direct vicinity of the balloon; and

(3) ensuring that persons assisting in the inflation and deflation of the envelope wear appropriate protective clothing.

OPS.GEN.020 Crew responsibilities

(a) Crew members shall be responsible for the proper execution of their duties which are related to the safety of the aircraft and its occupants, in accordance with the applicable requirements and, where applicable, the operations manual.

(b) Crew members shall be seated at their assigned stations and shall not perform any activities other than those required for the safe operation of the aircraft during critical phases of flight.

(c) Flight crew members shall keep their safety belt fastened while at their stations.

(d) At least one qualified flight crew member shall remain at the controls of the aircraft at all times.

(e) Crew members who undertake duties from more than one operator and are subject to flight and duty time limitations and rest requirements in accordance with OR.OPS.FTL shall:

(1) comply with all flight and duty time limitations and rest requirements applicable to their activities;

(2) inform each operator of their activities;

(3) maintain their individual records regarding flight and duty times and rest periods as referred to in OR.OPS.020.FTL; and

(4) upon request, present their records to each operator before commencing a flight duty period.

(f) Crew members shall not undertake duties on an aircraft if they know that they are suffering from or are likely to suffer from fatigue or they feel unfit, to the extent that the flight may be endangered.

(g) A crew member shall report to the pilot-in-command:

(1) any fault, failure, malfunction or defect, which he/she believes may affect the airworthiness or safe operation of the aircraft, including emergency systems; and

(2) any incident that was endangering, or could endanger, the safety of the operation.

OPS.GEN.025 Common language

All crew members shall communicate in a common language.

OPS.GEN.030 Transport of dangerous goods

(a) The transport of dangerous goods by air shall be conducted in accordance with the 2007-2008 Edition of the Technical Instructions for the Safe Transport of Dangerous Goods by Air published by decision of the Council of the International Civil Aviation Organization. (ICAO Doc 9284-AN/905.).

(b) Dangerous goods shall only be transported by an operator approved in accordance with OPS.SPA.DG, except when:

(1) they are not subject to the Technical Instructions in accordance with Part 1 of those Instructions.

(2) required on board the aircraft in accordance with airworthiness and operational requirements;

(3) required on board the aircraft for specialised purposes;

(4) carried by passengers or crew members in accordance with the Technical Instructions; or

(5) in baggage which has been separated from its owner.

(c) All reasonable measures shall be taken to prevent dangerous goods from being carried on board inadvertently.

(d) The operator shall, in accordance with the Technical Instructions, report without delay to the competent authority and the authority of the State where the accident or incident occurred:

(1) any incidents or accidents involving dangerous goods; and

(2) the finding of undeclared or misdeclared dangerous goods discovered in cargo or passengers' baggage.

Section II - Operational procedures

OPS.GEN.100 Ice and other contaminants

(a) At the commencement of a flight the external surfaces of the aircraft shall be clear of any deposit which might adversely affect its performance or controllability.

(b) The operator shall apply ground de-icing/anti-icing processes whenever determined necessary, on the basis of inspections and weather conditions.

OPS.GEN.105 Simulated abnormal situations in flight

Except in the case of flight instruction provided by a training organisation approved in accordance with Part-OR, when carrying passengers or cargo or when conducting commercial operations the following shall not be simulated:

(a) abnormal or emergency situations which require the application of abnormal or emergency procedures; or

(b) Instrument Meteorological Conditions (IMC) by artificial means.

OPS.GEN.110 Carriage of persons

ALL AIRCRAFT

(a) No person shall be in any part of an aircraft in flight which is not a part designed for the accommodation of persons, unless for the purpose of taking action necessary for the safety of the aircraft or of any animal or goods therein.

AEROPLANES AND HELICOPTERS

(b) In the case of aeroplanes and helicopters, persons carried shall be seated where, in the event of an emergency evacuation, they may best assist and not hinder evacuation from the aircraft.

(c) Prior to and during taxiing, take-off and landing, and whenever deemed necessary in the interest of safety by the pilot-in-command, each person on board shall occupy a seat or berth and, except in the case of parachute operations, have his/her safety belt or harness properly secured.

HELICOPTERS

(d) A helicopter operator shall specify which aircraft seats may be occupied by one adult and one infant properly secured by a restraint device.

OPS.GEN.115 Passenger briefing

Passengers shall be briefed on the location and use of emergency exits and relevant safety and emergency equipment.

OPS.GEN.120 Securing of passenger cabin and galleys

(a) Prior to and during taxiing, take-off and landing, all exits and escape paths shall be unobstructed.

(b) Prior to and during take-off and landing, and whenever deemed necessary in the interest of safety by the pilot-in-command, all equipment and baggage shall be properly secured.

OPS.GEN.125 Portable electronic devices

Portable electronic devices that can adversely affect the performance of the aircraft's systems and equipment shall not be used on board the aircraft.

OPS.GEN.130 Smoking on board

ALL AIRCRAFT

(a) No person shall be allowed to smoke on board:

(1) while the aircraft is on the ground, unless specifically permitted by the operator in accordance with specified procedures;

(2) while the aircraft is being refuelled; or

(3) whenever the pilot-in-command deems necessary in the interest of safety.

COMPLEX MOTOR-POWERED AIRCRAFT

(b) No person shall be allowed to smoke on board a complex motor-powered aircraft:

(1) in cargo compartments or other areas where cargo is carried;

(2) in those areas of the cabin where oxygen is being supplied;

(3) if the operator has declared a flight to be operated as a non-smoking flight; or

(4) outside those areas that the operator has designated smoking areas.

OPS.GEN.135.A Taxiing of aeroplanes

Aeroplanes shall only be taxied on the movement area of an aerodrome when the person at the controls is properly qualified to taxi an aeroplane.

OPS.GEN.140.H Rotor engagement

A helicopter rotor shall only be turned under power for the purpose of flight with a qualified pilot at the controls.

OPS.GEN.145 Use of aerodromes/operating sites

An operator shall only use aerodromes or operating sites that are adequate for the type of aircraft and operation concerned.

OPS.GEN.147 Visual Flight Rules (VFR) Operating minima

(a) Visual flight rules (VFR) flights shall be conducted in accordance with the Visual Flight Rules and table 1.

Table 1 – Minimum visibilities for VFR operations

Airspace class	ABCDE*	F	G
		Above 900 m (3 000 ft) AMSL or above 300 m (1 000 ft) above terrain, whichever is the higher	At and below 900 m (3 000 ft) AMSL or 300 m (1 000 ft) above terrain, whichever is the higher
Distance from cloud	1 500 m horizontally 300 m (1 000 ft) vertically		Clear of cloud and in sight of the surface

Flight visibility	8 km at and above 3 050 m (10 000 ft) AMSL** 5 km below 3 050 m (10 000 ft) AMSL**	5 km***

* VMC minima for Class A airspace are included for guidance but do not imply acceptance of VFR flights in Class A airspace.

** When the height of the transition altitude is lower than 3 050 m (10 000 ft) AMSL, FL100 should be used in lieu of 10 000 ft.

*** see (c)(1) below.

(b) Special VFR flights shall not be commenced when the visibility is less than 3 km and not otherwise conducted when the visibility is less than 1.5 km.

HELICOPTERS

(c) Helicopters shall be operated in a flight visibility of not less than:

(1) 1 500 m during daylight, except when in sight of land, if the helicopter is manoeuvred at a speed that will give adequate opportunity to observe other traffic and any obstacles in time to avoid a collision, the visibility may be reduced to 800 m for short period.

(2) 5 000 m during night.

(d) In Class G airspace, when flying between helidecks where the overwater sector is less than 10 nm, VFR flights are conducted in accordance with table 2.

Table 2 – Minima for flying between helidecks located in Class G airspace

	Day		Night	
	Height*	Visibility	Height*	Visibility
Single pilot	300 ft	3 km	500 ft	5 km
Two pilots	300 ft	2 km**	500 ft	5 km***

* The cloud base shall be such as to allow flight at the specified height below and clear of cloud.

** Helicopters may be operated in flight visibility down to 800 m provided the destination or an intermediate structure are continuously visible.

*** Helicopters may be operated in flight visibility down to 1 500 m provided the destination or an intermediate structure are continuously visible.

OPS.GEN.150 Instrument Flight Rules (IFR) Operating minima

(a) The operator shall specify aerodrome operating minima for each departure, destination and alternate aerodrome to be used. Such minima shall:

(1) not be lower than those specified by the State in which the aerodrome is located, except when specifically approved by that State; and

(2) require the prior approval of the competent authority in accordance with OPS.SPA.001.LVO.

(b) The minima referred to in (a) shall take into account any increment imposed by the competent authority.

(c) The minima for a specific type of approach and landing procedure are applicable if:

(1) the ground equipment required for the intended procedure is operative;

(2) the aircraft systems required for the type of approach are operative;

(3) the required aircraft performance criteria are met; and

(4) the crew is qualified accordingly.

(d) In establishing the aerodrome operating minima which will apply to any particular operation, an operator shall take account of:

(1) the type, performance and handling characteristics of the aircraft;

(2) the composition of the flight crew, their competence and experience;

(3) the dimensions and characteristics of the Final Approach and Take-off Areas (FATOs)/runways which may be selected for use;

(4) the adequacy and performance of the available visual and non-visual ground aids;

(5) the equipment available on the aircraft for the purpose of navigation and/or control of the flight path, as appropriate, during the take-off, the approach, the flare, the landing, the roll-out and the missed approach;

(6) the obstacles in the approach, the missed approach and the climb-out areas required for the execution of contingency procedures and necessary clearance;

(7) the obstacle clearance altitude/height for the instrument approach procedures;

(8) the means to determine and report meteorological conditions; and

(9) the flight technique to be used during the final approach.

OPS.GEN.155 Selection of alternate aerodromes

TAKE-OFF ALTERNATE AERODROMES

ALL AEROPLANES

(a) A take-off alternate aerodrome shall be selected and specified in the flight plan if the weather conditions at the aerodrome of departure are at or below the applicable aerodrome operating minima or it would not be possible to return to the aerodrome of departure for other reasons.

(b) The take-off alternate aerodrome shall be located within the following distance from the aerodrome of departure:

(1) aeroplanes having two power-units. Not more than a distance equivalent to a flight time of one hour at the single-engine cruise speed; and

(2) aeroplanes having three or more power-units. Not more than a distance equivalent to a flight time of two hours at the one-engine inoperative cruise speed.

(c) For an aerodrome to be selected as a take-off alternate the available information shall indicate that, at the estimated time of use, the conditions will be at or above the aerodrome operating minima for that operation.

HELICOPTERS – COMMERCIAL AIR TRANSPORT

(d) Helicopters used in commercial air transport shall comply with (a) and (c) above.

DESTINATION ALTERNATE AERODROMES

(e) For a flight to be conducted in accordance with instrument flight rules (IFR), at least one destination alternate shall be selected and specified in any flight plan, unless:

(1) for aeroplanes, the duration of the flight and the available current meteorological information indicates that, at the estimated time of arrival at the place of intended landing, and for a reasonable period before and after such time, the approach and landing may be made under visual meteorological conditions; or

(2) for helicopters, available current meteorological information indicates that the following meteorological conditions will exist from two hours before to two hours after the estimated time of arrival:

(i) A cloud base of at least 130 metres (m) (400 ft) above the minimum associated with the instrument approach procedure;

(ii) Visibility of at least 1 500 m more than the minimum associated with the procedure; or

(3) the place of intended landing is isolated and:

(i) there is no suitable destination alternate;

(ii) an instrument approach procedure is prescribed for the aerodrome of intended landing;

(iii) for aeroplanes, available current meteorological information indicates that the following meteorological conditions will exist from two hours before to two hours after the estimated time of arrival:

(A) A cloud base of at least 300 m (1 000 ft) above the minimum associated with the instrument approach procedure;

(B) Visibility of at least 5.5 km or of 4 km more than the minimum associated with the procedure; and

(iv) for helicopters, a Point of No Return (PNR) is determined in case of an offshore destination.

OPS.GEN.160 Departure and approach procedures

(a) Unless otherwise approved by the State responsible for an aerodrome, an operator shall use the departure and approach procedures established by that State.

(b) The pilot-in-command shall only accept an Air Traffic Control (ATC) clearance to deviate from a published departure or arrival route, provided obstacle clearance criteria can be observed and full account is taken of the operating conditions. In any case, the final approach shall be flown visually or in accordance with the published approach procedures.

OPS.GEN.165 Noise abatement

Operating procedures shall take into account the need to minimise the effect of aircraft noise.

OPS.GEN.170 Minimum terrain clearance altitudes – IFR flights

For each flight to be conducted in accordance with instrument flight rules (IFR), terrain clearance altitudes for the route to be flown shall be specified.

OPS.GEN.175 Minimum flight altitudes

An aircraft shall not be flown below minimum altitudes established by the State overflown, except when:

(a) necessary for take-off or landing; or

(b) descending in accordance with procedures established by that State subject to demonstration by the operator that the operation does not create a hazard to persons or property on the surface.

OPS.GEN.180 Routes and areas of operation

Operations shall be conducted in accordance with any restriction on the routes or the areas of operation imposed by the State overflown.

OPS.GEN.185 Meteorological conditions

(a) The pilot-in-command shall not initiate or continue a Visual Flight Rules (VFR) flight unless the latest available meteorological information indicates that the weather conditions along the route and at the intended destination at the appropriate time will be at or above the applicable VFR operating minima.

(b) A flight in accordance with instrument flight rules (IFR) shall only be initiated or continued towards the planned destination aerodrome when the latest available meteorological information indicates that, at the estimated time of arrival, the weather conditions at the destination, or at least one destination alternate aerodrome are at or above the applicable aerodrome operating minima.

OPS.GEN.190 Take-off conditions

Before commencing take-off, the pilot-in-command shall ensure that:

(a) according to the information available, the weather at the aerodrome or operating site and, for motor-powered aircraft, the condition of the runway/Final Approach and Take-off Area (FATO) intended to be used, will not prevent a safe take-off and departure; and

(b) the visibility/Runway Visual Range (RVR) and the ceiling in the take-off direction are equal to or better than the applicable aerodrome operating minima.

OPS.GEN.195 Approach and landing conditions

Before commencing an approach to land, the pilot-in-command shall ensure that according to the information available, the weather at the aerodrome or operating site and, for motor-powered aircraft, the condition of the runway/Final Approach and Take-off Area (FATO) intended to be used, will not prevent a safe approach, landing or missed approach, having regard to any performance information contained in the Aircraft Flight Manual (AFM) and/or the operations manual.

OPS.GEN.200 Commencement and continuation of approach

(a) An instrument approach shall only be continued below 1 000 ft above the aerodrome on the final approach segment when the reported Runway Visual Range (RVR) is at or above the applicable minima specified for the runway.

(b) If, after passing 1 000 ft above the aerodrome on the final approach segment, the RVR falls below the applicable minimum, the approach may be continued to Decision Altitude/Height (DA/H) or Minimum Descent Altitude/Height (MDA/H).

(c) The approach may be continued below DA/H or MDA/H and the landing may be completed provided that at least one of the following visual references for the intended runway is established at the DA/H or MDA/H and maintained:

(1) Elements of the approach light system;

(2) The threshold;

(3) The threshold markings;

(4) The threshold lights;

(5) The threshold identification lights;

(6) The visual glide slope indicator;

(7) The touchdown zone or touchdown zone markings;

(8) The touchdown zone lights; or

(9) Runway/Final Approach and Take-off Area (FATO) edge lights.

OPS.GEN.205 Fuel and oil supply

(a) In compliance with paragraph 2.a.7. of Annex IV to Regulation (EC) No 216/2008 (Essential requirements for air operations), the following amounts of reserve fuel for visual flight rules (VFR) flights and fuel for instrument flight rules (IFR) flights shall at least be carried.

BALLOONS

(b) For flights conducted in accordance with VFR, reserve fuel (gas or ballast) shall not be less than 30 minutes of flight.

AEROPLANES

(c) Except for non-commercial flights with other than complex motor-powered aircraft taking off and landing at the same aerodrome/operating site and remaining within 50 nautical miles (nm) of that aerodrome/operating site, flights conducted in accordance with VFR shall carry reserve fuel not less than:

(1) 30 minutes fuel at normal cruising altitude by day; or

(2) 45 minutes fuel at normal cruising speed by night.

(d) For flights conducted in accordance with IFR the amount of fuel to be carried shall be sufficient:

(1) to fly to the aerodrome/operating site of intended landing, and thereafter to fly 45 minutes at normal cruising altitude, when no alternate is required or no suitable alternate is available (i.e. the aerodrome/operating site is isolated and no suitable alternate is available); or

(2) when an alternate is required, to fly to and execute an approach and a missed approach at the aerodrome/operating site of intended landing, and thereafter:

(i) to fly to the specified alternate; and

(ii) to fly at least 45 minutes at normal cruising altitude.

HELICOPTERS

(e) Except for non-commercial flights with other than complex motor-powered aircraft taking off and landing at the same aerodrome/operating site and remaining within 50 nautical miles (nm) of that aerodrome/operating site, flights conducted in accordance with VFR shall carry reserve fuel not less than 20 minutes fuel at best range speed.

(f) For flights conducted in accordance with IFR, the amount of fuel to be carried shall be sufficient:

(1) to fly to the aerodrome/operating site of intended landing, and thereafter to fly 30 minutes at holding speed at 450 m (1 500 ft) above the destination aerodrome/operating site under standard temperature conditions and approach and land, when no alternate is required or no suitable alternate is available (i.e. the aerodrome/operating site is isolated and no suitable alternate is available); or

(2) when an alternate is required, to fly to and execute an approach and a missed approach at the aerodrome/operating site of intended landing, and thereafter:

(i) to fly to the specified alternate; and

(ii) to fly 30 minutes at holding speed at 450 m (1 500 ft) above the alternate aerodrome/operating site under standard temperature conditions and approach and land.

OPS.GEN.210 Refuelling with passengers embarking, on board or disembarking

(a) A balloon shall not be refuelled with passengers embarking, on board or disembarking.

(b) All other aircraft shall not be refuelled when passengers are embarking, on board or disembarking, unless:

(1) it is attended by the pilot-in-command or other qualified personnel ready to initiate and direct an evacuation of the aircraft; and

(2) for commercial operations, two-way communication is maintained between the personnel involved in the operation supervising the refuelling and the pilot-in-command or other qualified personnel required.

OPS.GEN.215 In-flight fuel checks

In-flight fuel checks shall be carried out on each flight at regular intervals.

OPS.GEN.220.B Operational limitations - balloons

(a) A landing with a balloon during night shall not be made, except for emergencies.

(b) A balloon may take-off during night, provided sufficient fuel is carried for a landing during day.

OPS.GEN.222 Ground proximity detection

When undue proximity to the ground is detected, the pilot flying shall immediately take corrective action to establish safe flight conditions.

Section III – Aircraft performance and operating limitations

OPS.GEN.300 Operating limitations

(a) During any phase of operation, the loading, the mass and, except for balloons, the centre of gravity (CG) of the aircraft shall comply with any limitation specified in the Aircraft Flight Manual (AFM).

(b) An aeroplane shall be operated within the limitations imposed by compliance with the applicable noise certification standards.

OPS.GEN.305 Weighing

(a) The mass and, except for balloons, the CG of an aircraft shall be established by actual weighing prior to initial entry into service.

(b) The accumulated effects of modifications and repairs on the mass and balance shall be accounted for and properly documented. The aircraft shall be reweighed whenever the effect of modifications on the mass and balance is not accurately known.

(c) The mass and CG of complex motor-powered aircraft used in non-commercial operations and aircraft used in commercial operations shall be re-established by actual weighing:

(1) at least every 4 years if individual aircraft masses are used; or

(2) at least once every 9 years if aeroplane fleet masses are used.

(d) The weighing shall be accomplished by the manufacturer of the aircraft or by a maintenance organisation approved in accordance with Part-M or Part-145.

OPS.GEN.310 Mass and balance system - complex motor-powered aircraft used in non-commercial operations and aircraft used in commercial operations

COMPLEX MOTOR-POWERED AIRCRAFT USED IN NON-COMMERCIAL OPERATIONS AND AIRCRAFT USED IN COMMERCIAL OPERATIONS

(a) An operator of a complex motor-powered aircraft used in non-commercial operations or an aircraft used in commercial operations shall establish a mass and balance system specifying how the following items are accurately determined for each flight:

(1) aircraft dry operating mass and CG, if applicable;

(2) mass of the traffic load;

(3) mass of the fuel load;

(4) aircraft loading under the supervision of qualified personnel;

(5) load distribution;

(6) take-off mass, landing mass and zero fuel mass, if applicable;

(7) CG positions, if applicable; and

(8) preparation and disposition of all documentation.

(b) The mass and balance computation based on electronic calculations shall be replicable by the flight crew.

AIRCRAFT USED IN COMMERCIAL OPERATIONS

(c) For commercial operations, mass and balance documentation shall be prepared prior to each flight specifying the load and its distribution.

OPS.GEN.315 Performance - general

(a) An aircraft shall only be operated if the performance is adequate to comply with the applicable rules of the air and any other restrictions applicable to the flight, the airspace or the aerodromes/operating sites used, taking into account the charting accuracy of any charts/maps used.

(b) Except when necessary for take-off or landing at an approved operating site, an aircraft shall only be operated over the congested areas of cities, towns or settlements or over an open-air assembly of persons, if it is able to make a landing without undue hazard to the aircraft occupants or to third parties, in the event of a power-unit failure.

OPS.GEN.320.A Take-off - complex motor-powered aeroplanes used in non-commercial operations and aeroplanes used in commercial operations

COMPLEX MOTOR-POWERED AEROPLANES USED IN NON-COMMERCIAL OPERATIONS AND AEROPLANES USED IN COMMERCIAL OPERATIONS

(a) When determining the maximum permitted take-off mass, the following shall be taken into account:

(1) the take-off distance shall not exceed the take-off distance available, with a clearway distance not exceeding half of the take-off run available;

(2) the take-off run shall not exceed the take-off run available;

(3) a single value of V_1 shall be used for the rejected and continued take-off; and

(4) on a wet or contaminated runway, the take-off mass shall not exceed that permitted for a take-off on a dry runway under the same conditions.

COMPLEX MOTOR-POWERED AEROPLANES

(b) In the event of a critical engine failure during take-off, complex motor-powered aeroplanes shall be able to discontinue the take-off and stop within the runway available or, in the case of multi-engined aeroplanes, continue the take-off and clear all obstacles along the flight path by an adequate margin until the aeroplane is in a position to comply with OPS.GEN.325.

OPS.GEN.325 En-route - Critical engine inoperative - complex motor-powered aircraft

In the event of a critical engine becoming inoperative at any point along the route, a multi-engine complex motor-powered aircraft shall be able to continue the flight to an aerodrome without flying below the minimum obstacle clearance altitude at any point.

OPS.GEN.330.A Landing - complex motor-powered aeroplanes

At any aerodrome, after clearing all obstacles in the approach path by a safe margin, the aeroplane shall be able to land and stop, a seaplane come to a satisfactorily low speed, within the landing distance available. Allowance may be made for expected variations in the approach and landing techniques, if such allowance has not been made in the scheduling of performance data.

Section IV - Instruments, data and equipment

OPS.GEN.400 Instruments and equipment – General

GENERAL OBJECTIVES

(a) An aircraft shall be equipped with instruments which will enable the flight crew to:

(1) control or, in the case of balloons, determine the flight path;

(2) carry out any required procedural manoeuvre; and

(3) observe the operating limitations in the expected operating conditions.

APPROVED AND NON-APPROVED EQUIPMENT

(b) Equipment and instrument required by Part-OPS shall be approved, except as specified in (c), and installed in accordance with Part-21.

(c) Instruments and equipment required by Part-OPS which do not need to be approved in accordance with Part-21, as well as any additional equipment which is not required by Part-OPS, but is carried on a flight, shall comply with the following:

(1) The information provided by these instruments, equipment or accessories shall not be used by the flight crew to comply with (a);

(2) The instruments and equipment shall not affect the airworthiness of the aircraft, even in the case of failures or malfunction.

ACCESSIBILITY AND POSITIONING OF INSTRUMENTS AND EQUIPMENT

(d) Instruments and equipment shall be readily operable or accessible from the station where the flight crew member that needs to use it is seated.

(e) Instruments and equipment used by flight crew members shall be arranged so as to enable them to see the indications for use readily from their station, with the minimum practicable deviation from the position and line of vision which they normally assume when looking forward along the flight path.

(f) All required emergency equipment shall be easily accessible for immediate use.

OPS.GEN.405 Equipment for all aircraft

AEROPLANES AND HELICOPTERS

(a) Aeroplanes and helicopters shall be equipped with:

(1) except in the case of aerobatic flights, at least one hand fire extinguisher:

(i) in the cockpit; and

(ii) in each passenger compartment which is separate from the cockpit;

(2) a seat or berth for each person older than 24 months;

(3) a seat belt for each seat and restraining belts for each berth;

(4) a restraint device for each person younger than 24 months; and

(5) spare electrical fuses, of the ratings required for complete circuit protection, for replacement of those fuses that are accessible in flight.

(b) The type and quantity of extinguishing agent for the required fire extinguishers shall be suitable for the type of fire likely to occur in the compartment where the extinguisher is intended to be used and the hazard of toxic gas concentration in compartments occupied by persons shall be minimised.

SAILPLANES

(c) Sailplanes shall be equipped in accordance with (a)(2) and (a)(3).

BALLOONS

(d) Balloons shall be equipped in accordance with (a)(1)(i) and an alternative source of ignition.

LARGE BALLOONS AND BALLOONS INVOLVED IN COMMERCIAL OPERATIONS

(e) Balloons with a maximum passenger capacity of more than 11 and balloons used in commercial operations shall, in addition to (d), be equipped with:

(1) protective gloves for each crew member;

(2) crew restraint harness(es);

(3) a hook knife;

(4) a fire blanket or fire resistant cover; and

(5) a drop line of at least 30 metres (m).

CARRIAGE OF PARACHUTISTS

(f) Notwithstanding the provisions of (a)(2), in the case of carriage of parachutists, the floor may be used as a seat, provided means are available for the parachutists to hold on.

OPS.GEN.410 Flight instruments and equipment - VFR flights

SAILPLANES, AEROPLANES AND HELICOPTERS

(a) When operating under Visual Flight Rules (VFR), sailplanes, aeroplanes, and helicopters shall be equipped with a means of measuring and displaying:

(1) magnetic heading;

(2) time, in hours, minutes and seconds;

(3) pressure altitude; and

(4) indicated air speed.

(b) When sailplanes, aeroplanes and helicopters operating under VFR cannot be maintained in a desired attitude without reference to one or more flight instruments, it shall, in addition to those required in (a), be equipped with a means of measuring and displaying:

(1) vertical speed;

(2) turn and slip for aeroplanes, and slip for helicopters;

(3) attitude. In the case of helicopters, two separate means of indicating attitude shall be available;

(4) stabilised heading; and

(5) when power is not adequately supplied to the instruments.

AEROPLANES AND HELICOPTERS IN MULTI-PILOT OPERATIONS

(c) Whenever two pilots are required for the operation, aeroplanes and helicopters shall be equipped with an additional separate means of indicating (a)(3), (a)(4), (b)(1), (b)(2), (b)(3) and (b)(4).

BALLOONS

(d) When operating under VFR, balloons shall be equipped in accordance with (a)(2), (a)(3) and also with:

(1) a means of indicating:

(i) drift direction; and

(ii) envelope temperature; and

LARGE BALLOONS AND BALLOONS INVOLVED IN COMMERCIAL OPERATIONS

(e) Balloons with a maximum passenger capacity of more than 11 and balloons used in commercial operations, when operating under VFR shall, in addition to (d), be equipped with:

(1) a means of measuring and displaying:

(i) vertical speed; and

(ii) pressure for each supply line;

OPS.GEN.415 Flight instruments and equipment - VFR night flights and IFR flights

AEROPLANES AND HELICOPTERS.

(a) Aeroplanes and helicopters operating Visual Flight Rules (VFR) night flights and Instrument Flight Rules (IFR) flights shall, in addition to complying with OPS.GEN.410(a), (b), and (c), be equipped with:

(1) a means of measuring and displaying outside air temperature;

(2) a means of preventing malfunction due to either condensation or icing for the means of measuring and displaying indicated air speed;

(3) an alternative source of static pressure;

(4) an anti-collision light system;

(5) navigation/position lights;

(6) a landing light;

(7) lighting supplied from the aircraft's electrical system to provide adequate illumination for all instruments and equipment essential to the safe operation of the aircraft;

(8) lighting supplied from the aircraft's electrical system to provide illumination in all passenger compartments;

(9) an electric torch for each crew member station;

(10) lights to conform with International Regulations for Preventing Collisions at Sea (hereinafter referred to as International Regulations for Preventing Collisions at Sea) if the aircraft is amphibious; and

(11) in the case of aeroplanes with speed limitations expressed in terms of Mach number, a means of indicating Mach number.

(b) Aeroplanes operating VFR night flights and IFR flights and helicopters operating IFR flights shall be equipped with a chart holder in an easily readable position which can be illuminated for night operations.

SAILPLANES

(c) Sailplanes operating VFR night flights or IFR flights, shall comply with (a) (4) to (10) inclusive.

BALLOONS

(d) Balloons operated at night shall, in addition to complying with OPS.GEN.410(d) and (e), as applicable, be equipped with:

(1) position lights; and

(2) a means of illuminating all of the instruments used by the flight crew.

OPS.GEN.420 Flights over water

SAILPLANES AND BALLOONS

(a) The pilot-in-command of a sailplane or balloon shall determine the risks to survival of the occupants of the aircraft in the event of a ditching, based on which he/she shall determine the carriage of:

(1) life jackets, or equivalent floatation devices, for each person on board, stowed in a position which is readily accessible from the seat or berth of the person for whose use it is provided;

(2) emergency locator transmitters; and

(3) equipment for making distress signal,

when operating a flight:

(i) over water beyond gliding distance from the shore; or

(ii) where the take-off or approach path is so disposed over water that in the event of a mishap there would be a likelihood of ditching;

LANDPLANES

(b) Landplanes shall be equipped with (a)(1) when:

(1) flying over water beyond gliding distance from the shore; or

(2) taking off or landing at an aerodrome or operating site where, in the opinion of the pilot-in-command, the take-off or approach path is so disposed over water that in the event of a mishap there would be a likelihood of a ditching.

SEAPLANES

(c) When flying over water, seaplanes shall, in addition to (a)(1),be equipped with:

(1) equipment for making the sound signals, as prescribed by the International Regulations for Preventing Collisions at Sea;

(2) one anchor; and

(3) one sea anchor (drogue), when necessary to assist in manoeuvring.

AEROPLANES

(d) The pilot-in-command of an aeroplane operated at a distance away from land where an emergency landing is possible greater than that corresponding to:

(1) 120 minutes at cruising speed or 400 nautical miles (nm), whichever is the lesser, in the case of aeroplanes capable of continuing the flight to an aerodrome with the critical power unit(s) becoming inoperative at any point along the route or planned diversions; or

(2) 30 minutes at cruising speed or 100 nm, whichever is the lesser, for all other aeroplanes,

shall determine the risks to survival of the occupants of the aeroplane in the event of a ditching, based on which he/she shall determine the carriage, in addition to (b) or (c) and (a)(3), of:

(i) life-saving rafts in sufficient numbers to carry all persons on board, stowed so as to facilitate their ready use in emergency; and

(ii) life-saving equipment, including means of sustaining life, as is appropriate to the flight to be undertaken.

HELICOPTERS

(e) Helicopters shall be equipped with (a)(1), when operated in:

(1) Performance Class 1 or 2 on a flight over water at a distance corresponding to more than 10 minutes flying time at normal cruising speed;

(2) Performance Class 3 on a flight over water beyond autorotational distance from the land; or

(3) Performance Class 2 or 3 when taking off or landing at an aerodrome/operating site where the take-off or approach path is over water.

(f) When operated in Performance Class 1 or 2 on a flight over water at a distance corresponding to more than 10 minutes flying time at normal cruising speed or in Performance Class 3 on a flight over water at a distance corresponding to more than three minutes flying time at normal cruising speed, helicopters shall, in addition to (a)(1), and when not precluded by considerations related to the type of helicopter used, be equipped with (a)(3) and (d).

(g) The pilot-in-command of a helicopter operated in Performance Class 3 shall determine the risks to survival of the occupants of the helicopter in the event of a ditching, based on which he/she shall determine if the life jackets required in (e) shall be worn by all occupants.

ALL AIRCRAFT

(h) Each life jacket or equivalent individual flotation device, when carried in accordance with (b), (c), (d), (e), (f) or (g) shall be equipped with a means of electric illumination for the purpose of facilitating the location of persons.

OPS.GEN.425.H Ditching - Helicopters

(a) Helicopters operated in Performance Class 1 or 2 on a flight over water in a hostile environment at a distance corresponding to more than 10 minutes flying time at normal cruising speed shall be:

(1) designed for landing on water; or

(2) certificated in accordance with ditching provisions in the relevant airworthiness code.

(b) In addition, helicopters shall comply with (a) or be fitted with emergency flotation equipment when operated in:

(1) Performance Class 1 or 2 on a flight over water in a non-hostile environment at a distance corresponding to more than 10 minutes flying time at normal cruising speed;

(2) Performance Class 3 on a flight over water beyond a safe forced landing distance from land; or

(3) Performance Class 2 when taking off or landing over water, except in the case of Helicopter Emergency Medical Services (HEMS) operations, where for the purpose of minimising exposure, the landing or take-off at a HEMS operating site located in a congested environment is conducted over water.

OPS.GEN.430 Emergency Locator Transmitter (ELT)

AEROPLANES

(a) Aeroplanes first issued with an individual certificate of airworthiness before and including 1 July 2008 shall be equipped with an Emergency Locator Transmitter (ELT) of any type.

(b) Aeroplanes first issued with an individual certificate of airworthiness after 1 July 2008 shall be equipped with an automatic ELT.

HELICOPTERS

(c) Helicopters shall be equipped with:

(1) at least one automatic ELT; and

(2) one Survival ELT (ELT(S)) in a life-saving raft or life jacket when the helicopter is operated in:

(i) Performance Class 1 or 2 on a flight over water at a distance corresponding to more than 10 minutes flying time at normal cruising speed; or

(ii) Performance Class 3 on a flight over water at a distance corresponding to more than three minutes flying time at normal cruising speed.

OPS.GEN.435 Survival equipment – Motor-powered aircraft

ALL AIRCRAFT

(a) Aircraft operated across areas in which search and rescue would be especially difficult shall be equipped with the following:

(1) Signalling equipment to make distress signals;.

(2) At least one ELT (S); and

(3) Additional survival equipment for the route to be flown taking account of the number of persons on board.

AEROPLANES

(b) Notwithstanding (a)(3), in the case of aeroplanes, the additional survival equipment specified in (a)(3) need not be carried when the aeroplane:

(1) remains within a distance from an area where search and rescue is not especially difficult, that corresponds to:

(i) 120 minutes at the one engine inoperative cruising speed for aeroplanes capable of continuing the flight to an aerodrome with the critical power unit(s) becoming inoperative at any point along the route or planned diversion routes; or

(ii) 30 minutes at cruising speed for all other aeroplanes;

or,

(2) remains within a distance no greater than that corresponding to 90 minutes at cruising speed from an area suitable for making an emergency landing; in the case of a complex motor-powered aircraft certificated in accordance with the applicable airworthiness code issued by the Agency.

OPS.GEN.440 High altitude flights - Oxygen

ALL AIRCRAFT

(a) Aircraft flying above altitudes at which the pressure altitude in the passenger compartments is above 10 000 ft (feet) shall carry enough breathing oxygen to supply:

(1) in the case of non-pressurised aircraft:

(i) all crew members and at least 10% of the passengers for any period in excess of 30 minutes when the pressure altitude in the passenger compartments will be between 10 000 ft and 13 000 ft; and

(ii) all crew members and passengers for any period that the pressure altitude in passenger compartments will be above 13 000 ft.

(2) in the case of pressurised aeroplanes:

(i) all crew members and a proportion of the passengers, for any period when, in the event of loss of pressurisation and taking into account the circumstances of the flight, the pressure altitude in the passenger compartment would be above 10 000 ft; and

(ii) all the occupants of the passenger compartment for no less than 10 minutes, in the case of aeroplanes operated at pressure altitudes above 25 000 ft, or operated below that altitude, but under conditions that will not allow them to descend safely to a pressure altitude of 13 000 ft within four minutes; and

(3) in the case of pressurised helicopters, all crew members and a proportion of the passengers, for any period when, in the event of loss of pressurisation and taking into account the circumstances of the flight, the pressure altitude in the passenger compartment would be above 10 000 ft.

(b) When engaged in performing duties essential to the safe operation of an aircraft in flight, flight crew members shall use breathing oxygen continuously in the circumstances specified in (a).

(c) Aircraft operated at altitudes for which the oxygen supply is required in accordance with (a) shall be equipped with oxygen storage and dispensing apparatus.

PRESSURISED AEROPLANES

(d) Pressurised aeroplanes operated at flight altitudes above 25 000 ft, or pressurised aeroplanes used in commercial air transport, shall, in addition, be equipped with a device to provide a warning indication to the flight crew of any loss of pressurisation.

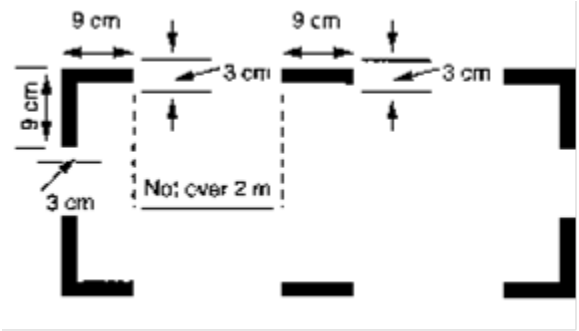
OPS.GEN.445 Operations in icing conditions at night

Aircraft flying in expected or actual icing conditions at night shall be equipped with a means to illuminate or detect the formation of ice. Such illumination shall not cause glare or reflection that would handicap flight crew members in the performance of their duties.

OPS.GEN.450 Marking of break-in points

If areas of the aircraft's fuselage suitable for break-in by rescue crews in an emergency are marked, such areas shall be marked as shown in Figure 1 of OPS.GEN.450.

Figure 1 of OPS.GEN.450



OPS.GEN.455 First-aid kits

(a) Aeroplanes and helicopters. Aeroplanes and helicopters shall be equipped with first-aid kits in accordance with Table 1 of OPS.GEN.455:

Table 1 of OPS.GEN.455

Number of passenger seats installed	Number of first-aid kits required
0 to 99	1
100 to 199	2
200 to 299	3
300 and more	4

(b) Balloons.

(1) Balloons shall be equipped with one first-aid kit.

(2) In the case of balloons with a maximum passenger capacity of more than 11, a second first-aid kit shall be carried in the retrieval vehicle.

(c) The first-aid kits shall be readily accessible for use.

(d) First-aid kits shall be maintained.

OPS.GEN.460 Airborne Collision Avoidance System (ACAS) II

ALL AIRCRAFT

(a) Whenever Airborne Collision Avoidance System (ACAS) II is installed, it shall be used in normal conditions during flight in a mode that enables Resolution Advisories (RAs) to be produced for the pilot flying when undue proximity to another aircraft is detected.

(b) When an RA is produced by ACAS II, the pilot flying shall immediately take the corrective action indicated by the RA, even if this is in conflict with an Air Traffic Control (ATC) instruction. The aircraft shall be promptly returned to the terms of the ATC instructions or clearance when the situation is resolved.

AEROPLANES

(c) Turbine-powered aeroplanes shall be equipped with an ACAS with a minimum performance level of at least ACAS II, when having:

(1) for non-commercial operations a maximum certificated take-off mass exceeding 15 000 kg (kilograms) or a maximum passenger seating configuration of more than 30; or

(2) for commercial operations a maximum certificated take-off mass exceeding 5 700 kg or a maximum passenger seating configuration of more than 19.

OPS.GEN.465.A Terrain Awareness Warning System (TAWS) - Aeroplanes

(a) Turbine-powered aeroplanes with a maximum certificated take-off mass exceeding 5 700 kg, or maximum passenger seating configuration of more than nine, shall be equipped with a TAWS that meets the requirements for Class A equipment.

(b) Reciprocating-engined-powered aeroplanes with a maximum certificated take-off mass exceeding 5 700 kg, or a maximum passenger seating configuration of more than nine and used in commercial air transport, shall be equipped with a TAWS that meets the requirement for Class B equipment.

(c) A TAWS shall provide, automatically, a timely and distinctive warning to the pilot flying, of:

(1) sink rate;

(2) ground proximity;

(3) altitude loss after take-off or go-around;

(4) incorrect landing configuration; and

(5) downward glide-slope deviation.

OPS.GEN.470.A Means for emergency evacuation - Aeroplanes

(a) Aeroplanes with passenger emergency exit sill heights of more than 1.83 metres (six feet) above the ground and aeroplanes with a separate emergency exit for the flight crew of more than 1.83 metres (six feet) above the ground, shall have means to enable passengers and crew at each exit to reach the ground safely in an emergency.

(b) Notwithstanding, Such means need not be provided at over-wing exits if the designated place on the aeroplane structure at which the escape route terminates is less than 1.83 metres (six ft) from the ground, with the aeroplane on the ground, the landing gear extended and the flaps in the take-off or landing position, whichever flap position is higher from the ground.

(c) The heights mentioned in (a) shall be measured:

(1) after the collapse of, or failure to extend of, one or more legs of the landing gear, for aeroplanes type certificated after 31 March 2000; and

(2) when the aeroplane has its landing gear extended, for all other aeroplanes.

(d) Assisting means for emergency evacuation that deploy automatically shall be armed during all phases of flight, including taxiing.

OPS.GEN.475 Emergency lighting - Aeroplanes and Helicopters

AEROPLANES

(a) Aeroplanes with a maximum passenger seating configuration of more than nine shall be equipped with an emergency lighting system with an independent power supply to facilitate the evacuation of the aeroplane.

(b) For aeroplanes with a maximum passenger seating configuration of more than 19, the emergency lighting system shall include:

(1) sources of general cabin illumination;

(2) internal lighting in floor level emergency exit areas;

(3) illuminated emergency exit marking and locating signs;

(4) in the case of aeroplanes for which the application for the type certificate or equivalent document was filed before 1 May 1972, when flying by night, exterior emergency lighting at all over-wing exits and at exits where descent assist means are required;

(5) in the case of aeroplanes for which the application for the type certificate or equivalent document was filed after 30 April 1972, when flying by night, exterior emergency lighting at all passenger emergency exits; and

(6) in the case of aeroplanes for which the type certificate was first issued after 31 December 1957, floor proximity emergency escape path marking systems in the passenger compartments.

(c) For aeroplanes with a maximum passenger seating configuration of 19 or less and issued with a type certificate in accordance with the European Aviation Safety Agency's

(hereinafter referred to as the Agency) airworthiness codes, the emergency lighting system shall include (a)(2)(i), (a)(2)(ii) and (a)(2)(iii).

(d) For aeroplanes with a maximum passenger seating configuration of 19 or less and not issued with a type certificate in accordance with the applicable airworthiness codes, the emergency lighting system shall include (a)(2)(i).

HELICOPTERS

(e) Helicopters with a maximum passenger seating configuration of more than 19 shall be equipped with:

(1) an emergency lighting system having an independent power supply to provide a source of general cabin illumination to facilitate the evacuation of the helicopter; and

(2) illuminated emergency exit marking and locating signs.

(f) Helicopters operating over water in commercial air transport operations shall be equipped with emergency exit illumination.

OPS.GEN.480 Seat belts and harnesses

ALL AIRCRAFT EXCEPT BALLOONS

(a) All aircraft, excluding balloons, used in commercial operations and complex motor-powered aircraft shall be equipped with.

(1) a safety belt with shoulder harness incorporating a device which will automatically restrain the occupant's torso in the event of rapid deceleration on each flight crew seat; and

(2) a safety harness on the seats for the minimum required cabin crew of all aircraft with a maximum passenger seating configuration of more than 19, which were first issued with an individual certificate of airworthiness after 31 December 1980.

(b) Safety belts with shoulder harnesses shall have a single point release.

HELICOPTERS

(c) Helicopters used in commercial operations and complex motor-powered helicopters first issued with an individual certificate of airworthiness after 31 July 1999, shall be equipped with a safety belt with diagonal shoulder strap or safety harness for each passenger over the age of 24 months.

OPS.GEN.485.A Crash axes and crowbars - Aeroplanes

(a) Aeroplanes with a maximum certificated take-off mass exceeding 5 700 kg, or with a maximum passenger seating configuration of more than nine, shall be equipped with one crash axe or crowbar located on the flight deck.

(b) When the aeroplane has a maximum passenger seating configuration of more than 200, an additional crash axe or crowbar shall be carried and located in or near the most rearward galley area.

OPS.GEN.490 Flight data recorder - Aeroplanes and Helicopters

AEROPLANES

(a) Aeroplanes:

(1) with a maximum certificated take-off mass exceeding 5 700 kg and first issued with an individual certificate of airworthiness after 1 January 2005; and

(2) with a maximum certificated take-off mass exceeding 27 000 kg and first issued with an individual certificate of airworthiness after 31 December 1988,

shall be equipped with a Flight Data Recorder (FDR) which uses a digital method of recording and storing data and has a method of retrieving that data from the storage medium available.

(b) The FDR for aeroplanes shall be capable of retaining data recorded during at least the last 25 hours.

HELICOPTERS

(c) Helicopters:

(1) with a maximum certificated take-off mass exceeding 3 175 kg and first issued with an individual certificate of airworthiness after 1 January 2005;

(2) with a maximum certificated take-off mass exceeding 7 000 kg and first issued with an individual certificate of airworthiness after 1 August 1999 up to and including 31 December 2004; and

(3) with a maximum certificated take-off mass exceeding 7 000 kg and first issued with an individual certificate of airworthiness after 31 December 1988 up to and including 31 July 1999,

shall be equipped with an FDR which uses a digital method of recording and storing data and has a method of retrieving that data from the storage medium available.

(d) The FDR for helicopters shall be capable of retaining data recorded during at least:

(1) the last eight hours, for helicopters referred to in (c)(1) and (c)(2);

(2) the last five hours, for helicopters referred to in (c)(3); and

(3) the last 10 hours, for helicopters with a maximum certificated take-off mass exceeding 3 175 kg and first issued with an individual certificate of airworthiness after 31 December 2009.

AEROPLANES AND HELICOPTERS

(e) Data shall be obtained from aircraft sources which enable accurate correlation with information displayed to the flight crew.

(f) The FDR shall automatically start to record the data prior to the aircraft being capable of moving under its own power and shall stop automatically after the aircraft is incapable of moving under its own power.

(g) The FDR shall have a device to assist in locating it in water.

OPS.GEN.495 Cockpit voice recorder - Aeroplanes and Helicopters

AEROPLANES

(a) Aeroplanes with a maximum certificated take-off mass exceeding 27 000 kg and first issued with an individual certificate of airworthiness after 31 December 1986, shall be equipped with a Cockpit Voice Recorder (CVR).

(b) The CVR shall be capable of retaining data recorded during at least:

(1) the preceding two hours, for aeroplanes when the individual certificate of airworthiness has been issued after 1 January 2003; or

(2) the preceding 30 minutes, for all other aeroplanes.

HELICOPTERS

(c) Helicopters with a maximum certificated take-off mass exceeding 7 000 kg and first issued with an individual certificate of airworthiness after 31 December 1986, shall be equipped with a CVR.

(d) The CVR shall be capable of retaining data recorded during at least:

(1) the preceding one hour, for helicopters when first issued with an individual certificate of airworthiness after 31 July 1999; or

(2) the preceding 30 minutes, for all other helicopters.

AEROPLANES AND HELICOPTERS

(c) The CVR shall start to record automatically prior to the aircraft moving under its own power and shall continue to record until the termination of the flight when the aircraft is no longer capable of moving under its own power.

(d) The CVR shall have a device to assist in locating it in water.

OPS.GEN.500 Data link recording - Aeroplanes and Helicopters

(a) Aeroplanes and helicopters first issued with an individual certificate of airworthiness on or after 8 April 2012, which have the capability to operate data link communications and are required to be equipped with a cockpit voice recorder, shall be equipped with a means of recording the following, where applicable:

(1) Data link communication messages related to air traffic services communications to and from the aircraft;

(2) Information that enables correlation to any associated records related to data link communications and stored separately from the aircraft;

(3) Information on the time and priority of data link communications messages, taking into account the system's architecture.

(b) The recorder shall use a digital method of recording and storing data and information and a method for retrieving that data. The recording method shall be such as to allow the data to match the data recorded on the ground.

(c) The recorder shall be capable of retaining data recorded during at least the preceding two hours of operation.

(d) The recorder shall have a device to assist in locating it in water.

(e) The recorder shall start to record automatically prior to the aeroplane or helicopter moving under its own power and shall continue to record until the termination of the flight when the aeroplane or helicopter is no longer capable of moving under its own power.

OPS.GEN.505 Preservation of FDR and CVR recordings - Aeroplanes and Helicopters

(a) The pilot-in-command shall be responsible for ensuring that during flight, Flight Data Recorders (FDRs) and Cockpit Voice Recorders (CVRs) are not:

(1) disabled;

(2) switched off; or

(3) intentionally erased in the event of an accident or an incident which is subject to mandatory reporting.

(b) In order to preserve the data recorded for investigating an accident or incident which is subject to mandatory reporting:

(1) the CVR may be switched off during flight by the pilot-in-command, if he/she believes that the recorded data would otherwise be erased automatically;

(2) recorders shall be de-activated upon completion of a flight; and

(3) the recorders shall not be re-activated without the investigating authority's agreement.

(c) The operator shall preserve the original recorded data referred to in (b) for a period of 60 days, unless otherwise directed by the investigating authority.

(d) Operational checks and evaluations of recordings from the FDR and CVR systems shall be conducted to ensure the continued serviceability of the recorders.

(e) The operator shall make available any flight recorder recording that has been preserved, if so determined by the competent authority.

OPS.GEN.510 Use of FDR and CVR recordings - Aeroplanes and Helicopters

Without prejudice to national criminal law:

(a) Cockpit Voice Recorder (CVR) recordings shall not be used for purposes other than for the investigation of an accident or incident which is subject to mandatory reporting, except with the consent of all crew members concerned; and

(b) Flight Data Recorder (FDR) recordings shall not be used for purposes other than for the investigation of an accident or incident which is subject to mandatory reporting, except when such records are:

(1) used by the operator for airworthiness or maintenance purposes only;

(2) de-identified; or

(3) disclosed under secure procedures.

OPS.GEN.515 Microphones - Aeroplanes and Helicopters

AEROPLANES

(a) Flight crew members on flight deck duty of complex motor-powered aeroplanes and aeroplanes used in commercial operations shall communicate through boom or throat microphones, when flying below the transition level/altitude.

HELICOPTERS

(b) Flight crew members on flight deck duty of complex motor-powered helicopters and helicopters used in commercial operations shall wear a headset with boom microphone or equivalent and use it as the primary device for all communications.

OPS.GEN.520 Flight crew interphone system

(a) Aircraft operated by more than one flight crew member shall be equipped with a flight crew interphone system, including headsets and microphones for use by all flight crew members.

(b) When a radio communication system is required, and in addition to (a), the aircraft shall be equipped with a transmit button on the flight controls at each pilot's station.

OPS.GEN.525 Communication equipment

(a) Aircraft operated under Visual Flight Rules (VFR) as a controlled flight, under Instrument Flight Rules (IFR) or at night shall be provided with radio communication equipment. Such equipment shall be capable of conducting two-way communication

with those aeronautical stations and on those frequencies prescribed by the appropriate authority.

(b) The radio communication equipment required in (a) shall provide for communication on the aeronautical emergency frequency.

OPS.GEN.530 Pressure-altitude-reporting transponder

Aircraft shall be equipped with a pressure-altitude-reporting Secondary Surveillance Radar (SSR) transponder when required by the airspace requirements.

OPS.GEN.535 Navigation equipment

(a) An aircraft shall be provided with navigation equipment which will enable it to proceed in accordance with:

(1) the flight plan; and

(2) the applicable airspace requirements.

(b) The number of navigation equipments shall be such that in the event of failure of one item of equipment during the flight, the remaining equipment will enable the aircraft to comply with (a).

(c) In Instrument Flight Rules (IFR) flights, an aircraft shall be provided with navigation equipment that provides guidance to a point from which a visual landing can be performed. This equipment shall be capable of providing guidance for each aerodrome at which it is intended to land in IFR and for any designated alternate aerodromes.

OPS.GEN.540.A Electronic navigation data management - Complex motor-powered aeroplanes

(a) An operator shall only use electronic navigation data products which support a navigation application that meets standards of integrity which are adequate for the intended use of the data.

(b) When the electronic navigation data products support a navigation application needed for an operation requiring a specific approval as per OPS.SPA, the operator shall demonstrate to the competent authority that the process applied and the delivered products meet standards of integrity which are adequate for the intended use of the data.

(c) An operator shall continuously monitor both the process and the products.

(d) An operator shall ensure the timely distribution and insertion of current and unaltered electronic navigation data to all aircraft that require it.

OPS.GEN.545 Cabin Crew Seats

Each seat for the minimum required cabin crew member shall be forward or rearward facing within 15° of the longitudinal axis of the aircraft.

OPS.GEN.550 Minimum equipment for flight

(a) A flight of a complex motor-powered aircraft or an aircraft involved in commercial operations shall not be commenced when any of the aircraft instruments, items of equipment or functions are inoperative, except if:

(1) such the aircraft instrument, item of equipment or function is part of the operator minimum equipment list (MEL); or

(2) the aircraft has been subject to a permit to fly issued by the competent authority or organisations approved in accordance with Part-21; or

(3) the aircraft instrument, item of equipment or function is not required for the safe operation of the aircraft.

(b) The MEL shall not deviate from Airworthiness Directives or Safety Directives issued or adopted by the Agency when these Directives exclude the MEL alleviation.

(c) Any instrument or item of equipment that has been installed in an aircraft and becomes inoperative shall not be removed thereof, unless:

(1) it is replaced by an operative instrument or equipment; or

(2) it is specifically permitted by the MEL; or

(3) the aircraft has been subject to a permit to fly issued by the competent authority or approved organisations.

Section V - Manuals, Logs and Records

OPS.GEN.600 Documents and information to be carried on all aircraft

(a) On any aircraft, the following documents shall be carried on each flight:

(1) the Aircraft Flight Manual or equivalent documents;

(2) the Certificate of Airworthiness;

(3) the Certificate of Registration;

(4) the original or copy of the Noise Certificate, if applicable;

(5) the original or copy of the third party liability Insurance Certificate;

(6) the journey log book for the aircraft;

(7) current and suitable aeronautical charts for the route of the proposed flight and all routes along which it is reasonable to expect that the flight may be diverted;

(8) procedures and visual signals for use by intercepting and intercepted aircraft which shall be easily accessible to the flight crew; and

(9) any other documentation which may be pertinent to the flight or is required by the States concerned with the flight.

(b) On non-commercial flights with sailplanes, other than complex motor-powered aeroplanes and helicopters taking off and landing at the same aerodrome/operating site and remaining within 50 nautical miles (nm) of that aerodrome/operating site, the documents and information referred to in OPS.GEN.600(a)(1) - (6) may be retained at the aerodrome/operating site.

(c) On non-commercial flights with balloons, the documents referred to in OPS.GEN.600(a)(1) - (6) may be carried in the retrieve vehicle.

OPS.GEN.605 Documents and information to be carried on non-commercial flights with complex motor-powered aircraft and aircraft used in commercial operations

(a) In addition to OPS.GEN.600(a), on flights with complex motor-powered aircraft used in non-commercial operations and aircraft used in commercial operations, the following documents and information shall be carried on each flight:

(1) the Aircraft Radio Licence;

(2) the Aircraft Technical Log in accordance with Part-M;

(3) details of the filed Air Traffic Service (ATS) flight plan, if applicable;

(4) information concerning search and rescue services for the area of the intended flight;

(5) a certified true copy of the operator certificate if the aircraft is used in commercial operations and a copy of the declaration if the aircraft is used in non-commercial operations;

(6) portions of the operations manual relevant to the duties of the crew;

(7) the Minimum Equipment List (MEL) or equivalent document; and

(8) the following operational flight information:

(i) the operational flight plan, if applicable;

(ii) appropriate notice to airmen (NOTAM)/aeronautical information service (AIS) briefing documentation;

(iii) appropriate meteorological information;

(iv) notification of special categories of passenger and special loads including dangerous goods, if applicable; and

(v) mass and balance documentation; if applicable.

(b) Notwithstanding paragraphs OPS.GEN.600(a) and OPS.GEN.605(a),

(1) on commercial flights other than commercial air transport remaining within 50 nm of the aerodrome/operating site of departure and returning to the aerodrome/operating site of departure on the same day;

(2) on commercial flights with sailplanes taking off and landing at the same aerodrome/operating site and remaining within 50 nm of that aerodrome/operating site; or

(3) on commercial air transport flights by day and over routes navigated by reference to visual landmarks, with:

(i) other than complex motor-powered aeroplanes taking off and landing at the same aerodrome/operating site; or

(ii) other than complex motor-powered helicopters and helicopters having a maximum passenger seating configuration of 9 or less engaged in flight operations conducted within a local area specified in the operations manual;

the documents and information referred to in paragraphs OPS.GEN.600(a)(1) - (6) and OPS.GEN.605(a)(1), (5) and (8)(ii)-(iii) may be retained at the aerodrome/operating site.

(c) On commercial flights with balloons, the documents referred to in paragraph OPS.GEN.600(a)(1) - (6) and OPS.GEN.605(a)(1), (5) and (8)(ii)-(iii) may be carried in the retrieve vehicle.

OPS.GEN.610 Journey log book

Particulars of the aircraft, its crew and each journey shall be retained for each flight or series of flights in the form of a journey log book.

OPS.GEN.615 Production of documentation and records

The pilot-in command shall make available within a reasonable time of being requested to do so by the competent authority, the documentation required to be carried on board.

Section VI – Security

OPS.GEN.700 Disruptive Passenger Behaviour

When deemed necessary, the pilot-in-command shall take appropriate measures to reduce the risk to flight safety emanating from potentially disruptive passengers hindering crew members from performing their duties or not complying with crew member instructions.

OPS.GEN.705 Reporting acts of unlawful interference

Following an act of unlawful interference on board an aircraft, the pilot-in-command or, if unable, the operator shall submit, without delay, a report to the competent authority in the State of the operator in compliance with its national civil aviation security programme, and shall inform the designated local authority.

Subpart B - Commercial Air Transport

Section I - General Requirements

OPS.CAT.001 Scope

This subpart establishes additional and specific requirements to be met by an operator undertaking commercial air transport operations, to ensure compliance with Annex IV to Regulation (EC) No 216/2008 (Essential requirements for air operations)

OPS.CAT.040 Carriage of sporting weapons and ammunition

Sporting weapons and ammunition carried in an aircraft shall be:

(a) inaccessible to passengers during flight, or if the aircraft does not have a separate compartment in which weapons can be stowed, appropriate procedures shall be applied to ensure that they are not immediately accessible to the passengers; and

(b) in the case of firearms or other weapons that can contain ammunition, unloaded.

OPS.CAT.045 Carriage of weapons of war and munitions of war

(a) In the case of carriage of weapons of war and munitions of war, prior approval for the method and conditions for transport by the States of the operator, of departure, arrival, transit and overflight is required.

(b) The pilot in command shall be notified in writing by the operator before the flight of the type and location of weapons of war or munitions of war to be carried. The notification shall be carried on the flight.

OPS.CAT.050 Information on emergency and survival equipment carried

The operator shall have available for immediate communication to rescue coordination centres information on emergency and survival equipment carried on board the aircraft.

Section II - Operational procedures

OPS.CAT.110 Carriage of special categories of passengers

(a) Special categories of passengers, requiring special conditions, assistance or devices when carried on a flight, shall only be carried under conditions that ensure the safety of the aircraft and its occupants.

(b) The pilot-in-command shall be notified when any persons referred to in (a) are planned to be carried on board.

OPS.CAT.111 Persons under the influence of alcohol or drugs

Persons under the influence of alcohol or drugs to such an extent that they may endanger the safety of the aircraft or its occupants shall not be allowed on the aircraft.

OPS.CAT.115 Passenger briefing

Passengers of motor-powered aircraft shall be provided with a safety briefing card on which pictorial instructions indicate the operation of emergency equipment and exits likely to be used by passengers in the case of an emergency.

OPS.CAT.116 Embarking and disembarking of passengers

(a) Embarking and disembarking of passengers shall be done under the responsibility of a person designated by the operator.

(b) In the case of balloons, embarking and disembarking shall not be undertaken during the inflation or the deflation of the balloon.

OPS.CAT.120 Stowage of baggage and cargo

(a) Only hand baggage and cargo that can be adequately and securely stowed shall be taken into the passenger compartment.

(b) All baggage and cargo on board, which might cause injury or damage, or obstruct aisles and exits if displaced, shall be stowed so as to prevent its movement.

OPS.CAT.130 Smoking on board

The non-smoking areas shall include the aisles and toilets.

OPS.CAT.150.H Operating minima - Helicopter Airborne Radar Approaches (ARAs) for overwater operations

(a) An ARA shall only be undertaken provided:

(1) the radar provides course guidance to ensure obstacle clearance; and

(2)

(i) the Minimum Descent Height (MDH) is determined from a radio altimeter; or

(ii) the Minimum Descent Altitude (MDA) plus an adequate margin is applied.

(b) ARA to moving rigs or vessels shall only be conducted in multi-crew operations.

(c) The decision range shall provide adequate obstacle clearance in the missed approach from any destination for which the ARA is planned.

(d) An approach shall only be continued beyond decision range or below MDH/A when visual reference with the destination has been established.

(e) For single pilot operations, appropriate increments shall be added to the MDH/A and decision range.

OPS.CAT.155.A Selection of alternate aerodromes - Aeroplanes

(a) Notwithstanding OPS.GEN.155, for a flight to be conducted in accordance with Instrument Flight Rules (IFR), at least one destination alternate aerodrome shall be selected and specified in any flight plan, unless:

(1) the destination aerodrome is isolated; or

(2) the flying time to the destination does not exceed six hours; and

(3) two separate runways are usable at the destination aerodrome and available current meteorological information indicates that the following meteorological conditions will exist from one hour before to one hour after the estimated time of arrival are such that:

(i) the ceiling is at least 2 000 ft or circling height plus 500 ft, whichever is higher; and

(ii) the visibility is at least 5 km.

(b) Two destination alternate aerodromes or one destination alternate aerodrome and one 3% en-route alternate aerodrome shall be specified when:

(1) available current meteorological information for the destination indicates that the meteorological conditions from one hour before to one hour after the estimated time of arrival will be below the applicable planning minima; or

(2) meteorological information is not available.

(c) Except in the case of an isolated destination aerodrome, or in the case of (b) above, the available current meteorological information for a destination aerodrome shall indicate that during a period commencing one hour before and ending one hour after the estimated time of arrival, the weather conditions will be at or above the applicable landing minima as specified in accordance with OPS.GEN.150.

(d) A destination alternate aerodrome, an isolated aerodrome, a 3% en-route alternate aerodrome or an en-route alternate aerodrome required at the planning stage shall only be selected when the available current meteorological information indicates that during a period commencing one hour before and ending one hour after the estimated time of arrival, the weather conditions will be at or above the applicable landing minima in Table 1A of OPS.CAT.155.A.

Table 1A of OPS.CAT.155.A Planning minima - Aeroplanes

Type of approach	Planning minima
CAT II and III	CAT I*
CAT I	Non-precision*and**
Non-precision	Non-precision ceiling + 200 ft Non-precision visibility + 1 000 m *and**
Circling	Circling

* Runway Visual Range (RVR)

** The ceiling must be at or above the Minimum Descent Height (MDH)

OPS.CAT.155.H Selection of alternate aerodromes - Helicopters

(a) Notwithstanding OPS.GEN.155, for a flight under Instrument Meteorological Conditions (IMC) or when flying Visual Flight Rules (VFR) and navigating by means other than by reference to visual landmarks, at least one destination alternate shall be selected and specified in any flight plan, unless:

(1) the destination is a coastal aerodrome;

(2) for a flight to any other onshore destination, the duration of the flight and the prevailing meteorological conditions at the estimated time of arrival at the intended destination, allow an approach and landing to be made under visual meteorological conditions; or

(3) the destination aerodrome is isolated and no alternate is available, in which case a Point of No Return (PNR) shall be determined.

(b) Two destination alternates shall be specified when:

(1) available current meteorological information for the destination indicates that the meteorological conditions from one hour before to one hour after the estimated time of arrival, will be below the applicable planning minima; or

(2) meteorological information is not available for the destination.

(c) Suitable offshore alternates may be selected and specified subject to the following:

(1) The offshore alternate shall only be used after passing a PNR. Prior to a PNR, onshore alternates shall be used;

(2) One-engine-inoperative performance capability shall be attainable prior to arrival at the alternate;

(3) Deck availability shall be guaranteed. The dimensions, configuration and obstacle clearance of individual aerodromes or operating sites shall be assessed, in order to establish operational suitability for use as an alternate by each helicopter type proposed to be used;

(4) Weather minima shall be established, taking reliability and accuracy of meteorological information into account;

(5) Appropriate requirements for this type of operation shall be reflected in the Minimum Equipment List (MEL).

(d) A destination or destination alternate aerodrome required at the planning stage shall only be selected when the available current meteorological information indicates that during a period commencing one hour before and ending one hour after the estimated time of arrival, the weather conditions will be at or above the applicable landing minima in Table 1H of OPS.CAT.155.H.

Table 1H of OPS.CAT.155.H Planning minima destination alternates - Helicopters

Type of approach	Planning minima
CAT II and III	CAT I*
CAT I	Ceiling + 200 ft Visibility + 400 m
Non-precision	Non-precision ceiling + 200 ft Non-precision visibility + 400 m *and**

* Runway Visual Range (RVR)

** The ceiling must be at or above the Minimum Descent Height (MDH)

OPS.CAT.156.A Selection of take-off alternate aerodromes - Aeroplanes

(a) A take-off alternate aerodrome shall be selected and specified in the operational flight plan, if:

(1) at the aerodrome of departure the weather conditions are at or below the applicable aerodrome operating minima; or

(2) it would not be possible to return to the aerodrome of departure due to meteorological or performance reasons.

(b) The take-off alternate aerodrome shall be located within the following distances from the aerodrome of departure:

(1) For aeroplanes having two engines:

(i) one hour flight time at One-Engine-Inoperative (OEI) cruise speed; or

(ii) the Extended Range Twin-Engine Operations (ETOPS) diversion time, subject to any Minimum Equipment List (MEL) restrictions, up to a maximum of two hours at the OEI cruise speed.

(2) For aeroplanes having three or more engines, two hours flight time at OEI cruise speed.

(c) The available current meteorological information for a take-off alternate aerodrome shall indicate that during a period commencing one hour before and ending one hour after the estimated time of arrival, the weather conditions will be at or above the applicable landing minima. The following criteria shall be taken into account:

(1) The ceiling, when the only approaches available are non-precision or circling approaches;

(2) Any limitation related to OEI operations.

OPS.CAT.156.H Selection of take-off alternate aerodromes - Helicopters

(a) For a flight under Instrument Meteorological Conditions (IMC), a take-off alternate within one hour flight time at normal cruise speed shall be selected and specified in the operational flight plan if it would not be possible to return to the aerodrome of departure due to meteorological reasons.

(b) The available current meteorological information for a take-off alternate shall indicate that during a period commencing one hour before and ending one hour after the estimated time of arrival, the weather conditions will be at or above the applicable landing minima. The following criteria shall be taken into account:

(1) The ceiling, when the only approaches available are non-precision or circling approaches;

(2) Any limitation related to one-engine-inoperative operations.

OPS.CAT.170 Minimum terrain clearance altitudes

(a) An operator shall specify minimum flight altitudes for all route segments to be flown, which provide the required terrain clearance, taking into account the performance of the aircraft.

(b) An operator of complex motor-powered aircraft shall use a method specified in its operations manual.

(c) Those specified minimum flight altitudes shall not be less than those established by the State overflown.

OPS.CAT.180 Routes and areas of operation

When single-engine aircraft are used, surfaces which permit a safe forced landing to be executed shall be available along the route, except for helicopters when holding an approval in accordance with Part OPS.SPA.001.SFL.

OPS.CAT.185.H Meteorological conditions - Helicopters

A flight to a helideck or elevated Final Approach and Take-Off Area (FATO) shall not be operated when, according to available information, the mean wind speed at the helideck or elevated aerodrome is 60 knots or more.

OPS.CAT.205 Fuel and oil supply

(a) Fuel and oil supply calculations shall at least be based upon the following operating conditions under which the flight is to be conducted:

(1) realistic aircraft fuel consumption data;

(2) anticipated masses;

(3) expected meteorological conditions; and

(4) air navigation services provider(s) procedures and restrictions.

AEROPLANES

(b) Notwithstanding OPS.GEN.205, fuel calculations shall be based upon the following:

(1) taxi fuel expected to be used prior to take-off;

(2) trip fuel to fly to the planned destination;

(3) alternate fuel, if a destination alternate is required, which shall include:

(i) fuel for a missed approach at the destination aerodrome; and

(ii) fuel for flying and landing at the destination alternate aerodrome, or if 2 destination alternates are required fuel to fly to and land at the alternate, which requires the greater amount of alternate fuel; and

(4) final reserve fuel:

(i) for aeroplanes with reciprocating engines to fly for 45 minutes;

(ii) for aeroplanes with turbine engines to fly for 30 minutes at holding speed at 450 m (1 500 ft) above aerodrome elevation in standard conditions, calculated with the estimated mass on arrival at the destination alternate aerodrome or the destination aerodrome, when no destination alternate aerodrome is required; or

(iii) in the case of an isolated aerodrome:

(A) for aeroplanes with reciprocating engines, fuel to fly for 45 minutes plus 15 % of the flight time planned to be spent at cruising level or two hours, whichever is less; or

(B) for aeroplanes with turbine engines, fuel to fly for two hours at normal cruise consumption above the destination aerodrome, including final reserve fuel;

(5) fuel to provide for contingencies; and

(6) extra fuel if requested by the pilot-in-command.

HELICOPTERS

(c) Notwithstanding OPS.GEN.205, fuel calculations shall be based upon the following:

(1) taxi fuel expected to be used prior to take-off;

(2) trip fuel to fly to the planned destination;

(3) alternate fuel, if a destination alternate is required, which shall include:

(i) fuel for a missed approach at the destination aerodrome; and

(ii) fuel for flying and landing at the destination alternate aerodrome; and

(iii) for offshore operations 10% of (i) and (ii) above;

(4) final reserve fuel:

(i) for VFR operations with reference to visual landmarks, 20 minutes ar best range speed;

(ii) for IFR or when flying VFR and navigating by means other than by reference to visual land marks or at night, fuel to fly for 30 minutes at holding speed at 450 m (1 500 ft) above the destination aerodrome in standard conditions, calculated with the estimated mass on arrival above the alternate aerodrome or the destination, when no alternate is required; or

(iii) in the case of an isolated aerodrome fuel to fly for two hours at holding speed;

(5) fuel to provide for contingencies; and

(6) extra fuel if requested by the pilot-in-command.

OPS.CAT.210 Refuelling/defuelling with wide cut fuels

An aircraft shall not be refuelled or defuelled with AVGAS or wide-cut type of fuel when passengers are embarking, on board or disembarking.

OPS.CAT.215 In-flight fuel checks

(a) The amount of usable fuel remaining at any time during flight shall not be less than the fuel required to proceed to an aerodrome/operating site where a safe landing can be made, with final reserve fuel remaining.

(b) The pilot-in-command shall declare an emergency when calculated usable fuel on landing, at the nearest adequate aerodrome/operating site where a safe landing can be performed, is less than final reserve fuel.

OPS.CAT.225.A Maximum distance from an adequate aerodrome for two-engined aeroplanes

(a) Two-engined aeroplanes shall not be operated over a route that contains a point further from an adequate aerodrome than:

(1) for turbo-propeller or jet-powered aeroplanes:

(i) the distance flown in 60 minutes at the One-Engine-Inoperative (OEI) cruise speed, for aeroplanes:

(A) with a Maximum Passenger Seating Configuration (MPSC) of more than 19; or

(B) a maximum take-off mass of 45 360 kg or more;

(ii) the distance flown in 120 minutes at the OEI cruise speed, for aeroplanes:

(A) with a MPSC of 19 seats or less; or

(B) a maximum take-off mass less than 45 360 kg.

For jet aeroplanes, the competent authority may extend the distance referred to above by a maximum of 60 minutes, provided this extension is within the performance limits of the aeroplane and the operator has experience to ensure the safety of the operation; and

(2) for other aeroplanes, the distance flown in 120 minutes at the OEI cruise speed, or 300 nautical miles, whichever is less.

(b) The OEI cruise speed shall be determined for each aeroplane type or variant operated, based on the true air speed that the aeroplane can maintain with OEI. The OEI cruise speed shall not exceed the Maximum Operating Speed (V_{MO}).

(c) Notwithstanding the provision of (a), a two-engined aeroplane may be operated beyond the maximum distance from an adequate aerodrome, provided:

(1) the aeroplane and its powerplant are certificated for the intended operation;

(2) the implementation of a set of conditions to ensure that the aeroplane and its powerplant are maintained to meet the necessary reliability criteria;

(3) the flight crew and all other operations personnel involved are trained and suitably qualified to conduct the intended operation; and

(4) the maximum diversion time is stipulated in the operations specification to the Air Operator's Certificate (AOC).

(d) For an extended range operation with a two-engined aeroplane, flight shall only be initiated if an adequate Extended Range Twin-Engine Operations (ETOPS) en-route alternate aerodrome is available, within either the maximum diversion time or a diversion time based on the application of the Minimum Equipment List (MEL), whichever is shorter.

OPS.CAT.230.A Pushback and towing - Aeroplanes

Pushback and towing shall be carried out in accordance with appropriate aviation standards and procedures.

OPS.CAT.235 Air Traffic Services - Motor-powered aircraft

(a) Air Traffic Services (ATS) shall be used for all flights whenever available.

(b) Notwithstanding (a), for operations with:

(1) helicopters having a maximum passenger seating configuration of 9 or less engaged in flight operations conducted within a local area specified in the operations manual; or

(2) other than complex motor-powered aircraft,

by day and over routes navigated by reference to visual landmarks, ATS shall be used when required by the applicable airspace requirements.

(c) A flight shall not be commenced unless a flight plan has been submitted to ATS, or adequate information has been deposited in order to permit alerting services to be activated if required.

(d) Notwithstanding (c), when operating from a site where it is impossible to submit a flight plan to ATS, it shall be transmitted as soon as possible after take-off by the pilot-in-command.

OPS.CAT.240.A Threshold crossing height - Aeroplanes

When conducting precision approaches, an aeroplane shall cross the threshold of the runway by a safe margin and in a landing configuration and attitude.

Section III – Aircraft Performance and operating limitations

OPS.CAT.316.A Performance General - Aeroplanes

(a) An operator shall:

(1) operate the aeroplane in accordance with the performance class as defined in the approved Operations Manual;

(2) use the performance data in the Aeroplane Flight Manual (AFM) and complement it, as necessary;

(3) take into account the aeroplane configuration, environmental conditions and the operation of systems which have an adverse effect on performance; and

(4) ensure that the mass of the aeroplane at any phase of the flight is not greater than permitted for the flight to be undertaken.

(b) Single propeller-driven aeroplanes. An operator of an aeroplane powered by one propeller shall not operate that aeroplane:

(1) at night; or

(2) in instrument meteorological conditions except under Special Visual Flight Rules.

(c) Two propeller-driven aeroplanes. Two propeller-driven aeroplanes which do not meet the applicable climb criteria shall be treated as single propeller-driven aeroplanes and shall comply with (b).

OPS.CAT.326.A Take-off requirements -Aeroplanes

The take-off distance shall not exceed the take-off distance available.

OPS.CAT.327.A Take-off obstacle clearance - Aeroplanes

The take-off flight path shall be cleared of all obstacles by lateral distance and horizontal or vertical distances depending on the aeroplane size and type of engines.

OPS.CAT.340.A En-Route requirements - Aeroplanes

(a) Single-engined aeroplanes. In the event of an engine failure, single-engined aeroplanes shall be capable of reaching a place at which a safe forced landing can be made.

(b) Multi-engined aeroplanes with all engines operative.

(1) propeller-driven aeroplanes with a maximum take-off mass of 5 700 kg or less and a maximum passenger seating configuration (MPSC) of 9 or less; and

(2) aeroplanes powered by reciprocating engines with a maximum take-off mass exceeding 5 700 kg or a maximum passenger seating configuration of more than 9

shall at any point on the route or on any planned diversion therefrom, be capable of a rate of climb of at least 300 ft per minute with all engines operating within the maximum continuous power conditions specified:

(i) at the minimum altitudes for a safe flight on each stage of the route to be flown; and

(ii) at the minimum altitudes necessary for compliance with the conditions prescribed in (c) and (d), as appropriate.

(c) One engine inoperative. Multi-engined aeroplanes shall, in the event of one engine becoming inoperative at any point on the route or on any planned diversion there from, be capable of continuing the flight to an altitude above an aerodrome where a landing can be made in accordance with OPS.CAT.345.A. This shall be met with the other engine or engines operating within the maximum continuous power conditions specified.

(d) Three or more engines aeroplanes, two engines inoperative.

(1) An aeroplane with three or more engines shall, at no point along the intended track, be more than 90 minutes away from an aerodrome at which the performance requirements applicable at the expected landing mass can be met. This shall be met at the all-engines long range cruising speed at standard temperature in still air.

(2) Notwithstanding (d)(1), the 90 minutes criteria may be exceeded, if, in the case of two engines inoperative en-route, the flight path with two engines inoperative permits the aeroplane to continue the flight to an aerodrome at which the performance requirements applicable at the expected landing mass are met. In this case, the diversion shall start from the point where two engines are assumed to fail simultaneously, to an aerodrome at which the performance requirements applicable at the expected landing mass are met.

OPS.CAT.345.A Landing requirements - Aeroplanes

LANDING DISTANCE

(a) When the weather information available to the pilot-in-command indicates that the runway at the estimated time of arrival may be:

(1) dry, the landing mass of the aeroplane shall allow a full stop landing from 50 ft above the threshold within a safe margin of the landing distance available at the destination aerodrome and at any alternate aerodrome which is appropriate to the performance class of the aeroplane; and

(2) wet or contaminated, the landing distance available in (a)(1) shall be:

(i) calculated in accordance with any data provided in the AFM for wet and contaminated runways; or

(ii) multiplied by a factor of 1.15, in the case that no data is provided in the AFM.

STEEP APPROACH

(b) The operator may apply Steep Approach procedures for the operation of turbojet-engined or propeller-driven aeroplanes using glide slope angles of 4.5° or more and with screen heights of less than 50 ft but not less than 35 ft, provided applicable criteria are met.

SHORT LANDING OPERATIONS

(c) The operator may use short landing operations for the operation of turbojet-engined or propeller-driven aeroplanes provided that suitable criteria are met.

OPS.CAT.355.H Performance applicability - Helicopters

(a) Except as specified in (a)(3) below, helicopters shall be operated in performance class 1 when:

(1) operating to/from an aerodrome/operating site located in a congested hostile environment; or

(2) having a maximum passenger seating configuration (MPSC) of more than 19.

(3) operations to a HEMS Operating Site or a Public Interest Site in a congested hostile environment; or operations to/from a helideck conducted with a helicopter having a MPSC of more than 19, may be operated in performance class 2.

(b) Helicopters shall be operated in performance class 1 or 2 when having a MPSC of 19 or less and more than 9.

(c) Helicopters shall be operated in performance class 1, 2 or 3 when having a MPSC of 9 or less.

(d) Helicopters operated in:

(1) performance class 1 or 2 shall be certificated in Category A; and

(2) performance class 3 shall be certificated in either Category A or B.

(e) Helicopters operated in performance class 2 or 3 may be operated without an assured safe forced landing capability during the landing and take-off phase under the conditions contained in OPS.SPA.SFL.

OPS.CAT.360.H Performance General - Helicopters

(a) A helicopter shall be operated in such a way that the mass:

(1) at the start of the take-off;

or, in the event of in-flight re-planning

(2) at the point from which the revised operational flight plan applies,

is not greater than the mass at which the requirements of the appropriate performance class can be complied with for the flight to be undertaken, allowing for expected reductions in mass as the flight proceeds, including any fuel jettisoning as appropriate.

(b) When showing compliance with the requirements of the appropriate performance class, due account shall be taken of the following parameters:

(1) mass of the helicopter;

(2) helicopter configuration;

(3) environmental conditions, in particular:

(i) pressure-altitude and temperature;

(ii) wind;

(4) operating techniques; and

(5) operation of any system which has an adverse effect on the performance.

OPS.CAT.365.H Obstacle accountability - Helicopters

(a) For the purpose of obstacle clearance requirements, an obstacle, including the surface of the earth, whether land or sea, located beyond the Final Approach and Take-off Area (FATO), in the take-off flight path or the missed approach flight path, shall be considered if its lateral distance from the nearest point on the surface below the intended flight path is not further than:

(1) For VFR operations:

(i) half of the minimum FATO (or the equivalent term used in the Flight Manual) width defined in the Helicopter Flight Manual (or, when no width is defined 0.75 D), plus 0.25 times D (or 3 m, whichever is greater), plus:

0.10 DR for VFR day operations; and

0.15 DR for VFR night operations.

(2) For IFR operations:

(i) 1.5 D (or 30 m, whichever is greater), plus:

0.10 DR for IFR operations with accurate course guidance; or

0.15 DR for IFR operations with standard course guidance; or

0.30 DR for IFR operations without course guidance.

(ii) when considering the missed approach flight path, the divergence of the obstacle accountability area only applies after the end of the take-off distance available;

(3) For operations with initial take-off conducted visually and converted to IFR/IMC at a transition point, the criteria required in (a)(1) apply up to the transition point then the criteria required in (a)(2) apply after the transition point. The transition point cannot be located before the end of TODRH for helicopters operating in performance class 1 and before the DPATO for helicopters operating in performance class 2.

(b) For take-off using a backup (or a lateral transition) procedure; for the purpose of obstacle clearance requirements, an obstacle, including the surface of the earth, whether land or sea, located in the back-up (or lateral transition) area, shall be considered if its lateral distance from the nearest point on the surface below the intended flight path is not further than:

(1) half of the minimum FATO (or the equivalent term used in the Flight Manual) width defined in the Helicopter Flight Manual (or, when no width is defined 0.75 D), plus 0.25 times D (or 3 m, whichever is greater), plus 0.10 for VFR day, or 0.15 for VFR night, of the distance travelled from the back of the FATO.

(c) Obstacles, including the surface of the earth, whether land or sea, may be disregarded if they are situated beyond:

(1) 7 R for day operations if it is assured that navigational accuracy can be achieved by reference to suitable visual cues during the climb;

(2) 10 R for night operations if it is assured that navigational accuracy can be achieved by reference to suitable visual cues during the climb;

(3) 300 m if navigational accuracy can be achieved by appropriate navigation aids; or

(4) 900 m in the other cases.

OPS.CAT.370.H Flight hours reporting - Helicopters

An operator shall make available to the competent authority the hours flown for each helicopter operated during the previous calendar year.

Section IV - Instruments, data and equipment

OPS.CAT.405 Hand fire extinguishers – Motor powered aircraft

(a) Hand fire extinguishers shall be evenly distributed in the passenger compartments, in accordance with Table 1 OPS.CAT.405.

Table 1 OPS.CAT.405

Maximum passenger seating configuration	Number of extinguishers
7 to 30	1
31 to 60	2
61 to 200	3
201 to 300	4
301 to 400	5
401 to 500	6
501 to 600	7
601 or more	8

(b) One hand fire extinguisher shall be located in or near each galley not located on the main passenger deck.

(c) At least one hand fire extinguisher shall be available for use in each cargo or baggage compartment accessible to crew members in flight.

OPS.CAT.406.A Safety harness - Aeroplanes

Aeroplanes with a maximum certificated take-off mass of less than 5 700 kg and with a maximum passenger seating configuration of less than 9 shall be fitted with a safety harness for each passenger seat.

OPS.CAT.407.A Number of spare electrical fuses - Aeroplanes

For those electrical fuses intended to be replaceable during flight, the number of spare fuses that are required to be carried, shall be the highest of:

(a) 10% of the number of fuses of each rating;

(b) three fuses for each rating; or

(c) the percentage of fuses required by the applicable airworthiness code.

OPS.CAT.410 Flight instruments and equipment for VFR flights – Motor powered aircraft

AEROPLANES AND HELICOPTERS

(a) In addition to OPS.GEN.410(a), aeroplanes and helicopters operating under Visual Flight Rules (VFR) shall be equipped with:

(1) a means of measuring and displaying:

(i) outside air temperature;

(ii) vertical speed;

(iii) turn and slip in the case of aeroplanes, and slip in the case of helicopters;

(iv) when power is not being adequately supplied to the required flight instruments; and

(v) in the case of aeroplanes with speed limitations expressed in terms of Mach number, a means of indicating Mach number.

(2) an anti-collision light system; and

(3) in the case of aeroplanes:

(i) lighting supplied from the aeroplane's electrical system to provide adequate illumination for all instruments and equipment essential to the safe operation of the aeroplane;

(ii) lighting supplied from the aeroplane's electrical system to provide illumination in all passenger compartments; and

(iii) an electric torch for each crew member station.

(b) Helicopters with a maximum certificated take-off mass exceeding 3175 kg or operating over water out of sight of land, or when the visibility is less than 1500 m and aeroplanes shall, in addition to (a), be equipped with a means of measuring and displaying:

(1) attitude; and

(2) stabilised heading.

(c) Whenever two pilots are required for the operation, aeroplanes and helicopters shall, in addition to OPS.GEN.410(c), be equipped with independent means of indicating (a)(1)(i) for each pilot.

(d) The airspeed indicating systems shall be equipped with a means of preventing malfunction due to either condensation or icing in the case of:

(1) aeroplanes with a maximum certificated take-off mass exceeding 5700 kg, or with a maximum passenger seating configuration of more than 9;

(2) aeroplanes first issued with an individual certificate of airworthiness on or after 1 April 1999; and

(3) helicopters with a maximum certificated take-off mass exceeding 3175 kg, or with a maximum passenger seating configuration of more than 9.

OPS.CAT.415 Flight instrument and equipment for VFR night flights and IFR flights – Motor powered aircraft

AEROPLANES AND HELICOPTERS

(a) In addition to OPS.GEN 415, aeroplanes and helicopters, when operating night flights under Visual Flight Rules (VFR) and Instrument Flight Rules (IFR) flights, shall be equipped with:

(1) an additional means of indicating altitude;

(2) a means of annunciating to the flight crew the failure of the means used to prevent malfunction due to condensation or icing, in the case of:

(i) aeroplanes first issued with an individual Certificate of Airworthiness on or after 1 April 1998;

(ii) aeroplanes with a maximum certificated take-off mass exceeding 5700 kg, or a maximum passenger seating configuration of more than 9 and issued with an individual Certificate of Airworthiness before 1 April 1998;

(iii) helicopters first issued with an individual Certificate of Airworthiness on or after 1 August 1999; and

(iv) helicopters with a maximum certificated take-off mass exceeding 3175 kg, or a maximum passenger seating configuration of more than 9 and issued with an individual Certificate of Airworthiness before 1 August 1999;

(3) a second landing light;

(4) in the cases of aeroplanes with a maximum certificated take-off mass exceeding 5700 kg or a maximum passenger seating configuration of more than 9 and helicopters:

(i) a standby attitude indicator capable of being used from either pilot's station;

(ii) a means of indicating when the standby attitude indicator is being operated by emergency power; and

(iii) a means of indicating when the standby attitude indicator is being supplied by its dedicated power supply, where the standby attitude indicator has its own dedicated power supply.

(b) Aeroplanes and helicopters when conducting IFR operations with a single pilot shall be equipped with an autopilot with, at least, altitude hold and heading mode.

AEROPLANES

(c) In the case of aeroplanes, the two landing lights required may be replaced by a single light having two separately energised filaments.

HELICOPTERS

(d) In the case of helicopters the second landing light required shall be adjustable in flight so as to illuminate the ground in front of and below the helicopter and the ground on either side of the helicopter.

OPS.CAT.416 Airborne weather equipment

When operated at night or in instrument meteorological conditions and in areas where thunderstorms, or other hazardous weather conditions regarded as detectable with airborne radar equipment may be expected, the following aircraft shall be equipped with airborne weather equipment:

(a) pressurised aeroplanes;

(b) non-pressurised aeroplanes with a maximum certificated take-off mass of more than 5700 kg;

(c) non-pressurised aeroplanes with a maximum passenger seating configuration of more than 9; and

(d) helicopters with a maximum passenger seating configuration of more than 9.

OPS.CAT.417.A Equipment to wipe windshield - Aeroplanes

Aeroplanes with a maximum certificated take-off mass of more than 5700 kg shall be equipped at each pilot station with a means to maintain a clear portion of the windshield during precipitation.

OPS.CAT.418.H Radio altimeters - Helicopters

Helicopters on flights over water shall be equipped with a radio altimeter capable of emitting an audio warning below a preset height and a visual warning at a height selectable by the pilot, when operating:

(a) out of sight of the land;

(b) in a visibility of less than 1500 m;

(c) at night; or

(d) at a distance from land corresponding to more than 3 minutes at normal cruising speed.

OPS.CAT.420 Flight over water – Motor-powered aircraft

AEROPLANES

(a) Notwithstanding OPS.GEN.420(d), an aeroplane operated at a distance away from land considered suitable for making an emergency landing, which is greater than that corresponding to:

(1) 120 minutes at cruising speed or 400 nautical miles, whichever is the lesser, in the case of aeroplanes capable of continuing the flight to an aerodrome with the critical power unit(s) becoming inoperative at any point along the route or planned diversions; or

(2) 30 minutes at cruising speed or 100 nautical miles, whichever is the lesser, for all other aeroplanes,

shall, in addition to OPS.GEN.420(a)(3), OPS.GEN.420(f) and OPS.GEN.420(b), or OPS.GEN.420(c), be equipped with:

(i) life-saving rafts in sufficient numbers to carry all persons on board, stowed so as to facilitate their ready use in emergency, and being of sufficient size to accommodate all the survivors in the event of a loss of one raft of the largest rated capacity;

(ii) a survivor locator light in each life-raft;

(iii) life-saving equipment, to provide the means for sustaining life, as appropriate for the flight to be undertaken; and

(iv) at least two survival Emergency Locator Transmitters (ELT (S)).

HELICOPTERS

(b) Helicopters certificated for operating on water, when so doing, shall, in addition to complying with OPS.GEN.420(e) and OPS.GEN.420(f), be equipped with:

(1) a sea anchor and other equipment necessary to facilitate mooring, anchoring, or manoeuvring the aircraft on water, appropriate to its size, weight and handling characteristics; and

(2) equipment for making the sound signals prescribed in the International Regulations for the prevention of collisions at sea.

(c) In addition to complying with OPS.GEN.420(e) and OPS.GEN.420(f), helicopters shall be equipped with emergency exit illumination when operated on a flight over water:

(1) in Performance Class 1 or 2, at a distance corresponding to more than 10 minutes flying time at normal cruising speed; or

(2) in Performance Class 3, at a distance corresponding to more than 3 minutes flying time at normal cruising speed.

OPS.CAT.424.A Ditching - Aeroplanes

Aeroplanes with a maximum passenger seating configuration of more than 30 shall be certificated for ditching when flying over water at a distance, from land suitable for making an emergency landing, which is greater than 120 minutes at cruising speed, or 400 nautical miles, whichever is the lesser.

OPS.CAT.426.H Crew survival suits - Helicopters

Each member of the crew of a helicopter shall wear a survival suit when operating:

(a) in Performance Class 1 or 2 on a flight over water in support of offshore operations, at a distance from the land corresponding to more than 10 minutes flying time at normal cruising speed, when the weather reports or forecasts available to the pilot-in-command indicate that the sea temperature will be less than plus 10°C during the flight, or the estimated rescue time exceeds the estimated survival time; or

(b) in Performance Class 3 on a flight over water beyond autorotational or safe forced landing distance from land, when the weather reports or forecasts available to the pilot-in-command indicate that the sea temperature will be less than plus 10°C during the flight.

OPS.CAT.427.H Additional requirements for helicopters operating to or from helidecks located in a hostile sea area

Helicopters operated on an offshore flight to or from a helideck located in a hostile sea area, at a distance from land corresponding to more than 10 minutes flying time at normal cruising speed, shall be operated in accordance with the following:

(a) When the weather report or forecasts available to the pilot-in-command indicate that the sea temperature will be less than plus 10°C during the flight, or when the estimated rescue time exceeds the calculated survival time, or the flight is planned to be conducted at night, all persons on board shall wear a survival suit;

(b) All life rafts carried in accordance with OPS.CAT.420 shall be installed so as to be usable in the sea conditions in which the helicopter's ditching, flotation and trim characteristics were evaluated in order to comply with the ditching requirements for certification;

(c) The helicopter shall be equipped with an emergency lighting system, having an independent power supply, to provide a source of general cabin illumination to facilitate the evacuation of the helicopter;

(d) All emergency exits, including crew emergency exits, and the means of opening them shall be conspicuously marked for the guidance of occupants using the exits in daylight or in the dark and such markings shall be designed to remain visible if the helicopter is capsized and the cabin is submerged;

(e) All non-jettisonable doors which are designated as Ditching Emergency Exits shall have a means of securing them in the open position so that they do not interfere with occupant egress in all sea conditions up to the maximum required to be evaluated for ditching and flotation;

(f) All doors, windows or other openings in the passenger compartment assessed as suitable for the purpose of underwater escape shall be equipped so as to be operable in an emergency;

(g) Lifejackets shall be worn at all times, unless the passenger or crew member is wearing an integrated survival suit that meets the combined requirement of the survival suit and lifejacket.

OPS.CAT.430 Emergency Locator Transmitter (ELT) – Motor-powered aircraft

AEROPLANES

(a) Notwithstanding OPS.GEN.430(a) and OPS.GEN.430(b), aeroplanes with a maximum passenger seating configuration of more than 19 shall be equipped with at least:

(1) two ELTs, one of which shall be automatic, in the case of aeroplanes first issued with an individual Certificate of Airworthiness after 1 July 2008; or

(2) one automatic Emergency Locator Transmitter (ELT), or two ELTs of any type , in other cases.

HELICOPTERS

(b) Notwithstanding OPS.GEN.430(c), helicopters operated in performance Class 1 or 2 used in offshore operations on a flight over water, in a hostile environment and at a distance corresponding to more than 10 minutes flying time at normal cruising speed shall be equipped with an Automatically Deployable Emergency Locator Transmitter (ELT(AD)).

OPS.CAT.432 Megaphones – Motor-powered aircraft

Aeroplanes with a maximum passenger seating configuration of more than 60 passengers and helicopters with a maximum passenger seating configuration of more than 19 passengers, when carrying one or more passenger, shall be equipped with a sufficient number of portable battery-powered megaphones for use by crew members during an emergency evacuation.

OPS.CAT.440 High altitude flights – Oxygen requirements for motor powered aircraft

ALL AIRCRAFT

(a) Notwithstanding OPS.GEN.440(a), crew members and passengers in:

(1) Pressurised aeroplanes shall be supplied with oxygen in accordance with Table 1 OPS.CAT.440.

(2) Non-pressurised aircraft shall be supplied with oxygen in accordance with Table 2 OPS.CAT.440.

AEROPLANES

(b) All pressurised aeroplanes operating at pressure altitudes above 25 000 ft shall be equipped with:

(1) quick donning masks for flight crew members;

(2) sufficient spare outlets and masks, or portable oxygen units with masks, for use by every required cabin crew member. The spare outlets or portable oxygen units shall be distributed evenly throughout the cabin to ensure immediate availability of oxygen to each cabin crew member; and

(3) an oxygen dispensing unit connected to oxygen supply terminals immediately available to each seated occupant.

(c) The total number of dispensing units and outlets required in (b) shall exceed the number of seats by at least 10%. The extra units shall be evenly distributed throughout the cabin.

(d) In the case of pressurised aeroplanes first issued with an individual Certificate of Airworthiness after 8 November 1998 and operated at pressure altitudes above 25 000 ft, or operated at pressure altitudes at, or below 25 000 ft under conditions that would not allow them to descend safely to 13 000 ft within 4 minutes, the individual oxygen dispensing units required in (b)(3) above shall be automatically deployable.

(e) Notwithstanding Table 1 OPS.CAT.440., the oxygen supply requirements for aeroplanes not certificated to fly above 25 000 ft, may be reduced to the entire flight time between 10 000 ft and 13 000 ft cabin pressure altitudes for all required cabin crew members and for at least 10% of the passengers if, at all points along the route to be flown, the aeroplane is able to descend safely within 4 minutes to a cabin pressure altitude of 13 000 ft.

Table 1 OPS.CAT.440 - Oxygen minimum requirements for pressurised aeroplanes

Supply for:	Duration and cabin pressure altitude
1. Occupants of cockpit seats on cockpit duty	(a) The entire flight time when the cabin pressure altitude is above 13 000 ft. (b) The remainder of the flight time when the cabin pressure altitude is between 10 000 ft and 13 000 ft, after the initial 30 minutes at these altitudes, but in no case less than: (1) 30 minutes supply for aeroplanes certificated to fly at altitudes below 25 000 ft; and (2) 2 hours supply for aeroplanes certificated to fly at altitudes of more than 25 000 ft.
2. Required cabin crew members	(a) The entire flight time when the cabin pressure altitude is above 13 000 ft, but not less than 30 minutes supply. (b) The remainder of the flight time when the cabin pressure altitude is between 10 000 ft and 13 000 ft, after the initial 30 minutes at these altitudes.
3. 100% of passengers	The entire flight time when the cabin pressure altitude is above 15 000 ft, but in no case less than 10 minutes supply.
4. 30% of passengers	The entire flight time when the cabin pressure altitude is between 14 000 ft and 15 000 ft.
5. 10% of passengers	The remainder of the flight time when the cabin pressure altitude is between 10 000 ft and 14 000 ft, after the initial 30 minutes at these altitudes.

Table 2 OPS.CAT.440 - Oxygen minimum requirements for non-pressurised aircraft

Supply for:	Duration and cabin pressure altitude
1. Occupants of cockpit seats on cockpit duty and crew members assisting flight crew in their duties	The entire flight time at pressure altitudes above 10 000 ft.
2. Required cabin crew members	The entire flights time at pressure altitudes above 13 000 ft and for any period exceeding 30 minutes at pressure altitudes between 10 000 ft and 13 000 ft.
3. 100% of passengers	The entire flight time at pressure altitudes above 13 000 ft.
4. 10% of passengers	The entire flight time after 30 minutes at pressure altitudes between 10 000 ft and 13 000 ft.

OPS.CAT.442.A Crew protective breathing equipment - Aeroplanes

(a) Aeroplanes with a maximum certificated take-off mass exceeding 5 700 kg, or having a maximum passenger seating configuration of more than 19 shall be equipped with Protective Breathing Equipment (PBE) for:

(1) each required flight crew member at their assigned duty station; accessible for immediate use; to protect the eyes, nose and mouth and to provide oxygen for a period of at least 15 minutes; and

(2) each required cabin crew member, adjacent to their duty station; to protect the eyes, nose and mouth and to provide oxygen for a period of at least 15 minutes.

(b) In addition, the aeroplanes in (a) shall be equipped with an additional portable PBE located near the hand fire extinguishers required in OPS.CAT.405 (b) and (c).

(c) Notwithstanding (b), when the fire extinguisher is located inside a cargo compartment, the additional portable PBE required shall be stowed outside, but adjacent to the entrance to that compartment.

OPS.CAT.447.A First aid oxygen - Aeroplanes

Pressurised aeroplanes operated at altitudes above 25 000 ft shall be equipped with a sufficient supply of undiluted oxygen and the adequate equipment to dispense it when involved in an operation for which a cabin crew member is required.

OPS.CAT.457.A Emergency medical kit – Aeroplanes

(a) Aeroplanes with a maximum passenger seating configuration of more than 30 shall be equipped with an emergency medical kit when any point on the planned route is more than 60 minutes flying time (at normal cruising speed) from an aerodrome at which qualified medical assistance is expected to be available.

(b) The pilot–in-command shall ensure that drugs are only administered by qualified personnel.

(c) The emergency medical kit shall be:

(1) dust and moisture proof;

(2) carried under security conditions; and

(3) maintained.

OPS.CAT.462.A Altitude alerting system – Aeroplanes

(a) The following aeroplanes shall be equipped with an altitude alerting system capable of alerting the flight crew when approaching, or deviating from, a pre-selected altitude:

(1) turbine-powered aeroplanes with a maximum certificated take-off mass exceeding 5 700 kg; or

(2) aeroplanes with a maximum passenger seating configuration of more than 9; or

(3) aeroplanes powered by turbo-jet engines.

(b) In the case of (a)(3), the warning shall be made by an aural signal.

(c) Notwithstanding (a), aeroplanes with a maximum certificated take-off mass of 5 700 kg or less, and with a maximum passenger seating configuration of more than 9, and first issued with an individual certificate of airworthiness before 1 April 1972 are not required to be equipped with an altitude alerting system.

OPS.CAT.482 Seat belts and harnesses for the observer seat in the cockpit

Any observer seat in the cockpit of aircraft, except balloons, shall be equipped with a safety belt with shoulder harness incorporating a device which will automatically restrain the occupant's upper torso in the event of rapid deceleration.

OPS.CAT.490 Flight data recorder – Motor powered aircraft

AEROPLANES

(a) Notwithstanding OPS.GEN.490(a):

(1) aeroplanes with a maximum certificated take-off mass exceeding 5 700 kg; and

(2) multi-engine turbine powered aeroplanes with a maximum certificated take-off mass of 5 700 kg or less, or with a maximum passenger seating configuration of more than 9, and first issued with an individual Certificate of Airworthiness after 31 March 1998,

shall be equipped with a flight data recorder (FDR) that uses a digital method of recording and storing data and a method of retrieving that data from the storage medium available.

(b) Notwithstanding OPS.GEN.490(b), the flight data recorder of aeroplanes shall be capable of retaining the data recorded during at least:

(1) the preceding 25 hours, for aeroplanes referred to in (a)(1); or

(2) the preceding 10 hours, in the case of aeroplanes referred to in (a)(2).

HELICOPTERS

(c) Notwithstanding OPS.GEN.490(c):

(1) helicopters with a maximum certificated take-off mass exceeding 3 175 kg and first issued with an individual Certificate of Airworthiness after 31 July 1999; and

(2) helicopters having a maximum certificated take-off mass exceeding 7 000 kg, or a maximum certificated seating configuration of more than 9, and first issued with an individual Certificate of Airworthiness between 1 January 1989 and 31 July 1999, inclusive,

shall be equipped with a flight data recorder that uses a digital method of recording and storing data and a method of retrieving that data from the storage medium available.

(d) Notwithstanding OPS.GEN.490(d), the flight data recorder shall be capable of retaining the data recorded during at least:

(1) the last 8 hours, for helicopters referred to in (c)(1);

(2) the last 5 hours, for helicopters referred to in (c)(2); or

(3) the last 10 hours for helicopter with a maximum certificated take-off mass exceeding 3 175 kg, and first issued with an individual certificate of airworthiness after 31 December 2009.

OPS.CAT.495 Cockpit voice recorder – Motor-powered aircraft

AEROPLANES

(a) Notwithstanding OPS.GEN.495(a):

(1) aeroplanes with a maximum certificated take-off mass exceeding 5 700 kg; and

(2) multi-engine turbine-powered aeroplanes with a maximum certificated take-off mass of 5 700 kg or less, or with a maximum certificated passenger seating configuration of more than 9 passengers and first issued with an individual Certificate of Airworthiness after 31 December 1989,

shall be equipped with a cockpit voice recorder (CVR).

(b) Notwithstanding OPS.GEN.495(b), in the case of aeroplanes, the cockpit voice recorder shall be capable of retaining the data recorded during at least:

(1) the preceding 2 hours for aeroplanes referred to in (a)(1) when the individual Certificate of Airworthiness has been issued after 31 March 1998; or

(2) the preceding 30 minutes, for aeroplanes referred to in (a)(2).

HELICOPTERS

(c) Notwithstanding OPS.GEN.495(c):

(1) all helicopters having a maximum certificated take-off mass exceeding 7 000 kg; and

(2) helicopters having a maximum certificated take-off mass exceeding 3175kg and first issued with an individual Certificate of Airworthiness after 31 December 1986,

shall be equipped with a cockpit voice recorder.

(d) Notwithstanding OPS.GEN.495(d), in the case of helicopters, the cockpit voice recorder shall be capable of retaining the data recorded during at least:

(1) the preceding 1 hour for helicopters referred to in (c)(1), when first issued with an individual Certificate of Airworthiness after 31 July 1999; or

(2) the preceding 30 minutes for helicopters referred to in (c)(2).

OPS.CAT.515.A Microphones - Aeroplanes

(a) Each flight crew member required to be on duty shall wear the headset with boom or throat microphones and use it as the primary device to listen to the voice communications with Air Traffic Services:

(1) on the ground:

(i) when receiving the ATC departure clearance via voice communication; and

(ii) when engines are running;

(2) in flight below transition altitude or 10000ft, which ever is higher; and

(3) whenever deemed necessary by the pilot-in-command.

OPS.CAT.516 Crew member interphone system – Motor-powered aircraft

AEROPLANES

(a) Aeroplanes with a maximum certificated take-off mass exceeding 15 000 kg, or with a maximum passenger seating configuration of more than 19 shall be equipped with a crew member interphone system.

(b) Notwithstanding (a), those aeroplanes first issued with an individual Certificate of Airworthiness before 1 April 1965 and registered in a Member State on 1 April 1995 are not required to be equipped with a crew member interphone system.

HELICOPTERS

(c) Helicopters shall be equipped with a crew member interphone system when carrying a crew member other than flight crew.

OPS.CAT.517 Public address system – Motor-powered aircraft

AEROPLANES AND HELICOPTERS

(a) The following aircraft shall be equipped with a public address system:

(1) aeroplanes with a maximum passenger seating configuration of more than 19; and

(2) helicopters with a maximum passenger seating configuration of more than 9.

HELICOPTERS

(b) Notwithstanding (a), the public address system may not be required for helicopters with a maximum passenger seating configuration of less than 19 if:

(1) the helicopter is designed without a bulkhead between the cockpit and passenger compartment; and

(2) the operator can demonstrate to the competent authority that, in flight the pilot's voice is audible at all passengers seats.

OPS.CAT.518 Fasten seat belts and no-smoking signs

Aircraft in which all passenger seats are not visible from the flight crew seat shall be equipped with a means of indicating to all passengers and cabin crew when seat belts shall be fastened and when smoking is not allowed.

OPS.CAT.519.A Internal doors and curtains - Aeroplanes

(a) Aeroplanes with a maximum passenger seating configuration of more than 19 shall be equipped with a door between the passenger and the cockpit with a placard saying "crew only" and a locking mechanism preventing passengers from opening it.

(b) Doors and curtains between passenger compartments shall be opened and secured in the open position during take off and landing.

(c) Doors that can be locked by passengers shall have an unlock mechanism for crew members.

OPS.CAT.525 Communication and navigation equipment for VFR as controlled flights, night flights and IFR flights – Motor-powered aircraft

(a) Motor powered aircraft shall be equipped with:

(1) two independent radio communication means;

(2) two independent navigation equipment appropriate for each phase of flight and appropriate to the route/area.

OPS.CAT.526 Audio selector panel

Aircraft operated under Instrument Flight Rules (IFR) shall be equipped with an audio selector panel operable from each flight crew member station.

Subpart C - Commercial operations other than Commercial Air Transport

Section I - General Requirements

OPS.COM.005 Scope

This subpart establishes additional and specific requirements to be met by an operator undertaking commercial operations other than Commercial Air Transport, to ensure compliance with Annex IV to Regulation (EC) No 216/2008 (Essential requirements for air operations).

OPS.COM.035 Application and use of dangerous goods in specialised tasks

The operator shall not fly over congested areas of cities, towns or settlements or over an open-air assembly of persons when applying or using dangerous goods for the purpose of a specialised task.

OPS.COM.040 Carriage and use of weapons in specialised tasks

(a) An operator may carry weapons on a flight for the purpose of a specialised task provided that the weapons are secured when carried.

(b) The operator shall ensure that the aircraft and persons on board and on the ground are not endangered when the weapons are used.

Section II - Operational procedures

OPS.COM.115 Briefing of operational personnel

Operational personnel involved in specialised tasks shall be briefed on operational procedures associated with the specific task before each flight or series of flights.

OPS.COM.270 Standard operating procedures - specialised operations other than the transport of persons, cargo or mail

(a) Specialised operations other than the transport of persons, cargo or mail shall be performed in accordance with Standard Operating Procedures (SOPs).

(b) Before commencing operations, the operator shall carry out a risk assessment and shall develop appropriate SOPs. The risk assessment and SOPs should address at least the following:

(1) Scope and complexity of the activity;

(2) Aircraft and equipment;

(3) Crew composition and training;

(4) Aircraft performance;

(5) Normal and emergency procedures;

(6) Ground equipment;

(7) Record keeping.

(c) Applicants for an Air Operator Certificate shall demonstrate to the competent authority that the SOPs mentioned in OPS.COM.270 (a) and (b) are suitable for the intended operation.

Section III – Aircraft performance and operating limitations

OPS.COM.316.A Performance criteria aeroplanes

When operating an aeroplane at a height of less than 150 m (500 ft) above the surface and outside a congested area, the operator shall, when the aeroplane is not able to sustain level flight in the event of a critical engine failure:

(a) establish operational procedures to minimise the consequences of an engine failure;

(b) establish a training programme for crew members;

(c) ensure that all occupants are briefed on the procedures to be carried out in the event of a forced landing; and

(d) ensure that all occupants wear the appropriate protective equipment.

OPS.COM.350.H Performance criteria helicopter

(a) Helicopters operating in a congested hostile environment shall be:

(1) certificated in category A; and

(2) operated at a mass and in conditions that, in the event of a critical power unit failure, the helicopter is capable of sustaining level flight. Measures shall be taken to prevent risk to persons on the ground and to alleviate risk to property on the surface.

(b) Helicopters operating outside a congested hostile environment shall be certificated in category A or B.

(c) When operating helicopters which, in the event of a critical power unit failure, are not able to sustain flight or perform a safe forced landing, the operator shall:

(1) establish operational procedures to minimise the consequences of a power unit failure;

(2) establish a training programme for crew members;

(3) ensure that all occupants are briefed on the procedures to be carried out in the event of a forced landing;

(4) ensure that the helicopter is equipped with appropriate crash mitigation equipment pertinent to the operation;

(5) ensure that all occupants wear the appropriate protective equipment; and

(6) ensure compliance with OPS.SFL when persons are carried.

(d) The mass at take off, landing or hover shall not exceed the maximum mass specified for a hover in ground effect (HIGE) with all power units operating at the appropriate power rating. If conditions prevail that a HIGE is not likely to be established, the helicopter mass shall not exceed the maximum mass specified for a hover out of ground effect (HOGE) with all power units operating at the appropriate power rating.

Section IV - Instruments, data and equipment

OPS.COM.406 Restraining devices

OPERATIONS WITH DOORS OPENED OR REMOVED

Crew members other than flight crew shall be restrained when carrying out specialised tasks with doors opened or removed.

OPS.COM.420.H Life jackets - Helicopters

Each person on board shall wear a life jacket during a flight operated on water or over water beyond auto-rotational/gliding distance from land where, in the event of a mishap, there would be a likelihood of ditching.

OPS.COM.425.H Ditching - Helicopters

Helicopters operated on a flight over water beyond 10 minutes distance from land, when carrying persons other than crew members, shall be designed for landing on water or fitted with emergency flotation equipment.

OPS.COM.426.H Survival suits - Helicopters

Each crew member shall wear a survival suit when operating on a flight on water or over water beyond auto-rotational/gliding distance from land where, in the event of a mishap, there would be a likelihood of ditching, and when the weather reports or forecasts available to the pilot-in-command indicate that the sea temperature will be less than plus 10°C during the flight.

OPS.COM.465.A Terrain Awareness Warning System (TAWS) - Aeroplanes

Notwithstanding OPS.GEN.465.A, the TAWS may be disabled during specific aerial work tasks which, by their nature, require the aircraft to be operated within a distance from the ground below that which would trigger the TAWS, in accordance with the terms of the operator's certificate or specifications.

OPS.COM.486 Emergency egress from the cockpit

Aircraft shall be equipped with effective means of breaking out of the cockpit.

OPS.COM.487 Crash mitigation equipment

Aircraft shall be equipped with crash mitigation equipment which is adequate for the type of operation.

OPS.COM.488 Individual protective equipment

Persons on board shall wear personal protective equipment which is adequate for the type of operation.

Subpart D - Operations requiring specific approvals

Section I - General Requirements

OPS.SPA.001.GEN Competent authority

Notwithstanding OPS.GEN.005, for the purpose of this Subpart, the competent authority for non-commercial operators conducting operations in PBN/MNPS and RVSM airspace shall be the State of registry.

OPS.SPA.005.GEN Scope

This part establishes the requirements to be met by an operator to qualify for the issue or continuation of specific operational approvals.

OPS.SPA.020.GEN Application for a specific approval

(a) Applicants for the initial issue of a specific approval shall provide the competent authority with the documentation required by the applicable subpart and the following information:

(1) The official name and business name, address and mailing address of the applicant; and

(2) A description of the intended operation.

(b) Without prejudice to OR.GEN.015, applicants for a specific approval shall demonstrate to the competent authority that:

(1) they comply with the requirements of the applicable section;

(2) the aircraft and required equipment comply with the applicable airworthiness requirements/approvals;

(3) a training programme has been established for flight crew and, as applicable, personnel involved in these operations; and

(4) operating procedures in accordance with the applicable subpart have been specified in the operations manual.

(c) Records relating to the requirements of (a) and (b) above shall be retained by the operator in accordance with OR.OPS.220.MLR.

OPS.SPA.025.GEN Privileges of an operator holding a specific approval

The scope of the activity that the operator is approved to conduct shall be specified in the operations manual and approval certificate or, for commercial operators, in the operations specifications to the air operator certificate.

OPS.SPA.030.GEN Changes to operations subject to a specific approval

(a) The operator shall notify the competent authority of any change on the items listed in OPS.SPA.020.GEN (a) and (b) and any of the requirements in the applicable section before such change takes place.

(b) The competent authority may prescribe the conditions under which the organisation may operate during such changes, unless the competent authority determines that the specific approval shall be suspended or revoked.

(c) In the case of a change to a specific approval, operators shall provide the competent authority with the relevant parts of the operations manual and all other relevant documentation.

OPS.SPA.035.GEN Continued validity of a specific approval

Specific approvals shall be issued for an unlimited duration. They shall remain valid subject to the operator remaining in compliance with this subpart, OR.GEN.030, OR.GEN.035 (a)(1),(b) and (c).

Section II - Operations in areas with specified navigation performance

OPS.SPA.001.SPN Operations in areas with specified performance based navigation (SPN)

(a) An aircraft shall only be operated in designated airspace, on routes or in accordance with procedures where navigation specifications are established, if the operator has been approved by the competent authority.

(b) An aircraft shall only be operated in designated airspace, based on ICAO Regional Air Navigation Agreement, minimum navigation performance specifications are established, if the operator has been approved by the competent authority.

(c) To obtain such approval by the competent authority, the operator shall:

(1) demonstrate that the navigation equipment meets the required performance in terms of navigation functionality, accuracy, integrity, availability and continuity;

(2) establish and maintain a training programme for the flight crew involved in these operations; and

(3) establish operating procedures specifying:

(i) the equipment to be carried, including its operating limitations and appropriate entries in the Minimum Equipment List (MEL);

(ii) flight crew composition and experience requirements;

(iii) normal procedures;

(iv) contingency procedures;

(v) incident reporting;

(vi) specific regional operating procedures, in case of MNPS; and

(vii) navigation database integrity, in case of PBN.

OPS.SPA.010.SPN Equipment requirements for operations in MNPS areas

(a) An aircraft conducting MNPS operations shall be equipped with navigation equipment that complies with the ICAO Regional Air Navigation Agreement.

(b) Navigation equipment shall be visible and operable by either pilot seated at his/her duty station.

OPS.SPA.030.SPN Flight crew requirements for operations in PBN or MNPS areas

For commercial air transport operations the minimum flight crew shall consist of at least two pilots.

Section III - Operations in airspace with reduced vertical separation minima

OPS.SPA.001.RVSM Operations in airspace with reduced vertical separation minima (RVSM)

(a) An aircraft shall only be operated in designated airspace where a reduced vertical separation minimum of 300 m (1 000 ft) applies above flight level (FL) 290, if:

(1) the aircraft has been issued with an RVSM airworthiness approval by the Agency in accordance with Part-21; and

(2) the operator has been approved by the competent authority.

(b) To obtain such approval by the competent authority, the operator shall:

(1) establish and maintain a training programme for the flight crew involved in these operations; and

(2) establish operating procedures specifying:

(i) the equipment to be carried, including its operating limitations and appropriate entries in the Minimum Equipment List (MEL);

(ii) flight crew composition and experience requirements;

(iii) flight planning;

(iv) pre-flight procedures;

(v) procedures prior to RVSM airspace entry;

(vi) in-flight procedures;

(vii) post flight procedures;

(viii) maintenance programme;

(ix) incident reporting; and

(x) specific regional operating procedures.

OPS.SPA.010.RVSM Equipment requirements for operations in RVSM airspace

(a) In addition to the equipment required by OPS.GEN, aircraft used for operations in RVSM airspace shall be equipped with:

(1) two independent altitude measurement systems;

(2) an altitude alerting system;

(3) an automatic altitude control system; and

(4) a Secondary Surveillance Radar (SSR) transponder with altitude reporting system that can be connected to the altitude measurement system in use for altitude control.

OPS.SPA.030.RVSM Flight crew requirements for operations in RVSM airspace

For commercial air transport operations the minimum flight crew shall consist of at least two pilots.

Section IV – Low visibility operations

OPS.SPA.001.LVO Low visibility operations (LVO)

(a) An aircraft shall only be operated in conditions lower than standard Category I, take-off in less than 400 m Runway Visual Range (RVR) or with the aid of Enhanced Vision Systems (EVS), if the operator has been approved by the competent authority.

(b) To obtain such approval by the competent authority, the operator shall:

(1) establish and maintain a training programme for the flight crew involved in these operations;

(2) establish operating procedures specifying:

(i) the equipment to be carried, including its operating limitations and appropriate entries in the Minimum Equipment List (MEL);

(ii) flight crew composition and experience requirements;

(iii) normal procedures;

(iv) contingency procedures; and

(3) establish a system for recording approach and/or automatic landing success and failure to monitor the overall safety of the operation.

OPS.SPA.010.LVO Aircraft requirements for LVO

(a) In addition to the equipment required by OPS.GEN, aircraft involved in LVO shall be equipped with a radio altimeter.

(b) Aircraft shall be certificated for operations with decision heights below 200 ft or no decision height.

OPS.SPA.020.LVO LVO operating minima

(a) The radio altimeter shall be used to determine the decision height.

(b) An operator shall not use an aerodrome for operations in accordance with this section, unless:

(1) the aerodrome has been approved for such operations by the State in which it is located;

(2) low visibility procedures (LVP) have been established at that aerodrome where LVO are to be conducted.

(c) The pilot-in-command shall ensure that:

(1) appropriate LVPs are in force according to information received from Air Traffic Services, before commencing a Low Visibility Take-off, a Lower than Standard Category I, an Other than Standard Category II, or a Category II or III approach, and

(2) the status of the visual and non-visual facilities are sufficient prior to commencing a Low Visibility Take-Off, an Approach utilising EVS, a Lower than Standard Category I, an Other than Standard Category II, or a Category II or III approach.

OPS.SPA.030.LVO Flight crew requirements for LVO

(a) The minimum flight crew for operations in meteorological conditions lower than standard Category I or with the aid of enhanced vision systems (EVS) shall consist of at least two pilots.

(b) Flight crew members shall be properly qualified prior to commencing LVO operations.

Section V - Transport of dangerous goods

OPS.SPA.001.DG Approval to transport dangerous goods

(a) Except as provided for in OPS.GEN.035(b), an operator shall only transport dangerous goods by air, if the operator has been approved by the competent authority.

(b) To obtain such approval by the competent authority, the operator shall in accordance with the Technical Instructions:

(1) establish and maintain a training programme for all personnel involved and demonstrate to the competent authority that adequate training has been given to all personnel;

(2) establish operating procedures to ensure the safe handling of dangerous goods at all stages of air transport containing information and instructions on:

(i) the operator's policy to transport dangerous goods;

(ii) the requirements for acceptance, packing, marking, handling, loading, stowage and segregation of dangerous goods;

(iii) special notification requirements in the event of an accident or occurrence when dangerous goods are being carried;

(iv) the response to emergency situations involving dangerous goods;

(v) the removal of any possible contamination;

(vi) the duties of all personnel involved, especially with relevance to ground handling and aircraft handling;

(vii) inspection for damage, leakage or contamination; and

(viii) incident reporting.

(c) An application for an approval to carry dangerous goods shall include information on the classes of dangerous goods intended to be carried.

OPS.SPA.040.DG Dangerous goods information and documentation

The operator shall, in accordance with the Technical Instructions:

(a) provide personnel with the necessary information enabling them to carry out their responsibilities;

(b) provide passengers with the necessary information on the transport of dangerous goods;

(c) provide written information to the pilot-in-command:

(1) about dangerous goods to be carried on the aircraft;

(2) for use in responding to in-flight emergencies;

(d) use an acceptance checklist;

(e) ensure that dangerous goods are accompanied by the required dangerous goods transport document(s);

(f) ensure that a copy of the information to the pilot-in-command and the dangerous goods transport document is retained on the ground for the duration of the flight;

(g) ensure that a copy of the information to the pilot-in-command is available at the intended destination aerodrome;

(h) retain the acceptance checklist, transport document and information to the pilot in command for at least 3 months after completion of the flight; and

(i) retain the training records of all personnel for at least 3 years.

Section VI - Helicopter operations without an assured safe forced landing capability

OPS.SPA.001.SFL Operations without an assured safe forced landing capability

(a) A helicopter shall only be operated without an assured safe forced landing capability if the operator has been approved by the competent authority, specifying the type of helicopter and operation.

(b) To obtain such approval the operator shall:

(1) provide appropriate power unit reliability statistics for the helicopter type and engine type;

(2) except for a HEMS operating site, assess the risk involved for:

(i) the type of helicopter to be used; and

(ii) the type of operations conducted.

(3) establish operating procedures specifying:

(i) the take-off and landing techniques to be applied at the aerodrome/operating site; and

(ii) site specific procedures in the case of public interest sites.

(4) implement a Usage Monitoring System; and

(5) implement a set of conditions to obtain and maintain the approval for a particular helicopter type; and

(6) establish and maintain a training programme for the crew involved in these operations.

OPS.SPA.005.SFL Applicability

Operations without an assured safe forced landing capability shall only be conducted in the following situations:

(a) at a HEMS operating site, when operating under an approval in accordance with OPS.SPA.001.HEMS;

(b) operations to/from helidecks with helicopters which have a maximum passenger seating configuration (MPSC) of more than 19;

(c) for Performance Class 2 take-off or landing outside a congested hostile environment:

(1) during the take-off phase, before reaching 200 ft above the take-off surface; and

(2) during the landing phase, below 200 ft above the landing surface.

(d) for Performance Class 3 operations, when operating outside a congested hostile environment:

(1) during the take-off phase, before reaching 200 ft above the take-off surface;

(2) during the landing phase, below 200 ft above the landing surface; and

(3) en-route in a specified, remote or mountain, area with turbine powered helicopters with a MPSC of 6 or less.

(e) at a public interest site, with multi-turbine powered helicopters with a MPSC of 6 or less:

(1) located in a congested hostile environment;

(2) established as public interest site before 1 July 2002; and

(3) where the dimensions or obstacle environment do not permit Performance Class 1 operations.

OPS.SPA.035.SFL Helicopter Flight Manual Limitations

For helicopters certificated in Category A, a momentary flight through the height velocity (HV) diagram is allowed during the take-off and landing phases, when the helicopter is operated under the approval in accordance with this section.

Section VII – Helicopter operations with night vision imaging systems

OPS.SPA.001.NVIS Night Vision Imaging System (NVIS) operations

(a) A helicopter shall only be operated in night VFR operations with the aid of night vision imaging systems (NVIS), if the operator has been approved by the competent authority.

(b) To obtain such approval by the competent authority, the operator shall:

(1) establish and maintain in addition to the requirements contained in Part OR.OPS a specific training and checking programme for the crew involved in these operations; and

(2) establish operating procedures specifying:

(i) the equipment to be carried, including its operating limitations and appropriate entries in the MEL;

(ii) crew composition and experience requirements;

(iii) procedures for crew members wearing night vision goggles;

(iv) procedures for the transition to and from an NVIS flight;

(v) use of the radio altimeter on an NVIS flight;

(vi) in-flight procedures for assessing visibility to ensure that operations are not conducted below the minima for non assisted night VFR flight.

OPS.SPA.010.NVIS Equipment requirements for NVIS operations

In addition to the equipment required by OPS.GEN and OPS.CAT or OPS.COM, helicopter involved in NVIS operations shall be equipped with a radio altimeter and a low height warning system giving visual and audio warnings selectable by the pilot and discernable during NVIS operation.

OPS.SPA.020.NVIS NVIS operating minima

Operations shall not be conducted below the VFR weather minima for the type of night operations being conducted.

OPS.SPA.030.NVIS Crew requirements for NVIS operations

The minimum crew shall consist of at least one pilot and one NVIS technical crew member.

Section VIII – Helicopter hoist operations

OPS.SPA.001.HHO Helicopter hoist operations (HHO)

(a) A helicopter shall only be operated for the purpose of hoist operations, if the operator has been approved by the competent authority.

(b) To obtain such approval by the competent authority, the operator shall:

(1) comply with the applicable requirements contained in OPS.GEN, OPS.CAT, OPS.COM and Part-OR, except for the variations contained in this Section;

(2) establish and maintain in addition to the requirements contained in Part OR.OPS a specific training and checking programme for the crew involved in these operations; and

(3) establish operating procedures specifying:

(i) performance criteria;

(ii) if applicable, the conditions under which offshore HHO transfer may be conducted including the relevant limitations on vessel movement and wind speed;

(iii) weather limitations for HHO;

(iv) criteria for determining the minimum size of the HHO site, appropriate to the task;

(v) crew composition and experience requirements; and

(vi) the method by which crew members record hoist cycles.

OPS.SPA.010.HHO Equipment requirements for HHO

(a) The installation of all helicopter hoist equipment including any radio equipment to comply with OPS.SPA.015.HHO and any subsequent modifications and, where applicable, its operation shall have an airworthiness approval appropriate to the intended function. Ancillary equipment must be designed and tested to the appropriate standard as required by the competent authority.

(b) Maintenance instructions for HHO equipment and systems shall be established by the operator, in liaison with the manufacturer and included in the operator's helicopter maintenance programme as required in Part-M.

OPS.SPA.015.HHO HHO communication

Two-way radio communication shall be established with the organisation for which the HHO is being provided and, where possible, communication with ground personnel of that organisation for:

(a) day and night offshore operations; and

(b) night onshore operations.

OPS.SPA.025.HHO Performance requirements for HHO operations

Except for HHO operations at a HEMS Operating Site, HHO operations performed as Commercial Air Transport (CAT) shall be capable of sustaining a critical power unit failure with the remaining engine(s) at the appropriate power setting, without hazard to the suspended person(s)/cargo, third parties, or property.

OPS.SPA.030.HHO Crew requirements for HHO operations

The minimum crew shall consist of at least one pilot and one HHO technical crew member.

Section IX - Helicopter emergency medical service operations

OPS.SPA.001.HEMS Helicopter emergency medical service operations (HEMS)

(a) A helicopter shall only be operated for the purpose of Helicopter Emergency Medical Service (HEMS) Operations, if the operator has been approved by the competent authority.

(b) To obtain such approval by the competent authority, the operator shall:

(1) hold a commercial air transport operator certificate in accordance with Part-OR;

(2) comply with the requirements contained in OPS.GEN, OPS.CAT and Part-OR, except for the variations contained in this Section;

(3) establish and maintain in addition to the requirements contained in Part OR.OPS a specific training and checking programme for the crew involved in these operations; and

(4) establish operating procedures, adapted to the operations area, specifying:

(i) HEMS operating minima;

(ii) performance requirements;

(iii) crew composition and experience requirements;

(iv) recommended routes for regular flights to surveyed sites with the minimum flight altitude;

(v) guidance for the selection of the HEMS operating site in case of a flight to an unsurveyed site;

(vi) guidance on take-off and landing procedures at unsurveyed HEMS operating sites;

(vii) the safety altitude for the area over flown;

(viii) procedures to be followed in case of inadvertent flight into cloud;

(ix) procedures for the use of portable equipment on board; and

(x) briefing of medical staff prior to any HEMS flight, or series of flights.

OPS.SPA.010.HEMS Equipment requirements for HEMS operations

(a) The installation of all helicopter dedicated medical equipment and any subsequent modifications and, where appropriate, its operation shall be approved in accordance with Part-21.

(b) Helicopters conducting HEMS flights shall be provided with communication equipment, in addition to that required for commercial air transport operations, capable of conducting two-way communication with the organisation for which the HEMS is being conducted and, where possible, to communicate with ground emergency service personnel.

OPS.SPA.020.HEMS HEMS operating minima

(a) HEMS flights in performance class 1 and 2 operations shall comply with the weather minima in Table 1 for dispatch and, Table 1 and the associated notes for the en-route phase of the HEMS flight. In the event that during the en-route phase the weather conditions fall below the cloud base or visibility minima shown, helicopters certificated for flights only under Visual Meteorological Conditions (VMC) shall abandon the flight or return to base. Helicopters equipped and certificated for IMC operations may abandon

the flight, return to base or convert in all respects to a flight conducted under IFR, provided the flight crew are suitably qualified.

Table 1 OPS.SPA.020 - HEMS operating minima

2 PILOTS		1 PILOT	
DAY			
Ceiling	Visibility	Ceiling	Visibility
500 ft and above	As defined by the applicable airspace VFR minima	500 ft and above	As defined by the applicable airspace VFR minima
499 - 400 ft	1 000 m*	499 – 400 ft	2 000 m
399 - 300 ft	2 000 m	399 – 300 ft	3 000 m
NIGHT			
Cloud Base	Visibility	Cloud Base	Visibility
1 200 ft **	2 500 m	1 200 ft**	3 000 m

* Visibility may be reduced to 800 m for short periods when in sight of land if the helicopter is manoeuvred at a speed that will give adequate opportunity to observe any obstacles in time to avoid a collision.

** Cloud base may be reduced to 1 000 ft for short periods.

(b) The weather minima for the dispatch and en-route phase of a HEMS flight in performance class 3 operations shall be a cloud ceiling of 600 ft and a visibility of 1 500 m.

OPS.SPA.025.HEMS Performance requirements for HEMS operations

(a) Performance class 3 operations shall not be conducted over a hostile environment.

(b) Take-off and landing

(1) Helicopters conducting operations to/from an aerodrome at a hospital which is located in a hostile environment shall be operated in accordance with performance class 1; except as provided for in OPS.SPA.005.SFL.

(2) Helicopters conducting operations to/from an HEMS operating site located in a hostile environment shall be operated in accordance with performance class 2.

(3) The HEMS operating site shall be big enough to provide adequate clearance from all obstructions. For night operations, the site shall be illuminated to enable the site and any obstructions to be identified.

OPS.SPA.045.HEMS HEMS operating base facilities

(a) If crew members are required to be on standby with a reaction time of less than 45 minutes, dedicated suitable accommodation shall be provided close to each operating base.

(b) At each operating base the pilots shall be provided with facilities for obtaining current and forecast weather information and shall be provided with satisfactory communications with the appropriate ATS unit. Adequate facilities shall be available for the planning of all tasks.

II. Draft Decision AMC and GM to Part – Air Operations (Part-OPS)

Acceptable Means of Compliance and Guidance material to Part-OPS

Subpart A - General operating and flight rules
Section I - General Requirements

GM OPS.GEN.005(a) Scope

GENERAL

The requirements are meant to be followed by the operator as defined in the Basic Regulation (Regulation (EC) No 216/2008). Therefore, the operator, whether the pilot/owner or an organisation, is considered to be responsible for taking those measures, unless the Implementing Rules specifically address measures to the pilot-in-command.

GM OPS.GEN.010 Definitions

For the purpose of this Subpart, the following definitions are used:

1. 'Circling' means the visual phase of an instrument approach to bring an aircraft into position for landing on a runway/FATO which is not suitably located for a straight-in approach.
2. 'Continuous Descent Final Approach (CDFA)' means a specific technique for flying the final-approach segment of a non-precision instrument approach procedure as a continuous descent, without level-off, from an altitude / height at or above the Final Approach Fix altitude / height to a point approximately 15m (50ft) above the landing runway threshold or the point where the flare manoeuvre should begin for the type of aeroplane flown.
3. 'Converted Meteorological Visibility (CMV)' means a value (equivalent to an RVR) which is derived from the reported meteorological visibility, as converted in accordance with the requirements in this subpart.
4. 'GNSS Landing System (GLS)' means an approach operation using augmented GNSS information to provide guidance to the aircraft based on its lateral and vertical GNSS position. (It uses geometric altitude reference for its final approach slope.)
5. 'Maximum take-off mass for helicopters' means the maximum permissible total helicopter mass at take-off.
6. 'Overpack' means an enclosure used by a single shipper to contain one or more packages and to form one handling unit for convenience of handling and stowage.
7. 'Package' means the complete product of the packing operation consisting of the packaging and its contents prepared for transport.
8. 'Packaging' means receptacles and any other components or materials necessary for the receptacle to perform its containment function.
9. 'Stabilised Approach (SAp)' means an approach which is flown in a controlled and appropriate manner in terms of configuration, energy and control of the flight path from a pre-determined point or altitude/height down to a point 50 feet above the threshold or the point where the flare manoeuvre is initiated if higher.
10. 'Visual approach' means an approach by an IFR flight when either part or all of an instrument approach procedure is not completed and the approach is executed with visual reference to the terrain.

AMC OPS.GEN.010(a)(9)&(10) Definitions

CATEGORY A AND CATEGORY B

1. Helicopters which have been certificated according to any of the following standards are considered to satisfy the Category A criteria. Provided that they have the necessary performance information scheduled in the Flight Manual, such helicopters are therefore eligible for performance class 1 or 2 operations:

   a. Certification as Category A under CS-27 or CS-29;

   b. Certification as Category A under JAR-27 or JAR-29;

   c. Certification as Category A under FAR Part 29;

   d. Certification as Group A under BCAR Section G;

   e. Certification as Group A under BCAR-29;

2. In addition to the above, certain helicopters have been certificated under FAR Part 27 and with compliance with FAR Part 29 engine isolation requirements as specified in FAA Advisory Circular AC 27-1. These helicopters may be accepted as eligible for Performance Class 1 or 2 operations provided that compliance is established with the following additional requirements of CS-29:

   CS 29.1027(a) Independence of engine and rotor drive system lubrication.

   CS 29.1187(e)

   CS 29.1195(a) & (b) Provision of a one-shot fire extinguishing system for each engine.

   CS 29.1197

   CS 29.1199

   CS 29.1201

   CS 29.1323(c)(1) Ability of the airspeed indicator to consistently identify the take-off decision point.

   * The requirement to fit a fire extinguishing system may be waived if the helicopter manufacturer can demonstrate equivalent safety, based on service experience for the entire fleet showing that the actual incidence of fires in the engine fire zones has been negligible.

3. Any helicopters certificated in accordance with to the following standards is considered to satisfy the Category B criteria.

   a. JAR-27;

   b. category B under JAR-29;

   c. FAR Part 27;

   d. category B under FAR Part 29;

   e. BCAR Section G; and

   f. group B under BCAR-29.

   If appropriately equipped, such helicopters are therefore eligible for performance class 3 operations.

GM OPS.GEN.010(a)(9)&(10) Definitions

CATEGORY A AND CATEGORY B

The performance operating rules of JAR-OPS 3, which were transposed into the implementing Rules, were drafted in conjunction with the performance requirements of JAR-29 Issue 1 and FAR Part 29 at Amendment 29-39. For helicopters certificated under FAR Part 29 at an earlier

amendment, or under BCAR Section G or BCAR-29, performance data will have been scheduled in the Helicopter Flight Manual according to these earlier requirements. This earlier scheduled data may not be fully compatible with these rules. Before performance class 1 or 2 operations are approved, it should be established that scheduled performance data is available which is compatible with the requirements of performance class 1 and 2 respectively.

GM OPS.GEN.010(a)(30) Definitions

HELICOPTER EMERGENCY MEDICAL SERVICES (HEMS) FLIGHT

1. A HEMS flight (or more commonly referred to as HEMS mission) normally starts and ends at the HEMS Operating Base following tasking by the 'HEMS Dispatch Centre'. Tasking can also occur when airborne, or on the ground at locations other than the HEMS Operating Base.
2. It is intended that the following elements be regarded as integral parts of the HEMS mission:
   a. Flights to and from the HEMS Operating Site when initiated by the HEMS Dispatch Centre;
   b. Flights to and from an aerodrome/operating site for the delivery or pick-up of medical supplies and/or persons required for completion of the HEMS mission;
   c. Flights to and from an aerodrome/operating site for refuelling required for completion of the HEMS mission.

   All these flights are subject to the applicable requirements and alleviations of this subpart.

GM OPS.GEN.010(a)(41) Definitions

HOSTILE ENVIRONMENT

Those open sea areas considered to constitute a hostile environment should be designated by the appropriate authority in the appropriate Aeronautical Information Publication or other suitable documentation.

AMC OPS.GEN.010(a)(63) Definitions

THE APPLICATION OF TODRH

The selected height should be determined with the use of Helicopter Flight Manual data, and be at least 10.7 m (35 ft) above:

1. the take-off surface; or
2. as an alternative, a level defined by the highest obstacle in the takeoff distance required.

GM OPS.GEN.010(a)(73) Definitions

THE APPLICATION OF TAKE-OFF DISTANCE REQUIRED HELICOPTERS (TODRH)

1. Discussion

   Original definitions for helicopter performance were derived from aeroplanes; hence the definition of take-off distance owes much to operations from runways. Helicopters on the other hand can operate from runways, confined and restricted areas and rooftop FATO's - all bounded by obstacles. As an analogy this is equivalent to a take-off from a runway with obstacles on and surrounding it.

It can therefore be seen that unless the original definitions from aeroplanes are tailored for helicopters, the flexibility of the helicopter might be constrained by the language of operational performance.

This GM concentrates on the critical term - Take-off Distance Required (TODRH) - and describes the methods to achieve compliance with it and, in particular, the alternative procedure described in ICAO Annex 6 Attachment A 4.1.1.2(b):

a. The take-off distance required does not exceed the takeoff distance available; or

b. As an alternative, the take-off distance required may be disregarded provided that the helicopter with the critical power-unit failure at the TDP can, when continuing the take-off, clear all obstacles between the end of the take-off distance available and the point at which it becomes established in a climb at VTOSS by a vertical margin of 10.7 m (35 ft) or more. An obstacle is considered to be in the path of the helicopter if its distance from the nearest point on the surface below the intended line of flight does not exceed 30 m or 1.5 times the maximum dimension of the helicopter, whichever is greater.

2. Definition of TODRH

The definition of TODRH from OPS.GEN.010(a)(73) is as follows:

a. Take-off distance required (TODRH) means the horizontal distance required from the start of the take-off to the point at which V_{TOSS}, a selected height, and a positive climb gradient are achieved, following failure of the critical power-unit being recognised at TDP, the remaining power-unit(s) operating within approved operating limits. The selected height is to be determined with the use of Helicopter Flight Manual data, and is to be at least 10.7 m (35 ft) above:

   i. the take-off surface; or

   ii. as an alternative, a level defined by the highest obstacle in the take-off distance required.

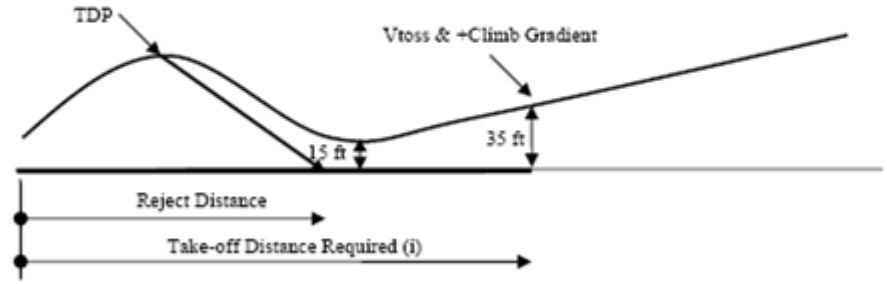
The original definition of TODRH was based only on the first part of this definition.

3. The clear area procedure (runway)

In the past, helicopters certificated in Category A would have had, at the least, a ‘clear area’ procedure. This procedure is analogous to an aeroplane Category A procedure and assumes a runway (either metalled or grass) with a smooth surface suitable for an aeroplane take-off (see Figure 1).

The helicopter is assumed to accelerate down the FATO (runway) outside of the HV diagram. If the helicopter has an engine failure before TDP, it must be able to land back on the FATO (runway) without damage to helicopter or passengers; if there is a failure at or after TDP the aircraft is permitted to lose height - providing it does not descend below a specified height above the surface (usually 15 ft if the TDP is above 15 ft). Errors by the pilot are taken into consideration but the smooth surface of the FATO limits serious damage if the error margin is eroded (e.g. by a change of wind conditions).

Figure 1 - Clear Area take-off



The operator only has to establish that the distances required are within the distance available (take-off distance and reject distance). The original definition of TODRH meets this case exactly.

From the end of the TODRH obstacle clearance is given by the climb gradient of the first or second climb segment meeting the requirement of AMC1 OPS.CAT.355.H (b) (or for performance class 2 – AMC3 OPS.CAT.355.H (b)). The clearance margin from obstacles in the take-off flight path takes account of the distance travelled from the end of the take-off distance required and operational conditions (IMC or VMC).

4. Category a procedures other than clear area

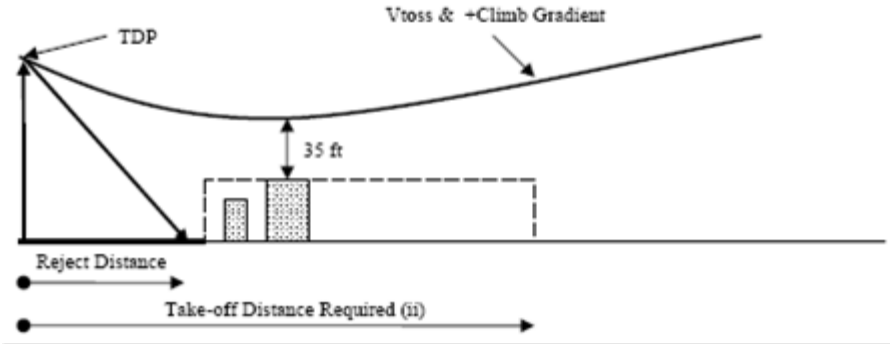
Procedures other than the clear area are treated somewhat differently. However, the short field procedure is somewhat of a hybrid as either part of the definition of TODRH can be utilised (the term 'helipad' is used in the following section to illustrate the principle only - it is not intended as a replacement for 'aerodrome').

4.1 Limited area, restricted area and helipad procedures (other than elevated)

The exact names of the procedure used for other than clear area are as many as there are manufacturers. However, principles for obstacle clearance are generic and the name is unimportant.

These procedures (see Figure 2 and Figure 3) are usually associated with an obstacle in the continued take-off area - usually shown as a line of trees or some other natural obstacle. As clearance above such obstacles is not readily associated with an accelerative procedure, as described in 3 above, a procedure using a vertical climb (or a steep climb in the forward, sideways or rearward direction) is utilised.

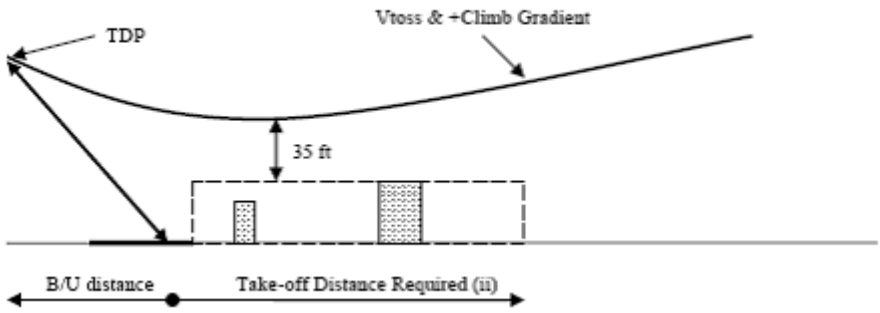
Figure 2 - Short Field take-off



With the added complication of a TDP principally defined by height together with obstacles in the continued take off area, a drop down to within 15 ft of the take-off surface is not deemed appropriate and the required obstacle clearance is set to 35 ft (usually called min-dip). The distance to the obstacle does not need to be calculated (provided it is outside the rejected distance required), as clearance above all obstacles

is provided by ensuring that helicopter does not descend below the min-dip associated with a level defined by the highest obstacle in the continued take-off area.

Figure 3 - Helipad take-off



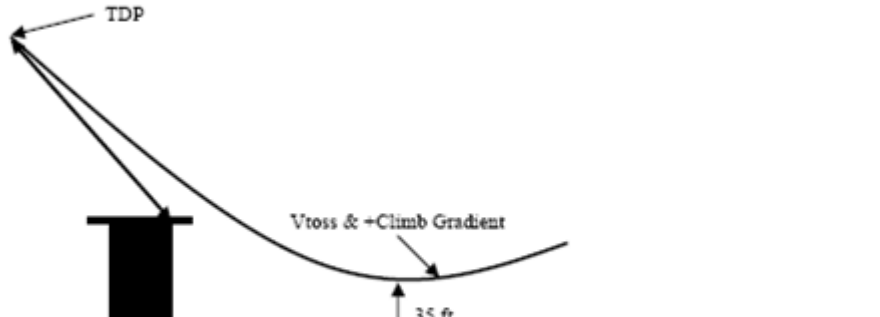
These procedures depend upon the alternative definition of TODRH.

As shown in Figure 3, the point at which V_{TOSS} and a positive rate of climb are met defines the TODRH. Obstacle clearance from that point is assured by meeting the requirement of AMC1 OPS.CAT.355.H (b) (or for performance class 2 - AMC3 OPS.CAT.355.H (b)). Also shown in Figure 3 is the distance behind the helipad which is the back-up distance (B/U distance).

4.2 Elevated helipad procedures

The elevated helipad procedure (see Figure 4) is a special case of the ground level helipad procedure discussed above.

Figure 4 - Elevate Helipad take-off



The main difference is that drop down below the level of the take-off surface is permitted. In the drop down phase, the Category A procedure ensures deck-edge clearance but, once clear of the deck-edge, the 35 ft* clearance from obstacles relies upon the calculation of drop down. The alternative definition of the TODRH is applied.

* 35ft may be inadequate at particular elevated FATO's which are subject to adverse airflow effects, turbulence, etc.

GM OPS.GEN.015 Pilot-in-command responsibilities and authority

GENERAL

In accordance with paragraph 1.c. of Annex IV to Regulation (EC) No 216/2008 (Essential requirements for air operations), the pilot-in-command must be responsible for the operation and safety of the aircraft and for the safety of all crew members, passengers and cargo on board. This should be understood as including the following:

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

2. The operation and safety of the aircraft:

   a. 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, for aeroplanes;

   b. when the rotors are turning, for helicopters;

   c. from the moment the launch procedure is started until the aircraft comes to rest at the end of the flight, for sailplanes; and

   d. from the moment the inflating of the envelope is started until the envelope is deflated, for balloons.

AMC1 OPS.GEN.015(a)(5) Pilot-in-command responsibilities and authority

ADMISSION TO THE COCKPIT/PILOT COMPARTMENT

The pilot-in-command should ensure that:

1. in the interests of safety, admission to the cockpit/pilot compartment does not cause distraction and/or interfere with the flight operation; and

2. all persons carried in the cockpit/pilot compartment are made familiar with the relevant restrictions and safety procedures.

AMC2 OPS.GEN.015(a)(5) Pilot-in-command responsibilities and authority

ADMISSION TO COCKPIT/PILOT COMPARTMENT – COMMERCIAL AIR TRANSPORT

1. Only the following persons may be admitted to or carried in the cockpit/pilot compartment:

   a. An operating crew member;

   b. A representative of the competent authority, if it is required for the performance of his/her official duties;

   c. A person authorised by the operator;

   d. Passengers, in the case of balloons with no separate pilot compartment.

2. In the case of other than complex motor-powered aircraft, persons admitted to or carried in the cockpit/pilot compartment may be carried in a pilot seat.

GM OPS.GEN.015(b) Pilot-in-command responsibilities and authority

AUTHORITY TO REFUSE CARRIAGE OR DISEMBARK

This may include:

1. special categories of passengers; or

2. persons that appear to be under the influence of alcohol or drugs.

AMC OPS.GEN.015(c) Pilot-in-command responsibilities and authority

REPORTING OF HAZARDOUS FLIGHT CONDITIONS

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

2. Such reports should be made whenever any of the following conditions are encountered or observed:

a. severe turbulence;

b. severe icing;

c. severe mountain wave;

d. thunderstorms, with or without hail, which are obscured, embedded, widespread or in squall lines;

e. heavy dust storm or heavy sandstorm;

f. volcanic ash cloud;

g. unusual and/or increasing volcanic activity or a volcanic eruption.

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

AMC OPS.GEN.015(d) Pilot-in-command responsibilities and authority

MITIGATING MEASURES

The use of additional crew members and controlled rest during flight are considered to be adequate mitigating measures.

GM OPS.GEN.015(d) Pilot-in-command responsibilities and authority

MITIGATING MEASURES – CONTROLLED REST

1. This Guidance Material (GM) addresses controlled rest taken by the minimum certificated flight crew. It is not related to planned in flight rest by members of an augmented crew.

2. Although flight crew members should stay alert at all times during flight, unexpected fatigue can occur as a result of sleep disturbance and circadian disruption. To cover for this unexpected fatigue, and to regain a high level of alertness, a controlled rest procedure in the cockpit, organised by the pilot-in-command may be used, if workload permits. 'Controlled rest' means a period of time 'off task' that may include actual sleep. The use of controlled rest has been shown to significantly increase the levels of alertness during the later phases of flight, particularly after the top of descent, and is considered to be good use of Crew Resource Management (CRM) principles. Controlled rest should be used in conjunction with other on board fatigue management countermeasures such as physical exercise, bright cockpit illumination at appropriate times, balanced eating and drinking, and intellectual activity.

3. Controlled rest taken in this way should not be considered to be part of a rest period for the purposes of calculating flight time limitations, nor used to justify any duty period. Controlled rest may be used to manage both sudden unexpected fatigue and fatigue which is expected to become more severe during higher workload periods later in the flight. Controlled rest is not related to fatigue management which is planned before flight.

4. Controlled rest periods should be agreed according to individual needs and the accepted principles of CRM; where the involvement of the cabin crew is required, consideration should be given to their workload.

5. When applying controlled rest procedures, the pilot-in-command should ensure that:

a. the other flight crew member/s is/are adequately briefed to carry out the duties of the resting flight crew member;

b. one flight crew member is fully able to exercise control of the aircraft at all times; and

c. any system intervention which would normally require a cross-check according to multi-crew principles is avoided until the resting flight crew member resumes his/her duties.

6. Controlled rest procedures should satisfy the following criteria:

a. Only one flight crew member at a time should take rest at his/her station; the harness should be used and the seat positioned to minimise unintentional interference with the controls;

b. The rest period should be no longer than 45 minutes (in order to limit any actual sleep to approximately 30 minutes) to limit deep sleep and associated long recovery time (sleep inertia);

c. After this 45-minute period, there should be a recovery period of 20 minutes during which sole control of the aircraft should not be entrusted to the flight crew member during his/her recovery period;

d. In the case of two-crew operations, means should be established to ensure that the non-resting flight crew member remains alert. This may include:

i. appropriate alarm systems;

ii. on board systems to monitor flight crew activity; and

iii. frequent cabin crew checks. In this case, the pilot-in-command should inform the senior cabin crew member of the intention of the flight crew member to take controlled rest, and of the time of the end of that rest; frequent contact should be established between the non-resting flight crew member and the cabin crew by communication means, and the cabin crew should check that the resting flight crew member is alert at the end of the period;

e. There should be a minimum of 20 minutes between two subsequent controlled rest periods in order to overcome the effects of sleep inertia and allow for adequate briefing;

f. If necessary, a flight crew member may take more than one rest period, if time permits, on longer sectors, subject to the restrictions above;

g. Controlled rest periods should terminate at least 30 minutes before the top of descent.

AMC OPS.GEN.015(e)(3) Pilot-in-command responsibilities and authority

PROTECTIVE CLOTHING - BALLOONS

Protective clothing should include:

1. long sleeves and trousers made out of natural fibres;

2. stout footwear; and

3. gloves.

AMC1 OPS.GEN.020(a) Crew responsibilities

FATIGUE RISK MANAGEMENT

1. In accordance with paragraph 7.f. of Annex IV to Regulation (EC) No 216/2008 (Essential requirements for air operations), no crew member must allow their task achievement/decision making to deteriorate to the extent that flight safety is endangered because of the effects of fatigue. Before commencing a flight, a crew member should take the following factors into account, as relevant, to assess the risk of personal fatigue:

a. Fatigue accumulated over a period of time and time since last rest;

b. Sleep deprivation (i.e. arising from interruption of the normal sleep/wake cycle);

c. Activity carried out prior to a flight, including physical activity;

d. Number or series of flights (sectors) planned or accomplished;

e. Duration of the planned flight activity;

f. The time of day/night at which the flight is scheduled to begin and time flown at night;

g. The pattern of working and sleeping relative to the circadian rhythm (24-hour physiological cycle);

h. Number and direction of time zones crossed;

i. Operational characteristics of the planned flight (e.g. weather conditions, familiarity with the route/destination, single/multi-pilot operation, service limitations of the aircraft, crew complement, such as reduced number of crew members, etc.).

2. Crew members should make optimum use of the opportunities and facilities for rest provided and plan and use their rest periods appropriately.

AMC2 OPS.GEN.020(a) Crew responsibilities

REPORTING OF ANY OCCURRENCE RELATED TO THE SAFETY OF THE AIRCRAFT AND ITS OCCUPANTS

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

GM OPS.GEN.020(a) Crew responsibilities

GENERAL

In accordance with paragraph 7.g. of Annex IV to Regulation (EC) No 216/2008 (Essential requirements for air operations), a crew member must not perform allocated 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:

1. Effects of deep water diving and blood donation, and allowing for a certain time period between these activities and returning to flying;

2. 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 mille.

AMC OPS.GEN.030 Transport of dangerous goods

EXEMPTION AND APPROVAL PROCEDURES OF THE TECHNICAL INSTRUCTIONS

1. 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 every effort is made to achieve an overall level of safety which is equivalent to that provided by the Technical Instructions. Although exemptions are most likely to be granted for the carriage of dangerous goods which 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 Instructions also make provision for some dangerous goods to be carried when an approval has been granted only by the State of Origin, providing specific conditions which are laid down in the Technical Instructions are met.

2. The States concerned are those of origin, transit, overflight and destination of the consignment and that of the operator.

3. 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 all relevant conditions on an exemption or approval are met.

4. The exemption or approval referred to above is in addition to the approval required by OPS.SPA.001.DG.

AMC OPS.GEN.030(b) Transport of dangerous goods

GENERAL

1. Dangerous goods required to be on board an aircraft in accordance with airworthiness and operational requirements are those which are for:

   a. the airworthiness of the aircraft;

   b. the safe operation of the aircraft; or

   c. the health of passengers or crew.

   Such dangerous goods include, but are not limited to:

   i. batteries;

   ii. fire extinguishers;

   iii. first-aid kits;

   iv. insecticides/air fresheners;

   v. life-saving appliances; and

   vi. portable oxygen supplies.

2. Articles and substances for specialised purposes are those connected with certain specialised aerial tasks or medical service operations. They should be carried in accordance with procedures and instructions contained in the operations manual and in accordance with officially recognised standards or national legislation. These procedures should be based on the ICAO Technical Instructions where possible but, as a minimum, they should mitigate the risks associated with their carriage.

AMC OPS.GEN.030(d)(1) Dangerous goods incident and accident reporting

GENERAL

1. Any type of dangerous goods incident or accident should be reported, irrespective of whether the dangerous goods are contained in cargo, mail, passengers' baggage or crew baggage.

2. 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 paragraph 3. 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.

3. The first and any subsequent report should be as precise as possible and contain such of the following data that are relevant:

   a. Date of the incident or accident or the finding of undeclared or misdeclared dangerous goods;

   b. Location, the flight number and flight date;

   c. Description of the goods and the reference number of the air waybill, pouch, baggage tag, ticket, etc;

   d. Proper shipping name (including the technical name, if appropriate) and UN/ID number, when known;

   e. Class or division and any subsidiary risk;

   f. Type of packaging, and the packaging specification marking on it;

   g. Quantity;

   h. Name and address of the shipper, passenger, etc;

   i. Any other relevant details;

   j. Suspected cause of the incident or accident;

   k. Action taken;

   l. Any other reporting action taken; and

   m. Name, title, address and telephone number of the person making the report.

4. Copies of relevant documents and any photographs taken should be attached to a report.

5. 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.

6. Dangerous Goods Reporting Form:

<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. Flight No:</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>
<tr><td colspan="4">23. Reference No of Airway Bill:</td></tr>
<tr><td colspan="4">24. Reference No of courier pouch, baggage tag, or passenger ticket:</td></tr>
<tr><td colspan="4">25. Name and address of shipper, agent, passenger, etc.:</td></tr>
<tr><td colspan="4">26. Other relevant information (including suspected cause, any action taken):</td></tr>
<tr><td colspan="2">27. Name and title of person making report:</td><td colspan="2">28. Telephone No:</td></tr>
<tr><td colspan="2">29. Company:</td><td colspan="2">30. Reporters ref:</td></tr>
<tr><td colspan="2" rowspan="2">31. Address:</td><td colspan="2">32. Signature:</td></tr>
<tr><td colspan="2">33. Date:</td></tr>
</table>

Description of the occurrence (continuation)

Notes for completion of the form:

1. Any type of dangerous goods occurrence must be reported, irrespective of whether the dangerous goods are contained in cargo, mail or baggage.

2. A dangerous goods accident is an occurrence associated with and related to the transport of dangerous goods which results in fatal or serious injury to a person or major property damage. For this purpose serious injury is an injury which is sustained by a person in an accident and which:

   a. requires hospitalisation for more than 48 hours, commencing within 7 days from the date the injury was received; or

   b. results in a fracture of any bones (except simple fractures of fingers, toes or nose); or

   c. involves lacerations which cause severe haemorrhage, nerve, muscle or tendon damage; or

   d. involves injury to any internal organ; or

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

   f. involves verified exposure to infectious substances or injurious radiation. A dangerous goods accident may also be an aircraft accident; in which case the normal procedure for reporting of air accidents must be followed.

3. A dangerous goods incident is an occurrence, other than a dangerous goods accident, associated with and related to the transport of dangerous goods, not necessarily occurring on board an aircraft, which results in injury to a person, property damage, fire, breakage, spillage, leakage of fluid or radiation or other evidence that the integrity of the packaging has not been maintained. Any occurrence relating to the transport of dangerous goods which seriously jeopardises the aircraft or its occupants is also deemed to constitute a dangerous goods incident.

4. This form should also be used to report any occasion when undeclared or misdeclared dangerous goods are discovered in cargo, mail or unaccompanied baggage or when accompanied baggage contains dangerous goods which passengers or crew are not permitted to take on aircraft.

5. An initial report, which may be made by any means, must be dispatched within 72 hours of the occurrence, to the competent authority of the State (a) of the operator; and (b) in which the incident occurred, unless exceptional circumstances prevent this. This occurrence report form, duly completed, must be sent as soon as possible, even if all the information is not available.

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

7. Any further information, or any information not included in the initial report, must be sent as soon as possible to authorities identified in paragraph 5.

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

AMC OPS.GEN.030(d)(2) Dangerous goods incident and accident reporting

REPORTING OF UNDECLARED OR MISDECLARED GOODS

An operator should also report the finding of undeclared or misdeclared dangerous goods. The first report should be dispatched within 72 hours of the discovery and include the details that are known at that time. If necessary, a subsequent report must be made as soon as possible giving whatever additional information has been established.

GM OPS.GEN.030 Transport of dangerous goods

GENERAL

1. The requirements to transport dangerous goods by air in accordance with the 2007-2008 Edition of the Technical Instructions for the Safe Transport of Dangerous Goods by Air published by decision of the Council of the International Civil Aviation Organization. (ICAO Doc 9284-AN/905.) is irrespective of whether an approval to carry dangerous goods in accordance with OPS.SPA.001.DG is held.
2. Dangerous goods referred to in OPS.GEN.030(b) are those mentioned in Part 1 of the ICAO Technical Instructions.
3. Baggage separated from its owner includes lost or improperly routed baggage which is carried by an operator for the purpose of returning it to its owner.

Section II - Operational procedures

AMC1 OPS.GEN.100 Ice and other contaminants

FLIGHT IN EXPECTED OR ACTUAL ICING CONDITIONS

1. In accordance with paragraph 2.a.5 of Annex IV to Regulation (EC) No 216/2008 (Essential requirements for air operations), in case of flight into known or expected icing conditions, the aircraft must be certified, equipped and/or treated to operate safely in such conditions. The procedures to be established by the operator should take account of the design, the equipment, the configuration of the aircraft and the necessary training. For these reasons, different aircraft types operated by the same company may require the development of different procedures. In every case the relevant limitations are those which are defined in the Aircraft Flight Manual (AFM) and other documents produced by the manufacturer.

2. The operator should ensure that the procedures take account of the following:

   a. The equipment and instruments which must be serviceable for flight in icing conditions;

   b. 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 which have to be made;

   c. The criteria the flight crew should use to assess the effect of icing on the performance and/or controllability of the aircraft;

   d. 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

   e. The action to be taken by the flight crew in a deteriorating situation (which may develop rapidly) resulting in an adverse affect 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.

3. Training for dispatch and flight in expected or actual icing conditions. The content of the operations manual should reflect the training, both conversion and recurrent, which flight crew, cabin crew and all other relevant operational personnel require in order to comply with the procedures for dispatch and flight in icing conditions:

   a. For the flight crew, the training should include:

      i. instruction in how to recognise, from weather reports or forecasts which are available before flight commences or during flight, the risks of encountering icing conditions along the planned route and on how to modify, as necessary, the departure and in-flight routes or profiles;

      ii. instruction in the operational and performance limitations or margins;

      iii. the use of in-flight ice detection, anti-icing and de-icing systems in both normal and abnormal operation; and

      iv. instruction in the differing intensities and forms of ice accretion and the consequent action which should be taken.

   b. For the cabin crew, the training should include;

      i. awareness of the conditions likely to produce surface contamination; and

      ii. the need to inform the flight crew of significant ice accretion.

AMC2 OPS.GEN.100 Ice and other contaminants

DE-ICING/ANTI-ICING

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

   a. 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;

   b. procedures to be followed if de-icing and/or anti-icing procedures are interrupted or unsuccessful;

   c. post treatment checks;

   d. pre take-off checks;

   e. pre take-off contamination checks;

   f. the recording of any incidents relating to de-icing and/or anti-icing; and

   g. the responsibilities of all personnel involved in de-icing and/or anti-icing.

2. Operator's procedures should ensure that:

   a. 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), infra-red heat or forced air, taking account of aircraft type-specific requirements;

   b. account is taken of the wing skin temperature versus Outside Air Temperature (OAT), as this may affect:

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

      ii. the performance of the de-icing/anti-icing fluids;

   c. when freezing precipitation occurs or there is a risk of freezing precipitation occurring which would contaminate the surfaces at the time of take-off, aircraft surfaces should be anti-iced. If both de-icing and anti-icing are required, the procedure may be performed in a one or two-step process, depending upon weather conditions, available equipment, available fluids and the desired hold-over time (HoT). One-step de-icing/anti-icing means that de-icing and anti-icing are carried out at the same time, using a mixture of de-icing/anti-icing fluid and water. Two-step de-icing/anti-icing means that de-icing and anti-icing are carried out in two separate steps. The aircraft is first de-iced using heated water only or a heated mixture of de-icing/anti-icing fluid and water. After completion of the de-icing operation a layer of a mixture of de-icing/anti-icing fluid and water, or of de-icing/anti-icing fluid only, is to be sprayed over the aircraft surfaces. The second step will be applied before the first step fluid freezes, typically within three minutes and, if necessary, area by area;

   d. when an aircraft is anti-iced and a longer HoT is needed/desired, the use of a less diluted Type II or Type IV fluid should be considered;

   e. 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;

   f. during conditions conducive to aircraft icing on the ground or after de-icing and/or anti-icing, an aircraft is not dispatched for departure unless it has been given a contamination check or a post treatment check by a trained and

qualified person. This check should cover all treated surfaces of the aircraft and be performed from points offering sufficient accessibility to these parts. To ensure that there is no clear ice on suspect areas, it may be necessary to make a physical check (e.g. tactile);

g. the required entry is made in the technical log;

h. 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;

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

j. when re-treatment is necessary, any residue of the previous treatment should be removed and a completely new de-icing/anti-icing treatment should be applied; and

k. 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.

3. Special operational considerations:

a. 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;

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

c. 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;

d. 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;

e. The limitations or handling procedures resulting from subparagraphs c and/or d above should be part of the flight crew pre-take-off briefing.

4. Communications:

a. 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;

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

c. 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.

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

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

   a. A new method, procedure and/or technique;

   b. A new type of fluid and/or equipment;

   c. A new type of aircraft.

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

   a. de-icing and/or anti-icing methods and procedures;

   b. fluids to be used, including precautions for storage and preparation for use;

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

   d. checking and communications procedures.

8. Special maintenance considerations:

   a. 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;

   b. 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 zero degrees Celsius. 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.

GM1 OPS.GEN.100 Ice and other contaminants

TERMINOLOGY

Terminology. Terms used in the context of de-icing/anti-icing should be given the following meaning:

1. Anti-icing fluid. Anti-icing fluid includes, but is not limited to, the following:

   a. Type I fluid if heated to min 60 °C at the nozzle;

   b. Mixture of water and Type I fluid if heated to min 60 °C at the nozzle;

   c. Type II fluid;

   d. Mixture of water and Type II fluid;

   e. Type III fluid;

   f. Mixture of water and Type III fluid;

   g. Type IV fluid;

   h. Mixture of water and Type IV fluid.

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

2. 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.

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

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

5. Contamination check. Check of aircraft for contamination to establish the need for de-icing.

6. De-icing fluid. Such fluid includes, but is not limited to, the following:

   a. Heated water;

   b. Type I fluid;

   c. Mixture of water and Type I fluid;

   d. Type II fluid;

   e. Mixture of water and Type II fluid;

   f. Type III fluid;

   g. Mixture of water and Type III fluid;

   h. Type IV fluid;

   i. Mixture of water and Type IV fluid.

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

7. De-icing/anti-icing. This is the combination of de-icing and anti-icing performed in either one or two steps.

8. Ground Ice Detection System (GIDS). System used during aircraft ground operations to inform the personnel involved in the operation and/or the flight crew about the presence of frost, ice, snow or slush on the aircraft surfaces.

9. 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:

   a. 10°C for a Type I de-icing/anti-icing fluid; or

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

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

11. Pre-take-off check. An assessment normally performed from within the flight deck, to validate the applied HoT.

12. 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.

GM2 OPS.GEN.100 Ice and other contaminants

ANTI-ICING CODES

1. The following are examples of anti-icing codes:

   a. “Type I” at (start time) – To be used if anti-icing treatment has been performed with a Type I fluid;

   b. “Type II/100” at (start time) – To be used if anti-icing treatment has been performed with undiluted Type II fluid;

   c. “Type II/75” at (start time) – To be used if anti-icing treatment has been performed with a mixture of 75 % Type II fluid and 25 % water;

   d. “Type IV/50” at (start time) – To be used if anti-icing treatment has been performed with a mixture of 50 % Type IV fluid and 50 % water.

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

GM3 OPS.GEN.100 Ice and other contaminants

DE-ICING/ANTI-ICING

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

1. General:

   a. Any deposit of frost, ice, snow or slush on the external surfaces of an aircraft may drastically affect its flying qualities because of reduced aerodynamic lift, increased drag, modified stability and control characteristics. Furthermore, freezing deposits may cause moving parts, such as elevators, ailerons, flap

actuating mechanism etc., to jam and create a potentially hazardous condition. Propeller/engine/Auxiliary Power Unit (APU)/systems performance may deteriorate due to the presence of frozen contaminants to 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 zero degrees centigrade;

b. 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;

c. Under certain meteorological conditions, de-icing and/or anti-icing procedures may be ineffective in provided sufficient protection for continued operations. Examples of these conditions are freezing rain, ice pellets and hail, heavy snow, high wind velocity, fast dropping OAT or any time when freezing precipitation with high water content is present. No HoT guidelines exist for these conditions;

d. Material for establishing operational procedures can be found, for example, in:

i. ICAO Annex 3, Meteorological Service for International Air Navigation;

ii. ICAO Manual of Aircraft Ground De-icing/Anti-icing Operations;

iii. ISO 11075 Aircraft -- De-icing/anti-icing fluids -- ISO type I ;

iv. ISO 11076 Aircraft -- De-icing/anti-icing methods with fluids2;

v. ISO 11077 Aerospace -- Self propelled de-icing/anti-icing vehicles -- Functional requirements2;

vi. ISO 11078 Aircraft - De-icing/anti-icing fluids -- ISO types II, III and IV2;

vii. AEA ”Recommendations for de-icing/anti-icing of aircraft on the ground”;

viii. AEA “Training recommendations and background information for de-icing/anti-icing of aircraft on the ground”;

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

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

xi. SAE ARP4737 Aircraft - De-icing/anti-icing methods;

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

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

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

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

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

2. Fluids:

a. Type I fluid: Due to its properties, Type I fluid forms a thin, liquid-wetting film on surfaces to which it is applied which, under certain weather conditions, gives

a very limited HoT. With this type of fluid, increasing the concentration of fluid in the fluid/water mix does not provide any extension in HoT;

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

c. Type III fluid is a thickened fluid especially intended for use on aircrafts with low rotation speeds;

d. Fluids used for de-icing and/or anti-icing should be acceptable to the operator and the aircraft manufacturer. These fluids normally conform to specifications such as SAE AMS1424, SAE AMS1428 or equivalent. Use of non-conforming fluids is not recommended due to their characteristics being unknown. The anti-icing and aerodynamic properties of thickened fluids may be seriously degraded by, for example, inappropriate storage, treatment, application, application equipment and age.

3. Hold-over protection:

a. 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;

b. 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 aircrafts (jet or propeller blast) and ground equipment and structures;

c. 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;

d. References to usable HoT tables may be found in the AEA “Recommendations for de-icing/anti-icing of aircraft on the ground”.

AMC OPS.GEN.110 Carriage of persons

SEATS WHICH PERMIT DIRECT ACCESS TO EMERGENCY EXITS

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

GM1 OPS.GEN.110 Carriage of persons

GENERAL – COMMERCIAL OPERATIONS OTHER THAN COMMERCIAL AIR TRANSPORT

The carriage of operational personnel indispensable to the performance of a task and carried on a flight taking place immediately before, during or immediately after and directly associated with a specialised task, is not considered Commercial Air Transport. Except for parachute operations, the number of persons carried should not exceed six, excluding crew members.

GM OPS.GEN.110 Carriage of persons

MEANING OF DIRECT ACCESS

'Direct access' means a seat from which a passenger can proceed directly to the exit without entering an aisle or passing around an obstruction.

AMC1 OPS.GEN.115 Passenger briefing

SAFETY AND EMERGENCY EQUIPMENT

Relevant safety and emergency equipment includes:

1. seat belts or harnesses;
2. life jackets;
3. oxygen equipment;
4. passenger emergency briefing cards; and
5. other emergency equipment.

AMC2 OPS.GEN.115 Passenger briefing

MOTOR-POWERED AIRCRAFT – COMMERCIAL AIR TRANSPORT

1. Before take-off, passengers should be given a demonstration on:
   a. the use of safety belts and/or safety harnesses, including how to fasten and unfasten safety belts and/or safety harnesses;
   b. the location and use of oxygen equipment, if required;
   c. the location and use of life jackets, if required; and
   d. for helicopters, the location and use of life-rafts and survival suits, if required.
2. Passengers should be given a briefing, if applicable, on the following items:
   a. Before take-off:
      i. smoking regulations;
      ii. back of the seat to be in the upright position and tray table stowed before take-off and landing;
      iii. location of emergency exits;
      iv. extinguishing all smoking materials whenever oxygen is being used;
      v. location and use of floor proximity escape path markings;
      vi. stowage of hand baggage;
      vii. restrictions on the use of portable electronic devices; and
      viii. location and contents of the safety briefing card.

b. After take-off:

i. smoking regulations;

ii. use of safety belts and/or safety harnesses; and

iii. safety benefits of having seat belts fastened when seated irrespective of seat belt sign illumination.

c. Before landing:

i. smoking regulations;

ii. use of safety belts and/or safety harnesses;

iii. back of the seat to be in the upright position and tray table stowed before take-off and landing;

iv. re-stowage of hand baggage; and

v. restrictions on the use of portable electronic devices.

d. After landing:

i. smoking regulations; and

ii. use of safety belts and/or safety harnesses.

3. The briefing may be conducted verbally, through the use of audio-visual equipment, or a combination of both.

4. In addition to paragraph 3.a.6. of Annex IV to Regulation (EC) No 216/2008 (Essential requirements for air operations), passengers should also be instructed in the use and location of the required survival equipment.

AMC3 OPS.GEN.115 Passenger briefing

PASSENGER SAFETY TRAINING – MOTOR-POWERED AIRCRAFT WHERE NO CABIN CREW IS REQUIRED TO BE CARRIED – COMMERCIAL AIR TRANSPORT

1. An operator should establish a training programme for passengers covering safety and emergency procedures, including AMC1 CAT OPS.GEN.115 1. and 2. for a given type of aircraft.

2. Passengers who have been trained according to this programme and have flown on the aircraft type within the last 90 days may be carried on board without receiving a briefing/demonstration as required by AMC1 CAT OPS.GEN.115.

AMC4 OPS.GEN.115.B Passenger briefing

GENERAL - BALLOONS

1. Before and after take-off and landing, passengers should be given a briefing, relevant to the phase of flight, on the following items:

a. The use of safety and emergency equipment, such as:

i. landing hand-holds; and

ii. the items mentioned in AMC1 OPS.GEN.115, where applicable.

b. Wearing of suitable clothing;

c. Smoking regulations;

d. Stowage of baggage;

e. The importance to remain inside the basket at all times;

f. The landing positions to be assumed to minimise the effect of the impact upon an emergency landing.

2. Before take-off, passengers should be given a demonstration on AMC4 OPS.GEN.115.B 1.a. and 1.f.

AMC OPS.GEN.120.B Securing of passenger cabin and galleys

CARRIAGE AND STOWAGE OF HAND BAGGAGE - BALLOONS

1. Only the following items should be considered for carriage as hand baggage during a balloon flight, provided they can be stowed so that they do not pose any hazard during flight or when carrying out emergency procedures:

   a. Camera equipment;

   b. Binoculars.

2. In the few minutes preceding the landing and on indication by the pilot-in-command, passengers should stow cameras, binoculars, etc. preferably in their adapted bag/case. Passengers should not keep bulky objects attached around the neck by straps.

AMC OPS.GEN.125 Portable electronic devices

GENERAL – COMMERCIAL AIR TRANSPORT

1. Scope:

   This AMC addresses Portable Electronic Devices (PEDs), which are not approved equipment permanently installed in the aircraft.

   Systems and equipment approved and installed in the aircraft will need to satisfy applicable certification requirements and related operating restrictions. Similarly, this AMC does not apply to permitted medical equipment which meets applicable requirements.

2. Restrictions on use of PEDs by passengers:

   If an operator permits passengers to use PEDs on board its aircraft, procedures should be in place to control their use. It is the responsibility of the operator to ensure that all aircraft crew and ground agents are trained to enforce the restrictions on this equipment consistent with these procedures. These procedures should ensure the following:

   a. Cell phones and other transmitting devices are not used and are switched off from the time at the start of the flight when the passengers have boarded and all doors have been closed until the end of the flight when a passenger door has been opened.

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

      This paragraph does not apply to a PED where the sole means of transmission is identified as a low power transmitting device compliant with the “Bluetooth” Standard.

      This paragraph may not apply to systems installed in the aircraft for the use of cell phones in-flight;

b. PEDs that are not transmitting devices are disconnected from any in-seat electrical power supply, switched off and stowed during taxiing, take-off, approach and landing, and during abnormal or emergency conditions.

This restriction does not apply to permitted medical equipment.

This restriction applies to equipment carried on by the passenger or loaned to the passenger by the aircraft operator.

In the case of a PED where the sole means of transmission is identified as a low power “Bluetooth” transmitter, it may be considered to be a non-intentional transmitter and may be used during non-critical phases of flight as allowed by this paragraph;

c. Necessary announcements are made both prior to and during boarding of the aircraft so that passengers may be reminded of the restrictions applicable to cell phones and other transmitting devices before fastening their seat belts;

d. Cabin crew monitor passenger use of equipment during the flight and, where necessary, ensure suspect equipment is switched off. The cabin crew should be particularly alert to passenger misuse of equipment which has a built-in cell phone. Furthermore, if turbulence is encountered and the crew determine that loose items could present a hazard, instructions will be given that these should be stowed;

e. Appropriate flight crew to cabin crew co-ordination exists to deal with interference or other PED safety related problems;

f. Crew are aware of the proper means to switch off in-seat power supplies used for PEDs;

g. Check-in and ground handling staff, as well as flight and cabin crews, are aware of the safety issues and restrictions concerning PEDs;

h. Occurrences are reported to the responsible authority of suspected or confirmed interference which has potential safety implications. Where possible, to assist follow-up technical investigation, reports should describe the offending device, identify the brand name and model number, its location in the aircraft at the time of the occurrence, interference symptoms, and the results of actions taken by the crew.

The co-operation of the device owner should be sought by obtaining contact details.

3. Restrictions on the use of PEDs by cabin crew:

PEDs provided to assist cabin crew in their duties should be switched off and stowed during taxiing, take-off, approach and landing, unless tests have been performed which confirm that these PEDs are not a source of unacceptable interference or other safety hazard.

Cabin crew should observe the same restrictions for cell phone usage as applicable to passengers.

4. Restrictions on use of PEDs by flight crew:

PEDs provided to assist the flight crew in their duties will need to be used in compliance with the procedures and conditions stated in the operations manual of the aircraft operator. Such equipment will need to be switched off and stowed during all phases of flight unless:

a. tests have been performed which confirm that these PEDs are not a source of unacceptable interference or distraction;

b. the PEDs do not pose a loose-item risk or other hazard, and

c. the conditions for their use in-flight are stated in the operations manual.

Flight and cabin crews should avoid using cell phones and other transmitting devices during critical pre-flight procedures (e.g. when loading route information into navigation systems or when monitoring fuel loading). Otherwise, flight crews and other persons involved in dispatching the aircraft will need to observe the same restrictions as passengers.

This restriction does not preclude use of a cell phone by the flight crew to deal with an emergency although reliance should not be predicated on a cell phone for this purpose.

5. Other precautions:

a. Except for items which do not pose a loose item risk, PEDs, together with any accessories such as spare batteries or cables, carried on board an aircraft for crew or passenger use, should be provided with suitable stowage facilities.

b. Where in-seat electrical power supplies are available for passenger use, information cards giving safety instructions should be provided.

GM OPS.GEN.125 Portable electronic devices

GENERAL - COMMERCIAL AIR TRANSPORT

1. General:

The use of PEDs on board aircraft by crew members and passengers presents a source of uncontrolled electro-magnetic radiation with the risk of adverse interference effects to aircraft systems. Given that a civil aircraft flying at high altitude and high speed in busy airspace is in an obviously hazardous environment, and given that many of the onboard systems are safety devices intended to reduce the risks of that environment to tolerable levels, then anything that degrades the effectiveness of those systems will increase the exposure of the aircraft to the hazards. Consequently, the aircraft operator needs to take measures that will reduce the risks to acceptable limits.

PEDs fall into two main categories; non-intentional transmitters and intentional transmitters. The first category includes, but is not limited to, computing equipment, cameras, radio receivers, audio and video reproducers, electronic games and toys, together with portable, non-transmitting devices intended to assist crew members in their duties. Intentional transmitters are transmitting devices such as remote control equipment (which may include some toys), two-way radios, cell phones and satellite phones. In periods between transmissions, an intentional transmitter may radiate interference as a non-intentional transmitter.

2. Non-intentional transmitting PEDs:

PEDs that are non-intentional transmitters will radiate emissions from internal oscillators and processor clocks, some types of motor, and power supply converters. The radio frequencies involved may fall in the bands used for aeronautical radio services, and emission levels may be sufficient to affect aircraft radio receivers through their antennas. Use of a PED on the flight deck presents a particular risk to those navigation systems having antenna systems located in the radome.

3. Intentional transmitting PEDs:

PEDs that are intentional transmitters may induce interference directly into aircraft equipment, wiring or components with sufficient power to adversely affect the proper functioning of aircraft systems. Many aircraft have non-metallic floors and internal doors that present no barrier to prevent the transmission from penetrating to the avionics equipment bays and to the flight deck. Tests have shown that demonstrated susceptibility levels of aircraft equipment, particularly equipment qualified to earlier standards can easily be exceeded.

a. Cell phones:

The rapid growth in cell phone usage has presented the most significant risk to aircraft safety from PED interference. Cell phones are both non-intentional and intentional transmitting PEDs, operating on spot channel frequencies in the bands of approximately 415 MHz, 900 MHz or 1800 MHz. (Some regions of the world use slightly different bands). Most use digital modulation but analogue types are still in use. Their maximum transmitted power is in the range of typically one to five watts. The actual power transmitted at a particular time is controlled by the cellular network and may vary from 20 mW to maximum rated power of the cell phone depending on quality of the link between the cell phone and the network. Even in standby mode, a cell phone transmits periodically to register and re-register with the cellular network and to maintain contact with a base station.

The transmitted power and precise radio frequency of an operating cell phone is dependent on the traffic on the network, the distance of the cell phone from the nearest base station, and any obstacles or attenuation in the signal path. An aircraft on the ground at an airport is likely to be in close proximity to a base station resulting in a strong link between that station and an onboard cell phone. Under these circumstances, the cell phone would seek a free channel in the assigned communication band and its output power would be set by the network to a low level sufficient to maintain the link. Interference levels would, as a result, be low and probably harmless but this cannot be guaranteed. Closing of the aircraft doors increases attenuation in the signal path, and as the aircraft increases its distance from the base station, the output power setting of the cell phone is increased, eventually to its maximum rating. The risk of interference is then at its greatest. At altitude, the cell phone will transmit periodically attempting to register with the cellular network. The quality of the link is likely to be poor and the cell phone will radiate maximum power in these circumstances. Furthermore, since it is likely to be in line-of-sight range of multiple base stations, some degradation of the network operation may result and actual communication may not be possible.

The effect of this type of functioning is that, when the aircraft is on the ground near a base station, the interference risk can be low but not negligible, and it will increase as the aircraft taxies and then climbs away from the network base stations.

The simultaneous use in an aircraft of several cell phones will result in transmissions at different radio frequencies leading to a more complex interference environment.

b. Private Mobile Radios (PMRs):

Private mobile radios conforming to the PMR 446 standard are now available to the general public for use as two-way radios without the need of a licence. These radios operate in the 446 MHz band and with sufficient power when transmitting to present an unacceptable interference risk in aircraft. Similarly, other types of two-way radios including those operating in the citizens' band present an unacceptable interference risk.

c. Wireless Area Networks:

Wireless Local Area Network (WLAN) is an evolving technology offering wireless data communications, replacing Ethernet cables, for computing information exchange with a range of about 100 metres.

Standards are being developed for WLAN such as the IEEE 802.11 and some future PEDs are likely to have this capability. WLAN uses radio transmissions of

low power in the 2.4 GHz band with consideration being given to use of the 5 GHz band. WLAN transmissions do not need to be licensed.

Similarly, Wireless Personal Area Network (WPAN) is an emerging technology offering wireless data and audio communications, with a range of about 10 metres. "Bluetooth" is the name given to one example of a WPAN technology. WPAN also uses unlicensed, very low power radio transmissions in the 2.4 GHz band. Bluetooth will be incorporated into many classes of PED and passengers are likely to bring them on board aircraft expecting to use such devices during the flight. Studies have been completed which show that the interference risk in aircraft from PEDs with a Bluetooth transmitter is sufficiently low to permit their use during non-critical phases of flight i.e. Bluetooth devices need be subject only to the general restrictions applied to non-intentional transmitters.

4. In-seat Power Supplies:

Many aircraft now offer an electrical supply at each passenger seat primarily for the purpose of operating laptop computers. These computers have safety devices to protect against over-charging of their re-chargeable batteries. Other types of PED might not have such protection and might be fitted (possibly incorrectly) with standard, non-chargeable batteries. Overcharging of batteries, or attempts to charge standard batteries, could cause them to fail in a dangerous manner with fire, smoke and fumes risks. It is the responsibility of the aircraft operator to ensure that PEDs connected to the in-seat supply do not present any additional hazard to persons on board the aircraft or to the aircraft itself. Safeguards include issuing passengers with information cards giving safety instructions for using the in-seat supplies and the restrictions for charging or handling batteries. The availability of a means to terminate and isolate such electrical supplies together with appropriate cabin crew procedures will be required as a condition of approval and use of in-seat power supplies.

5. Interference levels and effects:

a. Aircraft Equipment Qualification:

To qualify for approval, equipment to be installed in aircraft has to demonstrate that it is not susceptible to prescribed levels of radiated interference irrespective of the source, and that it will not radiate unacceptable interference. The levels were originally set to ensure equipment could co-exist in the aircraft without mutual interference. For example, for an equipment susceptibility test prior to 1985, the maximum field strength of radiated interference was set at only 0.1 volts per metre. The risk of an uncontrolled interference source within the aircraft was not addressed by earlier standards. Recognising the inadequacy of the earlier standards, the tests have become progressively more severe primarily to protect against external threats such as broadcast transmitters, radars, and satellite uplinks. For critical equipment, the susceptibility tests now involve field strengths of 200 volts per metre or more. However, even the latest standards permit a low level of immunity for some equipment. Many aircraft, including newly manufactured aircraft, still have systems and equipment qualified to earlier standards.

b. Interference Levels:

Studies have confirmed that the levels and radio frequencies of radiated interference from non-intentional transmitters are such that aircraft radio receivers can be affected. Over the years, many reports have been received by the authorities concerning such interference.

For an intentional transmitter such as a cell phone, an obvious risk is recognised even though the cell phone is not transmitting in the aeronautical frequency band. Applying fundamental principles, the maximum field strength E in volts per metre of the transmission at a distance D from a cell phone transmitting P

Watts of radio frequency power in a free, unobstructed space, can be estimated using the equation;

E = 7 √P divided by the distance D

(The strengths of electric and magnetic fields that exist in close proximity to the transmitting antenna (i.e. distances less than one wavelength and known as the near field) are not considered in this simple explanation.)

Thus, for a two watt cell phone, the maximum field strength in free space at one metre distance is approximately 10 volts per metre, and at 100 metres distance, approximately 0.1 volts per metre.

However, in the confines of a metallic aircraft fuselage, complex propagation paths arise due to reflections from the metallic structure which can lead to signal cancellation or re-enforcement at different locations in the aircraft. Although the free space equation does not give reliable results under these conditions, tests have shown that the field strength of the interfering cell phone transmission, at maximum power, will exceed by a significant margin the levels used in susceptibility tests for avionic equipment qualified to earlier standards. Similarly, these tests have shown that interference levels would vary by relatively small changes of location of a cell phone and that persons obstructing the transmission path reduce the interference.

c. Effects:

Reports of interference are increasing but it has been difficult to positively confirm in all cases that a PED has been the actual cause of a problem. This is due to the difficulty in replicating the conditions that existed at the time of the occurrence due to the multiple factors involved (e.g. geographical location of the aircraft, system operating modes, interference frequency and intensity, source location in the aircraft, and path attenuation). Cell phones have been positively identified as the cause of degraded communications and of false baggage compartment smoke warnings. Cell phones have been strongly implicated in other spurious cockpit/pilot compartment warnings, corrupted instrument displays, and pressurisation system malfunctions.

Although the total number of reports is relatively low considering the aircraft flight hours involved, the potential severity of the effects of interference means that the problem cannot be ignored.

As a general conclusion, interference can result in:

i. malfunctioning of multiple systems;

ii. false warnings of unsafe conditions;

iii. increased work load for the flight crew and the possibility of invoking emergency drills;

iv. reduced crew confidence in protection systems which may then be ignored during a genuine warning;

v. distraction of the flight crew from their normal duties;

vi. noise in the flight crew headphones; and/or

vii. hidden failures of safety systems with loss of protection.

6. Recommendations:

a. Aircraft operators should consider installing detectors in their aircraft, which together with suitable procedures can assist the cabin crew to detect unauthorised transmissions from commonly used types of cell phone.

b. Aircraft operators should seek the assistance of airport operators for the display of safety notices at aircraft boarding points reminding passengers to switch off cell phones and other transmitting devices.

AMC OPS.GEN.135.A Taxiing of aeroplanes

QUALIFIED PERSONNEL

A qualified person is either a flight crew member or a person designated by the operator that is:

1. competent to taxi;
2. qualified to use the radio telephone if radio communications are required;
3. has received instruction from a competent person on operational procedures, aerodrome layout, and where appropriate, information on routes, signs, marking, lights, ATC signals and instructions, phraseology and procedures; and
4. able to conform to the operational standards required for safe aircraft movement at the aerodrome.

GM OPS.GEN.140.H Rotor engagement

QUALIFIED PERSONNEL

The intent of this paragraph is to ensure that the pilot remains at the controls when the rotors are turning under power whilst not preventing ground runs being conducted by qualified personnel other than flight crew. The operator should ensure that the qualification of personnel, other than flight crew, which are authorised to conduct ground runs, is described in the appropriate manual.

AMC1 OPS.GEN.145 Use of aerodromes/operating sites

USE OF OPERATING SITES

1. The pilot-in-command should have available from a pre-survey or other publication, for each operating site to be used, diagrams or ground and aerial photographs, depiction (pictorial) and description of:
   a. the overall dimensions of the operating site;
   b. location and height of relevant obstacles to approach and take-off profiles, and in the manoeuvring area;
   c. approach and take-off flight paths;
   d. surface condition (blowing dust/snow/sand);
   e. provision of control of third parties on the ground (if applicable);
   f. lighting (if applicable);
   g. procedure for activating operating site in accordance with national regulations (if applicable);
   h. other useful information, for example appropriate Air Traffic Services (ATS) agency and frequency; and
   i. site suitability with reference to available aircraft performance.
2. For sites which are not pre-surveyed, the pilot-in-command should make, from the air and, in the case of balloons, also prior to take-off from the ground, a judgement on the suitability of a site. At least AMC OPS.GEN.145 1.a. to 1.e. inclusive and 1.i. should be considered.

AMC2 OPS.GEN.145 Use of aerodromes/operating sites

USE OF OPERATING SITES – COMMERCIAL AIR TRANSPORT

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

   a. An adequate site is a site which the operator considers to be satisfactory, taking account of the applicable performance requirements and site characteristics;

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

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

      i. the overall dimensions of the site;

      ii. location and height of relevant obstacles to approach and take-off profiles, and in the manoeuvring area;

      iii. approach and take-off flight paths;

      iv. surface condition (blowing dust/snow/sand);

      v. adequacy with reference to aircraft performance;

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

      vii. procedure for activating site with land owner or controlling authority;

      viii. other useful information, for example appropriate Air Traffic Services (ATS) agency and frequency; and

      ix. lighting (if applicable).

2. For sites which are not pre-surveyed, the operator should have in place a procedure which enables the pilot to make, from the air or, in the case of balloons, also prior to take-off, from the ground, a judgement on the suitability of a site. As a minimum, the items listed in 1.c.i. to vi. inclusive, should be considered.

3. Operations to non pre-surveyed sites by night should not be conducted, unless the operator is approved to do so in accordance with Part OPS.SPA.001.HEMS.

AMC3 OPS.GEN.145.H Use of aerodromes/operating sites

HELICOPTERS – USE OF HELIDECKS – COMMERCIAL AIR TRANSPORT

1. The content of the operations manual relating to the use of aerodromes should contain the listing of helideck limitations in a Helideck Limitations List (HLL) and a pictorial representation (template) of each helideck showing all necessary information of a permanent nature. The HLL will show, and be amended as necessary to indicate, the most recent status of each helideck concerning non-compliance with International Civil Aviation Organization (ICAO) Annex 14 Volume 2 , limitations, warnings, cautions or other comments of operational importance. An example of a typical template is shown in figure 1.

2. In order to ensure that the safety of flights is not compromised, the operator should obtain relevant information and details for compilation of the HLL, and the pictorial representation, from the owner/operator of the helideck.

3. When listing helidecks, if more than one name of the helideck exists, the most common name should be used; other names should also be included. After renaming a helideck, the old name should be included in the HLL for the ensuing six months.

4. All helideck limitations should be included in the HLL. Helidecks without limitations should also be listed. With complex installations and combinations of installations (e.g. co-locations), a separate listing in the HLL, accompanied by diagrams where necessary, may be required.

5. Each helideck should be assessed (based on limitations, warnings, cautions or comments) to determine its acceptability with respect to the following which, as a minimum, should cover the factors listed below:

   a. The physical characteristics of the helideck;

   b. The preservation of obstacle protected surfaces is the most basic safeguard for all flights. These surfaces are:

      i. the minimum 210° Obstacle Free Surface (OFS);

      ii. the 150° Limited Obstacle Surface (LOS); and

      iii. the minimum 180° falling "5:1" - gradient with respect to significant obstacles. If this is infringed or if an adjacent installation or vessel infringes the obstacle clearance surfaces or criteria related to a helideck, an assessment should be made to determine any possible negative effect which may lead to operating restrictions;

   c. Marking and lighting:

      i. Adequate perimeter lighting;

      ii. Adequate floodlighting;

      iii. Status lights (note: for night and day operations e.g. Aldis Lamp);

      iv. Dominant obstacle paint schemes and lighting;

      v. Helideck markings;

      vi. General installation lighting levels. Any limited authorisation in this respect should be annotated "daylight only operations" on the HLL;

   d. Deck surface:

      i. Surface friction;

      ii. Helideck net;

      iii. Drainage system;

      iv. Deck edge netting;

      v. Tie down system;

      vi. Cleaning of all contaminants;

   e. Environment:

      i. Foreign Object Damage;

      ii. Physical turbulence generators;

      iii. Bird control,

      iv. Air quality degradation due to exhaust emissions, hot gas vents or cold gas vents;

      v. Adjacent helidecks may need to be included in air quality assessment;

   f. Rescue and fire fighting:

      i. Primary and complementary media types, quantities, capacity and systems personal protective equipment and clothing, breathing apparatus;

ii. Crash box;

g. Communications & navigation:

i. Aeronautical Radio(s);

ii. R/T call sign to match helideck name and side identification which should be simple and unique;

iii. NDB or equivalent (as appropriate);

iv. Radio log;

v. Light signal (e.g. Aldis Lamp);

h. Fuelling facilities;

i. Additional operational and handling equipment:

i. Windsock;

ii. Wind recording;

iii. Deck motion recording and reporting where applicable;

iv. Passenger briefing system;

v. Chocks;

vi. Tie downs;

vii. Weighing scales.

j. Personnel:

Trained helideck staff (e.g. Helicopter Landing Officer/Helicopter Deck Assistant and fire fighters etc.).

6. For helidecks about which there is incomplete information, 'limited' use information may be issued by the operator prior to the first helicopter visit. During subsequent operations and before fully used, information should be gathered and the following procedures should apply:

a. Pictorial (static) representation:

i. Templates (see Figure 1) should be available, to be filled out during flight preparation on the basis of the information given by the helideck owner/operator and flight crew observations;

ii. Where possible, suitably annotated photographs may be used until the HLL and template has been completed;

iii. Until the HLL and template has been completed, operational restrictions (e.g. performance, routing etc.) may be applied;

iv. Any previous inspection reports should be obtained by the operator;

v. An inspection of the helideck should be carried out to verify the content of the completed HLL and template, following which the helideck may be fully used for operations;

b. With reference to the above, the HLL should contain at least the following:

i. HLL revision date and number;

ii. Generic list of helideck motion limitations;

iii. Name of helideck;

iv. 'D'-value of the helideck;

v. Limitations, warnings, cautions and comments;

c. The template should contain at least the following (see example below):

i. Installation/Vessel name;

ii. R/T call sign;

iii. Helideck Identification Marking;

iv. Side Panel Identification Marking;

v. Helideck elevation;

vi. Maximum installation/vessel height;

vii. 'D' Value;

viii. Type of installation/vessel;

A. Fixed manned

B. Fixed unmanned

C. Ship type (e.g. diving support vessel)

D. Semi-submersible

E. Jack-up

ix. Name of owner/operator;

x. Geographical position;

xi. Com/Nav Frequencies and Ident;

xii. General drawing preferably looking into the helideck with annotations showing location of derrick, masts, cranes, flare stack, turbine and gas exhausts, side identification panels, windsock etc.;

xiii. Plan view drawing, chart orientation from the general drawing, to show the above. The plan view will also show the 210 degree bisector orientation in degrees true;

xiv. Type of fuelling:

A. Pressure and Gravity

B. Pressure only

C. Gravity only

D. None

xv. Type and nature of fire fighting equipment;

xvi. Availability of GPU;

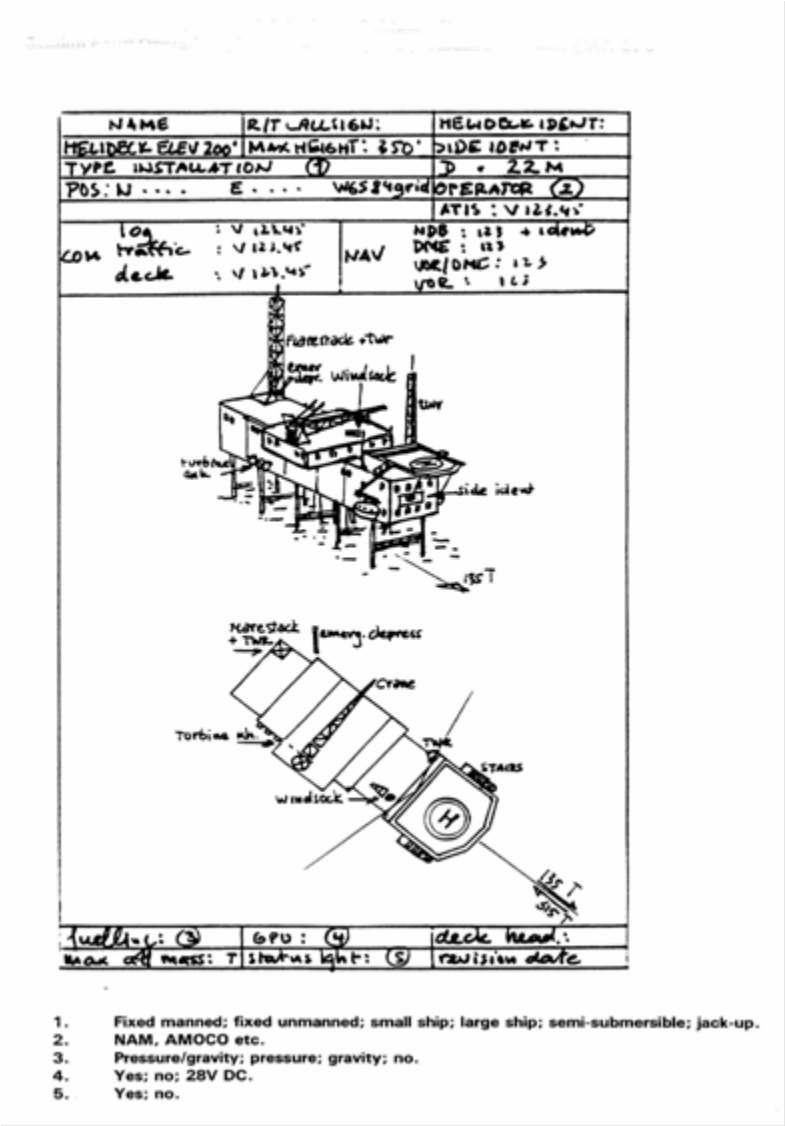
xvii. Deck heading;

xviii. Maximum allowable mass;

xix. Status light (Yes/No);

xx. Revision date of publication.

Figure 1 – Helideck Template



1. Fixed manned; fixed unmanned; small ship; large ship; semi-submersible; jack-up.
2. NAM, AMOCO etc.
3. Pressure/gravity; pressure; gravity; no.
4. Yes; no; 28V DC.
5. Yes; no.

AMC4 OPS.GEN.145 Use of aerodromes / operating sites

USE OF OPERATING SITES – COMMERCIAL OPERATIONS OTHER THAN COMMERCIAL AIR TRANSPORT

When using operating sites, the operator should take account of AMC2 OPS.GEN.145.

GM1 OPS.GEN.145 Use of aerodromes / operating sites

ADEQUATE AERODROME

At the expected time of use, the adequate aerodrome should be available and equipped with necessary ancillary services such as ATS, sufficient lighting, communications, weather reporting, navaids and emergency services.

GM2 OPS.GEN.145 Use of aerodromes / operating sites

PUBLICATIONS

'Other publication' mentioned in AMC OPS.GEN 145 refers to publication means, such as:

1. (Military) Aeronautical Information Publication;

2. Visual Flight Rules (VFR) Guides;

3. commercially available aeronautical publications (e.g. Jeppesen, AERAD, Fugawi); and

4. non-commercially available publications.

GM3 OPS.GEN.145 Use of aerodromes/operating sites

GUIDANCE DOCUMENTS – COMMERCIAL AIR TRANSPORT

Guidance on standards and criteria for the design of aerodromes are contained in:

1. ICAO Annex 14 Aerodromes ; and

2. ICAO Heliport Manual (Doc 9261-AN/903).

AMC OPS.GEN.147(c)(1) Visual Flight Rules (VFR) Operating minima

ADVISORY SPEEDS IN REDUCED VISIBILITY

When flight with a visibility of less than 5 km is permitted, the forward visibility should not be less than the distance travelled by the helicopter in 30 seconds so as to allow adequate opportunity to see and avoid obstacles (see table below).

Visibility (m)	Advisory speed (kts)
800	50
1 500	100
2 000	120

AMC1 OPS.GEN.150 Instrument Flight Rules (IFR) operating minima

SPECIFYING AERODROME MINIMA

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

AMC2 OPS.GEN.150 Instrument Flight Rules (IFR) operating minima

AERODROME MINIMA - GENERAL

1. The aerodrome operating minima should not be lower than the values given in AMC3 OPS.GEN.150 3. and AMC4 OPS.GEN.150.

2. All approaches should be flown as Stabilised Approaches (SAp). Different procedures may be used for a particular approach to a particular runway.

3. All 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. When calculating the minima in accordance with AMC4 OPS.GEN.150, the applicable minimum Runway Visual Range (RVR) should be increased by 200 metres (m) for Category A/B aeroplanes and by 400 m for Category C/D aeroplanes for approaches not flown using the CDFA technique, provided the resulting RVR/Converted Meteorological Visibility (CMV) value does not exceed 5000 m. SAp or CDFA should be used as soon as facilities are improved to allow these techniques.

AMC3 OPS.GEN.150 Instrument Flight Rules (IFR) operating minima

AERODROME MINIMA – TAKE-OFF MINIMA

1. General:

a. Take-off minima should be expressed as visibility or RVR limits, taking into account all relevant factors for each aerodrome planned to be used and aircraft characteristics. Depending on the obstacle situation on departure and/or forced landing, additional conditions (e.g. ceiling) should be specified;

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

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

d. When no reported meteorological visibility or RVR is available, a take-off should only be commenced if the pilot-in-command can determine that the RVR/visibility along the take-off runway/area is equal to or better than the required minimum.

2. Visual reference:

a. The take-off minima should be selected to ensure sufficient guidance to control the aircraft in the event of both a discontinued take-off in adverse circumstances and a continued take-off after failure of the critical power unit;

b. For night operations, ground lighting should be available to illuminate the runway/Final Approach and Take-Off Area (FATO) and any obstacles.

3. Required RVR/visibility:

a. Aeroplanes:

i. For multi-engined aeroplanes whose performance is such that, in the event of a critical power unit 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 an operator should be expressed as RVR/visibility values not lower than those given in Table 1a, except as provided in 3.a.iv.

Table 1a of AMC3 OPS.GEN.150 RVR/visibility for take-off

TAKE-OFF RVR/VISIBILITY				
Facilities	RVR/Visibility (Note 2)			
	Category A, B and C aeroplanes		Category D aeroplanes	
	Without LVTO approval in accordance with OPS.SPA.001.LVO	With LVTO approval in accordance with OPS.SPA.001.LVO	Without LVTO approval in accordance with OPS.SPA.001.LVO	With LVTO approval in accordance with OPS.SPA.001.LVO
Nil (Day only)	500 m	500 m	500 m	500 m
Runway edge lighting and/or centreline lighting	400 m (Note 1)	250 m (Note 1)	400 m (Note 1)	300 m (Note 1)
Runway edge and centreline lighting	400 m	200 m	400 m	250 m

Runway edge and centreline lighting and multiple RVR information	400 m	150 m (Note 3)	400 m	200 m (Note 3)

Note 1: For night operations at least runway edge and runway end lights are required.

Note 2: The reported RVR/visibility value representative of the initial part of the take-off run can be replaced by pilot assessment.

Note 3: The required RVR value should be achieved for all of the relevant RVR reporting points with the exception given in Note 2 of Table 1a.

ii. For multi-engined aeroplanes whose performance is such that they cannot comply with the performance conditions in 3.a.i., in the event of a critical power unit failure, there may be a need to re-land immediately and to see and avoid obstacles in the take-off area. Such aeroplanes may be operated to the following take-off minima provided they are able to comply with the applicable obstacle clearance criteria, assuming engine failure at the height specified. The take-off minima specified by an operator must be based upon the height from which the One-Engine-Inoperative (OEI) net take-off flight path can be constructed. The RVR minima used may not be lower than either of the values given in Table 1a or 2a, unless an approval in accordance with OPS.SPA.001.LVO is obtained;

Table 2a of AMC3 OPS.GEN.150 Assumed engine failure height above the runway versus RVR/visibility

TAKE-OFF RVR/VISIBILITY		
Assumed engine failure height above the take-off runway	RVR/Visibility (Note 2)	
	Without LVTO approval in accordance with OPS.SPA.001.LVO	With LVTO approval in accordance with OPS.SPA.001.LVO
< 50 ft	400 m	200 m
51 – 100 ft	400 m	300 m
101 – 150 ft	400 m	400 m
151 – 200 ft	500 m	500 m
201 – 300 ft	1 000 m	1 000 m
> 300 ft	1 500 m (Note 1)	1 500 m (Note 1)

Note 1: 1 500 m is also applicable if no positive take-off flight path can be constructed.

Note 2: The reported RVR/visibility value representative of the initial part of the take-off run can be replaced by pilot assessment.

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

iv. Operators approved in accordance with OPS.SPA.001.LVO may reduce the take-off minima to:

A. 125 m RVR (Category A, B and C aeroplanes) or 150 m RVR (Category D aeroplanes) provided the following criteria are met:

1. Low visibility procedures are in force;
2. High intensity runway centreline lights, spaced 15 m or less, and high intensity edge lights, spaced 60 m or less, are in operation;
3. Flight crew members have satisfactorily completed training in a flight simulator;
4. A 90 m visual segment is available from the cockpit at the start of the take-off run;
5. The required RVR value has been achieved for all of the relevant RVR reporting points.

B. less than 125 m (Category A, B and C aeroplanes) or 150 m (Category D aeroplanes) but not lower than 75 m, provided runway protection and facilities equivalent to Category III landing operations are available, when using either:

1. an approved lateral guidance system; or
2. an approved Head Up Display/Head Up Landing System (HUD/HUDLS) for take-off.

b. Helicopters:

i. For Performance Class 1 operations, an operator should specify an RVR and Visibility (RVR/VIS) as take-off minima in accordance with Table 1h;

Table 1h of AMC3 OPS.GEN.150 RVR/visibility for take-off

TAKE-OFF RVR/VISIBILITY		
Onshore aerodromes with Instrument Flight Rules (IFR) departure procedures	RVR/Visibility	
	Without LVTO approval in accordance with OPS.SPA.001.LVO	With LVTO approval in accordance with OPS.SPA.001.LVO
No lighting and no markings (day only)	400 m or the rejected take-off distance, whichever is the greater	250 m or the rejected take-off distance, whichever is the greater
No markings (night)	800 m	800 m
Runway edge/FATO lighting and centreline marking	400 m	200 m
Runway edge/FATO lighting, centreline marking and RVR information	400 m	150 m
Offshore helideck		
Two-pilot operations	400 m (Note 1)	250 m (Note 1)
Single-pilot operations	500 m (Note 1)	500 m (Note 1)

Note 1: The take-off flight path must be free of obstacles.

ii. For Performance Class 2 operations onshore, the pilot-in-command should operate to take-off minima of 800 m RVR/VIS and remain clear of

cloud during the take-off manoeuvre until reaching Performance Class 1 capabilities;

iii. For Performance Class 2 operations offshore, the pilot-in-command should operate to minima not less that that for Performance Class 1 and remain clear of cloud during the take-off manoeuvre until reaching Performance Class 1 capabilities. (Refer to Note 1 of Table 1h of AMC 3 OPS.GEN.150);

iv. Table 1 of AMC11 OPS.GEN.150, for converting reported meteorological visibility to RVR, should not be used for calculating take-off minima.

AMC4 OPS.GEN.150 Instrument Flight Rules (IFR) operating minima

AERODROME MINIMA – NON-PRECISION, CATEGORY I AND APPROACHES WITH VERTICAL GUIDANCE

1. A Non-Precision Approach (NPA) operation is an instrument approach using any of the facilities described in Table 1 of AMC4 OPS.GEN.150, with a Minimum Descent Height (MDH) or Decision Height (DH) not lower than 250 ft and an RVR/CMV of not less than 750 m for aeroplanes and 600 m for helicopters.

2. A Category I approach operation is a precision instrument approach and landing using Instrument Landing System (ILS), Microwave Landing System (MLS), GPS Landing System (GLS) (Global Navigation Satellite System (GNSS)/Ground-Based Augmentation System (GBAS)) or Precision Approach Radar (PAR) with a DH not lower than 200 ft and an RVR of not less than 550 m for aeroplanes and 500 m for helicopters.

3. An approach Procedure with Vertical Guidance (APV) is an instrument approach which utilises lateral and vertical guidance, but does not meet the requirements established for precision approach and landing operations, with a DH not lower than 250 ft and an RVR of not less than 600 m.

4. The DH to be used for an approach should be the highest of:

   a. the minimum height to which the approach aid can be used without the required visual reference;

   b. the Obstacle Clearance Height (OCH) for the category of aircraft;

   c. the published approach procedure DH, where applicable;

   d. 200 ft for Category I approach operations;

   e. the system minimum in Table 1 of AMC4 OPS.GEN.150; or

   f. the lowest decision height specified in the AFM or equivalent document, if stated.

5. The MDH for an approach should be the highest of:

   a. The OCH for the category of aircraft;

   b. The system minimum in Table 1 of AMC4 OPS.GEN.150; or

   c. The minimum descent height specified in the AFM, if stated.

Table 1 of AMC4 OPS.GEN.150 System minima vs facilities

SYSTEM MINIMA		
Facility	Lowest DH/MDH	
	Aeroplanes	Helicopters
Localizer with or without DME	250 ft	250 ft
SRA (terminating at ½ nm)	250 ft	250 ft
SRA (terminating at 1 nm)	300 ft	300 ft
SRA (terminating at 2 nm or more)	350 ft	350 ft
RNAV/LNAV	300 ft	n/a
VOR	300 ft	300 ft
VOR/DME	250 ft	250 ft
NDB	350 ft	300 ft
NDB/DME	300 ft	n/a
VDF (QDM & QCH)	350 ft	300 ft

AMC5 OPS.GEN.150 Instrument Flight Rules (IFR) operating minima

AERODROME MINIMA – CRITERIA FOR ESTABLISHING RVR/CMV

1. In order to qualify for the lowest allowable values of RVR/CMV detailed in Table 3 of AMC6 OPS.GEN.150.A (applicable to each approach grouping), the instrument approach should meet at least the following facility requirements and associated conditions:

   a. Instrument approaches with designated vertical profile up to and including 4.5 degrees for Category A and B aeroplanes and 3.77 degrees for Category C and D aeroplanes, where the facilities are:

      i. ILS/MLS/GLS/PAR; or

      ii. APV; and

      iii where the final approach track is offset by not more than 15 degrees for Category A and B aeroplanes and by not more than 5 degrees for Category C and D aeroplanes;

   b. Instrument approaches flown using the CDFA technique with a nominal vertical profile, up to and including 4.5 degrees for Category A and B aeroplanes and 3.77 degrees for Category C and D aeroplanes, where the facilities are NDB, NDB/DME, VOR, VOR/DME, LLZ, LLZ/DME, VDF, SRA or RNAV/LNAV, with a final approach segment of at least 3 Nautical Miles (nm), which also fulfil the following criteria:

      i. The final approach track is offset by not more than 15 degrees for Category A and B aeroplanes and by not more than 5 degrees 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 THR is available by FMS/RNAV or DME;

iii. If the Missed Approach Point (MAPt) is determined by timing, the distance from FAF to THR is < 8 nm.

c. Instrument approaches where the facilities are NDB, NDB/DME, VOR, VOR/DME, LLZ, LLZ/DME, VDF, SRA or RNAV/LNAV, not fulfilling the criteria in 1.b. of AMC 5 OPS.GEN.150, or with an MDH ≥ 1 200 ft.

2. The missed approach, after an approach has been flown using the CDFA technique, should be executed when reaching the Decision Altitude/Height (DA/H) 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.

AMC6 OPS.GEN.150.A Instrument Flight Rules (IFR) operating minima

AERODROME MINIMA – DETERMINATION OF RVR/CMV/VISIBILITY MINIMA FOR CATEGORY I APPROACH PROCEDURES WITH VERTICAL GUIDANCE AND NON-PRECISION APPROACH OPERATIONS – AEROPLANES

1. The minimum RVR/CMV/visibility should be the highest of the values derived from Table 2 of AMC6 OPS.GEN.150.A (RVR/CMV vs DH/MDH) and Table 3 of AMC6 OPS.GEN.150.A (Minimum and maximum applicable RVR/CMV for all instrument approaches down to Category I minima (lower and upper cut-off limits), but not greater than the maximum values shown in Table 3 of AMC6 A OPS.GEN.150, where applicable.

2. The values in Table 2 of AMC6 OPS.GEN.150.A (RVR/CMV vs DH/MDH) are derived from the following formula:

Required RVR/visibility (m) = [(DH/MDH (ft) x 0.3048)/tanα] - length of approach lights (m)

Note 1: α is the calculation angle, being a default value of 3.00 degrees increasing in steps of 0.10 degrees for each line in Table 2 of AMC6 OPS.GEN.150.A up to 3.77 degrees and then remains constant.

Note 2: The values derived from the above formula have been rounded to the nearest 50 m up to a value of 800 m RVR and thereafter to the nearest 100 m.

Note 3: The DH/MDH intervals in Table 2 of AMC6 OPS.GEN.150.A have been selected to avoid anomalies caused by the rounding of the calculated Obstacle Clearance Altitude (OCA)/H. The height intervals are 10 feet up to a DH/MDH of 300 feet, 20 feet up to a DH/MDH of 760 feet and then 50 feet for DH/MDH above 760 feet.

3. The formula may be used with the actual approach slope and/or the actual length of the approach lights for a particular runway. This formula may also be used to calculate the applicable RVR for special (one-off) approach operations in accordance with AMC8 A OPS.GEN.150 4. The formula may also be used to calculate the applicable RVR value for approaches with approach slopes greater than 4.5 degrees.

4. If the approach is flown with a level flight segment at or above MDA/H, 200 m should be added for Category A and B aeroplanes and 400 m for Category C and D aeroplanes to the minimum RVR/CMV value resulting from the application of Table 2 of AMC6 OPS.GEN.150.A (RVR/CMV vs DH/MDH) and Table 3 of AMC6 OPS.GEN.150.A (Minimum and maximum applicable RVR/CMV for all instrument approaches down to Category I minima (lower and upper cut-off limits). The added value corresponds to the time/distance required to establish the aeroplane on the final descent.

5. An RVR of less than 750 m as indicated in Table 2 of AMC6 OPS.GEN.150.A (RVR/CMV vs DH/MDH) may be used:

a. for Category I approach operations to runways with Full Approach Light System (FALS), Runway Touchdown Zone Lights (RTZL) and Runway Centreline Lights (RCLL), provided that the DH is not more than 200 ft;

b. for Category I approach operations to runways without RTZL and RCLL when using an approved HUDLS, or equivalent approved system, or when conducting a coupled approach or flight-director-flown approach to a DH equal to or greater than 200 ft. The ILS must not be promulgated as a restricted facility. The equivalent system could for instance be an approved HUD which is not certificated as a landing system, but is able to provide adequate guidance cues. Other devices may also be suitable, such as Enhanced/Synthetic Vision Systems (E/SVS) or other hybrids of such devices; or

c. for APV approach operations to runways with FALS, RTZL and RCLL when using an approved HUD.

6. RVR values lower than those given in Table 2 of AMC6 OPS.GEN.150.A (RVR/CMV vs DH/MDH) may be used for HUDLS and auto-land operations in accordance with Part OPS.SPA.LVO.

7. The visual aids comprise standard runway day markings and approach and runway lighting (runway edge lights, threshold lights, runway end lights and in some cases also touch-down zone and/or RCLL). The approach light configurations acceptable are classified and listed in Table 1 of AMC6 OPS.GEN.150.A (Approach light systems).

8. Notwithstanding the requirements in AMC6 OPS.GEN.150.A 7. RVR values relevant to a Basic Approach Lighting System (BALS) may be used on runways where the approach lights are restricted in length below 210 m due to terrain or water, but where at least one cross-bar is available.

9. For night operations or for any operation where credit for runway and approach lights is required, the lights must be on and serviceable except as provided for in Table 1 of AMC12 OPS.GEN.150.

Table 1 of AMC6 OPS.GEN.150.A Approach light systems

CLASS OF FACILITY	LENGTH, CONFIGURATION AND INTENSITY OF APPROACH LIGHTS
Full Approach Landing System (FALS)	ICAO: Precision Approach Category I Lighting System (HIALS≥ 720 m) Distance Coded Centreline, Barrette Centreline FAA: ALSF1, ALSF2, SSALR, MALSR, high or medium intensity and/or flashing lights, 720 m or more
Intermediate Approach Light System (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
Basic Approach Light System (BALS)	Any other Approach Lighting System (HIALS, MIALS or ALS 210-419 m) FAA: ODALS, high or medium intensity or flashing lights 210 - 419 m
No Approach Light System (NALS)	Any other Approach Lighting System (HIALS, MIALS or ALS <210 m) or No Approach Lights

Table 2 of AMC6 OPS.GEN.150.A RVR/CMV vs DH/MDH

DH or MDH	CLASS OF LIGHTING FACILITY			
	FALS	IALS	BALS	NALS
ft	m			
200 – 210	550	750	1 000	1 200
211 – 220	550	800	1 000	1 200
221 – 230	550	800	1 000	1 200
231 – 240	550	800	1 000	1 200
241 – 250	550	800	1 000	1 300
251 – 260	600	800	1 100	1 300
261 – 280	600	900	1 100	1 300
281 – 300	650	900	1 200	1 400
301 – 320	700	1 000	1 200	1 400
321 – 340	800	1 100	1 300	1 500
341 – 360	900	1 200	1 400	1 600
361 – 380	1 000	1 300	1 500	1 700
381 – 400	1 100	1 400	1 600	1 800
401 – 420	1 200	1 500	1 700	1 900
421 – 440	1 300	1 600	1 800	2 000
441 – 460	1 400	1 700	1 800	2 100
461 – 480	1 500	1 800	1 900	2 200
481 – 500	1 500	1 800	2 000	2 300
501 – 521	1 600	1 900	2 100	2 400
521 – 540	1 700	2 000	2 200	2 400
541 – 560	1 800	2 100	2 300	2 500
561 – 580	1 900	2 200	2 400	2 600
581 – 600	2 000	2 300	2 500	2 700
601 – 620	2 100	2 400	2 600	2 800
621 – 640	2 200	2 500	2 700	2 900
641 – 660	2 300	2 600	2 800	3 000
661 – 680	2 400	2 700	2 900	3 100
681– 700	2 500	2 800	3 000	3 200
701 – 720	2 600	2 900	3 100	3 300
721 – 740	2 700	3 000	3 200	3 400
741 – 760	2 700	3 000	3 300	3 500
761 – 800	2 900	3 200	3 400	3 600
801 – 850	3 100	3 400	3 600	3 800

851 – 900	3 300	3 600	3 800	4 000
901 – 950	3 600	3 900	4 100	4 300
951 – 1 000	3 800	4 100	4 300	4 500
1 001 – 1 100	4 100	4 400	4 600	4 900
1 101 – 1 200	4 600	4 900	5 000	5 000
1 201 and above	5 000	5 000	5 000	5 000

Table 3 of AMC6 OPS.GEN.150.A Minimum and maximum applicable RVR/CMV for all instrument approaches down to Category I minima (lower and upper cut-off limits):

FACILITY/CONDITIONS	RVR/CMV (m)	AEROPLANE CATEGORY			
		A	B	C	D
ILS, MLS, GLS, PAR and APV	Min	According to Table 2 of AMC6A OPS.GEN.150			
	Max	1 500	1 500	2 400	2 400
NDB, NDB/DME, VOR, VOR/DME, LLZ, LLZ/DME, VDF, SRA, RNAV/LNAV with a procedure which fulfils the criteria in AMC5 OPS.GEN.150 1.b.	Min	750	750	750	750
	Max	1 500	1 500	2 400	2 400
For NDB, NDB/DME, VOR, VOR/DME, LLZ, LLZ/DME, VDF, SRA, RNAV/LNAV: not fulfilling the criteria in AMC5 OPS.GEN.150 1.b., or with a DH or MDH ≥ 1200 ft	Min	1 000	1 000	1 200	1 200
	Max	According to Table 2 of AMC6 OPS.GEN.150.A if flown using the CDFA technique, otherwise an add-on of 200/400 m applies to the values in Table 2 of AMC6 OPS.GEN.150.A but not to result in a value exceeding 5000 m.			

10. For single-pilot operations, the minimum RVR/visibility for all approaches should be calculated in accordance with OPS.GEN.150 and its AMC material:

    a. An RVR of less than 800 m as indicated in Table 2 of AMC6 OPS.GEN.150.A may be used for Category I approaches provided any of the following is used at least down to the applicable DH:

        i. A suitable autopilot, coupled to an ILS or MLS which is not promulgated as restricted; or

        ii. An approved HUDLS (including, where appropriate, EVS), or equivalent approved system;

    b. Where RTZL and/or RCLL are not available, the minimum RVR/CMV should not be less than 600 m;

    c. An RVR of less than 800 m as indicated in Table 2 of AMC6 OPS.GEN.150.A may be used for APV operations to runways with FALS, RTZL and RCLL when using an approved HUDLS, or equivalent approved system, or when conducting a coupled approach to a DH equal to or greater than 250 ft.

AMC7 OPS.GEN.150.H Instrument Flight Rules (IFR) operating minima

AERODROME MINIMA – DETERMINATION OF RVR/CMV/VISIBILITY MINIMA FOR CATEGORY I, APPROACH PROCEDURES WITH VERTICAL GUIDANCE AND NON-PRECISION APPROACH OPERATIONS – HELICOPTERS

1. For non-precision approaches by helicopters operated in Performance Class 1 or 2, the minima given in Table 1 of AMC7 OPS.GEN.150.H should apply:

Table 1 of AMC7 OPS.GEN.150.H Onshore non-precision approach minima

ONSHORE NON-PRECISION APPROACH MINIMA (Notes 5, 6 and 7)				
MDH (ft)	Facilities/RVR (m)			
	Full (Note 1)	Intermediate (Note 2)	Basic (Note 3)	Nil (Note 4)
250 – 299	600	800	1 000	1 000
300 – 449	800	1 000	1 000	1 000
450 and above	1 000	1 000	1 000	1 000

Note 1: Full facilities comprise FATO/runway markings, 720 m or more of HI/MI approach lights, FATO/runway edge lights, threshold lights and FATO/runway end lights. Lights must be on.

Note 2: Intermediate facilities comprise FATO/runway markings, 420 - 719 m of HI/MI approach lights, FATO/runway edge lights, threshold lights and FATO/runway end lights. Lights must be on.

Note 3: Basic facilities comprise FATO/runway markings, <420 m of HI/MI approach lights, any length of LI approach lights, FATO/runway edge lights, threshold lights and FATO/runway end lights. Lights must be on.

Note 4: Nil approach light facilities comprise FATO/runway markings, FATO/runway edge lights, threshold lights, FATO/runway end lights or no lights at all.

Note 5: The tables are only applicable to conventional approaches with a nominal descent slope of not greater than 4 degrees. Greater descent slopes will usually require that visual glide slope guidance (e.g. PAPI) is also visible at the MDH.

Note 6: The above figures are either reported RVR or CMV.

Note 7: The MDH mentioned in Table 1 of AMC7 OPS.GEN.150.H refers to the initial calculation of MDH. When selecting the associated RVR, there is no need to take account of a rounding up to the nearest ten feet, which may be done for operational purposes, e.g. conversion to MDA.

a. Where the missed approach point is within ½ nm of the landing threshold, the approach minima given for full facilities may be used regardless of the length of approach lighting available. However, FATO/runway edge lights, threshold lights, end lights and FATO/runway markings are still required;

b. For night operations, ground lighting must be available to illuminate the FATO/runway and any obstacles;

c. For single-pilot operations, the minimum RVR is 800 m or the minima in Table 1 of AMC7 OPS.GEN.150.H, whichever is higher.

2. For Category I approaches by helicopters operated in Performance Class 1 or 2, the minima given in Table 2 of AMC7 OPS.GEN.150.H should apply:

Table 2 of AMC7 OPS.GEN.150.H Onshore precision approach minima – Category I

ONSHORE PRECISION APPROACH MINIMA – CATEGORY I (Notes 5, 6 and 7)				
MDH (ft)	Facilities/RVR (m)			
	Full (Note 1)	Intermediate (Note 2)	Basic (Note 3)	Nil (Note 4)
200	500	600	700	1 000
201 – 250	550	650	750	1 000
251 – 300	600	700	800	1 000
301 and above	750	800	900	1 000

Note 1: Full facilities comprise FATO/runway markings, 720 m or more of HI/MI approach lights, FATO/runway edge lights, threshold lights and FATO/runway end lights. Lights must be on.

Note 2: Intermediate facilities comprise FATO/runway markings, 420 - 719 m of HI/MI approach lights, FATO/runway edge lights, threshold lights and FATO/runway end lights. Lights must be on.

Note 3: Basic facilities comprise FATO/runway markings, <420 m of HI/MI approach lights, any length of LI approach lights, FATO/runway edge lights, threshold lights and FATO/runway end lights. Lights must be on.

Note 4: Nil approach light facilities comprise FATO/runway markings, FATO/runway edge lights, threshold lights, FATO/runway end lights or no lights at all.

Note 5: The above figures are either the reported RVR or CMV.

Note 6: The table is applicable to conventional approaches with a glide slope up to and including 4 degrees.

Note 7: The MDH mentioned in Table 2 of AMC 7 OPS.GEN.150.H refers to the initial calculation of MDH. When selecting the associated RVR, there is no need to take account of a rounding up to the nearest ten feet, which may be done for operational purposes, e.g. conversion to DA.

a. For night operations, ground lighting must be available to illuminate the FATO/runway and any obstacles;

b. For-single pilot operations, the minimum RVR should be calculated based on OPS.GEN.150 and its AMC material. An RVR of less than 800 m should not be used except when using a suitable autopilot coupled to an ILS or MLS, in which case normal minima apply. The DH applied should not be less than 1.25 times the minimum use height for the autopilot.

AMC8 OPS.GEN.150.A Instrument Flight Rules (IFR) operating minima

AERODROME MINIMA – CIRCLING – AEROPLANES

1. The MDH for circling should be the highest of:

   a. the published circling OCH for the aeroplane category;

   b. the minimum circling height derived from Table 1 of AMC8 OPS.GEN.150.A; or

   c. the DH/MDH of the preceding instrument approach procedure.

2. The MDA for circling should be calculated by adding the published aerodrome elevation to the MDH, as determined by AMC8 OPS.GEN.150.A 1.

3. The minimum visibility for circling should be the higher of:

   a. the circling visibility for the aeroplane category, if published;

   b. the minimum visibility derived from Table 1 of AMC8 OPS.GEN.150.A; or

   c. the RVR/CMV derived from Tables 2 and 3 of AMC6 OPS.GEN.150.A for the preceding instrument approach procedure.

4. Notwithstanding the requirements in AMC8 OPS.GEN.150.A 3. above and limited to locations where there is a clear public interest to maintain current operations, the visibility may not be increased above the values derived from Table 1 of AMC8 OPS.GEN.150.A, taking into account the operator's experience, training programme and flight crew qualification.

Table 1 of AMC8 OPS.GEN.150.A Minimum visibility and MDH for circling vs. aeroplane category

	AEROPLANE CATEGORY			
	A	B	C	D
MDH (ft)	400	500	600	700
Minimum meteorological visibility (m)	1 500	1 600	2 400	3 600

5. Circling with prescribed tracks is an accepted procedure within the meaning of this paragraph.

AMC9 OPS.GEN.150.H Instrument Flight Rules (IFR) operating minima

AERODROME MINIMA – ONSHORE CIRCLING – HELICOPTERS

1. Circling is the term used to describe the visual phase of an instrument approach, to bring an aircraft into position for landing on a FATO/runway which is not suitably located for a straight in approach.

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

3. Visual manoeuvring (circling) with prescribed tracks is an accepted procedure within the meaning of this paragraph.

AMC10 OPS.GEN.150 Instrument Flight Rules (IFR) operating minima

AERODROME MINIMA – VISUAL APPROACH

An RVR of less than 800 m should not be used for a visual approach.

AMC11 OPS.GEN.150 Instrument Flight Rules (IFR) operating minima

AERODROME MINIMA – CONVERSION OF REPORTED METEOROLOGICAL VISIBILITY TO RVR/CMV

1. A conversion from meteorological visibility to RVR/CMV should not be used for calculating take-off minima, Category II or III minima or when reported RVR is available. If the RVR is reported as being above the maximum value assessed by the aerodrome operator, e.g. "RVR more than 1 500 m", it is not considered to be a reported value for the purpose of this paragraph.

2. For all other circumstances, Table 1 of AMC11 OPS.GEN.150 should be used.

Table 1 of AMC11 OPS.GEN.150 Conversion of meteorological visibility to RVR/CMV

Lighting elements in operation	RVR/CMV = reported meteorological visibility x	
	Day	Night
HI approach and runway lighting	1.5	2.0
Any type of lighting installation other than above	1.0	1.5
No lighting	1.0	n/a

AMC12 OPS.GEN.150 Instrument Flight Rules (IFR) operating minima

AERODROME MINIMA – EFFECT ON LANDING MINIMA OF TEMPORARILY FAILED OR DOWNGRADED GROUND EQUIPMENT

1. These instructions are intended for use both pre-flight and in-flight. It is however not expected that the pilot-in-command would consult such instructions after passing the outer marker or equivalent position. 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 1 of AMC12 OPS.GEN.150, and the approach may have to be abandoned to allow this to happen.

2. Conditions applicable to Tables 1 of AMC12 OPS.GEN.150:

   a. Multiple failures of runway/ FATO lights other than indicated in Table 1 of AMC12 OPS.GEN.150 may not be acceptable;

   b. Deficiencies of approach and runway/FATO lights are treated separately;

   c. Category II or III operations. A combination of deficiencies in FATO/runway lights and RVR assessment equipment is not permitted;

   d. Failures other than ILS affect RVR only and not DH.

Table 1 of AMC12 OPS.GEN.150 Failed or downgraded equipment - effect on landing minima

FAILED OR DOWNGRADED EQUIPMENT	EFFECT ON LANDING MINIMA	
	Category I	APV & Non-Precision
ILS Standby Transmitter	No effect	
Outer Marker	No effect if replaced by equivalent position	APV – not applicable NPA with FAF: no effect unless used as FAF. If the FAF cannot be identified (e.g. no method available for timing of descent), non-precision operations cannot be conducted
Middle Marker	No effect	No effect unless used as MAPt
RVR Assessment Systems	On runways equipped with 2 or more RVR Assessment Units; one may be inoperative	No effect
Approach lights	Not permitted	Minima as for NALS

Approach lights except the last 210 m	Not permitted	Minima as for BALS
Approach lights except the last 420 m	No effect	Minima as for IALS
Standby power for approach lights	No effect	
Edge lights, threshold lights and runway end lights	Day – no effect Night – not permitted	
Centreline lights	No effect if F/D, HUDLS or auto-land otherwise RVR 750 m	No effect
Centreline lights spacing increased to 30 m	No effect	
Touch Down Zone lights	No effect if F/D, HUDLS or auto-land otherwise RVR 750 m	No effect
Taxiway light system	No effect	

GM1 OPS.GEN.150.A Instrument Flight Rules (IFR) operating minima

AERODROME MINIMA – AEROPLANE CATEGORIES

1. The criteria taken into consideration for the classification of aeroplanes by categories is the indicated air speed at threshold (V_{AT}) which is equal to the stalling speed (V_{SO}) multiplied by 1.3 or V_{S1G} multiplied by 1.23 in the landing configuration at the maximum certificated landing mass. If both V_{SO} and V_{S1G} are available, the higher resulting V_{AT} should be used. The aeroplane categories corresponding to V_{AT} values are in the Table 1 of GM1 OPS.GEN.150.A.

Table 1 of GM1 OPS.GEN.150.A Aeroplane categories corresponding to VAT values

AEROPLANE CATEGORY	V_{AT}
A	Less than 91 kts
B	91 – 120 kts
C	121 – 140 kts
D	141 – 165 kts
E	166 – 210 kts

2. The landing configuration which is to be taken into consideration should be defined by the operator or by the aeroplane manufacturer.

3. Permanent change of category (maximum landing mass):

   a. An operator may impose a permanent, lower, landing mass, and use this mass for determining the V_{AT};

   b. The category defined for a given aeroplane should be a permanent value and thus independent of the changing conditions of day-to-day operations;

   c. The category should be stated in the operations manual, where required.

GM2 OPS.GEN.150.A Instrument Flight Rules (IFR) operating minima

AERODROME MINIMA - CONTINUOUS DESCENT FINAL APPROACH (CDFA) – AEROPLANES

1. Introduction:

   a. Controlled Flight Into Terrain (CFIT) is a major causal category of accident and hull loss in commercial 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, pre-determined 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;

   b. 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 which can destabilise approaches, are seen as ways to reduce operational risks significantly;

   c. For completeness this guidance also includes criteria which should be considered to ensure the stability of an approach (in terms of the aeroplanes energy and approach-path control);

   d. The term CDFA has been selected to cover a technique for any type of non-precision approach;

   e. Non-precision approaches operated other than using a constant pre-determined vertical path or when the facility requirements and associated conditions do not meet the conditions specified in 2.d., RVR penalties apply. However, this should not preclude an operator from applying CDFA technique to such approaches. Those operations should be classified as special letdown procedures, since it has been shown that such operations, flown without additional training, may lead to inappropriately steep descent to the MDA/H, with continued descent below the MDA/H in an attempt to gain (adequate) visual reference;

   f. The advantages of CDFA are as follows:

      i. The technique enhances safe approach operations by the utilisation of standard operating practices;

      ii. The profile reduces the probability of infringement of obstacle-clearance along the final approach segment and allows the use of MDA as DA;

      iii. The technique is similar to that used when flying an ILS approach, including when executing the missed approach and the associated go-around manoeuvre;

      iv. The aeroplane attitude may enable better acquisition of visual cues;

      v. The technique may reduce pilot workload;

      vi. The Approach profile is fuel efficient;

      vii. The Approach profile affords reduced noise levels;

      viii. The technique affords procedural integration with APV approach operations;

      ix. When used and the approach is flown in a stabilised manner is the safest approach technique for all approach operations.

2. CDFA:

   a. Continuous Descent Final Approach. A specific technique for flying the final approach segment of a non-precision instrument approach procedure as a continuous descent, without level-off, from an altitude/height at or above the final approach fix altitude/height to a point approximately 15 m (50 ft) above

the landing runway threshold or the point where the flare manoeuvre should begin for the type of aircraft flown;

b. An approach is only suitable for application of CDFA technique when it is flown along a pre-determined vertical approach slope which follows a:

i. Designated Vertical Profile: A continuous vertical approach profile which forms part of the approach procedure design. APV is considered to be an approach with a designated vertical profile; or a

ii. Nominal Vertical Profile: A vertical profile not forming part of the approach procedure design, but which 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:

A. NDB, NDB/DME;

B. VOR, VOR/DME;

C. LLZ, LLZ/DME;

D. VDF, SRA or

E. RNAV/LNAV;

c. Stabilised Approach (SAp). An approach which is flown in a controlled and appropriate manner in terms of configuration, energy and control of the flight path from a pre-determined point or altitude/height down to a point 50 feet above the threshold or the point where the flare manoeuvre is initiated if higher:

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 an SAp, should not be confused with the path requirements for using the CDFA technique. The pre-determined path requirements for conducting an SAp are established by the operator and published in the operations manual part B; guidance for conducting SAp operations is given in 5.;

iii. The predetermined approach slope requirements for applying the CDFA technique are established by the following:

A. The instrument-procedure design when the approach has a designated vertical profile;

B. The published 'nominal' slope information when the approach has a nominal vertical profile;

C. The designated final-approach segment minimum of 3 nm, and maximum, when using timing techniques, of 8 nm;

iv. A Stabilised Approach will never have any level segment of flight at DA/H (or MDA/H as applicable). This enhances safety by mandating a prompt go-around manoeuvre at DA/H (or MDA/H);

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

d. Approach with a designated vertical profile using the CDFA technique:

i. The optimum angle for the approach slope is 3 degrees, and the gradient should preferably not exceed 6.5 percent which equates to a slope of 3.77 degrees, (400 ft/nm) for procedures intended for conventional aeroplane types/classes and/or operations. In any case, conventional approach slopes should be limited to 4.5 degrees for Category A and B aeroplanes and 3.77 degrees for Category C and D aeroplanes, which are the upper limits for applying the CDFA technique. A 4.5 degree approach slope is the upper limit for certification of conventional aeroplanes;

ii. The approach is to be flown utilising operational flight techniques and on board navigation system(s) and navigation aids to ensure it can be flown on the desired vertical path and track in a stabilised manner, without significant vertical path changes during the final-segment descent to the runway. APV is included;

iii. The approach is flown to a DA/H;

iv. No MAPt is published for these procedures;

e. Approach with a nominal vertical profile using the CDFA technique:

i. The optimum angle for the approach slope is 3 degrees, and the gradient should preferably not exceed 6.5 percent which equates to a slope of 3.77 degrees, (400 ft/nm) for procedures intended for conventional aeroplane types / class and / or operations. In any case, conventional approaches should be limited to 4.5 degrees for Category A and B aeroplanes and 3.77 degrees for Category C and D aeroplanes, which are the upper limits for applying CDFA technique. A 4.5 degree approach slope is the upper limit for certification of conventional aeroplanes;

ii. The approach procedure should meet at least the following facility requirements and associated conditions. NDB, NDB/DME, VOR, VOR/DME, LLZ, LLZ/DME, VDF, SRA, RNAV/LNAV) and fulfil the following criteria:

A. The final approach track off-set ≤ 5 degrees except for Category A and B aeroplanes, where the approach-track off-set is≤ 15 degrees; and

B. A FAF, or another appropriate fix where descent initiated is available; and

C. The distance from the FAF to the Threshold (THR) is less than or equal to 8 nm in the case of timing; or

D. The distance to the THR is available by FMS/RNAV or DME; or

E. The minimum final-segment of the designated constant angle approach path should not be less than 3 nm from the THR unless approved by the authority;

iii. CDFA may also be applied utilising the following:

A. RNAV/LNAV with altitude/height cross checks against positions or distances from the THR; or

B. Height crosscheck compared with DME distance values;

iv. The approach is flown to a DA/H;

v. The approach is flown as an SAp.

Generally, an MAPt is published for these procedures.

3. Operational procedures:

a. An MAPt should be specified to apply CDFA with a nominal vertical profile as for any non-precision approach;

b. The flight techniques associated with CDFA employ the use of a predetermined approach slope. The approach, in addition, is flown in a stabilised manner, in terms of configuration, energy and control of the flight path. The approach should be flown to a DA/H at which the decision to land or go-around is made immediately. This approach technique should be used when conducting:

i. all NPAs meeting the specified CDFA criteria in 2.d.; and

ii. all approaches categorised as APV;

c. The flight techniques and operational procedures prescribed above should always be applied; in particular with regard to control of the descent path and the stability of the aeroplane on the approach prior to reaching MDA/H. Level flight at MDA/H should be avoided as far as practicable. In addition appropriate procedures and training should be established and implemented to facilitate the applicable elements of 4., 5. and 6. Particular emphasis should be placed on 4.h., 5.a. to g. and 8.d.;

d. In cases where the CDFA technique is not used with high MDA/H, it may be appropriate to make an early descent to MDA/H with appropriate safeguards to include the above training requirements, as applicable, and the application of a significantly higher RVR/Visibility;

e. For circling approaches (Visual Manoeuvring), all the applicable criteria with respect to the stability of the final descent path to the runway should apply. In particular, the control of the desired final nominal descent path to the threshold should be conducted to facilitate the techniques described in 4. and 5.:

i. Stabilisation during the final straight-in segment for a circling approach should ideally be accomplished by 1000 ft above aerodrome elevation for turbo-jet aeroplanes;

ii. For a circling approach where the landing runway threshold and appropriate visual landing aids may be visually acquired from a point on the designated or published procedure (prescribed tracks), stabilisation should be achieved not later than 500 ft above aerodrome elevation. It is however recommended that the aeroplane be stabilised when passing 1000 ft above aerodrome elevation;

iii. When a low-level final turning manoeuvre is required in order to align the aeroplane visually with the landing runway, a height of 300 ft above the runway threshold elevation, or aerodrome elevation as appropriate, should be considered as the lowest height for approach stabilisation with wings level;

iv. Dependent upon aeroplane type/class the operator may specify an appropriately higher minimum stabilisation height for circling approach operations;

v. The operator should specify in the operations manual the procedures and instructions for conducting circling approaches, including at least:

A. the minimum required visual reference;

B. the corresponding actions for each segment of the circling manoeuvre;

C. the relevant go-around actions if the required visual reference is lost; and

D. the visual reference requirements for any operations with a prescribed track circling manoeuvre to include the MDA/H and any published MAPt;

f. Visual approach. All the applicable criteria with respect to the stability of the final descent path to the runway should apply to the operation of visual approaches. In particular, the control of the desired final nominal descent path to the threshold should be conducted to facilitate the appropriate techniques and procedures described in 6. and 7.:

i. Stabilisation during the final straight-in segment for a visual approach should ideally be accomplished by 500 ft above runway threshold elevation for turbo-jet aeroplanes;

ii. When a low level final turning manoeuvre is required in order to align the aeroplane with the landing runway, a minimum height of 300 ft above the runway threshold elevation (or aerodrome elevation as appropriate) should be considered as the lowest height for visual approach stabilisation with wings level;

iii. Dependent upon aeroplane type/class, the operator may specify an appropriately higher minimum stabilisation height for visual approach operations;

iv. The operator should specify in the operations manual the procedures and instructions for conducting visual approaches to include at least:

A. the minimum required visual reference;

B. the corresponding actions if the required visual reference is lost during a visual approach manoeuvre; and

C. the appropriate go-around actions;

g. The control of the descent path using the CDFA technique ensures that the descent path to the runway threshold is flown using either:

i. a variable descent rate or flight path angle to maintain the desired path, which may be verified by appropriate crosschecks;

ii. a pre-computed constant rate of descent from the FAF, or other appropriate fix which is able to define a descent point and/or from the final approach segment step-down fix; or

iii. vertical guidance, including APV;

The above techniques also support a common method for the implementation of flight-director-guided or auto-coupled RNAV/VNAV or GLS approaches;

h. The manoeuvre associated with the vertical profile of the missed approach should be initiated not later than reaching the MAPt or the DA/H specified for the approach, whichever occurs first. The lateral part of the missed approach procedure must be flown via the MAPt unless otherwise stated on the approach chart;

i. In case the CDFA technique is not used the approach should be flown to an altitude/height at or above the MDA/H where a level flight segment at or above MDA/H may be flown to the MAPt;

j. In case the CDFA technique is not used when flying an approach, an operator should implement procedures to ensure that early descent to the MDA/H will not result in a subsequent flight below MDA/H without adequate visual reference. These procedures could include:

i. awareness of radio altimeter information with reference to the approach profile;

ii. enhanced Ground Proximity Warning System and/or Terrain Awareness information;

iii. limitation of rate of descent;

iv. limitation of the number of repeated approaches;

v. safeguards against too early descents with prolonged flight at MDA/H; and

vi. specification of visual requirements for the descent from the MDA/H.

4. Flight techniques:

a. The CDFA technique can be used on almost any published non-precision approach when the control of the descent path is aided by either:

i. a recommended descent rate, based on estimated ground speed, which may be provided on the approach chart; or

ii. the descent path as depicted on the chart;

b. In order to facilitate the requirement of 4.a.ii., the operator should either provide charts which depict the appropriate cross check altitudes/heights with the corresponding appropriate range information, or such information should be calculated and provided to the flight crew in an appropriate and usable format;

c. For approaches flown coupled to a designated descent path using computed electronic glide-slope guidance (normally a 3 degree path), the descent path should be appropriately coded in the flight management system data base and the specified navigational accuracy (RNP) should be determined and maintained throughout the operation of the approach;

d. With an actual or estimated ground speed, a nominal vertical profile and required descent rate, the approach should be flown by crossing the FAF configured and on-speed. The tabulated or required descent rate is established and flown to not less than the DA/H, observing any step-down crossing altitudes if applicable;

e. To assure the appropriate descent path is flown, the pilot not flying should announce crossing altitudes as published fixes and other designated points are crossed, giving the appropriate altitude or height for the appropriate range as depicted on the chart. The pilot flying should promptly adjust the rate of descent as appropriate;

f. With the required visual reference requirements established, the aeroplane should be in position to continue descent through the DA/H or MDA/H with little or no adjustment to attitude or thrust/power;

g. When applying CDFA on an approach with a nominal vertical profile to a DA/H, it may be necessary to apply an add-on to the published minima (vertical profile only) to ensure sufficient obstacle clearance. The add-on, if applicable, should be published in the operations manual – (Aerodrome Operating Minima). However, the resulting procedure minimum will still be referred to as the DA/H for the approach;

h. Operators should establish a procedure to ensure that an appropriate callout (automatic or oral) is made when the aeroplane is approaching DA/H. If the required visual references are not established at DA/H, the missed approach procedure is to be executed promptly. Visual contact with the ground alone is not sufficient for continuation of the approach. With certain combinations of DA/H, RVR and approach slope, the required visual references may not be achieved at the DA/H in spite of the RVR being at or above the minimum required for the conduct of the approach. The safety benefits of CDFA are negated if prompt go-around action is not initiated;

i. The following bracketing conditions in relation to angle of bank, rate of descent and thrust/power management are considered to be suitable for most aeroplane types/class to ensure the predetermined vertical path approach is conducted in a stabilised manner:

i. Bank angle: As prescribed in the operations manual, should generally be less than 30 degrees;

ii. Rate of descent (ROD): The target ROD should not exceed 1000 fpm). The ROD should deviate by no more than + 300 fpm from the target ROD. Prolonged rates of descent which differ from the target ROD by more than 300 fpm indicate that the vertical path is not being maintained in a stabilised manner. The ROD should not exceed 1200 fpm, except under exceptional circumstances which have been anticipated and briefed prior to commencing the approach; for example, a strong tailwind. Zero rate of descent may be used when the descent path needs to be regained from below the profile. The target ROD may need to be initiated prior to reaching the required descent point (typically 0.3 nm before the descent point, dependent upon ground speed, which may vary for each type/class of aeroplane). (Refer to 4.i.iii.);

iii. Thrust/power management: The limits of thrust/power and the appropriate range should be specified in the operations manual Part B or equivalent documents;

j. Transient corrections/overshoots: The above-specified range of corrections should normally be used to make occasional momentary adjustments in order to maintain the desired path and energy of the aeroplane. Frequent or sustained overshoots should require the approach to be abandoned and a go-around initiated. A correction philosophy should be applied similar to that described in 5.;

k. The relevant elements of 4. should, in addition, be applied to approaches not flown using the CDFA technique; the procedures thus developed, thereby ensure a controlled flight path to MDA/H. Dependent upon the number of step down fixes and the aeroplane type/class, the aeroplane should be appropriately configured to ensure safe control of the flight path prior to the final descent to MDA/H.

5. Stabilisation of energy/speed and configuration of the aeroplane on the approach:

a. The control of the descent path is not the only consideration. Control of the aeroplane's configuration and energy is also vital to the safe conduct of an approach;

b. The approach should be considered to be fully stabilised when the aeroplane is:

i. tracking on the required approach path and profile;

ii. in the required configuration and attitude;

iii. flying with the required rate of descent and speed; and

iv. flying with the appropriate thrust/power and trim;

c. The following flight path control criteria should be met and maintained when the aeroplane passes the gates described in 6. and 7.;

d. The aeroplane is considered established on the required approach path at the appropriate energy for stable flight using the CDFA technique when:

i. it is tracking on the required approach path with the correct track set, approach aids tuned and identified as appropriate to the approach type flown and on the required vertical profile; and

ii. it is at the appropriate attitude and speed for the required target ROD with the appropriate thrust/power and trim;

e. It is recommended to compensate for strong wind/gusts on approach by speed increments given in the operations manual. To detect windshear and magnitude of winds aloft, all available aeroplane equipment such as FMS, INS, etc. should be used;

f. It is recommended that stabilisation during any straight-in approach without visual reference to the ground should be achieved at the latest when passing 1 000 ft above runway threshold elevation. For approaches with a designated vertical profile applying CDFA, a later stabilisation in speed may be acceptable if higher than normal approach speeds are required by ATC procedures or allowed by the operations manual. Stabilisation should, however, be achieved not later than 500 ft above runway threshold elevation;

g. For approaches where the pilot has visual reference with the ground, stabilisation should be achieved not later than 500 ft above aerodrome elevation. However, it is recommended that the aeroplane should be stabilised when passing 1000 ft above runway threshold elevation;

h. The relevant elements of 5. should, in addition, be applied to approaches not flown using the CDFA technique; the procedures thus developed ensure that a controlled and stable path to MDA/H is achieved. Dependent upon the number of step down fixes and the aeroplane type/class, the aeroplane should be appropriately configured to ensure safe and stable flight prior to the final descent to MDA/H.

6. Visual reference and path-control below MDA/H when not using the CDFA technique. In addition to the requirements stated in OPS.GEN.150 and its AMC material the pilot should have attained a combination of visual cues to safely control the aeroplane in roll and pitch to maintain the final approach path to landing. This should be included in the standard operating procedures and reflected in the operations manual.

7. Operational procedures and instructions for using the CDFA technique or not:

a. The operator should establish procedures and instructions for flying approaches using the CDFA technique and not. These procedures should be included in the operations manual and should include the duties of the flight crew during the conduct of such operations:

i. The operator should publish in the operations manual the requirements stated in 4. and 5., as appropriate to the aeroplane type or class to be operated;

ii. The checklists should be completed as early as practicable and preferably before commencing final descent towards the DA/H;

b. The operator's manuals should at least specify the maximum ROD for each aeroplane type/class operated and the required visual reference to continue the approach below:

i. the DA/H, when applying CDFA;

ii. the MDA/H, when not applying CDFA;

c. The operator should establish procedures which prohibit level flight at MDA/H without the flight crew having obtained the required visual references. It is not the intention to prohibit level flight at MDA/H when conducting a circling approach, which does not come within the definition of the CDFA technique;

d. The operator should provide the flight crew with unambiguous details of the technique used (CDFA or not). The corresponding relevant minima should include:

i. type of decision, whether DA/H or MDA/H;

ii. MAPt as applicable; and

iii. appropriate RVR/Visibility for the approach classification and aeroplane category;

e. Specific types/class of aeroplane, in particular certain Performance Class B and Class C aeroplanes, may be unable to comply fully with the requirements of this guidance relating to the operation of CDFA. This problem arises because some aeroplanes must not be configured fully into the landing configuration until required visual references are obtained for landing, because of inadequate missed approach performance engine out. For such aeroplanes, the operator should either:

i. obtain approval from the authority for an appropriate modification to the stipulated procedures and flight techniques prescribed herein; or

ii. increase the required minimum RVR to ensure the aeroplane will be operated safely during the configuration change on the final approach path to landing.

8. Training:

a. The operator should ensure that, prior to using the CDFA technique or not (as appropriate), each flight crew member undertakes the appropriate training and checking as required by Part OR.OPS.FC. Such training should cover the techniques and procedures appropriate to the operation which are stipulated in 4. and 5. The operator's proficiency check, if applicable, should include at least one approach to a landing or go-around as appropriate using the CDFA technique or not. The approach should be operated to the lowest appropriate DA/H or MDA/H as appropriate; and, if conducted in a simulator, the approach should be operated to the lowest approved RVR. The approach is not in addition to any manoeuvre currently required by either Part-FCL or Part-OPS. The requirement may be fulfilled by undertaking any currently required approach (engine out or otherwise) other than a precision approach, whilst using the CDFA technique;

b. The policy for the establishment of constant predetermined vertical path and approach stability are to be enforced both during initial and recurrent pilot training and checking. The relevant training procedures and instructions should be documented in the operations manual;

c. The training should emphasise the need to establish and facilitate joint crew procedures and CRM to enable accurate descent path control and the requirement to establish the aeroplane in a stable condition as required by the operator's operational procedures. If barometric vertical navigation is used, the crews should be trained in the errors associated with these systems;

d. During training, emphasis should be placed on the flight crew's need to:

i. maintain situational awareness at all times, in particular with reference to the required vertical and horizontal profile;

ii. ensure good communication channels throughout the approach;

iii. ensure accurate descent-path control particularly during any manually-flown descent phase. The non-operating/non-handling pilot should facilitate good flight path control by:

A. communicating any altitude/height crosschecks prior to the actual passing of the range/altitude or height crosscheck;

B. prompting, as appropriate, changes to the target ROD; and

C. monitoring flight path control below DA/MDA.

iv. understand the actions to be taken if the MAPt is reached prior to the MDA/H;

v. ensure that the decision to go-around must, at the latest, have been taken upon reaching the DA/H or MDA/H;

vi. ensure that prompt go-around action is taken immediately when reaching DA/H if the required visual reference has not been obtained as there may be no obstacle protection if the go-around manoeuvre is delayed;

vii. understand the significance of using the CDFA technique to a DA/H with an associated MAPt and the implications of early go-around manoeuvres; and

viii. understand the possible loss of the required visual reference (due to pitch-change/climb) when not using the CDFA technique for aeroplane types/classes which require a late change of configuration and/or speed to ensure the aeroplane is in the appropriate landing configuration;

e. Additional specific training when not using the CDFA technique with level flight at or above MDA/H:

i. The training should detail:

A. the need to facilitate CRM; with appropriate flight crew communication in particular;

B. the additional known safety risks associated with the 'dive-and-drive' approach philosophy which may be associated with non-CDFA;

C. the use of DA/H during approaches flown using the CDFA technique;

D. the significance of the MDA/H and the MAPt where appropriate;

E. the actions to be taken at the MAPt and the need to ensure that the aeroplane remains in a stable condition and on the nominal and appropriate vertical profile until the landing;

F. the reasons for increased RVR/Visibility minima when compared to the application of CDFA;

G. the possible increased obstacle infringement risk when undertaking level flight at MDA/H without the required visual references;

H. the need to accomplish a prompt go-around manoeuvre if the required visual reference is lost;

I. the increased risk of an unstable final approach and an associated unsafe landing if a rushed approach is attempted either from:

1. inappropriate and close-in acquisition of the required visual reference; or

2. unstable aeroplane energy and or flight path control; and

J. The increased risk of CFIT (see introduction).

9. Approaches requiring level flights:

   a. The procedures which are flown with level flight at/or above MDA/H should be listed in the operations manual;

   b. Operators should classify aerodromes where there are approaches which require level flight at/or above MDA/H as being B and C categorised. Such aerodrome categorisation will depend upon the operator's experience, operational exposure, training programme(s) and flight crew qualification(s).

GM3 OPS.GEN.150.A Instrument Flight Rules (IFR) operating minima

AERODROME MINIMA – CIRCLING – AEROPLANES

1. Terminology: XLS = ILS/MLS/GLS etc.

2. Visual manoeuvring (circling). 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.

3. Conduct of flight – General:

   a. The MDH and OCH included in the procedure are referenced to aerodrome elevation;

   b. The MDA is referenced to mean sea level;

   c. For these procedures, the applicable visibility is the meteorological VIS.

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

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

   b. At the beginning of the level flight phase at or above the MDA/H, the instrument approach track determined by radio navigation aids, RNAV, RNP or XLS should be maintained until:

      i. the pilot 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. the pilot estimates that the aeroplane is within the circling area before commencing circling; and

      iii. the pilot is able to determine the aeroplane's position in relation to the runway of intended landing with the aid of the appropriate external references;

   c. When reaching the published instrument MAPt and the conditions stipulated in 4.b., are unable to be established by the pilot, a missed approach should be carried out in accordance with that instrument approach procedure;

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

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

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

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

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

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

a. The aeroplane should remain on the initial instrument approach or letdown procedure until one of the following is reached:

i. The prescribed divergence point to commence circling on the prescribed track; or

ii. The appropriate initial instrument MAPt;

b. The aeroplane should be established on the instrument approach track determined by the radio navigation aids, RNAV, RNP, or XLS in level flight at or above the MDA/H at or by the circling manoeuvre divergence point;

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

d. When commencing the prescribed track-circling manoeuvre at the published divergence point, the subsequent manoeuvres should be conducted to comply with the published routing and promulgated heights/altitudes;

e. Unless otherwise specified, once the aeroplane is established on the prescribed track(s), the promulgated visual reference should not be required to be maintained unless:

i. required by the State; or

ii. the Circling MAPt (if published) is reached;

f. If the prescribed track-circling manoeuvre has a published MAPt and the required visual reference has not been obtained a missed approach should be executed in accordance with 6.b. and 6.c.;

g. Subsequent further descent below MDA/H should only commence when the required visual reference is obtained;

h. Unless otherwise specified in the procedure, final descent should not be initiated from MDA/H until the threshold of the intended landing runway has been appropriately identified and the aeroplane is in a position to continue with a normal rate of descent and land within the touchdown zone.

6. Missed approach:

a. Missed approach during instrument approach prior to circling:

i. If the decision to carry out a missed approach is taken when the aeroplane is positioned on the instrument approach track defined by radio-navigation aids RNAV, RNP, or XLS, and before commencing the circling manoeuvre, the published missed approach for the instrument approach should be followed;

ii. If the instrument approach procedure is carried out with the aid of an XLS or an SAp, the MAPt associated with an XLS procedure without glide path (GP-out procedure) or the SAp, where applicable, should be used;

b. If a prescribed missed approach is published for the circling manoeuvre, this overrides the manoeuvres prescribed below;

c. 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 and continue overhead the aerodrome where the pilot will establish the aeroplane in a climb on the instrument missed approach track;

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

i. established on the appropriate missed approach track; or

ii. at Minimum Sector Altitude (MSA);

e. All turns should (see Note 1 below) 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 Minimum Sector Altitude (MSA);

iv. the Minimum Holding Altitude (MHA) applicable for transition to a holding facility or fix, or continue to climb to a Minimum Safe Altitude; or

v. as directed by ATS/Control (C).

Note 1: When the go-around 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.

Note 2: 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;

f. In as much as 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;

g. If a missed approach procedure is promulgated for the runway (XX) 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 should be informed of the intention to fly the promulgated missed approach procedure for runway XX;

h. When the option described in 6.g. is undertaken the pilot-in-command should whenever possible advise at the earliest opportunity, the ATS/C of the intended go-around procedure. This dialogue should, if possible occur during the initial approach phase and include the intended missed approach to be flown and the level off altitude;

i. In addition to 6.h., the pilot-in-command should advise ATS/C when any go-around has 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.

GM4 OPS.GEN.150.H Instrument Flight Rules (IFR) operating minima

AERODROME MINIMA - ONSHORE AERODROME DEPARTURE PROCEDURES – HELICOPTERS

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

GM OPS.GEN.150(b) Instrument Flight Rules (IFR) operating minima

INCREMENTS IMPOSED BY THE COMPETENT AUTHORITY

Additional increments to the published minima may be imposed by the competent authorities to take into account special operations, such as downwind approaches and single-pilot operations.

AMC OPS.GEN.155.H Selection of alternate aerodromes

OFFSHORE ALTERNATES - HELICOPTERS

1. Suitable offshore alternates may be selected and specified subject to the following:
   a. The offshore alternate should only be used after passing a PNR. Prior to a PNR, onshore alternates should be used;
   b. Mechanical reliability of critical control systems and critical components should be considered and taken into account when determining the suitability of the alternate;
   c. OEI performance capability should be attainable prior to arrival at the alternate;
   d. To the extent possible, deck availability should be guaranteed; and
   e. Weather information must be reliable and accurate.
2. Offshore alternates should not be used when it is possible to carry enough fuel to have an onshore alternate. Offshore alternates should not be used in a hostile environment.
3. The landing technique specified in the AFM following control system failure may preclude the nomination of certain helidecks as alternate aerodromes.

GM1 OPS.GEN.155.A(a)(3) Selection of alternate aerodromes

ISOLATED AERODROME - AEROPLANES

The destination aerodrome could be considered as an isolated aerodrome if the fuel required to the nearest adequate destination alternate aerodrome is more than:

1. for aeroplanes with reciprocating engines, fuel to fly for 45 minutes plus 15 % of the flight time planned to be spent at cruising level or two hours, whichever is less; or
2. for aeroplanes with turbine engines, fuel to fly for two hours at normal cruise consumption above the destination aerodrome, including final reserve fuel.

GM2 OPS.GEN.155.H Selection of alternate aerodromes

OFFSHORE ALTERNATES – HELICOPTERS – COMMERCIAL AIR TRANSPORT

1. The procedures contained in AMC OPS.CAT.155.H(a)(1) are weather-critical. Consequently, meteorological data conforming to the standards contained in the

Regional Air Navigation Plan and ICAO Annex 3 Meteorological Service for International Air Navigation has been specified. As the following meteorological data is point specific, caution should be exercised when associating it with nearby aerodromes (or helidecks).

2. Meteorological Reports (METARs):

   a. Routine and special meteorological observations at offshore installations should be made during periods and at a frequency agreed between the meteorological authority and the operator concerned. They should comply with the requirements contained in the meteorological section of the ICAO Regional Air Navigation Plan , and should conform to the standards and recommended practices, including the desirable accuracy of observations, promulgated in ICAO Annex 3 Meteorological Service for International Air Navigation.

   b. Routine and selected special reports are exchanged between meteorological offices in the METAR or SPECI code forms prescribed by the World Meteorological Organisation.

3. Aerodrome Forecasts (TAFS):

   a. The aerodrome forecast consists of a concise statement of the mean or average meteorological conditions expected at an aerodrome or operating site during a specified period of validity, which is normally not less than nine hours, or more than 24 hours in duration. The forecast includes surface wind, visibility, weather and cloud, and expected changes of one or more of these elements during the period. Additional elements may be included as agreed between the meteorological authority and the operators concerned. Where these forecasts relate to offshore installations, barometric pressure and temperature should be included to facilitate the planning of helicopter landing and take-off performance.

   b. Aerodrome forecasts are most commonly exchanged in the TAF code form, and the detailed description of an aerodrome forecast is promulgated in the ICAO Regional Air Navigation Plan and also in ICAO Annex 3 Meteorological Service for International Air Navigation, together with the operationally desirable accuracy elements. In particular, the observed cloud height should remain within ±30% of the forecast value in 70% of cases, and the observed visibility should remain within ±30% of the forecast value in 80% 0f cases.

4. Landing Forecasts (TRENDS):

   a. The landing forecast consists of a concise statement of the mean or average meteorological conditions expected at an aerodrome or operating site during the two-hour period immediately following the time of issue. It contains surface wind, visibility, significant weather and cloud elements, and other significant information, such as barometric pressure and temperature, as may be agreed between the meteorological authority and the operators concerned.

   b. The detailed description of the landing forecast is promulgated in the ICAO Regional Air Navigation Plan and also in ICAO Annex 3 Meteorological Service for International Air Navigation, together with the operationally desirable accuracy of the forecast elements. In particular, the value of the observed cloud height and visibility elements should remain within +/-30% of the forecast values in 90% of the cases.

   c. Landing forecasts most commonly take the form of routine or special selected meteorological reports in the METAR code, to which either the code words “NOSIG”, i.e. no significant change expected; “BECMG” (becoming), or “TEMPO” (temporarily), followed by the expected change, are added. The two-hour period of validity commences at the time of the meteorological report.

5. When operating off shore, any spare payload capacity should be used to carry additional fuel if it would facilitate the use of an onshore alternate.

AMC OPS.GEN.165.A Noise abatement

NOISE ABATEMENT PROCEDURES - AEROPLANES

1. The operator's noise abatement procedures for departure and arrival/approach for each aircraft type, which should be designed to be simple and safe to operate with no significant increase in crew workload during critical phases of flight.
2. A pilot-in-command should follow noise abatement procedures whenever they would not have a detrimental effect on aircraft safety.

GM OPS.GEN.165.A Noise abatement

NOISE ABATEMENT PROCEDURES - COMPLEX MOTOR-POWERED AEROPLANES – COMMERCIAL AIR TRANSPORT

1. For each aeroplane type only two departure procedures should be defined, in accordance with Part I Section 7 of ICAO PANS-OPS Volume 1 (Doc 8168-OPS/611) , as follows:

   a. Noise Abatement Departure Procedure one (NADP 1) designed to meet the close-in noise abatement objective;

   b. Noise Abatement Departure Procedure two (NADP 2) designed to meet the distant noise abatement objective;

   c. In addition, each NADP climb profile can only have one sequence of actions.

2. This GM addresses only the vertical profile of the departure procedure. Lateral track has to comply with the Standard Instrument Departure (SID).

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

4. "Sequence of actions" means the order and the timing in which these pilot's actions are done.

5. Example:

   For a given aeroplane type, when establishing the distant NADP, an 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.

   For an aeroplane type, each of the two departure climb profiles may be defined by:

   a. one sequence of actions (one for close-in, one for distant);

   b. two Above Aerodrome Level (AAL) altitudes/heights:

   c. 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

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

   These two altitudes may be runway specific when the aeroplane Flight Management System (FMS) has the relevant function which permits the crew to change thrust reduction and/or acceleration altitude/height.

   If the aeroplane is not FMS equipped or the FMS is not fitted with the relevant function, two fixed heights should be defined and used for each of the two NADPs.

AMC OPS.GEN.170 Minimum terrain clearance altitudes

GENERAL

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

AMC OPS.GEN.175 Minimum flight altitudes

COMMERCIAL OPERATIONS OTHER THAN COMMERCIAL AIR TRANSPORT

1. When specifying minimum flight altitudes, the operator should take account of AMC OPS.CAT.170.
2. When specifying minimum altitudes for operations that can only be performed below the minimum altitudes, it should be taken into account that the aircraft:
   a. should not be flown over congested areas; and
   b. should not expose persons or property on the surface to risk of injury or damage.
3. Due consideration should be given to environmental factors, such as noise exposure.
4. Procedures should be developed based on a risk assessment in accordance with OPS.COM.270 giving due regard to factors, such as:
   a. type of operation;
   b. terrain to be overflown;
   c. obstacle situation;
   d. weather conditions, visibility, wind, turbulence;
   e. lighting conditions;
   f. crew experience;
   g. crew familiarity with the area;
   h. crew training;
   i. aircraft performance;
   j. number of persons on board; and
   k. any attached or underslung equipment or load.
5. Following the risk assessment, the Operations Manual (OM) should include Standard Operating Procedures (SOPs), such as:
   a. method of operational control of such operations;
   b. crew minimum experience;
   c. flight planning;
   d. pre-survey of the route and/or take-off/landing site;
   e. weather limitations;
   f. minimum altitudes;
   g. performance;
   h. (safe) forced landing areas;
   i. navigation; and
   j. personal protective equipment.

GM OPS.GEN.175 Minimum flight altitudes

DESCENDING BELOW SPECIFIED MINIMUM FLIGHT ALTITUDES

1. The operator may have to obtain permission from the authority of the State in which it intends to conduct operations involving flights below minimum altitudes.

2. The State overflown may specify procedures for certain commercial operations (e.g. helicopter operations or photo-flights) or flight instruction (e.g. training of emergency landings) which allow the operator or the approved training organisation to descend below the specified minimum flight altitudes.

AMC OPS.GEN.180.H Routes and areas of operation

HELICOPTER COASTAL TRANSIT OPERATIONS – COMMERCIAL AIR TRANSPORT

For helicopters operated in Performance Class 3 and conducting coastal transit operations, the width of the coastal corridor and the equipment carried, should be consistent with the conditions prevailing at the time.

GM OPS.GEN.180.H Routes and areas of operation

HELICOPTER COASTAL TRANSIT OPERATIONS – COMMERCIAL AIR TRANSPORT

1. A helicopter operating overwater in Performance Class 3 has to have certain equipment fitted. This equipment varies with the distance from land that the helicopter is expected to operate. The aim of this guidance material is to discuss that distance, bring into focus what fit is required and to clarify the operator's responsibility, when a decision is made to conduct coastal transit operations.

2. In the case of operations north of 45N or south of 45S, the coastal corridor facility may or may not be available in a particular state, as it is related to the State definition of open sea area as described in the definition of hostile environment.

3. Where the term coastal transit is used, it means the conduct of operations overwater within the coastal corridor in conditions where there is reasonable expectation that; the flight can be conducted safely in the conditions prevailing; and, following an engine failure, a safe forced landing and successful evacuation can be achieved; and survival of the crew and passengers can be assured until rescue is effected.

4. Coastal corridor is a variable distance from the coastline to a maximum distance corresponding to three minutes flying at normal cruising speed.

5. Establishing the width of the coastal corridor:

   a. The distance from land of coastal transit, is defined the boundary of a corridor that extends from the land, to a maximum distance of up to three minutes at normal cruising speed (approximately five to six nm). Land in this context includes sustainable ice and, where the coastal region includes islands, the surrounding waters may be included in the corridor and aggregated with the coast and each other. Coastal transit need not be applied to inland waterways, estuary crossing or river transit:

      i. In some areas, the formation of ice is such that it can be possible to land, or force land, without hazard to the helicopter or occupants. The operator may regard the definition of the “land” extends to these areas.

      ii. In view of the fact that such featureless and flat white surfaces could present a hazard and could lead to white-out conditions, the definition of land does not extend to flights over ice fields in OPS.CAT.410(b)(2)(ii) and OPS.CAT.418.H.

   b. The width of the corridor is variable from not safe to conduct operations in the conditions prevailing, to the maximum of three minutes wide. A number of

factors will, on the day, indicate if it can be used - and how wide it can be. These factors will include but not be restricted to:

i. the meteorological conditions prevailing in the corridor;

ii. the instrument fit of the aircraft;

iii. the certification of the aircraft - particularly with regard to floats;

iv. the sea state;

v. the temperature of the water;

vi. the time to rescue; and

vii. the survival equipment carried.

These can be broadly divided into the following three functional groups:

A. Those which meet the requirement for safe flying – i. and ii;

B. Those which meet the requirement for a safe forced landing and evacuation – i., ii., iii. and iv;

C. Those which meet the requirement for survival following a forced landing and successful evacuation – i., iv., v., vi. and vi;

6. Requirement for safe flying:

a. It is generally recognised that when flying out of sight of land in certain meteorological conditions, such as occur in high pressure weather patterns (goldfish bowl - no horizon, light winds and low visibility), the absence of a basic panel (and training) can lead to disorientation. In addition, lack of depth perception in these conditions demands the use of a radio altimeter with an audio voice warning as an added safety benefit - particularly when autorotation to the surface of the water may be required.

b. In these conditions a helicopter, without the required instruments and radio altimeter, should be confined to a corridor in which a pilot can maintain reference using the visual cues on the land.

7. Requirement for a safe forced landing and evacuation:

a. Weather and sea state both affect the outcome of an autorotation following an engine failure. It is recognised that the measurement of sea state is problematical and when assessing such conditions, good judgement has to be exercised by the operator and the commander.

b. Where floats have been certificated only for emergency use (and not for ditching), operations should be limited to those sea states which meet the requirement for such use - where a safe evacuation is possible.

(Ditching certification requires compliance with a comprehensive number of requirements relating to rotorcraft water entry, flotation and trim, occupant egress and occupant survival. Emergency flotation systems, generally fitted to smaller CS-27 rotorcraft, are approved against a broad requirement that the equipment should perform its intended function and not hazard the rotorcraft or its occupants. In practice, the most significant difference between ditching and emergency flotation systems is substantiation of the water entry phase. Ditching requirements call for water entry procedures and techniques to be established and promulgated in the AFM. The fuselage/flotation equipment should thereafter be shown to be able to withstand loads under defined water entry conditions which relate to these procedures. For emergency flotation equipment, there is no requirement to define the water entry technique and no specific conditions defined for the structural substantiation.)

8. Requirements for survival:

   a. Survival of crew members and passengers, following a successful autorotation and evacuation, is dependant on the clothing worn, the equipment carried and worn, the temperature of the sea and the sea state (see GM OPS.CAT.H.426). Search and rescue response/capability consistent with the anticipated exposure should be available before the conditions in the corridor can be considered non-hostile.

   b. Coastal Transit can be conducted (including north of 45N and south of 45S - when the definition of open sea areas allows) provided the requirements of GM OPS.GEN.180.H 7. and 8. are met and the conditions for a non-hostile coastal corridor are satisfied.

AMC1 OPS.GEN.185 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.

AMC2 OPS.GEN.185 Meteorological conditions

EVALUATION OF METEOROLOGICAL CONDITIONS

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

AMC3 OPS.GEN.185 Meteorological conditions

GENERAL – COMMERCIAL AIR TRANSPORT

In addition to AMC 1 and 2 OPS.GEN.185, a flight according to Instrument Flight Rules (IFR) should only be continued beyond:

1. the decision point when using the reduced contingency fuel procedure; or

2. the pre-determined point when using the pre-determined point procedure,

when available information indicates that the expected weather conditions at the time of arrival at the destination and/or required alternate aerodromes are at, or above, the applicable aerodrome operating minima.

AMC OPS.GEN.190.B Take-off conditions

FACILITIES AT THE TAKE-OFF SITE - BALLOONS

At the take-off site an anemometer should be provided by the operator.

AMC OPS.GEN.195 Approach and landing conditions

LANDING DISTANCE/FATO SUITABILITY

The in-flight determination of the landing distance/FATO suitability should be based on the latest available report, preferably not more than 30 minutes before the expected landing time.

AMC OPS.GEN.200 Commencement and continuation of approach

GENERAL

1. The RVR should not be less than the applicable minima.

2. Where RVR is not available, RVR values may be derived by converting the reported visibility (CMV) in accordance with AMC11 OPS.GEN.150.

3. If the MDA/H is above 500 ft above the aerodrome, the operator should establish an altitude/height, below which the approach should not be continued if the RVR/CMV is less than the applicable minima. This altitude/height should be at or above MDA/H + 500 ft but not above the FAF altitude/height.

4. The touchdown zone RVR is always prevailing over the other RVR values. If reported and relevant, the mid point and stop end RVR are also controlling.

   The minimum RVR should be at least:

   a. 125 m for the mid-point; or

   b. the RVR required for the touchdown zone; and

   c. 75 m for the stop-end.

   For aeroplanes equipped with a rollout guidance or control system, the minimum RVR value for the mid-point is 75 m. 'Relevant' means that part of the runway used during the high speed phase of the landing down to a speed of approximately 60 knots.

AMC1 OPS.GEN.205 Fuel and oil supply

FUEL PLANNING – NON-COMMERCIAL OPERATIONS

1. In computing the fuel and oil required, the following should be considered:

   a. Meteorological conditions forecast;

   b. Expected air traffic control routings and traffic delays;

   c. For IFR flight, one instrument approach at the destination aerodrome, including a missed approach;

   d. The procedures for loss of pressurisation, where applicable, or failure of one power-unit while en route;

   e. Any other conditions that may delay the landing of the aircraft or increase fuel and/or oil consumption.

2. Nothing precludes amendment of a flight plan in-flight, in order to re-plan the flight to another destination, provided that the all requirements can be complied with from the point where the flight is re-planned.

AMC2 OPS.GEN.205.B Fuel and oil supply

FUEL PLANNING – BALLOONS – COMMERCIAL AIR TRANSPORT

In addition to AMC2 B OPS.GEN.205, for flights conducted in accordance with visual flight rules, reserve fuel (gas or ballast) should not be less than to allow:

1. 45 minutes flight in mountainous areas; or

2. One-hour flight if the take-off is at night.

AMC3 OPS.GEN.205 Fuel and oil supply

RESERVE FUEL - COMMERCIAL OPERATIONS OTHER THAN COMMERCIAL AIR TRANSPORT

1. Notwithstanding AMC3 OPS.GEN.205.A and AMC4 OPS.GEN.205.H for flights remaining within 25 NM of the aerodrome/operating site of departure and with operating flight crew on board only, reserve fuel should not be less than:
   a. for aeroplanes, 20 minutes fuel at normal cruising altitude; and
   b. for helicopters, 10 minutes fuel at best range speed.
2. The operator should demonstrate to the competent authority that the amount of reserve fuel in accordance with 1 is essential for carrying out a specialised task.
3. The operator should specify in the OM:
   a. the type of activity where such reduced reserve fuel may be used;
   b. methods of reading and calculating the remaining fuel; and
   c. SOPs.
4. Refuelling facilities should be available at the aerodrome/operating site.
5. Refuelling should be performed between each flight.

AMC4 OPS.GEN.205 Fuel and oil supply

REFUELLING/DEFUELLING PROCEDURES - COMMERCIAL OPERATIONS OTHER THAN COMMERCIAL AIR TRANSPORT

1. The operator should establish refuelling/defuelling procedures specifying:
   a. the fuelling sites and equipment that may be used for fuelling the aircraft;
   b. the fuel quality for fuelling the aircraft;
   c. fire precautions and preparedness;
   d. the transport and storage of fuel in the operators care according to established standards;
   e. fuelling with engines/rotors running, if applicable; and
   f. in-flight refuelling, if applicable.
2. These procedures should take into account the minimisation of fire hazards and adequate protection of the natural environment.

AMC OPS.GEN.210 Refuelling with passengers embarking, on board or disembarking

GENERAL

1. Whenever applicable, the following precautions should be taken:
   a. Fire fighting facilities of the appropriate scale should be positioned so as to be immediately available in the event of a fire, when using operating sites;
   b. For aeroplanes:
      i. One qualified person should remain at a specified location during fuelling operations with passengers on board. This qualified person should be capable of handling emergency procedures concerning fire protection and fire-fighting, handling communications and initiating and directing an evacuation;
      ii. A two-way communication should be established and should remain available by the aeroplane's inter-communication system or other

suitable means between the personnel involved in the operation supervising the refuelling and the pilot-in-command or other qualified personnel on board the aeroplane;

iii. Crew, staff and passengers should be warned that re/defuelling will take place;

iv. 'Fasten Seat Belts' signs should be off;

v. 'NO SMOKING' signs should be on, together with interior lighting to enable emergency exits to be identified;

vi. Passengers should be instructed to unfasten their seat belts and refrain from smoking;

vii. Sufficient qualified personnel or the minimum required number of cabin crew, as applicable, should be on board and be prepared for an immediate emergency evacuation;

viii. If the presence of fuel vapour is detected inside the aeroplane, or any other hazard arises during re/defuelling, fuelling should be stopped immediately;

ix. The ground area beneath the exits intended for emergency evacuation and slide deployment areas should be kept clear;

x. Provision should be made for a safe and rapid evacuation;

c. For helicopters:

i. Door(s) on the refuelling side of the helicopter should remain closed;

ii. Door(s) on the non-refuelling side of the helicopter should remain open, weather permitting;

iii. Sufficient personnel should be immediately available to move passengers clear of the helicopter in the event of a fire.

iv. Sufficient qualified personnel should be on board and be prepared for an immediate emergency evacuation;

v. If the presence of fuel vapour is detected inside the helicopter, or any other hazard arises during re/defuelling, fuelling should be stopped immediately;

vi. The ground area beneath the exits intended for emergency evacuation and slide deployment areas should be kept clear;

vii. Provision should be made for a safe and rapid evacuation.

2. When re/defuelling with passengers on board, ground servicing activities and work inside the aircraft, such as catering and cleaning, should be conducted in such a manner that they do not create a hazard and that the aisles and emergency doors are unobstructed.

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

GM1 OPS.GEN.210 Refuelling with passengers embarking, on board or disembarking

REFUELLING/DEFUELLING WITH WIDE-CUT FUEL

1. 'Wide-cut fuel' (designated JET B, JP-4 or AVTAG) is an aviation turbine fuel that falls between gasoline and kerosene in the distillation range and consequently, compared to kerosene (JET A or JET A1), it has the properties of higher volatility (vapour pressure), lower flash point and lower freezing point.

2. Wherever possible, an operator should avoid the use of wide-cut fuel types. If a situation arises such that only wide-cut fuels are available for refuelling/defuelling, operators should be aware that mixtures of wide-cut fuels and kerosene turbine fuels can result in the air/fuel mixture in the tank being in the combustible range at ambient temperatures. The extra precautions set out below are advisable to avoid arcing in the tank due to electrostatic discharge. The risk of this type of arcing can be minimised by the use of a static dissipation additive in the fuel. When this additive is present in the proportions stated in the fuel specification, the normal fuelling precautions set out below are considered adequate.

3. Wide-cut fuel is considered to be “involved” when it is being supplied or when it is already present in aircraft fuel tanks.

4. When wide-cut fuel has been used, this should be recorded in the technical log. The next two uplifts of fuel should be treated as though they too involved the use of wide-cut fuel.

5. When refuelling/defuelling with turbine fuels not containing a static dissipater, and where wide-cut fuels are involved, a substantial reduction on fuelling flow rate is advisable. Reduced flow rate, as recommended by fuel suppliers and/or aeroplane manufacturers, has the following benefits:

   a. It allows more time for any static charge build-up in the fuelling equipment to dissipate before the fuel enters the tank;

   b. It reduces any charge which may build up due to splashing;

   c. Until the fuel inlet point is immersed, it reduces misting in the tank and consequently the extension of the flammable range of the fuel.

6. The flow rate reduction necessary is dependent upon the fuelling equipment in use and the type of filtration employed on the aeroplane fuelling distribution system. It is difficult, therefore, to quote precise flow rates. Reduction in flow rate is advisable whether pressure fuelling or over-wing fuelling is employed.

7. With over-wing fuelling, splashing should be avoided by making sure that the delivery nozzle extends as far as practicable into the tank. Caution should be exercised to avoid damaging bag tanks with the nozzle.

GM2 OPS.GEN.210 Refuelling with passengers embarking, on board or disembarking

REFUELLING/DEFUELLING PROCEDURES - COMMERCIAL OPERATIONS OTHER THAN COMMERCIAL AIR TRANSPORT

The OM should contain procedures, including the following:

1. Fuel quality:

   a. Documentation of fuel received;

   b. Sampling;

   c. Fuel grade;

   d. Installation, storage and dispensing processes;

   e. Labelling;

   f. Checking and testing, as appropriate, of fuel specification, age and contamination.

2. Fuelling while the engines are running:

   a. Safety precautions;

   b. One pilot at the controls.

3. Transport and storage of fuel:
   a. Operators fuel installation;
   b. Mobile storage (drums, cans, tanks);
   c. Transportation in, on or under the aircraft (dangerous goods).
4. Fuelling safety:
   a. Electrical bonding;
   b. Public protection;
   c. Control of access to storage areas;
   d. Fire safety in fuel farm and storage areas;
   e. Fire safety in mobile fuellers, fuelling pits, and fuelling cabinets;
   f. Training of fuelling personnel in fire safety;
   g. Fire code.
5. Environment:
   a. Precautionary measures;
   b. Fuel spills;
   c. Clean up;
   d. Reporting;

GM3 OPS.GEN.210 Refuelling with passengers embarking, on board or disembarking

AIRCRAFT REFUELLING PROVISIONS AND GUIDANCE ON SAFE REFUELLING PRACTICES

Provisions concerning aircraft refuelling are contained in Volume I (Aerodrome Design and Operations) of the ICAO Annex 14 (Aerodromes) , and guidance on safe refuelling practices is contained in Parts 1 and 8 of the ICAO Airport Services Manual (Doc9137).

GM OPS.GEN.220.B Operational limitations - balloons

BALLOON NIGHT FLIGHT

The risk of collision with overhead lines is considerable and cannot be overstated. The risk is considerably increased during night flights in conditions of failing light and visibility when there is increasing pressure to land. A number of incidents have occurred in the late evening in just such conditions, and may have been avoided had an earlier landing been planned. It is intended by the rule that night landings for this reason shall not be allowed.

Section III – Aircraft performance and operating limitations

AMC1 OPS.GEN.305 Weighing

1. 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 community operator to another do not have to be weighed prior to use by the receiving operator, unless more than 4 years have elapsed since the last weighing.

2. The mass and centre of gravity (CG) 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.

AMC2 OPS.GEN.305.A Weighing

FLEET MASS AND CG POSITION FOR AEROPLANES USED IN COMMERCIAL AIR TRANSPORT

1. For a group of aeroplanes of the same model and configuration, an average dry operating mass and CG position may be used as the fleet mass and CG position, provided that:

   a. the dry operating mass of an individual aeroplane does not differ by more than ±0.5 % of the maximum structural landing mass from the established dry operating fleet mass; or

   b. the CG position of an individual aeroplane does not differ by more than ±0.5 % of the mean aerodynamic chord from the fleet CG.

2. The operator should verify that, after an equipment or configuration change or after weighing, the aeroplane falls within the tolerances above.

3. To obtain fleet values, the operator should weigh, in the period between two fleet mass evaluations, a certain number of aeroplanes as specified in the Table below. “n” is the number of aeroplanes in the fleet using fleet values. Those aeroplanes in the fleet which have not been weighed for the longest time should be selected first.

Table 1 of AMC2 OPS.GEN.305.A Weighing

Number of aeroplanes in the fleet	Minimum number of weighings
2 or 3	n
4 to 9	(n + 3)/2
10 or more	(n + 51)/10

4. The interval between two fleet mass evaluations should not exceed 48 months.

5. The fleet values should be updated at least at the end of each fleet mass evaluation.

6. Aeroplanes which have not been weighed since the last fleet mass evaluation can be kept in a fleet operated with fleet values, provided that the individual values are revised by calculation and stay within the tolerances above. If these individual values no longer fall within the tolerances, the operator should determine new fleet values or operate aeroplanes not falling within the limits with their individual values.

7. If an individual aeroplane dry operating mass is within the fleet mass tolerance but its CG position exceeds the tolerance, the aeroplane may be operated under the applicable dry operating fleet mass but with an individual CG position.

8. Aeroplanes for which no mean aerodynamic chord has been published should be operated with their individual mass and CG position values. They may be operated under the dry operating fleet mass and CG position, provided that this can be justified by a study.

GM OPS.GEN.305.A Weighing

MAXIMUM STRUCTURAL LANDING MASS AEROPLANE

Maximum Structural Landing Mass is the maximum permissible total aeroplane mass upon landing under normal circumstances.

AMC OPS.GEN.310(a)(1) Mass and balance system - complex motor-powered aircraft used in non-commercial operations and aircraft used in commercial operations

DRY OPERATING MASS

To calculate the dry operating mass and the associated CG of the aircraft, the operator should take into account the mass of all operating items and crew members, and the influence of their position on the aircraft CG. This should be done by weighing or using the standard masses of 85 kg for flight and technical crew members and 75 kg for cabin crew members, including hand baggage. Account shall be taken of any additional baggage. On flights where crew masses, including hand baggage, are expected to exceed the standard crew masses, the actual mass of the crew should be determined by weighing.

AMC1 OPS.GEN.310(a)(2) Mass and balance system - complex motor-powered aircraft used in non-commercial operations and aircraft used in commercial operations

TRAFFIC LOAD

Traffic load should be determined by actual weighing or using standard masses for passengers, persons other than crew members and baggage.

AMC2 OPS.GEN.310(a)(2) Mass and balance system - complex motor-powered aircraft used in non-commercial operations and aircraft used in commercial operations

MASS VALUES FOR PASSENGERS/PERSONS OTHER THAN CREW MEMBERS[1] AND BAGGAGE

1. When

   a. the number of passenger seats available is:

      i. less than 10 for aeroplanes; or

      ii. less than 6 for helicopters; or

   b. the number of passengers is less than 11 for balloons,

   passenger mass may be calculated on the basis of a statement by, or on behalf of, each passenger, adding to it a predetermined mass to account for hand baggage and clothing.

   The predetermined mass for hand baggage and clothing should be established by the operator on the basis of studies relevant to his particular operation. In any case, it should not be less than:

[1] Persons other than crew members are usually involved in commercial operations other than commercial air transport (e.g. aerial photographer) and should be considered as passengers for this AMC.

i. 4 kg for clothing; and

ii. 6 kg for hand baggage.

The passengers' stated mass and the mass of passengers' clothing and hand baggage should be checked prior to boarding and adjusted, if necessary.

2. When determining the actual mass by weighing, passengers' personal belongings and hand baggage should be included. Such weighing should be conducted immediately prior to boarding the aircraft.

3. When using standard mass values, the standard mass values in Tables 1 and 2 below should be used. The standard masses include hand baggage and, for helicopters, the mass of any infant below 24 months carried by an adult on one passenger seat. Infants occupying separate passenger seats are considered as children.

Table 1 of AMC2 OPS.GEN.310(a)(2) Mass and balance system - Mass values for passengers – 20 seats or more

Passenger seats	20 and more		30 and more
	Male	Female	'All adult'
All flights except holiday charters	88 kg	70 kg	84 kg
Holiday charters*	83 kg	69 kg	76 kg
Children	35 kg	35 kg	35 kg

* Holiday charter means a charter flight that is part of a holiday travel package. On such flights the entire passenger capacity is hired by one or more charterer(s) for the carriage of passengers who are travelling, all or in part by air, on a round- or circle-trip basis for holiday purposes. The holiday charter mass values apply provided that not more than 5 % of passenger seats installed in the aircraft are used for the non revenue carriage of certain passengers. Categories of passengers such as company personnel, tour operators' staff, representatives of the press, authority officials etc. can be included within the 5% without negating the use of holiday charter mass values.

Table 2 of AMC2 OPS.GEN.310(a)(2) Mass and balance system - Mass values for passengers – 19 seats or less

Passenger seats	1 – 5	6 – 9	10 – 19
Male	104 kg	96 kg	92 kg
Female	86 kg	78 kg	74 kg
Children	35 kg	35 kg	35 kg

On aeroplanes flights with 19 passenger seats or less and all helicopter flights where no hand baggage is carried in the cabin or where hand baggage is accounted for separately, 6 kg may be deducted from the figures in Table 2 above. The following items are not considered hand baggage: an overcoat, an umbrella, a small handbag or purse, reading material or a small camera.

For helicopter operations in which a survival suit is provided to passengers, 3 kg should be added to the passenger mass value.

4. Where the total number of passenger seats available on the aircraft is 20 or more, the standard mass values for checked baggage of Table 3 should be used.

Table 3 of AMC2 OPS.GEN.310(a)(2) Mass and balance system - Mass values for baggage - 20 or more seats

Type of flight	Baggage standard mass

Domestic	11 kg
Within the European region	13 kg
Intercontinental	15 kg
All other	13 kg

Flights within the European region are flights conducted within the following area:

– N7200 E04500
– N4000 E04500
– N3500 E03700
– N3000 E03700
– N3000 W00600
– N2700 W00900
– N2700 W03000
– N6700 W03000
– N7200 W01000
– N7200 E04500

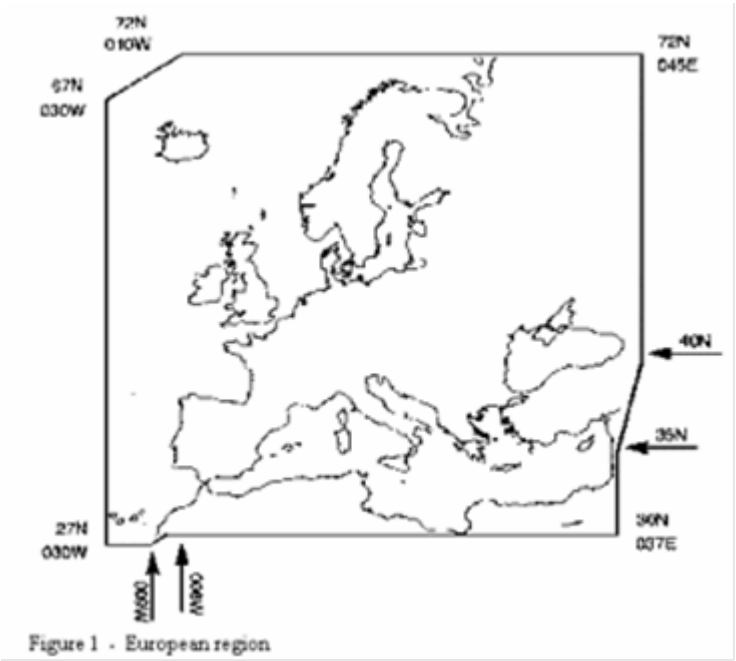


Figure 1 - European region

Domestic flight means a flight with origin and destination within the borders of one State.

Flights within the European region means flights, other than domestic flights, whose origin and destination are within the area specified above.

Intercontinental flights are flights beyond the European region with origin and destination in different continents.

For aircraft with 19 passenger seats or less, the mass of checked baggage should be determined by weighing.

For aircraft with 19 passenger seats or less used in non-commercial operations, the mass of checked baggage may also be calculated on the basis of a statement by, or on behalf of, each passenger. Where this is impractical, a minimum standard mass value of

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

5. The operator should determine the actual mass of passengers or checked baggage by weighing or add adequate mass increments whenever it can be expected that a significant number of passengers, including hand baggage, or checked baggage exceeds the standard masses.

6. Other standard masses may be used provided they are calculated on the basis of a detailed weighing survey plan and a reliable statistical analysis method is applied. The standard mass values should only be used in circumstances comparable with those under which the survey was conducted. Where these standard masses exceed those in Tables 1 - 3, then such higher values should be used.

AMC3 OPS.GEN.310(a)(2) Mass and balance system - complex motor-powered aircraft used in non-commercial operations and aircraft used in commercial operations

SPECIAL STANDARD MASSES FOR TRAFFIC LOAD

In addition to standard masses for passengers/persons other than crew members and checked baggage, an operator may 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.

AMC4 OPS.GEN.310(a)(2) Mass and balance system - complex motor-powered aircraft used in non-commercial operations and aircraft used in commercial operations

PROCEDURE FOR ESTABLISHING REVISED STANDARD MASS VALUES FOR PASSENGERS AND BAGGAGE FOR AIRCRAFT USED IN COMMERCIAL AIR TRANSPORT

1. Passengers

   a. Weight sampling method. The average mass of passengers and their hand baggage should be determined by weighing, taking random samples. The selection of random samples should by nature and extent be representative of the passenger volume, considering the type of operation, the frequency of flights on various routes, in/outbound flights, applicable season and seat capacity of the aircraft.

      i. Sample size. The survey plan should cover the weighing of at least the greatest of:

         A. A number of passengers calculated from a pilot sample, using normal statistical procedures and based on a relative confidence range (accuracy) of 1 % for all adult and 2 % for separate male and female average masses; and

         B. For aircraft:

            1. With a passenger seating capacity of 40 or more, a total of 2 000 passengers; or

            2. With a passenger seating capacity of less than 40, a total number of 50 multiplied by the passenger seating capacity.

   b. Passenger masses should include the mass of the passengers' belongings which are carried when entering the aircraft. When taking random samples of passenger masses, infants should be weighted together with the accompanying adult.

c. The location for the weighing of passengers should be selected as close as possible to the aircraft, at a point where a change in the passenger mass by disposing of or by acquiring more personal belongings is unlikely to occur before passengers board the aircraft.

d. Weighing machines used for passenger weighing should have a capacity of at least 150 kg. The mass should be displayed at minimum graduations of 500 g. The weighing machine should have an accuracy of at least 0,5 % or 200 g whichever is greater.

e. For each flight included in the survey the mass of the passengers, the corresponding passenger category (i.e. male/female/children) and the flight number should be recorded.

2. Checked baggage

The statistical procedure for determining revised standard baggage mass values based on average baggage masses of the minimum required sample size should comply with paragraph (a) for passengers above. For baggage, the relative confidence range (accuracy) amounts to 1 %. A minimum of 2000 pieces of checked baggage should be weighed.

3. Determination of revised standard mass values for passengers and checked baggage

a. To ensure that, in preference to the use of actual masses determined by weighing, the use of revised standard mass values for passengers and checked baggage does not adversely affect operational safety, a statistical analysis should be carried out. Such an analysis should generate average mass values for passengers and baggage as well as other data.

b. On aeroplanes with 20 or more passenger seats, these averages should apply as revised standard male and female mass values.

c. On smaller aeroplanes, the following increments should be added to the average passenger mass to obtain the revised standard mass values:

Table 1 of AMC4 OPS.GEN.310(a)(2) Mass and balance system

Number of passenger seats	Required mass increment
1 – 5	16 kg
6 – 9	8 kg
10 – 19	4 kg

Alternatively, all adult revised standard (average) mass values may be applied on aeroplanes with 30 or more passenger seats. Revised standard (average) checked baggage mass values are applicable to aircraft with 20 or more passenger seats.

d. All adult revised standard mass values should be based on a male/female ratio of 80/20 in respect of all flights except holiday charters which are 50/50. A different ratio on specific flights or routes may be used, provided supporting data shows that the alternative male/female ratio covers at least 84 % of the actual male/female ratios on a sample of at least 100 representative flights

e. The resulting average mass values should be rounded to the nearest whole number in kg. Checked baggage mass values should be rounded to the nearest 0,5 kg figure, as appropriate.

f. When operating on similar routes or networks, operators may pool their weighing surveys provided that in addition to the joint weighing survey results, results from individual operators participating in the joint survey are separately indicated in order to validate the joint survey results.

GM1 OPS.GEN.310(a)(2) Mass and balance system - complex motor-powered aircraft used in non-commercial operations and aircraft used in commercial operations

ADJUSTMENT OF STANDARD MASSES FOR AIRCRAFT USED IN COMMERCIAL AIR TRANSPORT

When standard mass values are used, AMC2 OPS.GEN.310(a)(2) 5. states that the operator should identify and adjust the passenger and checked baggage masses in cases where significant numbers of passengers or quantities of baggage are suspected of exceeding the standard values. This implies that the operations manual should contain appropriate directives to ensure that:

1. Check-in, operations and cabin staff and loading personnel report or take appropriate action when a flight is identified as carrying a significant number of passengers whose masses, including hand baggage, are expected to exceed the standard passenger mass, and/or groups of passengers carrying exceptionally heavy baggage (e.g. military personnel or sports teams); and
2. On small aircraft, where the risks of overload and/or CG errors are the greatest, pilots pay special attention to the load and its distribution and make proper adjustments.

GM2 OPS.GEN.310(a)(2) Mass and balance system - complex motor-powered aircraft used in non-commercial operations and aircraft used in commercial operations

STATISTICAL EVALUATION OF PASSENGERS AND BAGGAGE DATA FOR AIRCRAFT USED IN COMMERCIAL AIR TRANSPORT

1. Sample size.

   a. For calculating the required sample size it is necessary to make an estimate of the standard deviation on the basis of standard deviations calculated for similar populations or for preliminary surveys. The precision of a sample estimate is calculated for 95% reliability or 'significance', i.e. there is a 95% probability that the true value falls within the specified confidence interval around the estimated value. This standard deviation value is also used for calculating the standard passenger mass.

   b. As a consequence, for the parameters of mass distribution, i.e. mean and standard deviation, three cases have to be distinguished:

      i. μ, σ = the true values of the average passenger mass and standard deviation, which are unknown and which are to be estimated by weighing passenger samples.

      ii. μ', σ' = the 'a priori' estimates of the average passenger mass and the standard deviation, i.e. values resulting from an earlier survey, which are needed to determine the current sample size.

      iii. x, s = the estimates for the current true values of m and s, calculated from the sample.

      The sample size can then be calculated using the following formula:

$$n \geq \frac{(1.96 * \sigma' * 100)^2}{(e'_r * \mu')^2}$$

      where:

      n = number of passengers to be weighed (sample size)

      e'r = allowed relative confidence range (accuracy) for the estimate of μ by x (see also equation in paragraph 3). The allowed relative confidence range specifies the accuracy to be achieved when estimating the true mean. For example, if it is proposed to

estimate the true mean to within ± 1%, then e'r will be 1 in the above formula.

1.96 = value from the Gaussian distribution for 95% significance level of the resulting confidence interval.

2. Calculation of average mass and standard deviation. If the sample of passengers weighed is drawn at random, then the arithmetic mean of the sample (x) is an unbiased estimate of the true average mass (μ) of the population.

a. Arithmetic mean of sample where:

$$\bar{x} = \frac{\sum_{j=1}^{n} x_j}{n}$$

xj = mass values of individual passengers (sampling units).

b. Standard deviation where:

$$s = \sqrt{\frac{\sum_{j=1}^{n} (x_j - \bar{x})^2}{n-1}}$$

xj – = deviation of the individual value from the sample mean.

3. Checking the accuracy of the sample mean. The accuracy (confidence range) which can be ascribed to the sample mean as an indicator of the true mean is a function of the standard deviation of the sample which has to be checked after the sample has been evaluated. This is done using the formula:

$$e_r = \frac{1.96 * s * 100}{\sqrt{n} * \bar{x}} (\%)$$

whereby er should not exceed 1% for an all adult average mass and not exceed 2% for an average male and/or female mass. The result of this calculation gives the relative accuracy of the estimate of μ at the 95% significance level. This means that with 95% probability, the true average mass μ lies within the interval:

$$\bar{x} \pm \frac{1.96 * s}{\sqrt{n}}$$

4. Example of determination of the required sample size and average passenger mass.

a. Introduction. Standard passenger mass values for mass and balance purposes require passenger weighing programs be carried out. The following example shows the various steps required for establishing the sample size and evaluating the sample data. It is provided primarily for those who are not well versed in statistical computations. All mass figures used throughout the example are entirely fictitious.

b. Determination of required sample size. For calculating the required sample size, estimates of the standard (average) passenger mass and the standard deviation are needed. The 'a priori' estimates from an earlier survey may be used for this purpose. If such estimates are not available, a small representative sample of about 100 passengers has to be weighed so that the required values can be calculated. The latter has been assumed for the example.

Step 1: estimated average passenger mass.

n	x_j (kg)
1	79.9
2	68.1
3	77.9
4	74.5
5	_ 54.1
6	x 62.2
7	89.3
8	108.7
.	.
85	63.2
86	75.4
$\sum_{j=1}^{86}$	6 071.6

Step 2: estimated standard deviation.

n	xj	(xj – x)	(xj – x)2
1	79.9	+9.3	86.49
2	68.1	–2.5	6.25
3	77.9	+7.3	53.29
4	74.5	+3.9	15.21
5	54.1	–16.5	272.25
6	62.2	–8.4	70.56
7	89.3	+18.7	349.69
8	108.7	+38.1	1 451.61
.	.	.	.
85	63.2	–7.4	54.76
86	75.4	–4.8	23.04
$\sum_{j=1}^{86}$	6 071.6		34 683.40

$$\mu' = \bar{x} = \frac{\sum x_j}{n} = \frac{6071.6}{86}$$

= 70.6 kg

$$\sigma' = \sqrt{\frac{\sum (x_j - \bar{x})^2}{n-1}}$$

$$\sigma' = \sqrt{\frac{34\,683.40}{86-1}}$$

σ' = 20.20 kg

Step 3: required sample size.

The required number of passengers to be weighed should be such that the confidence range, e'r, does not exceed 1% as specified in paragraph 3.

$$n \geq \frac{(1.96 * \sigma' * 100)^2}{(e'_r * \mu')^2}$$

$$n \geq \frac{(1.96 * 20.20 * 100)^2}{(1 * 70.6)^2}$$

n ≥ 3145

The result shows that at least 3 145 passengers have to be weighed to achieve the required accuracy. If e'r is chosen as 2 % the result would be n ≥ 786.

Step 4: after having established the required sample size a plan for weighing the passengers is to be worked out.

c. Determination of the passenger average mass.

Step 1: Having collected the required number of passenger mass values, the average passenger mass can be calculated. For the purpose of this example it has been assumed that 3 180 passengers were weighed. The sum of the individual masses amounts to 231 186.2 kg.

n = 3180

$$\sum_{j=1}^{3180} X_j = 231186 \cdot 2 \quad kg$$

$$\bar{x} = \frac{\sum x_j}{n} = \frac{231186 \cdot 2}{3180} \quad kg$$

$$\bar{x} = 72 \cdot 7 \quad kg$$

Step 2: calculation of the standard deviation.

For calculating the standard deviation the method shown in paragraph 4.2 step 2 should be applied.

$$\sum (x_j - \bar{x})^2 = 745\,145 \cdot 20$$

$$s = \sqrt{\frac{\sum (x_j - \bar{x})^2}{n - 1}}$$

$$s = \sqrt{\frac{745\,145 \cdot 20}{3180 - 1}}$$

s = 15.31 kg

Step 3: calculation of the accuracy of the sample mean.

$$e_r = \frac{1 \cdot 96 * s * 100}{\sqrt{n} * \bar{x}} \%$$

$$e_r = \frac{1 \cdot 96 * 15 \cdot 31 * 100}{\sqrt{3180} * 72 \cdot 7} \%$$

er = 0.73 %

Step 4: calculation of the confidence range of the sample mean.

$$\bar{x} \pm \frac{1 \cdot 96 * s}{\sqrt{n}}$$

$$\bar{x} \pm \frac{1 \cdot 96 * 15 \cdot 31}{\sqrt{3180}} \quad kg$$

72.7 ± 0.5 kg

The result of this calculation shows that there is a 95% probability of the actual mean for all passengers lying within the range 72.2 kg to 73.2 kg.

GM3 OPS.GEN.310(a)(2) Mass and balance system - complex motor-powered aircraft used in non-commercial operations and aircraft used in commercial operations

GUIDANCE ON PASSENGER WEIGHING SURVEYS FOR AIRCRAFT USED IN COMMERCIAL AIR TRANSPORT

1. Information to the competent authority. An operator should advise the competent authority about the intent of the passenger weighing survey and explain the survey plan in general terms.

2. Detailed survey plan.

   a. An operator should establish and submit to the competent authority a detailed weighing survey plan that is fully representative of the operation, i.e. the network or route under consideration and the survey should involve the weighing of an adequate number of passengers.

   b. A representative survey plan means a weighing plan specified in terms of weighing locations, dates and flight numbers giving a reasonable reflection of the operator's timetable and/or area of operation.

   c. The minimum number of passengers to be weighed is the highest of the following:

      i. The number that follows from the means of compliance that the sample should be representative of the total operation to which the results will be applied; this will often prove to be the overriding requirement; or

      ii. The number that follows from the statistical requirement specifying the accuracy of the resulting mean values which should be at least 2% for male and female standard masses and 1% for all adult standard masses, where applicable. The required sample size can be estimated on the basis of a pilot sample (at least 100 passengers) or from a previous survey. If analysis of the results of the survey indicates that the requirements on the accuracy of the mean values for male or female standard masses or all adult standard masses, as applicable, are not met, an additional number of representative passengers should be weighed in order to satisfy the statistical requirements.

   d. To avoid unrealistically small samples a minimum sample size of 2 000 passengers (males + females) is also required, except for small aircraft where in view of the burden of the large number of flights to be weighed to cover 2 000 passengers, a lesser number is considered acceptable.

3. Execution of weighing programme.

   a. At the beginning of the weighing programme it is important to note, and to account for, the data requirements of the weighing survey report (see 6. below).

   b. As far as is practicable, the weighing programme should be conducted in accordance with the specified survey plan.

   c. Passengers and all their personal belongings should be weighed as close as possible to the boarding point and the mass, as well as the associated passenger category (male/female/child), should be recorded.

4. Analysis of results of weighing survey.

4.1 The data of the weighing survey should be analysed as explained in GM3 OPS.GEN.310(a)(2). To obtain an insight to variations per flight, per route etc. this analysis should be carried out in several stages, i.e. by flight, by route, by area, inbound/outbound, etc. Significant deviations from the weighing survey plan should be explained as well as their possible effect(s) on the results.

5. Results of the weighing survey.

a. The results of the weighing survey should be summarised. Conclusions and any proposed deviations from published standard mass values should be justified. The results of a passenger weighing survey are average masses for passengers, including hand baggage, which may lead to proposals to adjust the standard mass values given in AMC2 OPS.GEN.310(a)(2) Tables 1 and 2. These averages, rounded to the nearest whole number may, in principle, be applied as standard mass values for males and females on aircraft with 20 and more passenger seats. Because of variations in actual passenger masses, the total passenger load also varies and statistical analysis indicates that the risk of a significant overload becomes unacceptable for aircraft with less that 20 seats. This is the reason for passenger mass increments on small aircraft.

b. The average masses of males and females differ by some 15 kg or more and because of uncertainties in the male/female ratio the variation of the total passenger load is greater if all adult standard masses are used than when using separate male and female standard masses. Statistical analysis indicates that the use of all adult standard mass values should be limited to aircrafts with 30 passenger seats or more.

c. Standard mass values for all adults must be based on the averages for males and females found in the sample, taking into account a reference male/female ratio of 80/20 for all flights except holiday charters where a ratio of 50/50 applies. An operator may, based on the data from his weighing programme, or by proving a different male/female ratio, apply for approval of a different ratio on specific routes or flights.

6. Weighing survey report

The weighing survey report, reflecting the content of paragraphs 1–5 above, should be prepared in a standard format as follows:

WEIGHING SURVEY REPORT
1 Introduction Objective and brief description of the weighing survey.
2 Weighing survey plan Discussion of the selected flight number, airports, dates, etc. Determination of the minimum number of passengers to be weighed. Survey plan.
3 Analysis and discussion of weighing survey results Significant deviations from survey plan (if any). Variations in means and standard deviations in the network. Discussion of the (summary of) results.
4 Summary of results and conclusions Main results and conclusions. Proposed deviations from published standard mass values.
Attachment 1 Applicable summer and/or winter timetables or flight programmes.
Attachment 2 Weighing results per flight (showing individual passenger masses and sex); means and standard deviations per flight, per route, per area and for the total network.

AMC OPS.GEN.310(a)(3) Mass and balance system - complex motor-powered aircraft used in non-commercial operations and aircraft used in commercial operations

FUEL LOAD

The mass of the fuel load should be determined by using its actual relative density or a standard relative density.

GM OPS.GEN.310(a)(3) Mass and balance system - complex motor-powered aircraft used in non-commercial operations and aircraft used in commercial operations

FUEL DENSITY

1. 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.

2. Typical fuel density values are:

a.	Gasoline (piston engine fuel)	–	0.71
b.	JET A1 (Jet fuel JP 1)	–	0.79
c.	JET B (Jet fuel JP 4)	–	0.76
d.	Oil	–	0.88

AMC OPS.GEN.310(a)(4) Mass and balance system - complex motor-powered aircraft used in non-commercial operations and aircraft used in commercial operations

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 (e.g. hoist operations).

AMC OPS.GEN.310(a)(7) Mass and balance system - complex motor-powered aircraft used in non-commercial operations and aircraft used in commercial operations

CG LIMITS – OPERATIONAL CG ENVELOPE - COMMERCIAL AIR TRANSPORT

Unless seat allocation is applied and the effects of the number of persons per seat row, of cargo in individual cargo compartments and of fuel in individual tanks is accounted for in the balance calculation, operational margins should be applied to the certificated CG envelope. In determining the CG margins, possible deviations from the assumed load distribution should be considered. Passengers should be evenly distributed in the cabin. Operator procedures should fully account for the worst case variation in CG travel during flight caused by passenger/crew movement and fuel consumption/transfer.

GM OPS.GEN. 310(a)(7) Mass and balance system - complex motor-powered aircraft used in non-commercial operations and aircraft used in commercial operations

CG LIMITS – OPERATINAL CG ENVELOPE - COMMERCIAL AIR TRANSPORT

In the Certificate Limitations section of the Aircraft Flight Manual, 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. An operator should ensure that these limits are observed by defining operational procedures or a CG envelope which compensates for deviations and errors as listed below:

1. Deviations of actual CG at empty or operating mass from published values due, for example, to weighing errors, unaccounted modifications and/or equipment variations.

2. Deviations in fuel distribution in tanks from the applicable schedule.

3. Deviations in the distribution of baggage and cargo in the various compartments as compared with the assumed load distribution as well as inaccuracies in the actual mass of baggage and cargo.

4. Deviations in actual passenger seating from the seating distribution assumed when preparing the mass and balance documentation. Large CG errors may occur when 'free seating' (freedom of passengers to select any seat when entering the aircraft) is permitted. Although in most cases reasonably even longitudinal passenger seating can be expected, there is a risk of an extreme forward or aft seat selection causing very large and unacceptable CG errors (assuming that the balance calculation is done on the basis of an assumed even distribution). The largest errors may occur at a load factor of approximately 50% if all passengers are seated in either the forward or aft half of the cabin. Statistical analysis indicates that the risk of such extreme seating adversely affecting the CG is greatest on small aircraft.

5. Deviations of the actual CG of cargo and passenger load within individual cargo compartments or cabin sections from the normally assumed mid position.

6. Deviations of the CG caused by gear and flap positions and by application of the prescribed fuel usage procedure (unless already covered by the certified limits).

7. Deviations caused by in-flight movement of cabin crew, galley equipment and passengers.

AMC OPS.GEN.310(a)(8) Mass and balance system - complex motor-powered aircraft used in non-commercial operations and aircraft used in commercial operations

DOCUMENTATION - COMPLEX MOTOR-POWERED AIRCRAFT USED IN NON-COMMERCIAL OPERATIONS

The mass and balance computation may be available in flight planning documents or separate systems and may include standard load profiles.

AMC OPS.GEN.310(a)(8) and (b) Mass and balance system - complex motor-powered aircraft used in non-commercial operations and aircraft used in commercial operations

DOCUMENTATION - COMMERCIAL OPERATIONS

1. Mass and balance documentation should contain the following:

   a. Aircraft registration and type;

   b. Flight identification number and date;

   c. Pilot-in-command;

   d. Person who prepared the information;

   e. Dry operating mass and corresponding CG of the aircraft;

   f. Mass of the fuel at take-off and mass of trip fuel;

   g. Mass of consumables other than fuel;

   h. Load components including passengers, baggage, freight and ballast;

   i. Take-off Mass, Landing Mass and Zero Fuel Mass;

   j. Load distribution;

   k. Applicable aircraft CG positions; and

   l. The limiting mass and CG values.

2. For Performance Class B aeroplanes and for helicopters, the CG position may not need to be on the mass and balance documentation, if, for example, the load distribution is in accordance with a pre-calculated balance table or if it can be shown that for the planned operations a correct balance can be ensured, whatever the real load is.

3. The mass and balance documentation should:

   a. enable the pilot in command to determine that the load and its distribution are within the mass and balance limits of the aircraft; and

   b. include advise to the pilot in command whenever a non-standard method has been used for determining the mass of the load.

3. The information above may be available in flight planning documents or mass and balance systems.

4. 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. The operator should specify the maximum last minute change allowed in passenger numbers or hold load. New mass and balance documentation should be prepared if this maximum number is exceeded.

5. 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 6 months.

6. A copy of the final mass and balance documentation may be sent to aircraft via data or may be made available to the pilot-in–command by other means for its acceptance.

7. 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.

AMC OPS.GEN.315.B(b) Performance - general

BALLOON TAKE-OFF/LANDING IN CONGESTED AREAS

A balloon, when becalmed over a congested area, should land within that congested area such that third parties on the ground, passengers and crew are not endangered.

GM OPS.GEN.315.B(b) Performance - general

APPROVED OPERATING SITE FOR BALLOONS

In approving congested sites for take-off of balloons, the competent authority should consider the following:

1. availability of performance data to determine the climb-out performance of the balloon, taking into account the take-off area and the prevailing meteorological conditions;

2. the surrounding area should permit a safe forced landing; and

3. the performance of the balloon should be such that a continuous climb-out to the minimum safe altitude is ensured.

AMC1 OPS.GEN.320.A(a) Take-off - complex motor-powered aeroplanes used in non-commercial operations and aeroplanes used in commercial operations

TAKE-OFF MASS - COMPLEX MOTOR-POWERED AEROPLANES AND AEROPLANES USED IN COMMERCIAL OPERATIONS

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

1. the pressure altitude at the aerodrome;

2. the ambient temperature at the aerodrome;
3. the runway surface condition and the type of runway surface;
4. the runway slope in the direction of take-off;
5. not more than 50% of the reported head-wind component or not less than 150% of the reported tailwind component; and
6. the loss, if any, of runway length due to alignment of the aeroplane prior to take-off (for performance class A and class C aeroplanes an example is provided in appendix 2 to AMC OPS.CAT.A.316(a)(4)).

AMC2 OPS.GEN.320.A(a) Take-off - complex motor-powered aeroplanes used in non-commercial operations and aeroplanes used in commercial operations

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 OPS.GEN.320.A(a) Take-off - complex motor-powered aeroplanes used in non-commercial operations and aeroplanes used in commercial operations

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 may consider a take-off or landing, provided that he has applied the applicable performance adjustments, and any further safety measures he/she considers justified under the prevailing conditions. The excess runway length available including the criticality of the overrun area should also be considered.

AMC1 OPS.GEN.320.A(b) Take-off - complex motor-powered aeroplanes used in non-commercial operations and aeroplanes used in commercial operations

CONTINGENCY PROCEDURES FOR OBSTACLES CLEARANCES WITH ONE ENGINE INOPERATIVE – PERFORMANCE CLASS A AND CLASS C AEROPLANES IN COMMERCIAL AIR TRANSPORT OPERATIONS

In the case of multi-engined aeroplanes, an operator should establish contingency procedures to provide a safe route, avoiding obstacles, to enable the aeroplane in the case of one engine inoperative to either comply with the en-route requirements or land at either the aerodrome of departure or at a take-off alternate aerodrome.

GM1 OPS.GEN.320.A(b) Take-off - complex motor-powered aeroplanes used in non-commercial operations and aeroplanes used in commercial operations

CONTINGENCY PROCEDURES FOR OBSTACLES CLEARANCES WITH ONE ENGINE INOPERATIVE – PERFORMANCE CLASS A AEROPLANES IN COMMERCIAL AIR TRANSPORT OPERATIONS

Engine failure procedures for performance class A aeroplanes. If these procedures are based on an engine failure route that differs from the all engine departure route or SID normal departure, a “deviation point” can be identified where the engine failure route deviates from the normal departure route. Adequate obstacle clearance along the normal departure with failure of the critical engine at the deviation point will normally be available. However, in certain situations the obstacle clearance along the normal departure route may be marginal

and should be checked to ensure that, in case of an engine failure after the deviation point, a flight can safely proceed along the normal departure.

AMC2 OPS.GEN.320.A(b) Take-off - complex motor-powered aeroplanes used in non-commercial operations and aeroplanes used in commercial operations

ADEQUATE MARGIN

The adequate margin should be defined in the operations manual.

GM2 OPS.GEN.320.A(b) Take-off - complex motor-powered aeroplanes used in non-commercial operations and aeroplanes used in commercial operations

ADEQUATE MARGIN

1. “An adequate margin” is illustrated by the appropriate examples included in Attachment C to ICAO Annex 6, Part I.
2. Critical power-unit is the power-unit failure of which gives the most adverse effect on the aircraft characteristics relative to the case under consideration. On some aircraft there may be more than one equally critical power-unit. In this case, the expression “the critical power-unit” means one of those critical power-units (ICAO Annex 8).

GM OPS.GEN.325 One power-unit inoperative - complex motor-powered aircraft

HIGH TERRAIN OR OBSTACLE ANALYSIS

Further guidance material can be found in the applicable acceptable means of compliances with OPS.CAT.340.A and OPS.CAT.365.H.

AMC OPS.GEN.330.A Landing - complex motor-powered aeroplanes

ALLOWANCES

These allowances should be stated in the operations manual.

Section IV - Instruments, data and equipment

GM OPS.GEN.400(b) Instruments and equipments - General

APPROVED EQUIPMENT

The equipment approval in OPS.GEN.400(b) means that the equipment should have an authorisation or an approval in accordance with Part-21 (e.g. European Technical Standards Order (ETSO) authorisation).

GM1 OPS.GEN.400(c) Instruments and equipments - General

NON-APPROVED EQUIPMENT

1. The provision of this paragraph does not exempt the item of equipment from complying with Part-21 if the instrument or equipment is installed in the aircraft. In this case, the installation should be approved as required in Part-21 and should comply with the applicable airworthiness codes.
2. The functionality of non-installed instruments and equipment required by Part-OPS which do not need an equipment approval should be checked against recognised industry standards appropriated for the intended purpose. The operator is responsible for ensuring the maintenance of these instruments and equipment.
3. The failure of additional non-installed instruments or equipment not required by Part-OPS or the airworthiness codes or any applicable airspace requirements should not adversely affect the airworthiness and/or the safe operation of the aircraft. Examples are the following:
   a. Instruments supplying additional flight information (e.g. stand-alone Global Positioning System (GPS));
   b. Some aerial work equipment (e.g. some mission dedicated radios, wire cutters);
   c. Non-installed passenger entertainment equipment.

GM2 OPS.GEN.400(c) Instruments and equipments - General

LIST OF NON-APPROVED EQUIPMENT

The following items are typical examples of equipment which do not need an equipment approval:

1. Electric torch;
2. Accurate time piece;
3. Child restraint devices
4. Chart holder;
5. First aid kits;
6. Megaphones;
7. Survival and signalling equipment;
8. Sea anchors and equipment for mooring.GM OPS.GEN.400(e) Instruments and equipments - General

ACCESSIBILITY AND POSITIONING OF INSTRUMENTS AND EQUIPMENT

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

GM OPS.GEN.405(a)(1) Equipment for all aircraft

HAND FIRE EXTINGUISHERS

1. In the case of other than complex motor-powered aircraft, a hand fire extinguisher is considered to be necessary due to the development of toxic fumes when light composite materials catch fire.
2. For aerobatic flights, the hand fire extinguishers may become a hazard due to high G-loads.

AMC OPS.GEN.405(a)(2) Equipment for all aircraft

SEATS FOR MINIMUM REQUIRED CABIN CREW

Seats for the minimum required cabin crew members should be located close to the emergency exits and where cabin crew members can best assist passengers in the event of an emergency evacuation.

AMC OPS.GEN.405(a)(4) Equipment for all aircraft

RESTRAIN DEVICES FOR PERSON YOUNGER THAN 24 MONTHS - CHILD RESTRAIN DEVICES (CRD)

1. A child restraint device (CRD) is considered to be acceptable if:
   a. It is a 'supplementary loop belt' manufactured with the same techniques and the same materials of the approved safety belts; or
   b. It complies with paragraph (b) below.
2. Provided the CRD can be installed properly on the respective aircraft seat, the following CRDs are considered "acceptable":
   a. CRDs approved for use in aircraft by a competent authority on the basis of a technical standard and marked accordingly.
   b. CRDs approved for use in motor vehicles according to the UN standard ECE R 44, -03 or later series of amendments; or
   c. CRDs approved for use in motor vehicles and aircraft according to Canadian CMVSS 213/213.1; or
   d. CRDs approved for use in motor vehicles and aircraft according to US FMVSS No 213 and are manufactured to these standards on or after February 26, 1985. US approved CRDs manufactured after this date must bear the following labels in red letters:
      i. "THIS CHILD RESTRAINT SYSTEM CONFORMS TO ALL APPLICABLE FEDERAL MOTOR VEHICLE SAFETY STANDARDS" and
      ii. "THIS RESTRAINT IS CERTIFIED FOR USE IN MOTOR VEHICLES AND AIRCRAFT".
   e. CRDs qualified for use in aircraft according to the German "Qualification Procedure for Child Restraint Systems for Use in Aircraft" (TÜV Doc.: TÜV/958-01/2001).
   f. Devices approved for use in cars, manufactured and tested to standards equivalent to those listed above. The device must be marked with an associated

qualification sign, which shows the name of the qualification organisation and a specific identification number, related to the associated qualification project. The qualifying organisation should be a competent and independent organisation that is acceptable to the competent authority.

3. Location

a. Forward facing CRDs may be installed on both forward and rearward facing passenger seats but only when fitted in the same direction as the passenger seat on which it is positioned. Rearward facing CRDs can only be installed on forward facing passenger seats. A CRD may not be installed within the radius of action of an airbag, unless it is obvious that the airbag is de-activated or it can be demonstrated that there is no negative impact from the airbag.

b. A child in a restraint device should be located as near to a floor level exit as feasible.

c. A child in a restraint device should not hinder evacuation for any passenger.

d. For complex motor-powered aircraft involved in commercial air transport, a child in a restraint device should neither be located in the row (where rows are existing) leading to an emergency exit nor located in a row immediately forward or aft of an emergency exit. A window passenger seat is the preferred location. An aisle passenger seat or a cross aisle passenger seat is not recommended. Other locations may be acceptable provided the access of neighbour passengers to the nearest aisle is not obstructed by the CRD.

e. For complex motor-powered aircraft involved in commercial air transport, in general, only one CRD per row segment is recommended. More than one CRD per row segment is allowed if the children are from the same family or travelling group provided the children are accompanied by a responsible person sitting next to them. A row segment is the fraction of a row separated by two aisles or by one aisle and the aircraft fuselage.

4. Installation

a. CRDs should only be installed on a suitable aircraft seat with the type of connecting device they are approved or qualified for. E.g., CRDs to be connected by a three point harness only (most rearward facing baby CRDs currently available) should not be attached to an aircraft seat with a lap belt only, a CRD designed to be attached to a vehicle seat by means of rigid bar lower anchorages (ISO-FIX or US equivalent) only, should only be used on aircraft seats that are equipped with such connecting devices and should not be attached by the aircraft seat lap belt. The method of connecting should be the one shown in the manufacturer's instructions provided with each CRD.

b. All safety and installation instructions must be followed carefully by the responsible person accompanying the infant. For aircraft involved in commercial air transport, cabin crew should prohibit the use of any inadequately installed CRD or not qualified seat.

c. If a forward facing CRD with a rigid backrest is to be fastened by a lap belt, the restraint device should be fastened when the backrest of the passenger seat on which it rests is in a reclined position. Thereafter, the backrest is to be positioned upright. This procedure ensures better tightening of the CRD on the aircraft seat if the aircraft seat is reclinable.

d. The buckle of the adult safety belt must be easily accessible for both opening and closing, and must be in line with the seat belt halves (not canted) after tightening.

e. Forward facing restraint devices with an integral harness must not be installed such that the adult safety belt is secured over the child.

5. Operation

   a. Each CRD should remain secured to a passenger seat during all phases of flight, unless it is properly stowed when not in use.

   b. Where a CRD is adjustable in recline it must be in an upright position for all occasions when passenger restraint devices are required.

AMC OPS.GEN.410(a)(2) Flight instruments and equipment - VFR flights

MEANS FOR MEASURING AND DISPLAYING THE TIME

1. For other than complex motor-powered aircraft not involved in commercial operations, a means of measuring and displaying the time in hours, minutes and seconds may be a wrist watch capable of the same functions.

2. For complex motor-powered aircraft, an acceptable means of compliance with OPS.GEN.410(a)(2) should be considered to be a clock displaying hours, minutes and seconds, with a sweep-second pointer or digital presentation.

AMC OPS.GEN.410(a)(3) Flight instruments and equipment - VFR flights

CALIBRATION OF THE MEANS FOR MEASURING AND DISPLAYING PRESSURE ALTITUDE

1. The instrument measuring and displaying pressure altitude should be calibrated in feet (ft), with a sub-scale setting, calibrated in hectopascals/millibars, adjustable for any barometric pressure likely to be set during flight.

2. In the case of sailplanes and balloons, calibration in metres (m) is acceptable.

AMC OPS.GEN.410(a)(4) Flight instruments and equipment - VFR flights

CALIBRATION OF THE INSTRUMENT INDICATING AIR SPEED - SAILPLANES, AEROPLANES AND HELICOPTERS

The instrument indicating air speed should be calibrated in knots (kt). In the case of sailplanes with a maximum certificated take-off mass below 2 000 kg and aeroplanes other than complex motor-powered aeroplanes with a maximum certificated take-off mass below 2 000 kg, calibration in kilometres (km) per hour is acceptable.

AMC OPS.GEN.410(d)(1)(i) Flight instruments and equipment - VFR flights

MEANS OF INDICATING DRIFT DIRECTION - BALLOONS

The drift direction may be determined by using a map and reference to visual landmarks.

AMC OPS.GEN.410(b)(3) and OPS.GEN.415(a) Flight instruments and equipment - VFR flights and flight instruments and equipment - VFR night flights and IFR flights

ALTIMETERS - AEROPLANES

The altimeters of aeroplanes operating VFR flights when the aircraft cannot be maintained in a desired attitude without reference to one or more flight instruments, and of IFR flights, should have counter drum-pointer or equivalent presentation.

AMC OPS.GEN.410(b)(4) and OPS.GEN.415(a) Flight instruments and equipment - VFR flights and flight instruments and equipment - VFR night flights and IFR flights

HEADING INDICATOR - HELICOPTERS

Stabilised heading 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.

AMC OPS.GEN.410 and OPS.GEN.415 Flight instruments and equipment - VFR flights and flight instruments and equipment - VFR night flights and IFR flights

INTEGRATED INSTRUMENTS

1. Individual equipment requirements may be met by combinations of instruments or by integrated flight systems or by a combination of parameters on electronic displays, provided that the information so available to each required pilot is not less than the required in the applicable operational requirements, and the equivalent safety of the installation has been shown during type certification approval of the aircraft for the intended type of operation.
2. The means of measuring and indicating turn and slip, aircraft attitude and stabilised aircraft 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.

AMC OPS.GEN.410(c) and OPS.GEN.415(a) Flight instruments and equipment - VFR flights and flight instruments and equipment - VFR night flights and IFR flights

MULTI-PILOT OPERATIONS - DUPLICATE INSTRUMENTS - AEROPLANES AND HELICOPTERS

Duplicate instruments include separate displays for each pilot and separate selectors or other associated equipment where appropriate.

AMC OPS.GEN.415(a)(1) Flight instruments and equipment - VFR night flights and IFR flights

OUTSIDE AIR TEMPERATURE

1. The instrument should be calibrated in degrees Celsius.
2. A means of indicating outside air temperature may be an air temperature indicator which provides indications that are convertible to outside air temperature.

AMC OPS.GEN.415.A(a)(3) Flight instruments and equipment - VFR night flights and IFR flights

ALTERNATIVE SOURCE OF STATIC PRESSURE - AEROPLANES

1. Aeroplanes should have two independent static pressure systems.
2. However, in the case of propeller driven aeroplanes with a maximum certificated take-off mass of 5 700 kilograms (kg) or less, one static pressure and one alternative source of static pressure may be allowed.

GM OPS.GEN.415(a)(5) Flight instruments and equipment - VFR night flights and IFR flights

NAVIGATION LIGHTS

Specifications for navigation lights are contained in Appendix 1 to International Civil Aviation Organization (ICAO) Annex 6, Part II.

AMC OPS.GEN.415.H(a)(6) Flight instruments and equipment - VFR night flights and IFR flights

LANDING LIGHT - HELICOPTERS

The landing light should be trainable, at least in the vertical plane.

AMC OPS.GEN.415(b) Flight instruments and equipment - VFR night flights and IFR flights

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).

AMC OPS.GEN.415(d) Flight instruments and equipment - VFR night flights and IFR flights

BALLOON LIGHTS

1. The position lights should be one steady aviation white position light, and one flashing aviation red position light (or flashing aviation white) with an effective flash frequency of at least 40, but not more than 100, cycles per minute.
2. Both lights should have 360 degrees horizontal coverage and should be visible for at least 2 miles (approximately 3.22 km) under clear atmospheric conditions.
3. The white light should be located not more than 20 ft below the basket, trapeze, or other means for carrying occupants. The flashing red or white light should be located not less than seven ft or more than 10 ft below the steady white light.
4. There should be a means to retract and store the lights.

AMC OPS.GEN.420(e) Flights over water

LIFE JACKETS - HELICOPTERS

The life jacket should be accessible from the seat or berth of the person for whose use it is provided, with a safety belt or harness fastened.

GM OPS.GEN.420(a)-(e) Flights over water

LIFE JACKETS - ALL AIRCRAFT

Seat cushions are not considered to be flotation devices.

GM OPS.GEN.420(a), (d) and (f) Flights over water

EQUIPMENT FOR MAKING DISTRESS SIGNALS - SAILPLANES, BALLOONS, AEROPLANES AND HELICOPTERS

The equipment for making distress signals is described in ICAO Annex 2.

AMC OPS.GEN.420(a), (d) and (g) Flights over water

RISK ASSESSMENT

1. When conducting the risk assessment, the pilot-in-command should base his/her decision, as far as is practicable, on the implementing rules and AMCs applicable to the operation of aircraft.
2. The pilot-in-command should, for the determining the risk, take the following operating environment and conditions into account:

a. Sea state;

b. Sea and air temperatures;

c. The distance from land suitable for making an emergency landing;

d. The availability of search and rescue facilities.

AMC OPS.GEN.420(f) Flights over water

LIFE-SAVING RAFTS - HELICOPTERS

1. At least 50% of the life rafts carried should be deployable by remote control.

2. Rafts which are not deployable by remote control and which have a mass of more than 40 kg should be equipped with some means of mechanically assisted deployment.

AMC OPS.GEN.420(h) Flights over water

LIFE JACKETS

The means of electric illumination should be a survivor locator light.

GM OPS.GEN.425.H Ditching - Helicopters

PERFORMANCE CLASS 2 TAKE-OFF AND LANDING

Helicopters operated in Performance Class 2 and taking off or landing over water are exposed to a critical power unit failure.

GM OPS.GEN.430 Emergency Locator Transmitter (ELT)

DEFINITION

An Emergency Locator Transmitter (ELT) is a generic term describing equipment which broadcasts distinctive signals on designated frequencies and, depending on application, may be activated by impact or may be manually activated.

AMC1 OPS.GEN.430 Emergency Locator Transmitter (ELT)

ELT BATTERIES – MOTOR-POWERED AIRCRAFT

Batteries used in the ELTs should be replaced (or recharged, if the battery is rechargeable) when the equipment has been in use for more than 1 cumulative hour, and also when 50% of their useful life (or for rechargeable, 50% of their useful life of charge), as established by the equipment manufacturer has expired. The new expiry date for the replacement (or recharged) battery should be legibly marked on the outside of the equipment. The battery useful life (or useful life of charge) requirements of this paragraph do not apply to batteries (such as water-activated batteries) that are essentially unaffected during probable storage intervals.

AMC2 OPS.GEN.430 Emergency Locator Transmitter (ELT)

GENERAL – TYPES OF ELT AND GENERAL TECHNICAL SPECIFICATIONS

1. The ELT required by this provision should be one of the following:

   a. Automatic Fixed (ELT(AF)). An automatically activated ELT which is permanently attached to an aircraft and is designed to aid SAR teams in locating the crash site;

   b. Automatic Portable (ELT(AP)). An automatically activated ELT, which is rigidly attached to an aircraft before a crash, but is readily removable from the aircraft after a crash. It functions as an ELT during the crash sequence. If the ELT does

not employ an integral antenna, the aircraft-mounted antenna may be disconnected and an auxiliary antenna (stored 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);

c. Automatic Deployable (ELT(AD)). An ELT which is rigidly attached to the aircraft before the crash and which 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; or

d. Survival ELT (ELT(S)). An ELT which 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.

2. To minimize 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 maximize the probability of the signal being transmitted after a crash.

3. 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.

4. ELTs should be able to transmit on 121.5 MegaHertz (MHz) and 406 MHz.

AMC OPS.GEN.430.H(b)(2) Emergency Locator Transmitter (ELT)

ELT(S) - HELICOPTERS

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).

GM OPS.GEN.435 Survival equipment – Motor powered aircraft

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:

1. Areas so designated by the competent authority responsible for managing search and rescue; or

2. Areas that are largely uninhabited and where:

   a. The competent authority responsible for managing search and rescue has not published any information to confirm whether search and rescue would be or would not be especially difficult; and

   b. The competent authority referred to in 1. does not, as a matter of policy, designate areas as being especially difficult for search and rescue.

AMC OPS.GEN.435(a)(3) Survival equipment– Motor powered aircraft

ADDITIONAL SURVIVAL EQUIPMENT

1. The following additional survival equipment should be carried when required:

   a. 500 ml of water for each 4, or fraction of 4, persons on board;

   b. One knife;

   c. First Aid Equipment;

d. One set of Air/Ground codes;

2. In addition, when polar conditions are expected, the following should be carried:

a. A means for melting snow;

b. 1 snow shovel and 1 ice saw;

c. Sleeping bags for use by 1/3 of all persons on board and space blankets for the remainder or space blankets for all passengers on board;

d. 1 Arctic/Polar suit for each crew member carried.

3. 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.

AMC OPS.GEN.440(a) High altitude flights - Oxygen

BREATHING OXYGEN -

Breathing oxygen should be provided by a quick donning mask (See GM OPS.CAT.440(b)(1)).

AMC OPS.GEN.440(a)(1)(i) High altitude flights - Oxygen

PASSENGER OXYGEN SUPPLY BETWEEN 10 000 FT AND 13 000 FT

On routes where the oxygen is necessary to be carried for 10% of the passengers for the flight time between 10 000 ft and 13 000 ft, the oxygen may be provided by:

1. a plug-in or drop-out oxygen system with sufficient outlets and dispensing units uniformly distributed throughout the cabin so as to provide oxygen to each passenger at his/her own discretion when seated on his/her assigned seat; or

2. portable bottles, when a cabin crew member is carried on board such flight.

AMC OPS.GEN.440.A(a)(2) High altitude flights - Oxygen

MAXIMUM ALTITUDE WITHOUT A PASSENGER OXYGEN SYSTEM - AEROPLANES

For complex motor-powered pressurised aeroplanes and for pressurised aeroplanes used in commercial operations, the maximum altitude up to which an aeroplane can operate without a passenger oxygen system being installed and capable of providing oxygen to each cabin occupant, should be established using an emergency descent profile which takes into account the following conditions:

1. 17 seconds time delay for pilot's recognition and reaction, including mask donning, for trouble shooting and configuring the aeroplane for the emergency descent (emergency descent data/charts established by the aeroplane manufacturer and published in the Aircraft Flight Manual (AFM), and/or the AFM should be used to ensure uniform application of the option);

2. Maximum Operational Speed (VMO) or the airspeed approved in the AFM for emergency descent, (emergency descent data/charts established by the aeroplane manufacturer and published in the AFM, and/or AFM should be used to ensure uniform application of the option), whichever is the less;

3. All engines operative;

4. The estimated mass of the aeroplane at the top of climb.

GM OPS.GEN.440 High altitude flights - Oxygen

GENERAL

The high altitude flights concept is dealt with in detail in the ICAO Manual of Civil Aviation Medicine.

GM OPS.GEN.440(a)(2)(i) and (a)(3) High altitude flights - Oxygen

DETERMINATION OF THE PROPORTION OF THE PASSENGERS FOR OXYGEN SUPPLY

1. The determination of the proportion of the passengers for which oxygen should be supplied depends on the circumstances (e.g. maximum altitude, duration of the flight) of the flight to be undertaken and the performance of the aircraft.
2. For pressurised aircraft not involved in commercial air transport operations, the requirements in Table 1 of OPS.CAT.440 may be used as guidance material.

GM OPS.GEN.440(b) High altitude flights - Oxygen

DUTIES ESSENTIAL TO THE SAFE OPERATION OF AN AIRCRAFT

Flight duties which are essential to the safe operation of an aircraft include at least the control of aircraft in the flight path and the reaction to any normal, abnormal or emergency conditions.

AMC OPS.GEN.450 Marking of break-in points

COLOUR AND CORNERS' MARKING

1. The colour of the markings should be red or yellow and, if necessary, should be outlined in white to contrast with the background.
2. If the corner markings are more than 2 m apart, intermediate lines 9 centimetres (cm) x 3 cm should be inserted so that there is no more than 2 m between adjacent markings.

AMC1 OPS.GEN.455 First-aid kits

OTHER THAN COMPLEX MOTOR-POWERED AIRCRAFT AND BALLOONS

First-Aid Kits (FAKs) according to DIN 13164 or DIN 13157 are considered to meet the objective of OPS.GEN.455.

AMC2 OPS.GEN.455 First-aid kits

COMPLEX MOTOR-POWERED AIRCRAFT

1. First-Aid Kits (FAKs) should be equipped with appropriate and sufficient medications and instrumentation. However, these kits should be adapted by the operator according to the characteristics of the operation (scope of operation, flight duration, number and demographics of passengers etc.).
2. The following should be included in the FAKs:
    a. Equipment:
        i. Bandages (assorted sizes);
        ii. Burns dressings (unspecified);
        iii. Wound dressings (large and small);
        iv. Adhesive dressings (assorted sizes);
        v. Adhesive tape;

vi. Adhesive wound closures;

vii. Safety pins;

viii. Scissors;

ix. Antiseptic wound cleaner;

x. Disposable resuscitation aid;

xi. Disposable gloves;

xii. IV cannulae (if IV fluids are carried in the FAK, a sufficient supply of IV cannulae should be stored there as well).

b. Medications:

i. Simple analgesic (may include liquid form);

ii. Antiemetic;

iii. Nasal decongestant;

iv. Gastrointestinal antacid;

v. Anti-diarrhoeal medication (for aircraft carrying more than 9 passengers);

vi. Bronchial dilator spray.

c. Other:

i. A list of contents in at least 2 languages (English and one other). This should include information on the effects and side effects of medications carried;

ii. First-aid handbook;

iii. Medical incident report form;

iv. Biohazard disposal bags;

v. Ground/Air visual signal code for use by survivors.

d. An eye irrigator, whilst not required to be carried in the FAK, should, where possible, be available for use on the ground.

e. For security reasons, items such as scissors should be stored securely.

AMC OPS.GEN.455(d) First-aid kits

MAINTENANCE OF FIRST AID KITS

To be maintained first aid kits should be:

1. inspected periodically to confirm, to the extent possible, that contents are maintained in the condition necessary for their intended use; and

2. replenished at regular intervals, in accordance with instructions contained on their labels, or as circumstances warrant.

GM1 OPS.GEN.460(a) and (b) Airborne Collision Avoidance System (ACAS) II

GENERAL

1. The ACAS operational procedures and training programmes established by the operator should take into account GM2 OPS.GEN.460(a) and (b). This guidance material incorporates advice contained in:

a. ICAO Annex 10, Volume IV ;

b. ICAO PANS-OPS, Volume 1 ;

c. ICAO PANS-ATM ; and

d. ICAO guidance material “ACAS Performance-Based Training Objectives” (published under Attachment E of state letter AN 7/1.3.7.2-97/77).

2. Additional guidance material on ACAS may be referred to, including information available from such sources as Eurocontrol.

GM2 OPS.GEN.460(a) and (b) Airborne Collision Avoidance System (ACAS) II

ACAS FLIGHT CREW TRAINING PROGRAMMES

1. During the implementation of ACAS, several operational issues were identified which had been attributed to deficiencies in flight crew training programmes. As a result, the issue of flight crew training has been discussed within the ICAO, which has developed guidelines for operators to use when designing training programmes.

2. This guidance material contains performance-based training objectives for ACAS II flight crew training. Information contained in this paper related to Traffic Advisories (TAs) is also applicable to ACAS I and ACAS III 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).

3. The information provided is valid for TCAS II version 6.04A as well as for version 7 (ACAS II). Where differences arise, these are identified.

4. 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.

5. ACAS Academic Training:

a. 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.

b. Essential items:

i. Theory of operation. The flight crew member should demonstrate an understanding of ACAS 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:

1. Surveillance:

a. ACAS interrogates other transponder-equipped aircraft within a nominal range of 14 nautical miles (nm).

b. ACAS surveillance range can be reduced in geographic areas with a large number of ground interrogators and/or ACAS II-equipped aircraft.

c. 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.

2. Collision avoidance:

a. TAs can be issued against any transponder-equipped aircraft which responds to the ICAO Mode C interrogations, even if the aircraft does not have altitude reporting capability.

b. RAs can be issued only against aircraft that are reporting altitude and in the vertical plane only.

c. RAs issued against an ACAS-equipped intruder are co-ordinated to ensure complementary RAs are issued.

d. Failure to respond to an RA deprives own aircraft of the collision protection provided by own ACAS.

e. Additionally, in ACAS-ACAS encounters, it 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:

1. 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 air traffic services are different from the miss distances against which ACAS issues alerts;

2. Thresholds for issuing a TA or an RA vary with altitude. The thresholds are larger at higher altitudes;

3. A TA occurs from 15 to 48 seconds and an RA from 15 to 35 seconds before the projected CPA;

4. 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:

1. ACAS will neither track nor display non-transponder-equipped aircraft, nor aircraft not responding to ACAS Mode C interrogations;

2. ACAS will automatically fail if the input from the aircraft's barometric altimeter, radio altimeter or transponder is lost.

a. 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.

b. ACAS may react in an improper manner when false altitude information is provide to own ACAS or transmitted by another aircraft. Individual operators should ensure that their flight crews are aware of the types of unsafe conditions which can arise. Flight crews 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;

3. 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;

4. ACAS may not display all proximate transponder-equipped aircraft in areas of high density traffic;

5. The bearing displayed by ACAS is not sufficiently accurate to support the initiation of horizontal manoeuvres based solely on the traffic display;

6. 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;

7. 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:

1. "Increase Descent" RAs are inhibited below 1 450 ft agl;
2. "Descend" RAs are inhibited below 1 100 ft agl;
3. All RAs are inhibited below 1 000 ft agl;
4. All TA aural annunciations are inhibited below 500 ft agl (1 000ft version 6.04A);
5. Altitude and configuration under which "Climb" and "Increase Climb" RAs are inhibited. ACAS can still issue "Climb" and "Increase Climb" RAs when operating at the aeroplane's certified ceiling. (In some aircraft types, "Climb" or "Increase Climb" RAs are never inhibited.)

ii. Operating procedures. The flight crew member should demonstrate the knowledge required to operate the ACAS avionics and interpret the information presented by ACAS. This training should address the following:

A. Use of controls. Objective: To verify that the pilot can properly operate all ACAS and display controls.

Criteria: Demonstrate the proper use of controls including:

1. Aircraft configuration required to initiate a self-test;
2. Steps required to initiate a self-test;
3. 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;
4. 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;
5. Recognising that the configuration of the display does not affect the ACAS surveillance volume;
6. Selection of lower ranges when an advisory is issued, to increase display resolution;
7. Proper configuration to display the appropriate ACAS information without eliminating the display of other needed information;

8. 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;

9. 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 an operator's specific display implementation. Criteria: The flight crew member should demonstrate the ability to properly interpret information displayed by ACAS, including the following:

1. Other traffic, i.e. traffic within the selected display range that is not proximate traffic, or causing a TA or RA to be issued;

2. Proximate traffic, i.e. traffic that is within 6 nm and ±1 200 ft;

3. Non-altitude reporting traffic;

4. No bearing TAs and RAs;

5. Off-scale TAs and RAs. The selected range should be changed to 6. TAs. The minimum available display range which allows the traffic to be displayed should be selected, to provide the maximum display resolution;

7. RAs (traffic display). The minimum available display range of the traffic display which allows the traffic to be displayed should be selected, to provide the maximum display resolution;

8. 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;

9. 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:

1. Knowledge of the operator's guidance for the use of TA only;

2. Reasons for using this mode. If TA only is not selected when an airport is conducting simultaneous operations from parallel runways separated by less than 1 200 ft, and to some intersecting runways, RAs can be expected. If for any reason TA only is not selected and an RA is received in these situations, the response should comply with the operator's approved procedures.

3. All TA aural annunciations are inhibited below 500 ft agl (1 000 ft agl for version 6.04A). 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 co-ordination. 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:

1. Task sharing between the pilot flying and the pilot not flying;

2. Expected call-outs;

3. Communications with Air Traffic Control (ATC).

E. Phraseology requirements. Objective: To verify that the flight crew member is aware of the requirements for reporting RAs to the controller. Criteria: The flight crew member should demonstrate the following:

1. The use of the phraseology contained in ICAO PANS-OPS;

2. An understanding of the procedures contained in ICAO PANS-ATM and ICAO Annex 2;

3. The understanding that verbal reports should be made promptly to the appropriate ATC unit:

a. whenever any manoeuvre has caused the aeroplane to deviate from an air traffic clearance;

b. 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

c. 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 requirements. Objective: To verify that the flight crew member is aware of the requirements 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 requirements and the material available to the flight crew member should be tailored to the operator’s operating environment. For operators involved in commercial operations, this responsibility is satisfied by the flight crew member reporting to the operator according to the applicable reporting requirements.

c. Non-essential items: Advisory thresholds. Objective: To demonstrate knowledge of the criteria for issuing TAs and RAs. Criteria: The flight crew member should demonstrate an understanding of the methodology used by ACAS to issue TAs and RAs and the general criteria for the issuance of these advisories, including the following:

i. The minimum and maximum altitudes below/above which TAs will not be issued;

ii. When the vertical separation at CPA is projected to be less than the ACAS-desired separation, a corrective RA which requires a change to the existing vertical speed will be issued. This separation varies from 300 ft at low altitude to a maximum of 700 ft at high altitude;

iii. When the vertical separation at CPA is projected to be just outside the ACAS-desired separation, a preventive RA which 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.

6. ACAS manoeuvre training:

a. 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 flight simulator equipped with an ACAS display and controls similar in appearance and operation to those in the aircraft. If a flight simulator is utilised, CRM should be practised during this training.

b. 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.

c. 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 'safety flash' Bulletins.

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 not flying. 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 not flying 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 not flying. The pilot flying should respond to a corrective RA with appropriate control inputs. The pilot not flying should monitor the response to the RA and should provide updates on the traffic location by checking the traffic display. Proper Crew Resource Management (CRM) should be used;

C. Proper interpretation of the displayed information. The pilot should recognise the intruder causing the RA to be issued (red square on display). The pilot should respond appropriately;

D. For corrective RAs, the response should be initiated in the proper direction within five seconds of the RA being displayed. The change in vertical speed should be accomplished with an acceleration of approximately ¼ g (gravitational acceleration of 9.81 m/sec²);

E. Recognition of the initially displayed RA being modified. Response to the modified RA should be properly accomplished, as follows:

1. For increase rate RAs, the vertical speed change should be started within two and a half seconds of the RA being displayed. The change in vertical speed should be accomplished with an acceleration of approximately ⅓ g;

2. For RA reversals, the vertical speed reversal should be started within two and a half seconds of the RA being displayed. The change in vertical speed should be accomplished with an acceleration of approximately ⅓ g;

3. For RA weakenings, the vertical speed should be modified to initiate a return towards the original clearance;

4. An acceleration of approximately ¼ g will be achieved if the change in pitch attitude corresponding to a change in vertical speed of 1 500 ft/min is accomplished in approximately five seconds, and of ⅓ g if the change is accomplished in approximately three seconds. The change in pitch attitude required to establish a rate of climb or descent of 1 500 ft/min from level flight will be approximately six degrees when the True Air Speed (TAS) is 150 kt, four degrees at 250 kt, and two degrees at 500 kt. (These angles are derived from the formula: 1000 divided by TAS.)

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

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

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

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

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

K. When possible, an ATC clearance should be complied with while responding to an RA. For example, if the aircraft can level at the assigned altitude while responding to RA (an "adjust vertical speed" RA (version 7), "reduce climb" or "reduce descent" RA (version 6.04A), 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 which it considers to be a threat when selecting an RA. As such, it is possible for ACAS to issue an RA against one intruder which results in a manoeuvre towards another intruder which is not classified as a threat. If the second intruder becomes a threat, the RA will be modified to provide separation from that intruder.

7. ACAS initial evaluation:

a. 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.

b. The flight crew member’s understanding of the manoeuvre training items should be assessed in a 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.

c. 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.

8. ACAS recurrent training:

a. 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.

b. It is recommended that operator's recurrent training programmes using 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 two-year period. If a 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.

AMC OPS.GEN.465.A(c) Terrain Awareness Warning System (TAWS) - Aeroplanes

TAWS WARNING

The warning referred in OPS.GEN.465.A(c) should be provided by aural signals that may be supplemented by visual signals.

GM1 OPS.GEN.465.A Terrain Awareness Warning System (TAWS) - Aeroplanes

TAWS CLASS A AND TAWS CLASS B

The minimum performance standards for TAWS Class A and TAWS Class B equipment are described in the Agency’s ETSO-C151a .

GM2 OPS.GEN.465.A Terrain Awareness Warning System (TAWS) - Aeroplanes

GUIDANCE MATERIAL FOR TAWS FLIGHT CREW TRAINING PROGRAMMES

1. Introduction:

a. This guidance material contains performance-based training objectives for TAWS flight crew training.

b. The training objectives cover five areas: theory of operation; pre-flight operations; general in-flight operations; response to TAWS cautions; and response to TAWS warnings.

c. The term ‘TAWS’ in this guidance material means a Ground Proximity Warning System (GPWS) enhanced by a forward-looking terrain avoidance function. Alerts include both cautions and warnings.

d. The content of this guidance material is intended to assist operators who are producing training programmes. The information it contains has not been tailored to any specific aircraft or TAWS equipment, but highlights features which are typically available where such systems are installed. It is the responsibility of the individual operator to determine the applicability of the

content of this guidance material to each aircraft and TAWS equipment installed and their operation. Operators should refer to the AFM and/or Aircraft/Flight Crew Operating Manual A/FCOM, or similar documents, for information applicable to specific configurations. If there should be any conflict between the content of this guidance material and that published in the other documents described above, then information contained in the AFM or A/FCOM will take precedence.

2. Scope:

a. The scope of this guidance material is designed to identify training objectives in the areas of: academic training; manoeuvre training; initial evaluation; and recurrent qualification. Under each of these four areas, the training material has been separated into those items which are considered essential training items and those which are considered to be desirable. In each area, objectives and acceptable performance criteria are defined.

b. 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, ie a flight simulator. Where appropriate notes are included within the performance criteria which amplify or clarify the material addressed by the training objective.

3. Performance-based training objectives:

a. 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 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:

1. 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 flap and gear selector position sensors.

2. The forward looking terrain avoidance function utilises an accurate source of known aircraft position, such as that which may be provided by a Flight Management System (FMS) or GPS, or an electronic terrain database. The source and scope of the terrain, obstacle and airport data, and features such as the terrain clearance floor, the runway picker, and geometric altitude (where provided), should all be described.

3. 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:

1. basic GPWS alerting modes specified in the ICAO Standard:

   Mode 1: excessive sink rate;

   Mode 2: excessive terrain closure rate;

   Mode 3: descent after take-off or go-around;

   Mode 4: unsafe proximity to terrain;

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

2. an additional, optional alert mode:- Mode 6: radio altitude call-out (information only); TAWS cautions and warnings which alert the flight crew to obstacles and terrain ahead of the aircraft in line with or adjacent to its projected flight path (Forward-Looking Terrain Avoidance (FLTA) and Premature Descent Alert (PDA) functions).

D. TAWS limitations. Objective: To verify that the pilot is aware of the limitations of TAWS. Criteria: The pilot should demonstrate knowledge and an understanding of TAWS limitations identified by the manufacturer for the equipment model installed, such as:

1. navigation should not be predicated on the use of the terrain display;

2. unless geometric altitude data is provided, use of predictive TAWS functions is prohibited when altimeter subscale settings display ‘QFE’;

3. nuisance alerts can be issued if the aerodrome of intended landing is not included in the TAWS airport database;

4. in cold weather operations, corrective procedures should be implemented by the pilot unless the TAWS has in-built compensation, such as geometric altitude data;

5. 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;

6. radio signals not associated with the intended flight profile (eg ILS glide path transmissions from an adjacent runway) may cause false alerts;

7. inaccurate or low accuracy aircraft position data could lead to false or non-annunciation of terrain or obstacles ahead of the aircraft; and

8. 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:

1. A means of silencing voice alerts;

2. A means of inhibiting ILS glide path signals (as may be required when executing an ILS back beam approach);

3. A means of inhibiting flap position sensors (as may be required when executing an approach with the flaps not in a normal position for landing);

4. A means of inhibiting the FLTA and PDA functions;

5. A means of selecting or deselecting the display of terrain information, together with appropriate annunciation of the status of each selection.

b. 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:

A. The means by which, before flight, any equipment self-test functions can be initiated;

B. The means by which TAWS information can be selected for display;

C. The means by which 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;

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 the following:

A. How to recognise 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);

B. How to recognise 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 co-ordination. 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;

B. How multi-function displays will be used to depict TAWS information at take-off, in the cruise and for the descent, approach, landing (and any go-around). This will be in accordance with procedures specified by the operator, who will recognise that it may be more desirable that other data 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 requirements. Objective: To verify that the pilot is aware of the requirements 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 air traffic control unit;

B. The type of written report which 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:

A. awareness of the modes associated with basic GPWS, including the input data associated with each; and

B. awareness of the visual and aural annunciations that can be issued by TAWS and how to identify which are cautions and which are warnings.

c. TAWS manoeuvre training. The pilot should demonstrate the knowledge required to respond correctly to TAWS cautions and warnings. This training should address the following topics:

i. Response to cautions:

A. Objective: To verify that the pilot properly interprets and responds to cautions. Criteria: The pilot should demonstrate an understanding of the need, without delay:

1. to initiate action required to correct the condition which has caused the TAWS to issue the caution and to be prepared to respond to a warning, if this should follow; and

2. 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:

1. to reduce a rate of descent and/or to initiate a climb;

2. to regain an ILS glide path from below, or to inhibit a glide path signal if an ILS is not being flown;

3. to 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;

4. to select gear down; and/or

5. to initiate a turn away from the terrain or obstacle ahead and towards an area free of such obstructions if a forward-looking terrain display indicates that this would be a good solution and the entire manoeuvre can be carried out in clear visual conditions.

ii. Response to warnings. Objective: To verify that the pilot properly interprets and responds to warnings. Criteria: The pilot should demonstrate an understanding of the following:

A. The need, without delay, to initiate a climb in the manner specified by the operator;

B. The need, without delay, to maintain the climb until visual verification can be made that the aircraft will clear the terrain or obstacle ahead or until above the appropriate sector safe altitude (if certain about the location of the aircraft with respect to terrain) even if the TAWS warning stops. If, subsequently, the aircraft climbs up through the sector safe altitude, but the visibility does not allow the flight crew to confirm that the terrain hazard has ended, checks should be made to verify the location of the aircraft and to confirm that the altimeter subscale settings are correct;

C. When the workload permits, that the flight crew should notify the air traffic controller of the new position and altitude/flight level, and what the 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:

1. the aircraft is being operated by day in clear, visual conditions; and

ii. it is immediately clear to the pilot that the aircraft is in no danger in respect of its configuration, proximity to terrain or current flight path.

d. 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 simulator equipped with TAWS visual and aural displays and inhibit selectors similar in appearance and operation to those in the aircraft which the pilot will fly. The results should be assessed by a synthetic flight instructor, synthetic flight examiner, type rating instructor or type rating examiner.

iii. The range of scenarios should be designed to give confidence that proper and timely responses to TAWS cautions and warnings will result in the aircraft avoiding a CFIT accident. To achieve this objective, the pilot should demonstrate taking the correct action to prevent a caution developing into a warning and, separately, the escape manoeuvre needed in response to a warning. These demonstrations should take place when the external visibility is zero, though there is much to be learnt if, initially, the training is given in 'mountainous' or 'hilly' terrain with clear visibility. This training should comprise a sequence of scenarios, rather than be included in Line Orientated Flying Training (LOFT).

iv. A record should be made, after the pilot has demonstrated competence, of the scenarios that were practised.

e. 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.

f. Reporting procedures:

i. Verbal reports. Verbal reports should be made promptly to the appropriate air traffic control unit:

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

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

C. when an air traffic control unit issues instructions which, if followed, would cause the pilot to manoeuvre the aircraft towards terrain or obstacle or it would appear from the display that a potential CFIT occurrence is likely to result.

ii. Written reports. Written reports should be submitted in accordance with the operator's occurrence reporting scheme and they also should be recorded in the aircraft technical log:

A. whenever the aircraft flight path has been modified in response to a TAWS alert (false, nuisance or genuine);

B. whenever a TAWS alert has been issued and is believed to have been false; and/or

C. if it is believed that a TAWS alert should have been issued, but was not.

iii. Within this guidance material, and with regard to reports:

A. the term 'false' means that the TAWS issued an alert which could not possibly be justified by the position of the aircraft in respect to terrain and it is probable that a fault or failure in the system (equipment and/or input data) was the cause;

B. the term 'nuisance' means that the TAWS issued an alert which was appropriate, but was not needed because the flight crew could determine by independent means that the flight path was, at that time, safe;

C. the term 'genuine' means that the TAWS issued an alert which was both appropriate and necessary; and

D. the report terms described in GM2 OPS.GEN.A.465 3.f.iii are only meant to be assessed after the occurrence is over, to facilitate subsequent analysis, the adequacy of the equipment and the programmes it contains. The intention is not for the flight crew to attempt to classify an alert into any of these three categories when visual and/or aural cautions or warnings are annunciated.

AMC OPS.GEN.485.A Crash axes and crowbars - Aeroplanes

POSITION OF CRASH AXES AND CROWBARS FOR AEROPLANES USED IN COMMERCIAL AIR TRANSPORT OPERATIONS

For aeroplanes used in commercial air transport operations, crash axes and crowbars located in the passenger compartment should be stored in a position not visible to passengers.

AMC1 OPS.GEN.490.A Flight data recorder - Aeroplanes

LIST OF PARAMETERS TO BE RECORDED FOR AEROPLANES FIRST ISSUED WITH AN INDIVIDUAL CERTIFICATE OF AIRWORTHINESS ON OR AFTER 1 JANUARY 2010

1. The Flight Data Recorder (FDR) should, with reference to a timescale, record:

a. the parameters listed in Table 1 of AMC1 OPS.GEN.490.A;

b. the additional parameters listed in Table 2 of AMC1 OPS.GEN.490.A, when the information 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; and

c. any dedicated parameters related to novel or unique design or operational characteristics of the aeroplane, as determined by the competent authority responsible for the type certification or supplemental type certification.

2. 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 the European Organisation for Civil Aviation Equipment (EUROCAE) ED-112.

Table 1 of AMC1 OPS.GEN.490.A

No.*	Parameter
1a	Time; or
1b	Relative time count
1c	Global Navigation Satellite System (GNSS) time synchronisation
2	Pressure altitude
3a	Indicated air speed; or
3b	Calibrated air speed
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 Cockpit Voice Recorder (CVR)/FDR synchronisation reference.
9	Engine thrust/power
9a	Parameters required to determine propulsive thrust/power on each engine
9b	Cockpit thrust/power lever position for aeroplanes with non-mechanically linked cockpit - engine control
14	Total or Outside Air Temperature (OAT)
16	Longitudinal acceleration (body axis)
17	Lateral acceleration
18	Primary flight control surface and primary flight control pilot input (for multiple or split surfaces, a suitable combination of inputs is acceptable in lieu of recording each surface separately. For aeroplanes which have a flight control break-away capability that allows either pilot to operate the controls independently, record both inputs):
18a	pitch axis
18b	roll axis
18c	yaw axis
19	Pitch trim surface position
23	Marker beacon passage
24	Warnings - in addition to the master warning each “red” warning (including smoke warnings from other compartments) should be recorded when the warning condition cannot be determined from other parameters or from the CVR
25	Each navigation receiver frequency selection
27	Air - ground status and, if the sensor is installed, each landing gear
38	Selected barometric setting - to be recorded for the aeroplane in which the parameter is displayed electronically

44	Selected flight path (all pilot selectable modes of operation) - to be recorded for the aeroplane in which the parameter is displayed electronically
45	Selected decision height - to be recorded for the aeroplane in which the parameter is displayed electronically
75	All cockpit 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 cockpit input forces

* The number in the left hand column reflects the serial number depicted in EUROCAE ED-112.

Table 2 of AMC1 OPS.GEN.490.A

AEROPLANES FOR WHICH THE INFORMATION DATA SOURCE FOR THE PARAMETER IS EITHER USED BY AEROPLANE SYSTEMS OR IS AVAILABLE ON THE INSTRUMENT PANEL FOR USE BY THE FLIGHT CREW TO OPERATE THE AEROPLANE.

No.*	Parameter
10	Flaps: Trailing edge flap position and cockpit control selection
11	Slats: Leading edge flap (slat) position and cockpit 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 3 operations, each radio altimeter should be recorded. It is acceptable to arrange them so that at least one is recorded every second.
21	Vertical deviation - the approach aid in use should be recorded. For autoland/Category 3 operations, each system should be recorded. It is acceptable to arrange them so that at least one is recorded every second).
21a	ILS glide path
21b	MLS elevation
21c	GNSS approach path/IRNAV vertical deviation
22	Horizontal deviation - the approach aid in use should be recorded. For auto land/Category 3 operations, each system should be recorded. It is acceptable to arrange them so that at least one is recorded every second).
22a	ILS localiser
22b	MLS azimuth
22c	GNSS approach path/IRNAV lateral deviation

26	DME 1 and 2 distances
28	GPWS/TAWS/GCAS status:
28a	Selection of terrain display mode, including pop-up display status
28b	Terrain alerts, including cautions and warnings and advisories
28c	On/off switch position
29	Angle of attack
30	Low pressure warning (each system):
30a	Hydraulic pressure
30b	Pneumatic pressure
31	Ground speed
32	Landing gear:
32a	Landing gear
32b	Gear selector position
33	Navigation data:
33a	Drift angle
33b	Wind speed
33c	Wind direction
33d	Latitude
33e	Longitude
33f	GNSS augmentation in use
34	Brakes:
34a	Left and right brake pressure
34b	Left and right brake pedal position
35	Additional engine parameters (if not already recorded in parameter 9 of Table 1 of AMC1 OPS.GEN.490.A and if the aeroplane is equipped with a suitable data source):
35a	Engine Pressure Ratio (EPR)
35b	N_1
35c	Indicated vibration level
35d	N_2
35e	Exhaust Gas Temperature (EGT)
35f	Fuel flow
35g	Fuel cut-off lever position
35h	N_3
36	Traffic Alert and Collision Avoidance System (TCAS)/ACAS - a suitable combination of discrete should be recorded to determine the status of system:
36a	Combined control
36b	Vertical control
36c	Up advisory

36d	Down advisory
36e	Sensitivity level
37	Wind-shear warning
38a	Pilot
38b	First officer
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
44a	Course/DSTRK
44b	Path angle
44c	Co-ordinates of final approach path (IRNAV/IAN)
46	Electronic Flight Instrument System (EFIS) display format:
46a	Pilot
46b	First Officer
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	APU bleed valve position
52	Computer failure - critical flight and engine control system
53	Engine thrust command
54	Engine thrust target
55	Computed centre of gravity
56	Fuel quantity or fuel quantity in CG trim tank
57	Head up display in use
58	Para visual display on
59	Operational stall protection, stick shaker and pusher activation
60	Primary navigation system reference:
60a	GNSS
60b	Inertial Navigational System (INS)
60c	VOR/DME
60d	MLS

60e 60f	Loran C ILS
61	Ice detection
62	Engine warning - each engine vibration
63	Engine warning - each engine over temperature
64	Engine warning - each engine oil pressure low
65	Engine warning - each engine over speed
66	Yaw trim surface position
67	Roll trim surface position
68	Yaw or sideslip angle
69	De-icing and/or anti-icing systems selection
70	Hydraulic pressure - each system
71	Loss of cabin pressure *
72	Cockpit trim control input position pitch - when mechanical means for control inputs are not available, cockpit display trim positions or trim command should be recorded
73	Cockpit trim control input position roll - when mechanical means for control inputs are not available, cockpit display trim positions or trim command should be recorded
74	Cockpit trim control input position yaw - when mechanical means for control inputs are not available, cockpit display trim positions or trim command should be recorded
76	Event marker
77	Date
78	ANP or EPE or EPU

* The number in the left hand column reflects the serial number depicted in EUROCAE ED-112.

AMC2 OPS.GEN.490.A Flight data recorder - Aeroplanes

LIST OF PARAMETERS TO BE RECORDED FOR AEROPLANES FIRST ISSUED WITH AN INDIVIDUAL CERTIFICATE OF AIRWORTHINESS ON OR AFTER 1 APRIL 1998

1. The FDR should, with reference to a timescale, record:

   a. the parameters listed in Table 1 of AMC2 OPS.GEN.490.A, for those aeroplanes with a maximum certificated take-off mass of more than 5 700 kg and first issued with an individual certificate of airworthiness after 1 January 2005;

   b. the parameters listed in Table 2 of AMC2 OPS.GEN.490.A, for those aeroplanes with a maximum certificated take-off mass of more than 27 000 kg;

   c. any dedicated parameters relating to novel or unique design or operational characteristics of the aeroplane, as determined by the competent authority responsible for the type certification or supplemental type certification; and

   d. the additional parameters listed in Table 3 of AMC2 OPS.GEN.490.A, for those aeroplanes equipped with an electronic display system.

2. When determined by the competent authority responsible for type certification or supplemental type certification, the flight data recorder of aeroplanes first issued with an individual certificate of airworthiness before 20 August 2002 and equipped with an

electronic display system does not need to record those parameters listed in Table 3 of AMC2 OPS.GEN.490.A for which:

a. the sensor is not available;

b. the aeroplane system or equipment generating the data needs to be modified; or

c. the signals are incompatible with the recording system.

4. The operational performance requirements for FDRs should be those laid down in EUROCAE ED-55 Minimum Operational Performance Specification for Flight Data Recorder Systems.

5. The parameters to be recorded should meet, as far as is practicable, the performance specifications (designated ranges, sampling intervals, accuracy limits and minimum resolution in read-out) defined in the relevant tables of EUROCAE ED-55. The remarks columns of those tables are considered to be acceptable means of compliance with the parameter specifications.

6. For aeroplanes with novel or unique design or operational characteristics, the additional parameters should be those required by authority responsible for type certification or supplemental type certification.

7. If recording capacity is available, as many of the additional parameters specified in table A1.5 of EUROCAE ED-55 as is possible, should be recorded.

Table 1 of AMC2 OPS.GEN.490.A

AEROPLANES WITH A MAXIMUM CERTIFICATED TAKE-OFF MASS EXCEEDING 5 700 KG AND FIRST ISSUED WITH AN INDIVIDUAL CERTIFICATE OF AIRWORTHINESS AFTER 1 JANUARY 2005

No.*	Parameter
1	Time or relative time count
2	Pressure altitude
3	Indicated air speed
4	Heading
5	Normal acceleration
6	Pitch attitude
7	Roll attitude
8	Manual radio transmission keying
9	Propulsive thrust/power on each engine and cockpit thrust/power lever position if applicable
10	Trailing edge flap or cockpit control selection
11	Leading edge flap or cockpit control selection
12	Thrust reverse status
13	Ground spoiler position and/or speed brake selection
14	Total or outside air temperature
15	Autopilot, autothrottle and AFCS mode and engagement status
16	Longitudinal acceleration (body axis)
17	Lateral acceleration

* The number in the left hand column reflects the serial numbers depicted in EUROCAE ED-55.

Table 2 of AMC2 OPS.GEN.490.A

PARAMETERS FOR AEROPLANES WITH A MAXIMUM CERTIFICATED TAKE-OFF MASS EXCEEDING 27 000 KG

No.*	Parameter
1	Time or relative time count
2	Pressure altitude
3	Indicated air speed
4	Heading
5	Normal acceleration
6	Pitch attitude
7	Roll attitude
8	Manual radio transmission keying
9	Propulsive thrust/power on each engine and cockpit thrust/power lever position if applicable
10	Trailing edge flap or cockpit control selection
11	Leading edge flap or cockpit control selection
12	Thrust reverse status
13	Ground spoiler position and/or speed brake selection
14	Total or outside air temperature
15	Autopilot, autothrottle and AFCS mode and engagement status
16	Longitudinal acceleration (body axis)
17	Lateral acceleration
18	Primary flight controls - control surface position and/or pilot input (pitch, roll, yaw)
19	Pitch trim position
20	Radio altitude
21	Vertical beam deviation (ILS glide path or MLS elevation)
22	Horizontal beam deviation (ILS localiser or MLS azimuth)
23	Marker beacon passage
24	Warnings
25	Reserved (navigation receiver frequency selection is recommended)
26	Reserved (DME distance is recommended)
27	Landing gear squat switch status or air/ground status
28	GPWS
29	Angle of attack
30	Low pressure warning (hydraulic and pneumatic power)
31	Ground speed

32	Landing gear or gear selector position

* The number in the left hand column reflects the serial numbers depicted in EUROCAE ED-55.

Table 3 of AMC2 OPS.GEN.490.A

ADDITIONAL PARAMETERS FOR AEROPLANES EQUIPPED WITH ELECTRONIC DISPLAY SYSTEMS

No.	No.*	Parameter
33	6	Selected barometric setting (each pilot's station)
34	7	Selected altitude
35	8	Selected speed
36	9	Selected mach
37	10	Selected vertical speed
38	11	Selected heading
39	12	Selected flight path
40	13	Selected decision height
41	14	EFIS display format
42	15	Multi-function/engine/alerts display format

* The number in the centre column reflects the serial numbers depicted in table A1.5 of EUROCAE ED-55.

AMC3 OPS.GEN.490.A Flight data recorder - Aeroplanes

LIST OF PARAMETERS TO BE RECORDED FOR AEROPLANES FIRST ISSUED WITH AN INDIVIDUAL CERTIFICATE OF AIRWORTHINESS ON OR AFTER 1 JUNE 1990 UP TO AND INCLUDING 31 MARCH 1998

1. The flight data recorder should, with reference to a timescale, record the parameters listed in Table 1 of AMC3 OPS.GEN.490.A.

2. When determined by the competent authority responsible for type certification or supplemental type certification, the flight data recorder of aeroplanes having a maximum certificated take-off mass of 27 000 kg does not need to record parameters 14 and 15b of Table 1 of AMC3 OPS.GEN.490.A when any of the following conditions are met:

   a. The sensor is not readily available;

   b. Sufficient capacity is not available in the FDR system;

   c. A change is required in the equipment that generates the data.

3. When determined by the competent authority responsible for type certification or supplemental type certification and agreed by the Agency, the flight data recorder does not need to record parameters 15b 23, 24, 25, 26, 27, 28, 29, 30 and 31 of Table 1 of AMC3 OPS.GEN.490.A, when any of the following conditions are met:

   a. The sensor is not readily available;

   b. Sufficient capacity is not available in the FDR system;

   c. A change is required in the equipment that generates the data;

   d. For navigational data (NAV frequency selection, DME distance, latitude, longitude, ground speed and drift), the signals are not available in digital form;

e. When the above conditions have been met and compliance with this AMC would imply significant modifications to the aeroplane with a severe re-certification effort.

4. When determined by the competent authority responsible for type certification or supplemental type certification and agreed by the Agency, the flight data recorder does not need to record individual parameters that can be derived by calculation from the other recorded parameters.

Table 1 of AMC3 OPS.GEN.490.A

AEROPLANES WITH A MAXIMUM CERTIFICATED TAKE-OFF MASS EXCEEDING 27 000 KG

No.	Parameter
1	Time or relative time count
2	Pressure altitude
3	Indicated air speed
4	Heading
5	Normal acceleration
6	Pitch attitude
7	Roll attitude
8	Manual radio transmission keying unless an alternate means to synchronise FDR and CVR recordings is provided
9	Power on each engine
10	Trailing edge flap or cockpit control selection
11	Leading edge flap or cockpit control selection
12	Thrust reverse position (for turbo-jet aeroplanes only)
13	Ground spoiler position and/or speed brake selection
14	Outside air temperature or total air temperature
15a	Autopilot engagement status
15b	Autopilot operating modes, autothrottle and AFCS systems engagement status and operating modes.
16	Longitudinal acceleration
17	Lateral acceleration
18	Primary flight controls - control surface position and/or pilot input (pitch, roll and yaw)
19	Pitch trim position
20	Radio altitude
21	Glide path deviation
22	Localiser deviation
23	Marker beacon passage
24	Master warning
25	NAV 1 and NAV 2 frequency selection
26	DME 1 and DME 2 distance
27	Landing gear squat switch status

28	Ground proximity warning system
29	Angle of attack
30	Hydraulics, each system (low pressure)
31	Navigation data
32	Landing gear or gear selector position

AMC4 OPS.GEN.490.A Flight data recorder - Aeroplanes

LIST OF PARAMETERS TO BE RECORDED FOR AEROPLANES FIRST ISSUED WITH AN INDIVIDUAL CERTIFICATE OF AIRWORTHINESS BEFORE 1 JUNE 1990

1. The flight data recorder should, with reference to a timescale, record the parameters listed in Table 1 of AMC4 OPS.GEN.490.A.

2. When determined by the competent authority responsible for type certification or supplemental type certification and agreed by the Agency, the FDR of aeroplanes with a maximum certificated take-off mass exceeding 27 000 kg that are of a type which was first type certificated after 30 September 1969 does not need to record the parameters 13, 14 and 15b in Table 1 of AMC4 OPS.GEN.490.A, when any of the following conditions are met:

   a. Sufficient capacity is available on a FDR system;

   b. The sensor is readily available;

   c. A change is not required in the equipment that generates the data.

3. When so determined by the competent authority responsible for type certification or supplemental type certification and agreed by the Agency, the FDR does not need to record individual parameters that can be derived by calculation from the other recorded parameters.

Table 1 of AMC4 OPS.GEN.490.A

AEROPLANES WITH A MAXIMUM CERTIFICATED TAKE-OFF MASS EXCEEDING 27 000 KG

No.	Parameter
1	Time or relative time count
2	Pressure altitude
3	Indicated air speed
4	Heading
5	Normal acceleration
6	Pitch attitude
7	Roll attitude
8	Manual radio transmission keying unless an alternate means to synchronise the FDR and CVR recordings is provided
9	Power on each engine
10	Trailing edge flap or cockpit control selection
11	Leading edge flap or cockpit control selection
12	Thrust reverse position (for turbo-jet aeroplanes only)
13	Ground spoiler position and/or speed brake selection

14	Outside air temperature or total air temperature
15a	Autopilot engagement status
15b	Autopilot operating modes, autothrottle and AFCS, systems engagement status and operating modes.
16	Longitudinal acceleration
17	Lateral acceleration
18	Primary flight controls - control surface position and/or pilot input (pitch, roll and yaw)
19	Pitch trim position
20	Radio altitude
21	Glide path deviation
22	Localiser deviation
23	Marker beacon passage
24	Master warning
25	NAV 1 and NAV 2 frequency selection
26	DME 1 and DME 2 distance
27	Landing gear squat switch status
28	Ground proximity warning system
29	Angle of attack
30	Hydraulics, each system (low pressure)
31	Navigation data (latitude, longitude, ground speed and drift angle)
32	Landing gear or gear selector position

Appendix 1 to AMC3 and AMC4 OPS.GEN.490.A Flight data recorder - Aeroplanes

PERFORMANCES SPECIFICATIONS FOR THE PARAMETERS TO BE RECORDED FOR AEROPLANES FIRST ISSUED WITH AN INDIVIDUAL CERTIFICATE OF AIRWORTHINESS BEFORE 1 APRIL 1998

1. The parameters to be recorded should meet the performance specifications (designated ranges, recording intervals and accuracy limits) defined in Table 1 of Appendix 1 to AMC3 and AMC4 OPS.GEN.490.A.

2. FDR systems for which the recorded parameters do not comply with the performance specifications of Table 1 of Appendix 1 to AMC3 and AMC4 OPS.GEN.490.A (i.e. range, sampling intervals, accuracy limits and recommended resolution readout) may be acceptable to the competent authority responsible for the type certification or supplemental type certification.

3. All aeroplanes should record the following additional parameters, when further recording capacity is available:

   a. Remaining parameters below, as applicable:

      i. Operational information from electronic display systems, such as EFIS, Electronic Centralised Aircraft Monitor (ECAM) and Engine Indications and Crew Alerting System (EICAS). The following order of priority should be used:

A. Parameters selected by the flight crew relating to the desired flight path, e.g. barometric pressure setting, selected altitude, selected air speed, decision height, autoflight system engagement and mode indications if not recorded from another source;

B. Display system selection/status, e.g. SECTOR, PLAN, ROSE, NAV, WXR, COMPOSITE, COPY;

C. Warnings and alerts;

D. The identity of displayed pages for emergency procedures and checklists.

ii. Retardation information including brake application for use in the investigation of landing over-runs and rejected take-offs;

iii. Additional engine parameters (EPR, N_1 EGT, fuel flow, etc.);

b. Any dedicated parameter relating to novel or unique design or operational characteristics of the aeroplane.

4. For the purpose of the alleviations specified in AMC3 OPS.GEN.490.A and AMC4 OPS.GEN.490.A, they should be acceptable only when adding recording of missing parameters to the existing FDR system would require a major upgrade of the system itself. Account should be taken of the following:

a. The extent of the modification required;

b. The down-time period;

c. Equipment software development.

5. The term "capacity available" refers to the space on both the flight data acquisition unit and the flight data recorder not allocated for recording the required parameters, or the parameters recorded for the purpose of accident investigation, as acceptable to the competent authority.

6. A sensor is considered "readily available" when it is already available or can be easily incorporated.

Table 1 of Appendix 1 to AMC3 and AMC4 OPS.GEN.490.A

PARAMETERS PERFORMANCE SPECIFICATIONS

No.	Parameter	Range	Sampling interval in seconds	Accuracy limits (sensor input compared to FDR readout)	Recommended resolution in readout	Remarks
1	Time or relative time count	24 hours	4	±0•125% per hour	1 second	Co-ordinated Universal Time (UTC) preferred where available, otherwise elapsed time
2	Pressure altitude	-1 000 ft to maximum certificated altitude of aircraft +5 000 ft	1	±100 ft to ±700 ft	5 ft	For altitude record error see EASA ETSO-C124a
3	Indicated air speed	50 kt to max V_{SO} Max VSO to 1•2 V_d	1	±5% ±3%	1 kt	VSO stalling speed or minimum steady flight speed in the landing configuration VdF design diving speed
4	Heading	360º	1	±2º	0•5º	
5	Normal acceleration	-3 g to +6 g	0•125 ±	0•125 ±1% of maximum range excluding a datum error of ±5%	0•004 g	
6	Pitch attitude	±75º	1	±2º	0•5º	
7	Roll attitude	±180º	1	±2º	0•5º	
8	Manual radio transmission keying	Discrete	1	-	-	On-off (one discrete). An FDR/CVR time synchronisation signal complying with 4.2.1 of EUROCAE ED-55 is considered to be an acceptable alternative means of compliance

9	Power on each engine	Full range	Each engine each second	±2%	0•2% of full range	Sufficient parameters e.g. EPR/N, or Torque/N_P as appropriate to the particular engine should be recorded to determine power
10	Trailing edge flap or cockpit control selection	Full range or each discrete position	2	±5% or as pilot's indicator	0•5% of full range	
11	Leading edge flap or cockpit control selection	Full range or each discrete position	2	-	0•5% of full range	
12	Thrust reverser position	Stowed, in transit and reverse	Each reverser each second	±2% unless higher accuracy uniquely required	-	
13	Ground spoiler and/or speed brake selection	Full range or each discrete position	1	±2º	0•2% of full range	
14	Outside air temperatures or total air temperature	Sensor range	2	-	0•3º	
15a	Autopilot engagement status					
15b	Autopilot operating modes, auto-throttle and AFCS systems engagement	A suitable combination of discretes	1		-	

	status and operating modes					
16	Longitudinal acceleration	± 1 g	0•25	±1•5% of maximum range excluding a datum error of ±5%	0•004 g	
17	Lateral acceleration	±1 g	0•25	±1•5% of maximum range excluding a datum error of ±5%	0•004 g	
18	Primary flight controls, control surface positions and/or pilot input (pitch, roll, yaw)	Full range	1	±2º unless higher accuracy uniquely required	0•2% of full range	For aeroplanes with conventional control systems 'or' applies For aeroplanes with non-mechanical control systems 'and' applies For aeroplanes with split surfaces a suitable combination of inputs is acceptable in lieu of recording each surface separately
19	Pitch trim position	Full range	1	±3% unless higher accuracy uniquely required	0•3% of full range	
20	Radio altitude	-20 ft to +2 500 ft	1	±2 ft or ±3% whichever is greater below 500 ft and ±5% above 500 ft	1 ft below 500 ft, 1 ft +5% of full range above 500 ft	As installed. Accuracy limits are recommended
21	Glide path deviation	Signal range	1	±3%	0•3% of full range	As installed. Accuracy limits are recommended
22	Localiser deviation	Signal range	1	±3%	0•3% of full range	As installed. Accuracy limits are recommended
23	Marker beacon	Discrete	1	–	–	A single discrete is

	passage					acceptable for all markers
24	Master warning	Discrete	1	–	–	
25	NAV 1 and 2 frequency selection	Full range	4	As installed	–	
26	DME 1 and 2 distance	0-200 nm	4	As installed	–	Recording of latitude and longitude from INS or other navigation system is a preferred alternative
27	Landing gear squat switch status	Discrete	1	–	–	
28	Ground proximity warning system (GPWS)	Discrete	1	–	–	
29	Angle of attack	Full range	0•5	As installed	0•3% of full range	
30	Hydraulics	Discrete(s)	2	–	–	
31	Navigation data	As installed	1	As installed	–	
32	Landing gear or gear selector position	Discrete	4	As installed	–	

AMC1 OPS.GEN.490.H Flight data recorder - Helicopters

LIST OF PARAMETERS TO BE RECORDED FOR HELICOPTERS FIRST ISSUED WITH AN INDIVIDUAL CERTIFICATE OF AIRWORTHINESS ON OR AFTER 1 JANUARY 2010

1. The FDR should, with reference to a timescale, record:

   a. the parameters listed in Table 1 of AMC1 OPS.GEN.490.H;

   b. the additional parameters listed in Table 2 of AMC1 OPS.GEN.490.H, when the information data source for the parameter is used by helicopter systems or is available on the instrument panel for use by the flight crew to operate the helicopter; and

   c. any dedicated parameters related to novel or unique design or operational characteristics of the helicopter as determined by the competent authority responsible for type certification or supplemental type certification.

2. The FDR should meet the operational performance requirements and specifications of EUROCAE ED-112 and Attachment B of ICAO Annex 6, Part III .

3. FDR systems for which the recorded parameters do not meet the performance specifications of EUROCAE ED-112 (i.e. range, sampling intervals, accuracy limits and recommended resolution readout) could be acceptable to the competent authority responsible for type certification or supplemental type certification.

Table 1 of AMC1 OPS.GEN.490.H

No.*	Parameter
1	Time or relative time count
2	Pressure altitude
3	Indicated air speed
4	Heading
5	Normal acceleration
6	Pitch attitude
7	Roll attitude
8	Manual radio transmission keying CVR/FDR synchronisation reference
9	Power on each engine
9a	Free power turbine speed (N_F)
9b	Engine torque
9c	Engine gas generator speed (N_G)
9d	Cockpit power control position
9e	Other parameters to enable engine power to be determined
10a	Main rotor speed
10b	Rotor brake (if installed)
11	Primary flight controls – Pilot input and/or control output position (if applicable)
11a	Collective pitch
11b	Longitudinal cyclic pitch
11c	Lateral cyclic pitch

11d	Tail rotor pedal
11e	Controllable stabilator (if applicable)
11f	Hydraulic selection
12	Hydraulics low pressure (each system should be recorded.)
13	Outside air temperature
18	Yaw rate or yaw acceleration
20	Longitudinal acceleration (body axis)
21	Lateral acceleration
25	Marker beacon passage
26	Warnings - a discrete should be recorded for the master warning, gearbox low oil pressure and sas failure. other 'red' warnings should be recorded where the warning condition cannot be determined from other parameters or from the cockpit voice recorder.
27	Each navigation receiver frequency selection
37	Engine control modes

* The number in the left hand column reflects the serial numbers depicted in EUROCAE ED-112

Table 2 of AMC1 OPS.GEN.490.H

HELICOPTERS FOR WHICH THE INFORMATION DATA SOURCE FOR THE PARAMETER IS EITHER USED BY HELICOPTER SYSTEMS OR IS AVAILABLE ON THE INSTRUMENT PANEL FOR USE BY THE FLIGHT CREW TO OPERATE THE HELICOPTER

No.*	Parameter
14	AFCS mode and engagement status
15	Stability augmentation system engagement (each system should be recorded)
16	Main gear box oil pressure
17	Gear box oil temperature
17a	Main gear box oil temperature
17b	Intermediate gear box oil temperature
17c	Tail rotor gear box oil temperature
19	Indicated sling load force (if signals readily available)
22	Radio altitude
23	Vertical deviation - the approach aid in use should be recorded.
23a	ILS glide path
23b	MLS elevation
23c	GNSS approach path
24	Horizontal deviation - the approach aid in use should be recorded.
24a	ILS localiser
24b	MLS azimuth
24c	GNSS approach path

28	DME 1 & 2 distances
29	Navigation data
29a	Drift angle
29b	Wind speed
29c	Wind direction
29d	Latitude
29e	Longitude
29f	Ground speed
30	Landing gear or gear selector position
31	Engine exhaust gas temperature (T_4)
32	Turbine Inlet Temperature (TIT/ITT)
33	Fuel contents
34	Altitude rate (vertical speed) - only necessary when available from cockpit instruments
35	Ice detection
36	Helicopter Health and Usage Monitor System (HUMS) - only when information from the HUMS is used by the crew or aircraft system
36a	Engine data
36b	Chip detector
36c	Track timing
36d	Exceedance discretes
36e	Broadband average engine vibration
38	Selected barometric setting - to be recorded for helicopters where the parameter is displayed electronically
38a	Pilot
38b	First officer
39	Selected altitude (all pilot selectable modes of operation) - to be recorded for the helicopters where the parameter is displayed electronically
40	Selected speed (all pilot selectable modes of operation) - to be recorded for the helicopters where the parameter is displayed electronically
41	Not used (selected mach)
42	Selected vertical speed (all pilot selectable modes of operation) - to be recorded for the helicopters where the parameter is displayed electronically
43	Selected heading (all pilot selectable modes of operation) - to be recorded for the helicopters where the parameter is displayed electronically
44	Selected flight path (all pilot selectable modes of operation) - to be recorded for the helicopters where the parameter is displayed electronically
45	Selected decision height (all pilot selectable modes of operation) - to be recorded for the helicopters where the parameter is displayed electronically
46	EFIS display format
47	Multi-function/engine/alerts display format

48	event marker

* The number in the left hand column reflects the serial numbers depicted in EUROCAE ED-112

AMC2 OPS.GEN.490.H Flight data recorder - Helicopters

LIST OF PARAMETERS TO BE RECORDED FOR HELICOPTERS HAVING A MCTOM EXCEEDING 3 175 KG AND FIRST ISSUED WITH AN INDIVIDUAL CERTIFICATE OF AIRWORTHINESS AFTER 1 JANUARY 2005 AND HELICOPTERS HAVING A MCTOM EXCEEDING 7 000 KG AND FIRST ISSUED WITH AN INDIVIDUAL CERTIFICATE OF AIRWORTHINESS AFTER 31 DECEMBER 1988

1. The FDR should, with reference to a timescale, record:
   a. for helicopters with a maximum certificated take-off mass between 3 175 kg and 7 000 kg, the parameters listed in Table 1 of AMC2 OPS.GEN.490.H;
   b. for helicopters with a maximum certificated take-off mass of more than 7 000 kg, the parameters listed in Table 2 of AMC2 OPS.GEN.490.H;
   c. any dedicated parameters relating to novel or unique design or operational characteristics of the helicopter; and
   d. the parameters listed in Table 3 of AMC2 OPS.GEN.490.H, for helicopters equipped with electronic display system.
2. When determined by the competent authority responsible for type certification or supplemental type certification and agreed by the Agency, the FDR of helicopters with a maximum certificated take-off mass of more than 7 000 kg does not need to record parameter 19 of Table 2 of AMC2 OPS.GEN.490.H, if any of the following conditions are met:
   a. The sensor is not available;
   b. A change is required in the equipment that generates the data.
3. Individual parameters that can be derived by calculation from the other recorded parameters, need not be recorded, if determined by the competent authority responsible for type certification or supplemental type certification and agreed by the Agency.
4. The parameters to be recorded should meet, as far as is practicable, the performance specifications (designated ranges, sampling intervals, accuracy limits and minimum resolution in read-out) defined in the relevant tables of EUROCAE ED-55. The remarks columns of those tables are considered to be acceptable means of compliance with the parameter specifications.
5. Table 1 of AMC2 OPS.GEN.490.H refers to table A1-4 of EUROCAE ED-55, Table 2 of AMC2 OPS.GEN.490.H refers to table A1-2 of EUROCAE ED-55 and Table 3 of AMC2 OPS.GEN.490.H refers to parameters 6 to 15 of table A1.5 of EUROCAE ED-55.
6. If recording capacity is available, as many of the additional parameters specified in table A1.5 of EUROCAE ED-55 as is possible, should be recorded.
7. For the purpose of this AMC, a sensor is considered to be ‘readily available’ when it is already available or can be easily incorporated.
8. The term ‘where practicable’ used in the remarks column of table A1.5 of EUROCAE ED-55 means that account should be taken of the following:
   a. Whether the sensor is already available or can be easily incorporated;
   b. Whether sufficient capacity is available in the flight recorder system;

c. For navigational data (nav frequency selection, DME distance, latitude, longitude, groundspeed and drift), whether the signals are available in digital form;

d. The extent of modification required;

e. The down-time period required;

f. Equipment software development.

Table 1 of AMC2 OPS.GEN.490.H

HELICOPTERS WITH A MAXIMUM CERTIFICATED TAKE-OFF MASS EXCEEDING 3 175 KG

No.	Parameter
1	Time or relative time count
2	Pressure altitude
3	Indicated air speed
4	Heading
5	Normal acceleration
6	Pitch attitude
7	Roll attitude
8	Manual radio transmission keying
9	Power on each engine (free power turbine speed and engine torque)/cockpit power control position (if applicable)
10a	Main rotor speed
10b	Rotor brake (if installed)
11	Primary flight controls - pilot input and control output position (if applicable)
11a	Collective pitch
11b	Longitudinal cyclic pitch
11c	Lateral cyclic pitch
11d	Tail rotor pedal
11e	Controllable stabilator
11f	Hydraulic selection
12	Warnings
13	Outside air temperature
14	Autopilot engagement status
15	Stability augmentation system engagement

Table 2 of AMC2 OPS.GEN.490.H

HELICOPTERS WITH A MAXIMUM CERTIFICATED TAKE-OFF MASS EXCEEDING 7 000 KG

No.	Parameter
1	Time or relative time count
2	Pressure altitude
3	Indicated airspeed
4	Heading

5	Normal acceleration
6	Pitch attitude
7	Roll attitude
8	Manual radio transmission keying
9	Power on each engine (free power turbine speed and engine torque)/cockpit power control position (if applicable)
10a	Main rotor speed
10b	Rotor brake (if installed)
11	Primary flight controls - pilot input and control output position (if applicable)
11a	Collective pitch
11b	Longitudinal cyclic pitch
11c	Lateral cyclic pitch
11d	Tail rotor pedal
11e	Controllable stabilator
11f	Hydraulic selection
12	Hydraulics low pressure
13	Outside air temperature
14	AFCS mode and engagement status
15	Stability augmentation system engagement
16	Main gear box oil pressure
17	Main gear box oil temperature
18	Yaw rate or yaw acceleration
19	Indicated sling load force (if installed)
20	Longitudinal acceleration (body axis)
21	Lateral acceleration
22	Radio altitude
23	Vertical beam deviation (ILS glide path or MLS elevation)
24	Horizontal beam deviation (ILS localiser or MLS azimuth)
25	Marker beacon passage
26	Warnings
27	Reserved (Nav receiver frequency selection is recommended)
28	Reserved (DME distance is recommended)
29	Reserved (navigation data is recommended)
30	Landing gear or gear selector position

Table 3 of AMC2 OPS.GEN.490.H

HELICOPTERS EQUIPPED WITH ELECTRONIC DISPLAY SYSTEMS

No.	Parameter
6	Selected barometric setting (each pilot station)
7	Selected altitude
8	Selected speed
9	Selected mach
10	Selected vertical speed
11	Selected heading
12	Selected flight path
13	Selected decision height
14	EFIS display format
15	Multi function/engine/alerts display format

AMC OPS.GEN.495.A Cockpit voice recorder - Aeroplanes

GENERAL

1. The CVR should, with reference to a timescale, record:
   a. flight crew members' two-way voice communications by radio, interphone system and public address system, if installed;
   b. the aural environment of the cockpit, including, where practicable, without interruption, the microphone audio signals; and
   c. voice or audio signals identifying navigation or approach aids introduced into a headset or speaker.
2. The operational performance requirements for CVRs should be those laid down in EUROCAE Documents ED56 or ED56A (Minimum Operational Performance Requirements For Cockpit Voice Recorder Systems) dated February 1988 and December 1993 respectively.

AMC OPS.GEN.495.H Cockpit voice recorder - Helicopters

GENERAL

1. The CVR should, with reference to a timescale, record:
   a. flight crew members' two-way voice communications via radio, interphone system and public address system;
   b. the aural environment of the cockpit, including, where practicable, without interruption, the microphone audio signals;
   c. voice or audio signals identifying navigation or approach aids introduced into a headset or speaker; and
   d. for helicopters not equipped with a flight data recorder, the parameters necessary to determine main rotor speed.
2. The operational performance requirements of EUROCAE ED-56/56A should be considered to be acceptable means of compliance.

AMC OPS.GEN.495(c) Cockpit voice recorder

RECORDING

Depending on the availability of electrical power, the CVR should start to record as early as possible during the cockpit checks, prior to the flight until the cockpit checks immediately following engine shutdown at the end of the flight.

AMC OPS.GEN.490 and OPS.GEN.495 Flight data recorder and cockpit voice recorder

COMBINATION RECORDERS

1. A combination recorder is a flight recorder that records:
   a. all voice communications and the aural environment required by the applicable CVR AMC; and
   b. all parameters and specifications required by the applicable FDR AMC.
2. When two combination recorders are installed, one should be located near the cockpit, 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.
3. For aeroplanes, compliance with CVR and FDR requirements may be achieved by:
   a. one combination recorder, if the aeroplane should be equipped with either a CVR or an FDR;
   b. one combination recorder, if an aeroplane with a maximum certificated take-off mass of 5 700 kg or less should be equipped with both a CVR and an FDR; or
   c. two combination recorders, if an aeroplane with a maximum certificated take-off mass of more than 5 700 kg should be equipped with both a CVR and an FDR.

AMC1 OPS.GEN.500 Data link recording - Aeroplanes and Helicopters

GENERAL

1. Depending on the date of type certification, the aircraft shall be capable of recording the messages as specified in AMC2 OPS.GEN.500.
2. As a means of compliance with OPS.GEN.500 (a)(2), the operator should enable correlation by providing information which allows an accident investigator to understand what data was provided to the aircraft and by which provider.
3. The timing information associated with the data link communications messages required to be recorded by OPS.GEN.500 (a)(3) should be capable of being determined from the airborne-based recordings. This timing information should include at least the following:
   a. The time each message was generated;
   b. The time any message was available to be displayed by the crew;
   c. The time each message was actually displayed or recalled from a queue;
   d. The time of each status change.
4. The message priority should be recorded when it is defined by the protocol of the data link communication message being recorded.
5. The expression ‘taking into account the system architecture’, in OPS.GEN.500 (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:

a. The extent of the modification required;

b. The down-time period;

c. Equipment software development.

6. The intention is that new designs of source systems should include this functionality and support the full recording of the required information.

7. The applications to be recorded should meet the performance specifications defined in the relevant tables of part IV CNS/ATM recorder systems of EUROCAE ED-112.

8. Depending on the availability of electrical power, the flight recorder should start to record as early as possible during the cockpit checks prior to engine start at the beginning of the flight until the cockpit checks immediately following engine shutdown at the end of the flight.

AMC2 OPS.GEN.500 Data link recording - Aeroplanes and Helicopters

LIST OF APPLICATIONS

1. For aeroplanes and helicopters first issued with a type certificate after 31 December 2009, data link communications messages that support the applications in Table 1 of AMC2 OPS.GEN.500 should be recorded.

Table 1 of AMC2 OPS.GEN.500

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 (2)	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, Controller Access Parameters (CAP) and System Access Parameters (SAP).	C
4	Flight information	This includes any application used for delivery of flight information data to specific aeroplanes. This includes Data Link-	C

		Automatic Terminal Information Service (D-ATIS), Data Link-Operational Terminal Information Service (D-OTIS), text weather services, Data Link-Flight Information System (D-FIS) and Notice to Airmen (NOTAM) delivery.	
		Terminal Weather Information for Pilots (TWIP)	M
5	Broadcast surveillance (2)	This includes elementary and enhanced surveillance systems, as well as Automatic Dependent Surveillance-Broadcast (ADS-B), Terminal Information Service-Broadcast (TIS-B) and Flight Information System-Broadcast (FIS-B).	M
6	AOC data	This includes any application transmitting or receiving data used for AOC purposes (in accordance with the ICAO definition of AOC). Such systems may also process AAC messages, but there is no requirement to record AAC messages	M*
7	Graphics (1)	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*

2. For aeroplanes and helicopters first issued with a type certificate before 1 January 2010, data link communications messages that support the applications in Table 2 of AMC2 OPS.GEN.500 should be recorded:

Table 2 of AMC2 OPS.GEN.500

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 FANS-1/A and ATN, these are AFN and 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 CPDLC application. It also includes applications used for the exchange of OCL and DCL, as well as data link delivery of taxi clearances.	C
3	Addressed surveillance (2)	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 ADS-C application.	C
		CAP	C*

		SAP	C*
4	Flight information	This includes any application used for delivery of flight information data to specific aeroplanes. This includes D-ATIS, D-OTIS, text weather services, D-FIS and NOTAM delivery.	C
		TWIP	M
5	Broadcast surveillance (2)	This includes elementary and enhanced surveillance systems, as well as ADS-B, TIS-B and FIS-B.	M*
6	AOC data	This includes any application transmitting or receiving data used for AOC purposes (in accordance with the ICAO definition of AOC). Such systems may also process AAC messages, but there is no requirement to record AAC messages.	M*
7	Graphics (1)	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*

GM OPS.GEN.500 Data link recording - Aeroplanes and Helicopters

GENERAL

1. The letters and expressions in Tables 1 and 2 of AMC2 OPS.GEN.500 have the following meaning:

   a. C: Complete contents recorded

   b. M: Information that enables correlation with any associated records stored separately from the aeroplane.

   c. *: Applications that are to be recorded only as far as is practicable, given the architecture of the system.

   d. 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.

   e. 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.

2. The definitions of the applications type in Tables 1 and 2 of AMC2 OPS.GEN.500 are described in Table 1 of GM OPS.GEN.500.

Table 1 of GM OPS.GEN.500

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	FLIPCY	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	EUROCAE ED-89A Data Link Application System Document (DLASD) for the "ATIS" Data Link Service
9	OCL	OCL messages	EUROCAE ED-106A Data Link Application System Document (DLASD) for "Oceanic Clearance" (OCL) Datalink Service
10	DCL	DCL messages	EUROCAE ED-85A 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-OR. 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-OR. Information that enables correlation with any associated records stored separately from the aeroplane. Definition in ED-112.
13	Surveillance	CAP, SAP	Use definition in ED-93.

AAC Aeronautical Administrative Communications

ADS-B Automatic Dependent Surveillance - Broadcast

ADS-C Automatic Dependent Surveillance - Contract

AFN Aircraft Flight Notification

AOC Aeronautical Operational Control

ATIS Automatic Terminal Information Service

ATSC Air Traffic Service Communication

CAP Controller Access Parameters

CPDLC Controller Pilot Data Link Communications

CM Configuration/Context Management

D-ATIS Data link ATIS

D-FIS Data link Flight Information Service

DCL Departure Clearance

FANS Future Air Navigation System

FLIPCY	Flight Plan Consistency
OCL	Oceanic Clearance
SAP	System Access Parameters
TWIP	Terminal Weather Information for Pilots

AMC OPS.GEN.505(d) Preservation of FDR and CVR recordings - Aeroplanes and Helicopters

OPERATIONAL CHECKS AND EVALUATIONS OF RECORDINGS OF REPRESENTATIVE FLIGHT

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

1. save the recordings for the period of operating time as required by OPS.GEN.490, OPS.GEN.495 and OPS.GEN.500, except that, for the purpose of testing ad maintaining recorders, up to one hour of the oldest recorded material at the time of testing may be erased;
2. keep a document which presents the information necessary to retrieve and convert the stored data into engineering units; and
3. at all times, preserve a record of at least one representative flight made within the last 12 months which includes a take-off, climb, cruise, descent, approach to landing and landing, together with a means of identifying the record with the flight to which it relates.

GM OPS.GEN.505(b) and (c) Preservation of FDR and CVR recordings - Aeroplanes and Helicopters

REMOVAL OF RECORDERS, INSPECTIONS AND MAINTENANCE

1. The need for removal of the FDR data from the aircraft will be determined by the investigating authority with due regard to the seriousness of an occurrence and the circumstances, including the impact on the operation.
2. Procedures for the inspections and maintenance practices of the FDR and CVR systems are given in Attachment A of ICAO Annex 6, Part II and in Annex I-B of EUROCAE ED-112.

GM OPS.GEN.505(d) Preservation of FDR and CVR recordings - Aeroplanes and Helicopters

OPERATIONAL CHECKS AND EVALUATIONS OF RECORDINGS OF REPRESENTATIVE FLIGHT

The representative flight may not be possible to be preserved if:

1. there are technical reasons as to why all the data cannot be preserved; and/or
2. the aircraft may have been dispatched with unserviceable recording equipment, as permitted by the operators' MEL.

AMC OPS.GEN.515(b) and OPS.GEN.520(a) Microphones - Aeroplanes and Helicopters and Flight Crew interphone system

HEADSETS

1. A headset consists of a communication device which includes two earphones to receive and a microphone to transmit audio signals to the aircraft's communication system. To comply with the minimum performance requirements, the earphones and microphone should match the communication system's characteristics and the cockpit environment. The headset should be adequately adjustable in order to fit the pilot's head. Headset boom microphones should be of the noise cancelling type.

2. 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 aircraft.

GM OPS.GEN.515(b) and OPS.GEN.520(a) Microphones - Aeroplanes and Helicopters and Flight Crew interphone system

HEADSETS

The term 'headset' includes any aviation helmet incorporating headphones and microphone worn by a flight crew member.

AMC OPS.GEN.520 Flight Crew interphone system

GENERAL

The flight crew interphone system should not be of a handheld type.

GM OPS.GEN.525(b) Communication equipment

AERONAUTICAL EMERGENCY FREQUENCY

The aeronautical emergency frequency is 121.5 MHz.

AMC OPS.GEN.530 Pressure-altitude-reporting transponder

GENERAL

1. The SSR transponder of aircraft being operated under European air traffic control should comply with any applicable Single European Sky legislation.
2. If the Single European Sky legislation is not applicable, the SSR transponder should operate in accordance with the relevant provisions of Volume IV of ICAO Annex 10.
3. The SSR transponder may have additional capabilities, if so required by the applicable airspace requirements.

AMC OPS.GEN.535(a) Navigation equipment

VISUAL REFERENCE TO LANDMARKS

Navigation for flight under visual flight rules may be accomplished by visual reference to landmarks.

GM OPS.GEN.535(a)(2) Navigation equipment

APPLICABLE AIRSPACE REQUIREMENTS

For aircraft being operated under European air traffic control, the applicable airspace requirements include the Single European Sky legislation. .

GM OPS.GEN.535(b) Navigation equipment

NUMBER OF NAVIGATION EQUIPMENTS

The requirement in OPS.GEN.535(b) may be met by means other than the duplication of equipment.

AMC OPS.GEN.525 and 535 Communication equipment and Navigation equipment

GENERAL

When compliance with OPS.GEN.525 and OPS.GEN.535 requires more than one communication or navigation equipment unit to be provided, each should be independent of the other(s), to the extent that a failure in any one will not result in failure of any other AMC OPS.GEN.540.A(b) Electronic Navigation Data Management - complex motor-powered aeroplanes

NAVIGATION DATA PRODUCTS NEEDED FOR OPERATIONS IN ACCORDANCE WITH OPS.SPA

1. When an operator of a complex motor-powered aeroplane uses a navigation database which supports an airborne navigation application as a primary means of navigation, the navigation database supplier should hold a Type 2 Letter of Acceptance (LoA), or equivalent.

2. If this airborne navigation application is needed for an operation requiring a specific approval in accordance with OPS.SPA, the operator's procedures should be based upon the Type 2 LoA acceptance process.

3. A Type 2 LoA is issued by the Agency in accordance with the Agency's Opinion Nr. 01/2005 on The Acceptance of Navigation Database Suppliers (hereinafter referred to as the Agency's Opinion Nr. 01/2005). The definitions of navigation database, navigation database supplier, data application integrator, Type 1 LoA and Type 2 LoA can be found in the Agency's Opinion Nr. 01/2005.

4. Equivalent to a Type 2 LoA is the FAA Type 2 LoA, issued in accordance with the Federal Aviation Administration (FAA) Advisory Circular AC 20-153 , and the Transport Canada Civil Aviation (TCCA) 'Acknowledgement Letter of an Aeronautical Data Process' which uses the same basis.

5. EUROCAE ED-76/Radio Technical Commission for Aeronautics (RTCA) DO-200A Standards for Processing Aeronautical Data contains guidance relating to the processes which the supplier may follow.

Section V - Manuals, Logs and Records

AMC OPS.GEN.600 Documents and information to be carried on all aircraft

1. In case of loss or theft of documents the operation may continue until the flight reaches the base or a place where a replacement document can be provided.
2. The documents and information may be available in a form other than on printed paper. Accessibility, usability and reliability should be assured.
3. For commercial air transport operations, if the competent authority has issued an English translation of the Noise Certificate, this should be carried as well.
4. The procedures and the visual signals for use by intercepting and intercepted aircraft are those contained in ICAO Annex 2. For non-commercial operators with complex motor-powered aircraft and commercial operators, this may be part of the operations manual.
5. Any other documents that may be pertinent to the flight or required by the States concerned with the flight may include:
   a. the ground-air signal codes for search and rescue purposes;
   b. cargo and/or passenger manifests; and
   c. forms to comply with reporting requirements.

AMC OPS.GEN.605 Documents and information to be carried on non-commercial flights with complex motor-powered aircraft and aircraft used in commercial operations

INFORMATION SEARCH AND RESCUE SERVICES AND OPERATIONS MANUAL

1. The information pertinent to the intended flight concerning search and rescue services and should be easily accessible in the cockpit.
2. Portions of the operations manual relevant to the duties of the crew should be easily accessible to the crew on board the aircraft.

AMC OPS.GEN.605(a)(7) Documents and information to be carried on non-commercial flights with complex motor-powered aircraft and aircraft used in commercial operations

EQUIVALENT DOCUMENT

For other than complex motor-powered aircraft, the Minimum Equipment List (MEL) may be in the form of an equivalent document as specified in accordance with Part-21.

AMC OPS.GEN.610 Journey log book

GENERAL

1. The aircraft journey log book should contain the following items:
   a. aircraft registration;
   b. date;
   c. crew member names and duty assignments;
   d. departure and arrival points and times;

e. purpose/nature of the flight;

f. incidents, observations (if any); and

g. signature of the pilot-in-command.

2. The journey log may be combined with the aircraft log book as required in M.A.305.

3. The information or parts thereof may be retained in a form other than on printed paper. In such cases, an acceptable level of accessibility, usability and reliability should be assured.

GM OPS.GEN.610 Journey log book

SERIES OF FLIGHTS

The term ‘series of flights’ is used to facilitate a single set of documentation.

Section VI – Security

GM OPS.GEN.700 Disruptive Passenger Behavior

GENERAL

1. Operators engaged in the transportation of passengers should take into account that their passengers could obstruct the safe operation of the aircraft. Passenger behaviour may be affected by a variety of factors, including:

   a. limitations on personal 'freedom', such as restrictions on smoking or on the use of mobile phones;

   b. physical effects, such as from consummation of alcohol, illness, or taking of medication, possibly increased from effects of higher altitude and less available oxygen;

   c. social or psychological effects, such as from fear of flying, claustrophobia, or reluctance to follow instructions.

2. The pilot-in-command should consider preventive measures when the possibility of disruptive passenger behaviour is anticipated. Such measures could include, but are not limited to:

   a. communication with the potentially disruptive passenger in an effort to reduce the likelihood of disruptive behaviour;

   b. reseating a potentially disruptive passenger to an area where there is less risk of passenger interference;

   c. deny boarding to the potentially disruptive passenger or cancel the flight.

Subpart B - Commercial Air Transport

Section I - General Requirements

AMC1 OPS.CAT.010 Definitions

DEFINITIONS USED IN AMC/GM

1. Accelerate-stop distance available (ASDA): The length of the take-off run available plus the length of stopway, if such stopway is declared available by the competent authority and is capable of bearing the mass of the aeroplane under the prevailing operating conditions.

2. Contingency fuel. The fuel required to compensate for unforeseen factors which could have an influence on the fuel consumption to the destination aerodrome such as deviations of an individual aeroplane from the expected fuel consumption data, deviations from forecast meteorological conditions and deviations from planned routings and/or cruising levels/altitudes.

3. Damp runway: A runway is considered damp when the surface is not dry, but when the moisture on it does not give it a shiny appearance.

6. Maximum Structural Landing Mass is the maximum permissible total aeroplane mass upon landing under normal circumstances.

7. Take-off decision point (TDP) means the point used in determining take-off performance from which, a power unit failure having been recognised at this point, either a rejected take-off may be made or a take-off safely continued.

8. Take-off distance available (TODAH) means the length of the final approach and take-off area plus the length of helicopter clearway (if provided) declared available and suitable for helicopters to complete the takeoff.

9. Rejected take-off distance required (RTODRH) means the horizontal distance required from the start of the take-off to the point where the helicopter comes to a full stop following a power unit failure and rejection of the take-off at the take-off decision point.

10. Landing decision point (LDP) means the point used in determining landing performance from which, a power unit failure having been recognised at this point, the landing may be safely continued or a baulked landing initiated.

11. Rejected take-off distance available (RTODAH) means the length of the final approach and take-off area declared available and suitable for helicopters operated in Performance Class 1 to complete a rejected take-off.

AMC OPS.CAT.040 Carriage of weapons and ammunition

STOWAGE OF WEAPONS AND AMMUNITION

1. If the aircraft does not have a separate compartment in which weapons can be stowed, procedures should take into account the nature of the flight, its origin and destination, and the possibility of unlawful interference. As far as possible, the weapons should be stowed so they are not immediately accessible to the passengers (e.g. in locked boxes, in checked/personal baggage which is stowed under other baggage or under fixed netting). The pilot-in-command should be notified accordingly.

2. The applicability of OPS.GEN.035 should be taken into account.

GM OPS.CAT.040 Carriage of weapons and ammunition

SPORTING WEAPONS AND AMMUNITION

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

2. A firearm is any gun, rifle or pistol which fires a projectile.

3. The following firearms are generally regarded as being sporting weapons:

   a. Those designed for shooting game, birds and other animals;

   b. Those used for target shooting, clay-pigeon shooting and competition shooting, providing the weapons are not those on standard issue to military forces;

   c. Air guns, dart guns, starting pistols, etc.

GM OPS.CAT.045 Carriage of weapons and ammunition

WEAPONS AND MUNITION OF WAR

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

2. It is the responsibility of the operator to check, with the States concerned, whether or not a particular weapon or munitions is regarded as a weapon of war or munitions of war.

AMC OPS.CAT.050 Information on emergency and survival equipment carried

GENERAL

The information on emergency and survival equipment carried should include, as applicable, the number, colour and type of life rafts and pyrotechnics, details of emergency medical supplies, water supplies and the type and frequencies of the emergency portable radio equipment. Filing an ATC flight plan and ticking the appropriate boxes is considered to satisfy the requirement.

Section II - Operational procedures

AMC1 OPS.CAT.110 Carriage of special categories of passengers

GENERAL

1. Special categories of passengers should not be allocated, nor occupy, seats where their presence could:
   a. impede the crew in their duties;
   b. obstruct access to emergency equipment; or
   c. impede the emergency evacuation of the aircraft.
2. When carrying special categories of passengers, the following should be taken into account:
   a. The number and category of those persons;
   b. The total number of passengers carried compared to the seating capacity of the aircraft configuration;
   c. The number and composition of the crew able to assist special categories of passengers in case of emergencies.

GM OPS.CAT.110 Carriage of special categories of passengers

GENERAL

The following persons are those who should be considered as special categories of passengers, requiring special conditions, assistance and/or devices when carried on a flight:

1. Person with Reduced Mobility (PRM); this is understood to mean a person whose mobility is reduced due to physical incapacity (sensory or locomotory), an intellectual deficiency, age, illness or any other cause of disability;
2. Children (whether accompanied or not) and infants;
3. Passengers with animals;
4. Deportees or inadmissible passengers;
5. Prisoners in custody.

AMC2 OPS.CAT.110.B Carriage of special categories of passengers

CARRIAGE OF CHILDREN AND PERSONS WITH REDUCED MOBILITY - BALLOONS

An operator may exclude children and/or PRMs from transportation in a balloon, when:

1. their presence may impede:
   a. the crew in their duties;
   b. access to emergency equipment; or
   c. the emergency evacuation of the balloon; and/or
2. those persons are:
   a. unable to take a proper brace position; or
   b. smaller than the height of the basket plus 20 cm.

AMC1 OPS.CAT.120 Stowage of baggage and cargo

MOTOR-POWERED AIRCRAFT

The following should be taken into account to ensure that hand baggage and cargo is adequately and securely stowed:

1. Each item carried in a passenger compartment should be stowed in a location that is capable of restraining it;
2. Mass limitations placarded on, or adjacent to, stowages should not be exceeded;
3. Underseat stowages should only be used when the seat is equipped with a restraint bar and the baggage is of such size that it may adequately be restrained by this equipment;
4. Items should not be stowed in toilets or against bulkheads that are incapable of restraining articles against movement forwards, sideways or upwards unless the bulkheads carry a placard specifying the greatest mass that may be placed there;
5. Baggage and cargo placed in lockers should be of a size that does not prevent latched doors from being closed securely;
6. Baggage and cargo should not be placed where it can impede access to emergency equipment;
7. Checks should be made before take-off, before landing, and whenever the fasten seat belts signs are illuminated or whenever deemed necessary to ensure that baggage is stowed where it cannot impede evacuation from the aircraft or cause injury by movement as may be appropriate to the phase of flight.

AMC2 OPS.CAT.120 Stowage of baggage and cargo

CARGO CARRIAGE IN THE PASSENGER COMPARTMENT – MOTOR-POWERED AIRCRAFT

The following should be observed before carrying cargo in the passenger compartment:

1. Dangerous goods should not be allowed;
2. For aeroplanes, a mix of passengers and live animals should only be allowed for pets weighing not more than eight kg and guide dogs;
3. The weight of cargo should not exceed the structural loading limits of the floor or seats;
4. The number/type of restraint devices and their attachment points should be capable of restraining the cargo in accordance with applicable certification specifications;
5. Cargo should be located such that, in the event of an emergency evacuation, it will not hinder egress nor impair the crew's view.

AMC OPS.CAT.150.H Operating minima - Helicopter Airborne Radar Approaches (ARAs) for overwater operations

GENERAL

1. Before commencing the final approach the pilot-in-command should ensure that a clear path exists on the radar screen for the final and missed approach segments. If lateral clearance from any obstacle will be less than one nm (nautical mile), the pilot-in-command should:
   a. approach to a nearby target structure and thereafter proceed visually to the destination structure; or
   b. make the approach from another direction leading to a circling manoeuvre.
2. The pilot-in-command should ensure that the cloud ceiling is sufficiently clear above the helideck to permit a safe landing.

3. Notwithstanding the minima in AMC OPS.CAT.H.150 3.a. and b., the Minimum Descent Height (MDH) should not be less than 50 ft (feet) above the elevation of the helideck.

   a. The MDH for an airborne radar approach should not be lower than:

      i. 200 ft by day; or

      ii. 300 ft by night.

   b. The MDH for an approach leading to a circling manoeuvre should not be lower than:

      i. 300 ft by day; or

      ii. 500 ft by night.

4. A Minimum Descent Altitude (MDA) may only be used if the radio altimeter is unserviceable. The MDA should be a minimum of MDH +200 ft and should be based on a calibrated barometer at the destination or on the lowest forecast QNH for the region.

5. The decision range should not be less than ¾ nm.

6. The MDA/H for a single-pilot ARA should be 100 ft higher than that calculated using AMC OPS.CAT.H.150 3. and 4. The decision range should not be less than one nm.

GM OPS.CAT.150.H Operating minima - Helicopter Airborne Radar Approaches (ARAs) for overwater operations

GENERAL

1. General:

   a. The helicopter ARA procedure may have as many as five separate segments. These are the arrival, initial, intermediate, final, and missed approach segments. In addition, the requirements of the circling manoeuvre to a landing under visual conditions should be considered. The individual approach segments can begin and end at designated fixes, however, the segments of an ARA may often begin at specified points where no fixes are available.

   b. The fixes, or points, are named to coincide with the associated segment. For example, the intermediate segment begins at the Intermediate Fix (IF) and ends at the Final Approach Fix (FAF). Where no fix is available or appropriate, the segments begin and end at specified points; for example, Intermediate Point (IP) and final approach point (FAP). The order in which this guidance material discusses the segments is the order in which the pilot would fly them in a complete procedure: that is, from the arrival through initial and intermediate to a final approach and, if necessary, the missed approach.

   c. Only those segments which are required by local conditions applying at the time of the approach need be included in a procedure. In constructing the procedure, the final approach track, (which should be orientated so as to be substantially into wind) should be identified first as it is the least flexible and most critical of all the segments. When the origin and the orientation of the final approach have been determined, the other necessary segments should be integrated with it to produce an orderly manoeuvring pattern which does not generate an unacceptably high work-load for the flight crew.

   d. Examples of ARA procedures, vertical profile and missed approach procedures are contained in Figures 1 to 5 of GM OPS.CAT.H.150.

2. Obstacle environment:

   a. Each segment of the ARA is located in an over-water area which has a flat surface at sea level. However, due to the passage of large vessels which are not required to notify their presence, the exact obstacle environment cannot be

determined. As the largest vessels and structures are known to reach elevations exceeding 500 ft amsl (above mean sea level), the uncontrolled offshore obstacle environment applying to the arrival, initial and intermediate approach segments can reasonably be assumed to be capable of reaching to at least 500 ft amsl. But, in the case of the final approach and missed approach segments, specific areas are involved within which no radar returns are allowed. In these areas the height of wave crests and the possibility that small obstacles may be present which are not visible on radar, results in an uncontrolled surface environment which extends to an elevation of 50 ft amsl.

b. Under normal circumstances, the relationship between the approach procedure and the obstacle environment is governed according to the concept that vertical separation is very easy to apply during the arrival, initial and intermediate segments, while horizontal separation, which is much more difficult to guarantee in an uncontrolled environment, is applied only in the final and missed approach segments.

3. Arrival segment:

The arrival segment commences at the last en-route navigation fix, where the aircraft leaves the helicopter route, and it ends either at the Initial Approach Fix (IAF) or, if no course reversal, or similar manoeuvre is required, it ends at the IF. Standard en-route obstacle clearance criteria should be applied to the arrival segment.

4. Initial approach segment:

The initial approach segment is only required if a course reversal, race track, or arc procedure is necessary to join the intermediate approach track. The segment commences at the IAF and on completion of the manoeuvre ends at the IP. The Minimum Obstacle Clearance (MOC) assigned to the initial approach segment is 1 000 ft.

5. Intermediate approach segment:

The intermediate approach segment commences at the IP, or in the case of "straight in" approaches, where there is no initial approach segment, it commences at the IF. The segment ends at the FAP and should not be less than two nm in length. The purpose of the intermediate segment is to align and prepare the helicopter for the final approach. During the intermediate segment the helicopter should be lined up with the final approach track, the speed should be stabilised, the destination should be identified on the radar, and the final approach and missed approach areas should be identified and verified to be clear of radar returns. The MOC assigned to the intermediate segment is 500 ft.

6. Final approach segment:

a. The final approach segment commences at the FAP and ends at the Missed Approach Point (MAPt). The final approach area, which should be identified on radar, takes the form of a corridor between the FAP and the radar return of the destination. This corridor should not be less than two nm wide in order that the projected track of the helicopter does not pass closer than 1 nm to the obstacles lying outside the area.

b. On passing the FAP, the helicopter will descend below the intermediate approach altitude, and follow a descent gradient which should not be steeper than 6·5%. At this stage vertical separation from the offshore obstacle environment will be lost. However, within the final approach area the MDA/H, will provide separation from the surface environment. Descent from 1 000 ft amsl to 200 ft amsl at a constant 6·5% gradient will involve a horizontal distance of two nm. In order to follow the guideline that the procedure should not generate an unacceptably high work-load for the flight crew, the required actions of levelling at MDH, changing heading at the Offset Initiation Point (OIP), and turning away at MAPt

should not be planned to occur at the same time. Consequently, the FAP should not normally be located at less than four nm from the destination.

c. During the final approach, compensation for drift should be applied and the heading which, if maintained, would take the helicopter directly to the destination, should be identified. It follows that, at an OIP located at a range of 1·5 nm, a heading change of 10° is likely to result in a track offset of 15° at 1nm, and the extended centreline of the new track can be expected to have a mean position lying some 300 - 400 metres to one side of the destination structure. The safety margin built in to the 0·75 nm Decision Range (DR) is dependent upon the rate of closure with the destination. Although the air speed should be in the range 60/90 kts (knots) during the final approach, the ground speed, after due allowance for wind velocity, should be no greater than 70 kts.

7. Missed approach segment:

a. The missed approach segment commences at the MAPt and ends when the helicopter reaches minimum en-route altitude. The missed approach manoeuvre is a "turning missed approach" which should be of not less than 30° and should not, normally, be greater than 45°. A turn away of more than 45° does not reduce the collision risk factor any further, nor will it permit a closer DR. However, turns of more than 45° may increase the risk of pilot disorientation and, by inhibiting the rate of climb (especially in the case of a One-Engine-Inoperative (OEI) go-around), may keep the helicopter at an extremely low level for longer than is desirable.

b. The missed approach area to be used should be identified and verified as a clear area on the radar screen during the intermediate approach segment. The base of the missed approach area is a sloping surface at 5·2% gradient starting from MDH at the MAPt. The concept is that a helicopter executing a turning missed approach will be protected by the horizontal boundaries of the missed approach area until vertical separation of more than 130 ft is achieved between the base of the area, and the offshore obstacle environment of 500 ft amsl which prevails outside the area.

c. A missed approach area, taking the form of a 45° sector orientated left or right of the final approach track, originating from a point 5 nm short of the destination, and terminating on an arc three nm beyond the destination, will normally satisfy the requirements of a 30° turning missed approach.

8. The required visual reference:

The visual reference required is that the destination should be in view in order that a safe landing may be carried out.

9. Radar equipment:

During the ARA procedure colour mapping radar equipment with a 120° sector scan and 2·5 nm range scale selected, may result in dynamic errors of the following order:

a. Bearing/tracking error ± 4·5° with 95% accuracy;

b. Mean ranging error - 250 metres (m);

c. Random ranging error ± 250 m with 95% accuracy.

Figure 1 of GM OPS.CAT.150.H Arc procedure

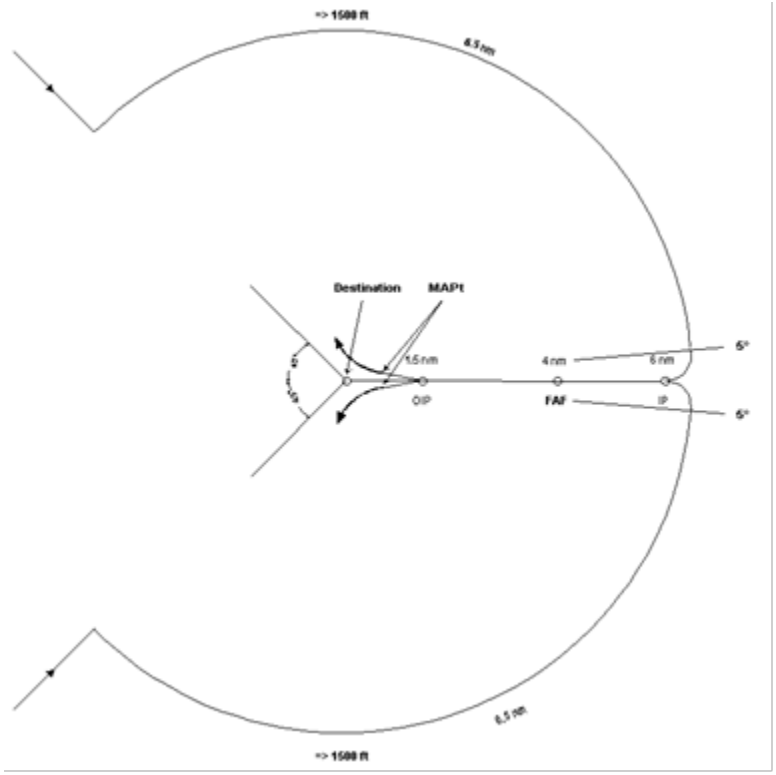


Figure 2 of GM OPS.CAT.150.H Base Turn Procedure – Direct Approach

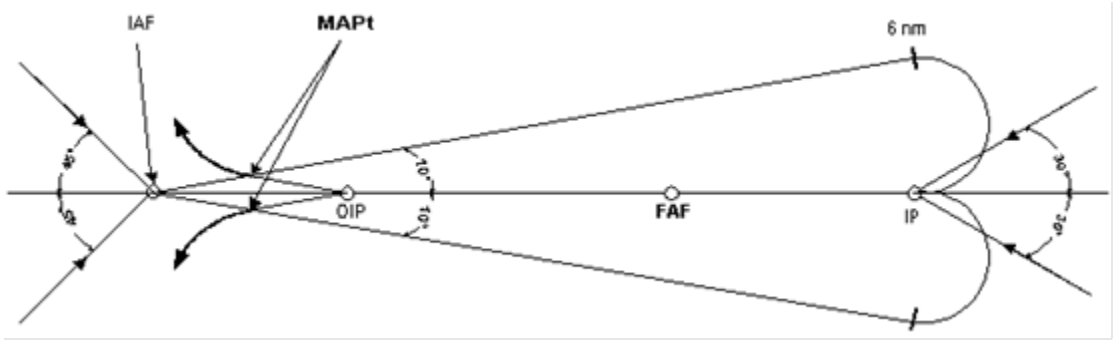


Figure 3 of GM OPS.CAT.150.H Holding Pattern & Race Track Procedure

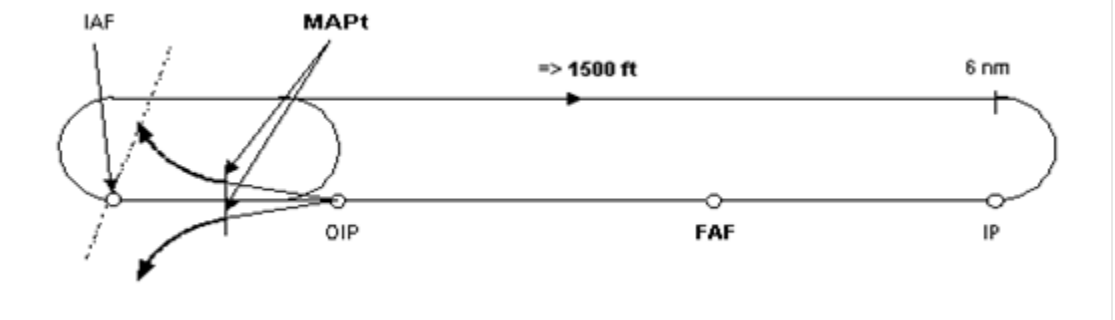


Figure 4 of GM OPS.CAT.150.H Vertical Profile

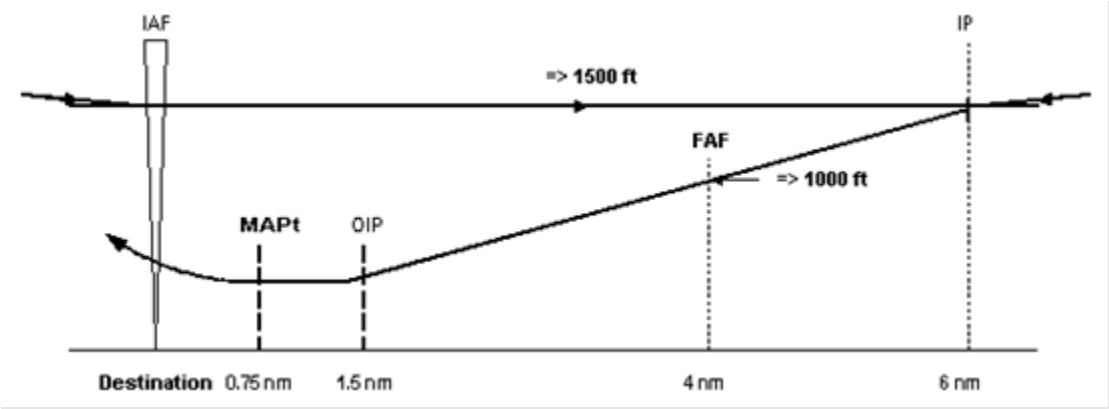
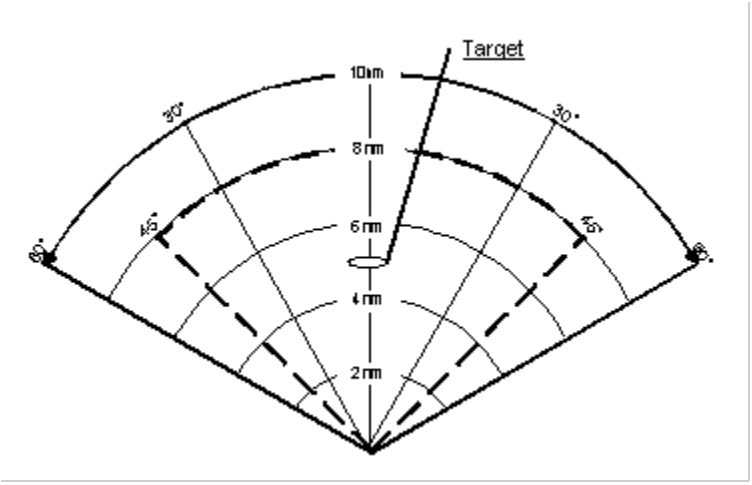


Figure 5 of GM OPS.CAT.150.H Missed Approach Area Left & Right



AMC OPS.CAT.155.A Selection of aerodromes - Aeroplanes

APPLICATION OF AERODROME FORECASTS

APPLICATION OF AERODROME FORECASTS (TAF & TREND) TO PRE-FLIGHT PLANNING (ICAO Annex 3 refers)

1. APPLICATION OF INITIAL PART OF TAF

a. Applicable time period: From the start of the TAF validity period up to the time of applicability of the first subsequent 'FM...*' or 'BECMG' or, if no 'FM' or 'BECMG' is given, up to the end of the validity period of the TAF.

b. Application of forecast The prevailing weather conditions forecast in the initial part of the TAF should be fully applied with the exception of the mean wind and gusts (and crosswind) which should be applied in accordance with the policy in the column 'BECMG AT and FM' in the table below. This may however be overruled temporarily by a 'TEMPO' or 'PROB**' if applicable according to the table below.

2. APPLICATION OF FORECAST FOLLOWING CHANGE INDICATORS IN TAF AND TREND

TAF or TREND for AERODROME PLANNED AS:	FM (alone) and BECMG AT:	BECMG (alone), BECMG FM, BECMG TL, BECMG FM...* TL in case of:		TEMPO (alone), TEMPO FM, TEMPO TL, TEMPO FM...* TL, PROB 30/40 (alone)			PROB TEMPO
	Deterioration and Improvement	Deterioration	Improvement	Deterioration		Improvement	Deterioration and Improvement
				Transient/Showery Conditions in connection with short-lived weather phenomena, e.g. thunderstorms, showers	Persistent Conditions In connection with e.g. haze, mist, fog, dust/sandstorm, continuous precipitation	In any case	
DESTINATION at ETA ± 1 hr	Applicable from the start of the change	Applicable from the time of start of change		Not applicable	Applicable	Should be disregarded	Deterioration may be disregarded; Improvement should be disregarded including mean wind and gusts
TAKE-OFF ALTERNATE at ETA ± 1 hr					Mean wind should be within required limits		
DEST. ALTERNATE at ETA ± 1 hr	Mean wind should be within required limits				Gusts may be disregarded		
ENROUTE ALTERNATE at ETA ± 1 hr	Gusts may be disregarded			Mean wind and gusts exceeding required limits may be disregarded			
ETOPS ENROUTE ALTERNATE at earliest/latest ETA ± 1 hr	Applicable from the time of start of change	Applicable from the time of end of change		Applicable if below applicable landing minima			
	Mean wind should be within required limits						
	Gusts exceeding crosswind limits should be fully applied.						

Note 1: 'required limits' are those contained in the operations manual

Note 2: If promulgated aerodrome forecasts do not comply with the requirements of ICAO Annex 3, operators should ensure that guidance in the application of these reports is provided.

* The space following 'FM' should always include a time group e.g. 'FM 1030'.

GM OPS.CAT.155.A(a)(2) Selection of aerodromes - Aeroplanes

FLIGHT DURATION

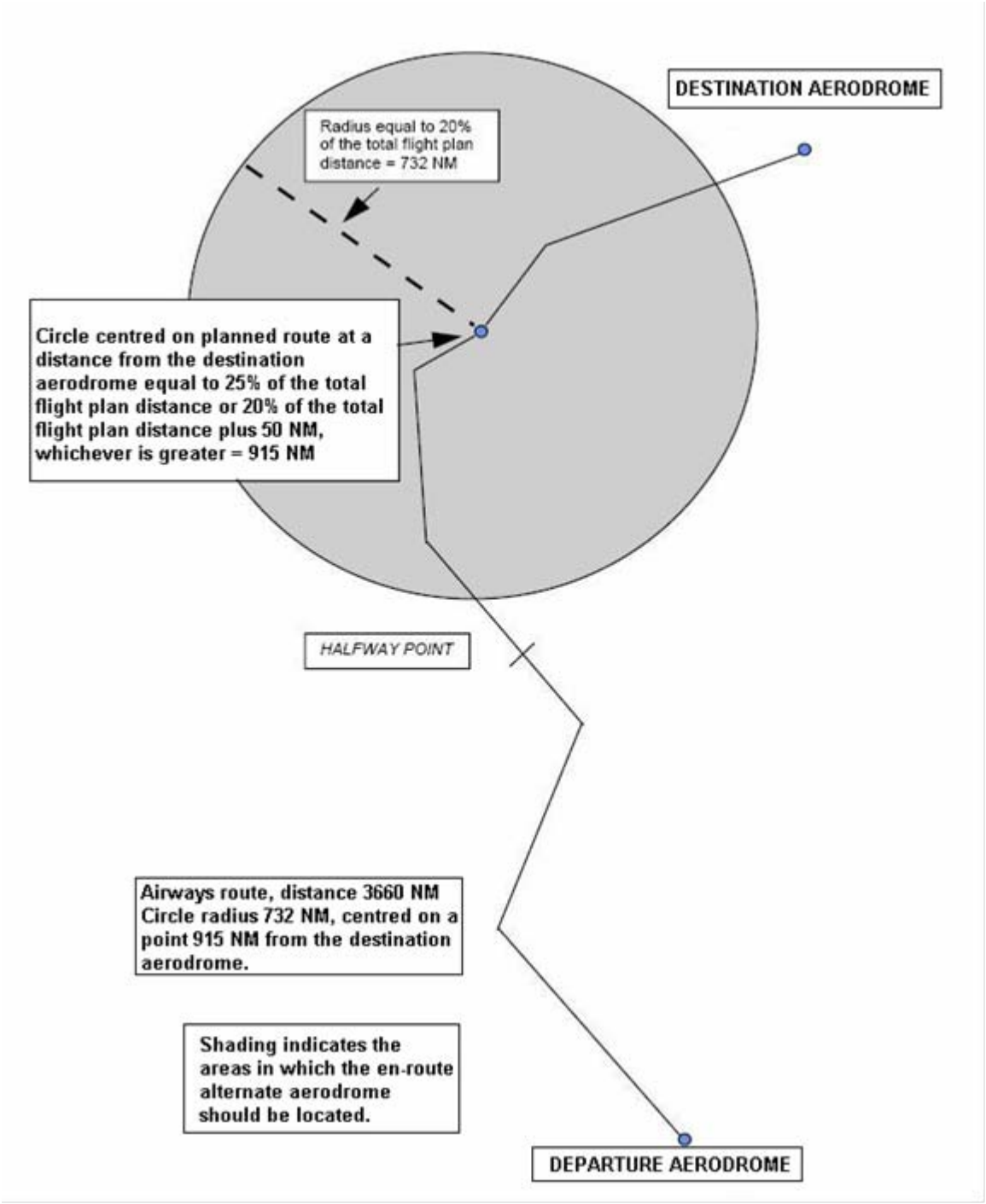
The flying time of six hours to the destination includes planned flights from take-off to landing as well as the duration to the destination from the moment of in-flight re-planning in accordance with AMC1 CAT OPS.GEN.205 3.

AMC OPS.CAT.155.A(b) Selection of aerodromes - Aeroplanes

LOCATION OF THE 3% EN-ROUTE ALTERNATE (ERA) AERODROME

The 3% ERA aerodrome should be located within a circle having a radius equal to 20% of the total flight plan distance, the centre of which lies on the planned route at a distance from the destination aerodrome of 25% of the total flight plan distance, or at least 20% of the total flight plan distance plus 50 nm, whichever is greater, all distances are to be calculated in still air conditions (see figure 1 of AMC OPS.CAT.155.A(b)).

Figure 1 of AMC OPS.CAT.155.A(b) Location of the 3% En-Route Alternate (ERA) aerodrome



GM OPS.CAT.155.A(d) Selection of aerodromes - Aeroplanes

PLANNING MINIMA

'Non-precision minima' in Table 1A of OPS.CAT.A.155 means the next highest minimum that is available in the prevailing wind and serviceability conditions; Localiser only approaches, if published, are considered to be 'non precision' in this context. It is recommended that operators wishing to publish tables of planning minima choose values that are likely to be appropriate on the majority of occasions (e.g. regardless of wind direction). Unserviceabilities should, however, be fully taken into account.

AMC OPS.CAT.156.A(b)(1) Selection of take-off alternate aerodromes - Aeroplanes

TAKE-OFF ALTERNATE DISTANCE

1. The OEI cruise speed derived from the Aircraft Flight Manual (AFM) should be based on still air standard conditions and the actual take-off mass.

2. If the AFM does not contain an OEI cruise speed, the speed to be used for calculations should be the one achieved with the remaining engine(s) set at maximum continuous power.

AMC OPS.CAT.155.H(a)(1) Selection of aerodromes - Helicopters

COASTAL AERODROMES

1. The requirement is applicable to helicopters routing from offshore only and should be based on an individual safety case assessment.

2. The following should be taken into account:

   a. Suitability of the weather based on the landing forecast for the destination;

   b. The fuel required to meet the instrument flight rules requirements;

   c. Where the destination coastal aerodrome is not directly on the coast it should be:

      i. within a distance that, taking into account the fuel, the helicopter can, at any time after crossing the coastline, return to the coast, descend safely and carry out a visual approach and landing with visual flight rules fuel reserves intact, and

      ii. geographically sited so that the helicopter can, within the Rules of the Air, and within the landing forecast:

         A. proceed inbound from the coast at 500 ft above ground level and carry out a visual approach and landing; or

         B. proceed inbound from the coast on an agreed route and carry out a visual approach and landing.

   d. Procedures for coastal aerodromes should be based on a landing forecast of at least:

      i. by day: A cloud base of decision height/minimum decision height + 400 ft, and a visibility of four km (kilometres), or, if descent over the sea is intended, a cloud base of 600 ft and a visibility of four km; and

      ii. by night: A cloud base of 1 000 ft and a visibility of five km.

   e. The descent to establish visual contact with the surface should take place over the sea or as part of the instrument approach;

   f. Routings and procedures for coastal aerodromes nominated as such should be included in the operations manual;

   g. The minimum equipment list should reflect the requirement for Airborne Radar and Radio Altimeter for this type of operation.

GM OPS.CAT.155.H(a)(1) Selection of aerodromes - Helicopters

COASTAL AERODROMES

1. The procedures contained in AMC OPS.CAT.H.155(a)(1) are weather-critical. Consequently, a “Landing forecast” conforming to the standards contained in the Regional Air Navigation Plan and ICAO Annex 3 (hereinafter referred to as ICAO Annex 3 Meteorological Service for International Air Navigation) should be used. In particular,

the value of the observed cloud height and visibility elements should remain within ±30% of the forecast values in 90% of the cases.

2. The “Landing forecast” consists of a concise statement of the mean or average meteorological conditions expected at an aerodrome during the two-hour period immediately following the time of issue. It contains surface wind, visibility, significant weather and cloud elements, and may contain other significant information, such as barometric pressure and temperature.

3. The landing forecast most commonly takes the form of a routine or special selected meteorological report in the METAR code to which a TREND is added. The code words “NOSIG”, i.e. no significant change expected; “BECMG” (becoming); or “TEMPO” (temporarily); followed by the expected change, are used. The two-hour period of validity of the forecast commences at the time of the meteorological report.

AMC OPS.CAT.155.H(c) Selection of aerodromes - Helicopters

OFFSHORE ALTERNATES

1. Offshore alternate deck landing environment:

   The landing environment of a helideck that is proposed for use as an offshore alternate should be pre-surveyed and, as well as the physical characteristics, the effect of wind direction and strength, and turbulence established. This information, which should be available to the pilot-in-command at the planning stage and in-flight, should be published in an appropriate form in the operations manual (including the orientation of the helideck) such that the suitability of the helideck for use as an offshore alternate, can be assessed. The alternate helideck should meet the criteria for size and obstacle clearance appropriate to the performance requirements of the type of helicopter concerned.

2. Performance considerations:

   The use of an offshore alternate is restricted to helicopters which can achieve OEI In Ground Effect (IGE) hover at an appropriate power rating at the offshore alternate. Where the surface of the Offshore alternate helideck, or prevailing conditions (especially wind velocity), precludes an OEI IGE, OEI Out of Ground Effect (OGE) hover performance at an appropriate power rating should be used to compute the landing mass. The landing mass should be calculated from graphs provided in the relevant parts of the operations manual. (When arriving at this landing mass, due account should be taken of helicopter configuration, environmental conditions and the operation of systems which have an adverse effect on performance.) The planned landing mass of the helicopter including crew, passengers, baggage, cargo plus 30 minutes Final Reserve fuel, should not exceed the OEI landing mass at the time of approach to the offshore alternate.

3. Weather considerations:

   a. Meteorological Observations:

      When the use of an offshore alternate is planned, the meteorological observations at the destination and alternate should be taken by an observer responsible for the provision of meteorological services. (Automatic meteorological observations stations may be used).

   b. Weather Minima:

      When the use of an offshore alternate is planned, an operator should not select a helideck as a destination or offshore alternate unless the aerodrome forecast, indicates that, during a period commencing one hour before and ending one hour after the expected time of arrival at the destination and offshore alternate, the weather conditions will be at or above the planning minima shown in Table 1 of AMC OPS.CAT.155.H(c).

Table 1 of AMC OPS.CAT.155.H(c) Planning minima

	Day	Night
Cloud Base	600 ft	800 ft
Visibility	4 km	5 km

c. Conditions of Fog

Where fog is forecast, or has been observed within the last two hours within 60 nm of the destination or alternate, offshore alternates should not be used.

4. Actions at Point of No Return:

Before passing the Point of No Return, which should not be more that 30 minutes from the destination, the following actions should have been completed:

a. Confirmation that navigation to the destination and offshore alternate can be assured;

b. Radio contact with the destination and offshore alternate (or master station) has been established;

c. The landing forecast at the destination and offshore alternate have been obtained and confirmed to be at or above the required minima;

d. The requirements for OEI landing (see AMC OPS.CAT.155.H(c) 2.) have been checked (in light of the latest reported weather conditions) to ensure that they can be met;

e. To the extent possible, having regard to information on current and forecast use of the offshore alternate and on conditions prevailing, the availability of the offshore alternate should be guaranteed by the duty holder (the rig operator in the case of fixed installations and the owner in the case of mobiles) until the landing at the destination, or the offshore alternate, has been achieved (or until offshore shuttling has been completed).

5. Offshore shuttling:

Provided that the actions in AMC OPS.CAT.155.H(c) 4. have been completed, offshore shuttling, using an offshore alternate, may be carried out.

GM OPS.CAT.155.H(d) Selection of aerodromes - Helicopters

PLANNING MINIMA

'Non-precision minima' in Table 1H of OPS.CAT.155.H means the next highest minimum that is available in the prevailing wind and serviceability conditions; Localiser only approaches, if published, are considered to be 'non precision' in this context. It is recommended that operators wishing to publish tables of planning minima choose values that are likely to be appropriate on the majority of occasions (e.g. regardless of wind direction). Unserviceabilities should, however, be fully taken into account.

AMC OPS.CAT.170 Minimum terrain clearance altitudes

MINIMUM FLIGHT ALTITUDES

1. The operator should take into account the following factors when using a method for specifying minimum flight altitudes:

a. The accuracy in which the position of the aircraft can be determined;

b. Probable inaccuracies in the altimeter indication;

c. Terrain characteristics (e.g. sudden changes in the elevation) along the routes or in the areas where operations are to be conducted;

d. The probability of encountering unfavourable meteorological conditions (e.g. severe turbulence and descending air currents);

e. Possible inaccuracies in aeronautical charts.

2. When specifying minimum flight altitudes, due consideration should be given to:

a. corrections for temperature and pressure variations from standard values;

b. ATC requirements; and

c. any foreseeable contingencies along the planned route.

GM OPS.CAT.170 Minimum terrain clearance altitudes

MINIMUM FLIGHT ALTITUDES

1 The following are examples of some of the methods available for calculating minimum flight altitudes.

2 KSS Formula:

a. Minimum Obstacle Clearance Altitude (MOCA).

i. MOCA is the sum of:

A. the maximum terrain or obstacle elevation whichever is highest; plus

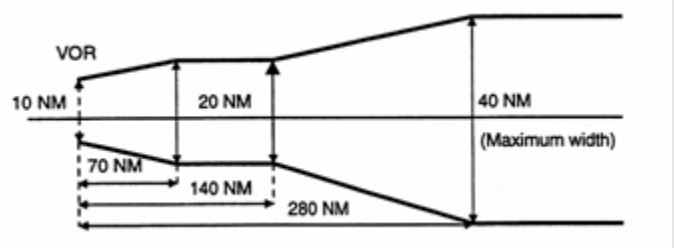
B. 1 000 ft for elevation up to and including 6 000 ft; or

C. 2 000 ft for elevation exceeding 6 000 ft rounded up to the next 100 ft.

ii. The lowest MOCA to be indicated is 2 000 ft.

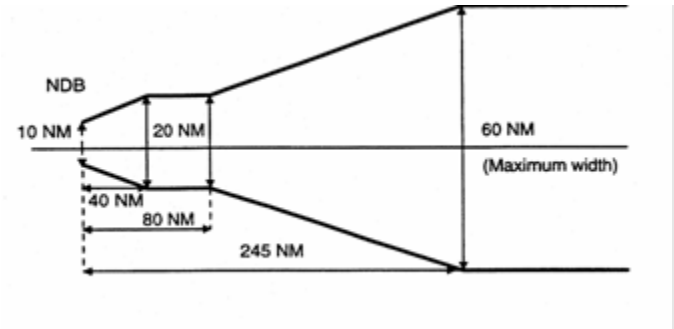
iii. From a VOR station, the corridor width is defined as a borderline starting 5 nm either side of the VOR, diverging four degrees from centreline until a width of 20 nm is reached at 70 nm out, thence paralleling the centreline until 140 nm out, thence again diverging four degrees until a maximum width of 40 nm is reached at 280 nm out. Thereafter the width remains constant (see Figure 1 of GM OPS.CAT.170).

Figure 1 of GM OPS.CAT.170



iv. From a Non-Directional Beacon (NDB), similarly, the corridor width is defined as a borderline starting five nm either side of the NDB diverging seven degrees until a width of 20 nm is reached 40 nm out, thence paralleling the centreline until 80 nm out, thence again diverging seven degrees until a maximum width of 60 nm is reached 245 nm out. Thereafter the width remains constant (see Figure 2 of GM OPS.CAT.170).

Figure 2 of GM OPS.CAT.170



v. MOCA does not cover any overlapping of the corridor.

b. Minimum Off-Route Altitude (MORA). MORA is calculated for an area bounded by each or every second LAT/LONG square on the Route Facility Chart (RFC)/Terminal Approach Chart (TAC) and is based on a terrain clearance as follows:

i. Terrain with elevation up to 6 000 ft (2 000 m) – 1 000 ft above the highest terrain and obstructions;

ii. Terrain with elevation above 6 000 ft (2 000 m) – 2 000 ft above the highest terrain and obstructions.

3 Jeppesen Formula (see Figure 3 of GM OPS.CAT.170)

a. MORA is a minimum flight altitude computed by Jeppesen from current ONC or WAC charts. Two types of MORAs are charted which are:

i. route MORAs e.g. 9800a; and

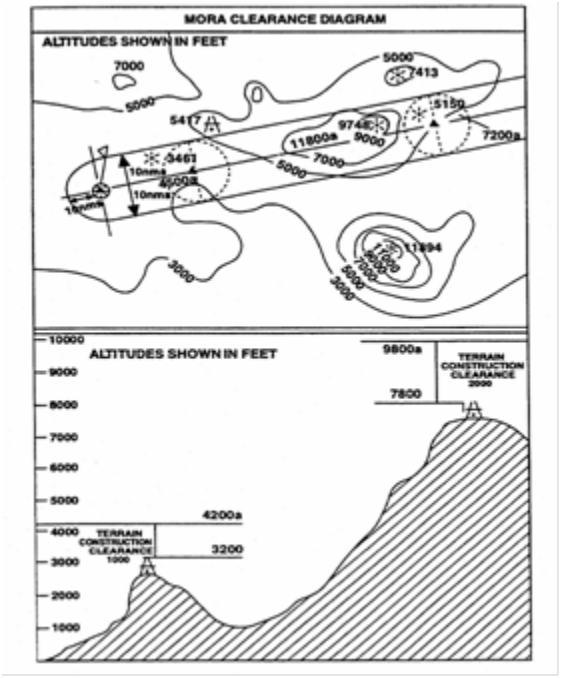
ii. grid MORAs e.g. 98.

b. Route MORA values are computed on the basis of an area extending 10 nm to either side of route centreline and including a 10 nm radius beyond the radio fix/reporting point or mileage break defining the route segment.

c. MORA values clear all terrain and man-made obstacles by 1 000 ft in areas where the highest terrain elevation or obstacles are up to 5 000 ft. A clearance of 2 000 ft is provided above all terrain or obstacles which are 5 001 ft and above.

d. A Grid MORA is an altitude computed by Jeppesen and the values are shown within each Grid formed by charted lines of latitude and longitude. Figures are shown in thousands and hundreds of feet (omitting the last two digits so as to avoid chart congestion). Values followed by ± are believed not to exceed the altitudes shown. The same clearance criteria as explained in GM OPS.CAT.170 3.c. apply.

Figure 3 of GM OPS.CAT.170



4 ATLAS Formula:

a. Minimum safe En-route Altitude (MEA). Calculation of the MEA is based on the elevation of the highest point along the route segment concerned (extending from navigational aid to navigational aid) within a distance on either side of track as specified below:

i. Segment length up to 100 nm – 10 nm (See Note 1 below).

ii. Segment length more than 100 nm – 10% of the segment length up to a maximum of 60 nm See Note 2 below).

Note 1: This distance may be reduced to five nm within TMAs where, due to the number and type of available navigational aids, a high degree of navigational accuracy is warranted.

Note 2: In exceptional cases, where this calculation results in an operationally impracticable value, an additional special MEA may be calculated based on a distance of not less than 10 nm either side of track. Such special MEA will be shown together with an indication of the actual width of protected airspace.

b. The MEA is calculated by adding an increment to the elevation specified above as appropriate:

Elevation of highest point	Increment
Not above 5 000 ft	1 500 ft
Above 5 000 ft but not above 10 000 ft	2 000 ft
Above 10 000 ft	10% of elevation plus 1 000 ft

The resulting value is adjusted to the nearest 100 ft.

Note: For the last route segment ending over the initial approach fix, a reduction to 1 000 ft is permissible within TMAs where, due to the number and type of available navigation aids, a high degree of navigational accuracy is warranted.

c. Minimum safe Grid Altitude (MGA). Calculation of the MGA is based on the elevation of the highest point within the respective grid area.

The MGA is calculated by adding an increment to the elevation specified above as appropriate:

Elevation of highest point	Increment
Not above 5 000 ft	1 500 ft
Above 5 000 ft but not above 10 000 ft	2 000 ft
Above 10 000 ft	10% of elevation plus 1 000 ft

The resulting value is adjusted to the nearest 100 ft.

AMC1 OPS.CAT.205 Fuel and oil supply

FUEL PLANNING

1. Fuel planning should be based on:
   a. data provided by the aircraft manufacturer; or
   b. current aircraft specific data derived from a fuel consumption monitoring system.
2. In-flight re-planning for calculating usable fuel required when a flight has to proceed along a route or to a destination aerodrome other than originally planned should include:
   a. trip fuel for the remainder of the flight;
   b. reserve fuel consisting of:
      i. contingency fuel;
      ii. alternate fuel, if a destination alternate aerodrome is required. (This does not preclude selection of the departure aerodrome as the destination alternate aerodrome);
      iii. final reserve fuel; and
      iv. additional fuel, if required by the type of operation (e.g. Extended Range Twin-Engine Operations (ETOPS); and
   c. extra fuel, if required by the pilot-in-command.

AMC2 OPS.CAT.205.A Fuel and oil supply

FUEL PLANNING - AEROPLANES

1. The pre-flight calculation of usable fuel required for a flight should include the following:
   a. Taxi fuel, which should not be less than the amount expected to be used prior to take-off. Local conditions at the departure aerodrome and Auxiliary Power Unit (APU) consumption should be taken into account;
   b. Trip fuel, which should include:
      i. fuel for take-off and climb from aerodrome elevation to initial cruising level/altitude, taking into account the expected departure routing;
      ii. fuel from top of climb to top of descent, including any step climb/descent;
      iii. fuel from top of descent to the point where the approach is initiated, taking into account the expected arrival procedure; and
      iv. fuel for approach and landing at the destination aerodrome;

c. Reserve fuel, consisting of:

i. Contingency fuel; except as provided for in 2. below 'Reduced Contingency Fuel', which should be the higher of A. or B. below:

A.

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. not less than 3% of the planned trip fuel or, in the event of in-flight re-planning, 3% of the trip fuel for the remainder of the flight, provided that an ERA aerodrome is available in accordance with AMC OPS.CAT.A.155(b); or

3. an amount of fuel sufficient for 20 minutes flying time based upon the planned trip fuel consumption provided that the operator has established a fuel consumption monitoring programme for individual aeroplanes and uses valid data determined by means of such a programme for fuel calculation; or

4. an amount of fuel based on a statistical method which ensures an appropriate statistical coverage of the deviation from the planned to the actual trip fuel. This method is used to monitor the fuel consumption on each city pair/aeroplane combination and the operator uses this data for a statistical analysis to calculate contingency fuel for that city pair/aircraft combination.

B. An amount to fly for five minutes at holding speed at 1 500 ft (450 m) above the destination aerodrome in standard conditions;

ii. Alternate fuel, if a destination alternate aerodrome is required. (This does not preclude selection of the departure aerodrome as the destination alternate aerodrome). This should include:

A. fuel for a missed approach from the applicable minimum descent altitude/decision height (MDA/DH) at the destination aerodrome to missed approach altitude, taking into account the complete missed approach procedure;

B. fuel for climb from missed approach altitude to cruising level/altitude, taking into account the expected departure routing;

C. fuel for cruise from top of climb to top of descent, taking into account the expected routing;

D. fuel for descent from top of descent to the point where the approach is initiated, taking into account the expected arrival procedure;

E. fuel for executing an approach and landing at the destination alternate aerodrome; and

F. where two destination alternate aerodromes are required, sufficient fuel to proceed to the alternate aerodrome which requires the greater amount of alternate fuel;

iii. Final reserve fuel:

A. For aeroplanes with reciprocating engines, fuel to fly for 45 minutes;

B. For aeroplanes with turbine engines, fuel to fly for 30 minutes at holding speed at 1 500 ft (450 m) above aerodrome elevation in standard conditions, calculated with the estimated mass on arrival at the destination alternate aerodrome or the destination aerodrome, when no destination alternate aerodrome is required and

iv. Additional fuel, if required by the type of operation (e.g. ETOPS). The minimum additional fuel, if not already included in 1.c.i.A.1. and 2., should allow:

A. the aeroplane to descend as necessary and proceed to an adequate alternate aerodrome in the event of engine failure or loss of pressurisation, whichever requires the greater amount of fuel based on the assumption that such a failure occurs at the most critical point along the route;

B. hold there for 15 minutes at 1 500 ft (450 m) above aerodrome elevation in standard conditions;

C. make an approach and landing; and

D. holding for 15 minutes at 1 500 ft (450 m) above destination aerodrome elevation in standard conditions, when a flight is operated without a destination alternate aerodrome;

d. Extra fuel, if required by the pilot-in-command.

2. Reduced Contingency Fuel (RCF) Procedure:

If an operator uses pre-flight planning to a destination 1 aerodrome with a reduced contingency fuel procedure using a decision point along the route and a destination 2 aerodrome (optional refuel destination), the amount of usable fuel, on board for departure, should be the greater of a. or b. below:

a. The sum of:

i. Taxi fuel;

ii. Trip fuel to the destination 1 aerodrome, via the decision point;

iii. Contingency fuel equal to not less than 5% of the estimated fuel consumption from the decision point to the destination 1 aerodrome;

iv. Alternate fuel or no alternate fuel if the decision point is at less than six hours from the destination 1 aerodrome and the requirements of OPS.CAT.A.155(a)(3) are fulfilled;

v. Final reserve fuel;

vi. Additional fuel; and

vii. Extra fuel, if required by the pilot-in-command.

b. The sum of:

i. Taxi fuel;

ii. Trip fuel to the destination 2 aerodrome, via the decision point;

iii. Contingency fuel equal to not less than the amount calculated in accordance with 1.c.i. from departure aerodrome to the destination 2 aerodrome;

iv. Alternate fuel, if a destination 2 alternate aerodrome is required;

v. Final reserve fuel;

vi. Additional fuel; and

vii. Extra fuel, if required by the pilot-in-command.

3. Pre-Determined Point (PDP) Procedure:

If an operator plans to a destination alternate aerodrome where the distance between the destination aerodrome and the destination alternate aerodrome is such that a flight can only be routed via a predetermined point to one of these aerodromes, the amount of usable fuel, on board for departure, should be the greater of a. or b. below:

a. The sum of:

i. Taxi fuel;

ii. Trip fuel from the departure aerodrome to the destination aerodrome, via the predetermined point;

iii. Contingency fuel calculated in accordance with 1.c.i.;

iv. Additional fuel, which should not be less than final reserve fuel,

A. for aeroplanes with reciprocating engines, fuel to fly for 45 minutes plus 15% of the flight time planned to be spent at cruising level or two hours, whichever is less; or

B. for aeroplanes with turbine engines, fuel to fly for two hours at normal cruise consumption above the destination aerodrome; and

v. Extra fuel, if required by the pilot-in-command; or

b. The sum of:

i. Taxi fuel;

ii. Trip fuel from the departure aerodrome to the destination alternate aerodrome, via the predetermined point;

iii. Contingency fuel calculated in accordance with 1.c.i.;

iv. Additional fuel, which should not be less than final reserve fuel,

A. for aeroplanes with reciprocating engines, fuel to fly for 45 minutes; or

B. for aeroplanes with turbine engines, fuel to fly for 30 minutes at holding speed at 1 500 ft (450 m) above the destination alternate aerodrome elevation in standard conditions; and

v. Extra fuel, if required by the pilot-in-command.

4. Isolated aerodrome procedure:

If an operator plans to an isolated aerodrome, the last possible point of diversion to any available ERA aerodrome should be used as the pre-determined point in accordance with 3.

AMC3 OPS.CAT.205.H Fuel and oil supply

FUEL PLANNING HELICOPTERS

1. The pre-flight calculation of usable fuel required for a flight should include the following:

a. Taxi fuel, which should not be less than the amount expected to be used prior to take-off. Local conditions at the departure aerodrome and APU consumption should be taken into account;

b. Trip fuel, which should include:

i. fuel for take-off and climb from aerodrome elevation to initial cruising level/altitude, taking into account the expected departure routing;

ii. fuel from top of climb to top of descent, including any step climb/descent;

iii. fuel from top of descent to the point where the approach is initiated, taking into account the expected arrival procedure; and

iv. fuel for approach and landing at the destination aerodrome;

c. Reserve fuel consisting of:

i. contingency fuel;

A. For IFR flights, or for VFR flights in a hostile environment, 10% of the planned trip fuel; or

B. For VFR flights in a non-hostile environment, 5% of the planned trip fuel;

ii. alternate fuel, if a destination alternate aerodrome is required (This does not preclude selection of the departure aerodrome as the destination alternate aerodrome). This should include:

A. fuel for a missed approach from the applicable MDA/DH at the destination aerodrome to missed approach altitude, taking into account the complete missed approach procedure;

B. fuel for a climb from missed approach altitude to cruising level/altitude;

C. fuel for the cruise from top of climb to top of descent;

D. fuel for descent from top of descent to the point where the approach is initiated, taking into account the expected arrival procedure;

E. fuel for executing an approach and landing at the selected destination alternate aerodrome; and

F. For helicopters operating to or from aerodrome located in a hostile environment, 10% of 1.c.ii.A. to E.

iii. final reserve fuel;

A. For VFR flights navigating by day with reference to visual landmarks, 20 minutes fuel at best range speed; or

B. For IFR flights or when flying VFR and navigating by means other than by reference to visual landmarks or at night, fuel to fly for 30 minutes at holding speed at 1 500 ft (450 m) above the destination aerodrome in standard conditions calculated with the estimated mass on arrival above the alternate aerodrome, or the destination aerodrome, when no alternate aerodrome is required; and

iv. additional fuel, if required by the type of operation (e.g. isolated aerodromes); and

d. Extra fuel if required by the pilot-in-command.

2. Isolated aerodrome IFR procedure:

If an operator plans flying IFR to an isolated aerodrome, or when flying Visual Flight Rules (VFR) and navigating by means other than by reference to visual landmarks, for which a destination alternate does not exist, the amount of fuel at departure should include:

a. taxi fuel;

b. trip fuel;

c. contingency fuel calculated in accordance with 1.c.i.;

d. additional fuel to fly for two hours at holding speed including final reserve fuel; and

e. extra fuel, if required by the pilot-in-command.

3. Sufficient fuel should be carried at all times to ensure that following the failure of a power unit which occurs at the most critical point along the route, the helicopter is able to:

a. descend as necessary and proceed to an adequate aerodrome;

b. hold there for 15 minutes at 1 500 ft (450 m) above aerodrome elevation in standard conditions; and

c. make an approach and landing.

AMC4 OPS.CAT.205.A Fuel and oil supply

FUEL PLANNING OTHER THAN COMPLEX MOTOR-POWERED AEROPLANES

The pre-flight calculation of usable fuel required for a flight with other than complex motor-powered aircraft should include:

1. taxi fuel (fuel consumed before take-off), if significant;

2. trip fuel (fuel to reach the destination);

3. reserve fuel, consisting of

a. contingency fuel that is not less than 5% of the planned trip fuel or, in the event of in-flight re-planning, 5% of the trip fuel for the remainder of the flight; and

b. final reserve fuel to fly for an additional period of 45 minutes;

4. alternate fuel (fuel to reach the destination alternate aerodrome via the destination), if a destination alternate is required; and

5. extra fuel (fuel that the pilot-in-command may require in addition to that above).

AMC5 OPS.CAT.205.H Fuel and oil supply

FUEL PLANNING OPERATIONS BY DAY AND OVER ROUTES NAVIGATED BY REFERENCE TO VISUAL LANDMARKS WITH HELICOPTERS HAVING A MAXIMUM PASSENGER SEATING CONFIGURATION OF NINE OR LESS ENGAGED IN-FLIGHT OPERATIONS CONDUCTED WITHIN A LOCAL AREA OR OTHER THAN COMPLEX MOTOR-POWERED HELICOPTERS

1. On completion of a flight, the fuel remaining should not be less than an amount sufficient for 30 minutes flying time at normal cruising speed. This may be reduced to 20 minutes when operating within an area providing continuous and suitable precautionary landing sites. Final reserve fuel should be specified in the operations manual to enable compliance with OPS.CAT.215(b).

2. Local area operations encompass usually an area within a distance of 20-25 nm.

GM1 OPS.CAT.205 Fuel and oil supply

CONTINGENCY FUEL STATISTICAL METHOD

1. As an example, the following values of statistical coverage of the deviation from the planned to the actual trip fuel provide appropriate statistical coverage:

a. 99% coverage plus 3% of the trip fuel, if the calculated flight time is less than two hours, or more than two hours and no suitable ERA aerodrome is available;

b. 99% coverage if the calculated flight time is more than two hours and a suitable ERA aerodrome is available;

c. 90% coverage if:

i. The calculated flight time is more than two hours; and

ii. A suitable ERA aerodrome is available; and

iii. At the destination aerodrome two separate runways are available and usable, one of which is equipped with an ILS/MLS, and the weather conditions are in compliance with OPS.CAT.A.156(b)(1)(ii); or the ILS/MLS is operational to Cat II/III operating minima and the weather conditions are at or above 500 ft/2 500 m.

2. The fuel consumption database used in conjunction with these values should be based on fuel consumption monitoring for each route/aeroplane combination over a rolling two-year period.

GM2 OPS.CAT.205 Fuel and oil supply

CONTINGENCY FUEL - HELICOPTERS

At the planning stage, not all factors which could have an influence on the fuel consumption to the destination aerodrome can be foreseen. Therefore, contingency fuel is carried to compensate for items, such as:

1. deviations of an individual helicopter from the expected fuel consumption data;

2. deviations from forecast meteorological conditions; and

3. deviations from planned routings and/or cruising levels/altitudes.

AMC1 OPS.CAT.215 In-flight fuel checks

IN-FLIGHT FUEL MANAGEMENT – MOTOR-POWERED AIRCRAFT

Except for VFR day flights of other than complex motor-powered aeroplanes, and operations by day and over routes navigated by reference to visual landmarks with helicopters with a maximum passenger seating configuration of nine or less engaged in-flight operations conducted within a local area and other than complex motor-powered helicopters, in-flight fuel management should be carried out according to the following criteria:

In-flight fuel checks:

1. Fuel checks should be carried out in-flight at regular intervals. The usable remaining fuel should be recorded and evaluated to:

a. compare actual consumption with planned consumption;

b. check that the usable remaining fuel is sufficient to complete the flight; and

c. determine the expected usable fuel remaining on arrival at the destination aerodrome.

2. The relevant fuel data should be recorded.

AMC2 OPS.CAT.215.A In-flight fuel checks

IN-FLIGHT FUEL MANAGEMENT – AEROPLANES

Except for VFR day flights of other than complex motor-powered aeroplanes, in-flight fuel management should be carried out according to the following criteria:

1. The expected usable fuel remaining on arrival at the destination aerodrome should not be less than:

   a. the required alternate fuel plus final reserve fuel, or

   b. the final reserve fuel, if no alternate aerodrome is required.

2. If, as a result of an in-flight fuel check, the expected usable fuel remaining on arrival at the destination aerodrome is less than:

   a. the required alternate fuel plus final reserve fuel, the pilot-in-command should take into account the traffic and the operational conditions prevailing at the destination aerodrome, at the destination alternate aerodrome and at any other adequate aerodrome, in deciding whether to proceed to the destination aerodrome or to divert so as to perform a safe landing with not less than final reserve fuel; or

   b. the final reserve fuel if no alternate aerodrome is required, the pilot-in-command should take appropriate action and proceed to an adequate aerodrome so as to perform a safe landing with not less than final reserve fuel.

3. On a flight using the RCF procedure, in order to proceed to the destination 1 aerodrome, the usable fuel remaining at the decision point should be at least the total of:

   a. trip fuel from the decision point to the destination 1 aerodrome;

   b. contingency fuel equal to 5% of trip fuel from the decision point to the destination 1 aerodrome;

   c. destination 1 aerodrome alternate fuel, if a destination 1 alternate aerodrome is required; and

   d. final reserve fuel.

4. On a flight using the PDP procedure in order to proceed to the destination aerodrome, the usable fuel remaining at the PDP should be at least the total of:

   a. trip fuel from the PDP to the destination aerodrome;

   b. contingency fuel from the PDP to the destination aerodrome calculated in accordance with AMC2 A CAT OPS.GEN.205 1.c.i.; and

   c. fuel required according to AMC2 A CAT OPS.GEN.205 3.b.iv.

5. Prior to a flight with one destination alternate aerodrome and one 3% ERA aerodrome in accordance with OPS.CAT.A.155(b), the final point of diversion to the 3% ERA aerodrome so as to land with final-reserve fuel remaining should be determined. When approaching this point, the pilot-in-command should assess the expected usable fuel remaining, the weather conditions, the traffic and operational conditions prevailing at destination, destination alternate, and 3% ERA aerodrome. The pilot-in-command should divert to the ERA or the destination alternate aerodrome if the destination aerodrome is below operational minima or if no meteorological information is available for the destination aerodrome.

AMC3 OPS.CAT.215.H In-flight fuel checks

IN-FLIGHT FUEL MANAGEMENT – HELICOPTERS

Except for operations by day and over routes navigated by reference to visual landmarks with helicopters having a maximum passenger seating configuration of nine or less engaged in-flight operations conducted within a local area or other than complex motor-powered helicopters, in-flight fuel management should be carried out according to the following criteria:

1. If, as a result of an in-flight fuel check, the expected usable fuel remaining on arrival at the destination is less than the required alternate fuel plus final reserve fuel, the pilot-in-command should:

   a. divert; or

   b. re-plan the flight in accordance with OPS.CAT.H.155(c),

   unless he/she considers it safer to continue to the destination, provided that at an on-shore destination, when two suitable, separate touch down and lift-off areas are available and the weather conditions at the destination comply with OPS.GEN.185, the pilot-in-command may use alternate fuel before landing at the destination;

2. If, as a result of an in-flight fuel check on a flight to an isolated destination aerodrome, planned in accordance with AMC3 H CAT OPS.GEN.205 3., the expected fuel remaining at the point of last possible diversion is less than the sum of fuel to divert to an aerodrome selected in accordance with OPS.CAT.H.156, contingency fuel and final reserve fuel, the pilot-in-command should:

   a. divert; or

   b. proceed to the destination, provided that at on-shore destinations, two suitable separate touch down and lift-off areas are available at the destination and the expected weather conditions at the destination comply with those specified for planning in OPS.GEN.185.

AMC OPS.CAT.225.A Maximum distance from an adequate aerodrome for two-engined aeroplanes

OPERATIONS MANUAL

The following data, specific to each type or variant of aeroplane, should be included in the operations manual:

1. The OEI cruise speed and the method of calculation; and

2. The maximum distance from an adequate aerodrome.

AMC OPS.CAT.225.A(c) Maximum distance from an adequate aerodrome for two-engined aeroplanes

OPERATION OF TWIN TURBOJET AEROPLANES HAVING A MAXIMUM PASSENGER SEATING CONFIGURATION OF 19 OR LESS AND HAVING A MAXIMUM TAKE-OFF MASS OF LESS THAN 45 360 KG BETWEEN 120 AND 180 MINUTES FROM AN ADEQUATE AERODROME – OPERATIONAL CRITERIA FOR SMALL TWINS WITHOUT ETOPS CAPABILITY

1. For operations between 120 and 180 minutes, due account should be taken of the aeroplane's design and capabilities (as outlined below) and an operator's experience related to such operations. Relevant information should be included in the operations manual and the operator's maintenance procedures. The term "the aeroplane's design" in this paragraph does not imply any additional type design approval requirements (beyond the applicable original Type Certification (TC) requirements).

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

   a. Propulsion systems - The aeroplane engine should meet the applicable requirements prescribed in CS-25 and CS-E or equivalent (e.g. JAR-25, FAR-25, JAR-E, FAR-E), concerning engine TC, installation and system operation. In

addition to the performance standards established by the Agency or competent authority at the time of engine certification, the engines should comply with all subsequent mandatory safety standards specified by the Agency or competent authority, including those necessary to maintain an acceptable level of reliability. In addition, consideration should be given to the effects of extended duration single-engine operation (e.g. the effects of higher power demands such as bleed and electrical).

b. Airframe systems - With respect to electrical power, three or more reliable (as defined by CS-25 or equivalent (e.g. JAR-25, FAR-25)) and independent electrical power sources should be available, each of which should be capable of providing power for all essential services which should at least include the following:

i. Sufficient instruments for the flight crew providing, as a minimum, attitude, heading, air speed and altitude information;

ii. Appropriate pitot heating;

iii. Adequate navigation capability;

iv. Adequate radio communication and intercommunication capability;

v. Adequate flight deck and instrument lighting and emergency lighting;

vi. Adequate flight controls;

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

viii. Adequate engine instrumentation;

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

x. Such warnings, cautions and indications as are required for continued safe flight and landing;

xi. Fire protection (engines and APU);

xii. Adequate ice protection including windshield de-icing;

xiii. Adequate control of the flight deck and cabin environment including heating and pressurisation.

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

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

A. To ensure hydraulic power (Hydraulic Motor Generator) reliability, it may be necessary to provide two or more independent energy sources.

B. The ADG/RAT, if fitted, should not require engine dependent power for deployment.

C. The APU should meet the criteria in AMC OPS.CAT.A.220(c) c.

c. APU - The APU, if required for extended range operations, should be certificated as an essential APU and should meet the applicable CS-25 and CS-APU provisions or equivalent (e.g. JAR-25, JAR-APU, FAR-25).

d. Fuel supply system - Consideration should include the capability of the fuel supply system to provide sufficient fuel for the entire diversion taking account of aspects such as fuel boost and fuel transfer.

3. Powerplant events and corrective action:

a. All powerplant events and operating hours should be reported by the operator to the airframe and engine Supplementary (S)TC holders as well as to the competent authority.

b. These events should be evaluated by the operator in consultation with the competent authority and with the engine and airframe (S)TC holders. The competent authority may consult the Agency to ensure that world wide data is evaluated.

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

d. The evaluation or statistical assessment, when available, may result in corrective action or the application of operational restrictions.

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

f. Arrangements to ensure that all corrective actions required by the Agency are implemented.

4. Maintenance:

The maintenance programme in accordance with Part-M should be based upon reliability programmes including the following elements but not limited to:

a. engine oil consumption programmes - Such programmes are intended to support engine condition trend monitoring; and

b. engine condition monitoring programme - A programme for each powerplant that monitors engine performance parameters and trends of degradation that provides for maintenance actions to be undertaken prior to significant performance loss or mechanical failure.

5. Flight Crew Training:

Flight crew training for this type of operation should include, in addition to the requirements of Part MS, particular emphasis on the following:

a. Fuel management - Verifying required fuel on board prior to departure and monitoring fuel on board en-route including calculation of fuel remaining. Procedures should provide for an independent cross-check of fuel quantity indicators (e.g. fuel flow used to calculate fuel burned compared to indicate fuel remaining). Confirmation that the fuel remaining is sufficient to satisfy the critical fuel reserves;

b. Procedures for single and multiple failures in-flight that may give rise to go/no-go and diversion decisions - Policy and guidelines to aid the flight crew in the diversion decision making process and the need for constant awareness of the closest suitable alternate aerodrome in terms of time;

c. OEI performance data - Drift down procedures and OEI service ceiling data;

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

6. Pre-departure check:

A pre-departure check, additional to the pre-flight inspection required by Part-M should be reflected in the operations manual. Flight crew members who are responsible for the pre-departure check of an aeroplane should be fully trained and competent to do so. The training programme required should cover all relevant tasks with particular emphasis on checking required fluid levels.

7. MEL:

The MEL should take into account all items specified by the manufacturer relevant to operations in accordance with this AMC.

8. Dispatch/flight planning requirements:

The operator's dispatch requirements should address the following:

a. Fuel and oil supply - An aeroplane should not be dispatched on an extended range flight unless it carries sufficient fuel and oil to comply with the applicable operational requirements and any additional reserves determined in accordance with the following:

i. Critical fuel scenario - The critical point is the furthest point from an alternate aerodrome assuming a simultaneous failure of an engine and the pressurisation system. For those aeroplanes that are type certificated to operate above Flight Level 450, the critical point is the furthest point from an alternate aerodrome assuming an engine failure. The operator should carry additional fuel for the worst case fuel burn condition (one engine vs. two engines operating), if this is greater than the additional fuel calculated in accordance with Part-OPS fuel requirements, as follows:

A. Fly from the critical point to an alternate aerodrome:

1. At 10 000ft; or

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

3. At the single-engine ceiling, provided that the aeroplane is type certificated to operate above Flight Level 450;

B. Descend and hold at 1 500 ft for 15 minutes in ISA conditions;

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

D. A normal approach and landing;

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

iii. APU operation - If an APU has to be used to provide additional electrical power, consideration should be given to the additional fuel required;

b. Communication facilities - The availability of communications facilities in order to allow reliable two-way voice communications between the aeroplane and the appropriate air traffic control unit at OEI cruise altitudes;

c. Aircraft Technical Log review to ensure proper MEL procedures, deferred items, and required maintenance checks completed;

d. ERA aerodrome(s) - Ensuring that ERA aerodromes are available for the intended route, within 180 minutes based upon the OEI cruise speed which is a speed within the certificated limits of the aeroplane, selected by the operator, and confirmation that, based on the available meteorological information, the weather conditions at ERA aerodromes are at or above the applicable minima for the period of time during which the aerodrome(s) may be used.

Table 1 of AMC OPS.CAT.225.A(c) - Planning minima

Approach Facility	Alternate Airfield Ceiling	Weather Minima Visibility/RVR
Precision Approach procedure	Authorised DH/DA plus an increment of 200 ft	Authorised visibility plus an increment of 800 metres
Non-Precision Approach or Circling Approach	Authorised MDA/H plus an increment of 400 ft	Authorised visibility plus an increment of 1 500 m

AMC OPS.CAT.230.A Pushback and towing - Aeroplanes

TOWBARLESS TOWING

1. Towbarless towing should be based on the applicable SAE ARP (Aerospace Recommended Practices), i.e. 4852B/4853B/5283 (as amended).

2. Pre- or post-taxi positioning of the aeroplane should only be executed by towbarless towing when:

   a. the aeroplane is protected by its own design from damage to the nose wheel steering system due to towbarless towing operation; or

   b. a system/procedure is provided to alert the flight crew that such damage may have or has occurred; or

   c. the towbarless towing vehicle is designed to prevent damage to the aeroplane type.

AMC OPS.CAT.235 Air Traffic Services - motor-powered aircraft

GENERAL

1. In-flight operational instructions involving a change to the air traffic flight plan should be co-ordinated with the appropriate ATS unit.

2. When unable to submit or to close the ATS flight plan due to lack of ATS facilities or any other means of communications to ATS, an operator should alert search and rescue services.

3. To ensure that each flight is located at all times, the operator should:

   a. have available the information required to be included in a VFR flight plan, and the location, date and estimated time for re-establishing communications;

b. if an aeroplane is overdue or missing, provide for notification to the appropriate ATS or search and rescue facility; and

c. make provisions for the information to be retained at a designated place until completion of the flight.

4. Local area operations encompass usually an area within a distance of 20 - 25 nm.

5. For VFR day operations of single-engined aeroplanes by day, non-mandatory contact with ATS should be maintained to the extent appropriate to the nature of the operation.

Section III - Aircraft performance and operating limitations

AMC OPS.CAT.316.A(a) Performance General – Aeroplanes

USE OF CHARTS FOR TAKE-OFF, IN-FLIGHT AND LANDING

An operator should take account of the charting accuracy when assessing compliance with the performance requirements.

AMC OPS.CAT.316.A(a)(1) Performance General – Aeroplanes

AEROPLANE PERFORMANCE CLASSES

Aeroplanes should be classified into three performance classes:

1. Performance Class A. Performance class A aeroplanes should be multi-engined aeroplanes powered by turbo-propeller engines with a maximum passenger seating configuration of more than 9 or a maximum take-off mass exceeding 5 700 kg, and all multi-engined turbojet powered aeroplanes.
2. Performance Class B. Performance class B aeroplanes should be aeroplanes powered by propeller engines with a maximum passenger seating configuration of 9 or less and a maximum take-off mass of 5 700 kg or less.
3. Performance Class C. Performance class C aeroplanes should be aeroplanes powered by reciprocating engines with a maximum passenger seating configuration of more than 9 or a maximum take-off mass exceeding 5 700 kg.

AMC OPS.CAT.316.A(a)(2) Performance General – Aeroplanes

AEROPLANE FLIGHT MANUAL DATA

1. Operational factors. When applying factors, account may be taken of any operational factors already incorporated in the Aeroplane Flight Manual (AFM) performance data to avoid double application of factors.
2. Reverse thrust credit for landing. Landing distance data included in the AFM (or Pilot Operating Handbook (POH), etc.) with credit for reverse thrust can only be considered to be approved for the purpose of showing compliance with the applicable requirements if it contains a specific statement from the applicable competent authority responsible for type design that it complies with a recognised airworthiness code (e.g. CS-23/25, FAR 23/25, JAR 23/25 or equivalent).
3. Factoring of Automatic Landing Distance Performance Data for Performance Class A Aeroplanes. In those cases, where the landing requires the use of an automatic landing system, and the distance published in the AFM includes safety margins that are equivalent to those contained in AMC OPS.CAT.345(a).A, the landing mass of the aeroplane should be the lesser of:
    a. the landing mass determined in accordance with AMC OPS.CAT.325(a)(4).A, as appropriate; or
    b. the landing mass determined for the automatic landing distance for the appropriate surface condition as given in the AFM or equivalent document. Increments due to system features such as beam location or elevations, or procedures such as use of overspeed, should also be included.

AMC OPS.CAT.316.A(a)(3) Performance General – Aeroplanes

PERFORMANCE ON WET AND CONTAMINATED RUNWAYS

1. For a wet and contaminated runway:

   a. the performance data should be determined in accordance with CS 25.1591 or equivalent;

   b. if the performance data has been determined on the basis of a measured runway friction coefficient, a procedure correlating the measured runway friction coefficient and the effective braking coefficient of friction of the aeroplane type over the required speed range for the existing runway conditions should be applied; and

   c. on a wet or contaminated runway, the take-off mass should not exceed that permitted for a take-off on a dry runway under the same conditions.

2. For performance purposes, an operator should consider a damp runway, other than a grass runway, to be dry.

AMC OPS.CAT.316.A(a)(4) Performance General – Aeroplanes

MASS OF THE AEROPLANE FOR TAKE-OFF, IN-FLIGHT AND LANDING

1. Take-off and in-flight mass. The mass of the aeroplane at the start of the take-off or, in the event of in-flight re-planning, at the point from which the revised operational flight plan applies should not be greater than the mass at which the requirements can be complied with for the flight to be undertaken allowing for expected reductions in mass as the flight proceeds, and for fuel jettisoning as is provided for in the particular provision.

   When determining the maximum permitted take-off mass, in addition to AMC1 OPS.GEN.320.A(a), an operator should also take into account the following:

   a. the impact of engine failures on the take-off distance required;

   b. the runway slope in the direction of take-off as indicated in Appendix 1 to AMC OPS.CAT.325.A(a)(4); and

   c. the loss, if any, of runway length due to alignment of the aeroplane prior to take-off as indicated in Appendix 2 to AMC OPS.CAT.325.A(a)(4).

2. Landing mass. The landing mass of the aeroplane should not exceed the maximum landing mass specified for the altitude and the ambient temperature expected for the estimated time of landing at the destination and alternate aerodrome.

3. Landing mass for missed approach for Performance Class A aeroplanes.

   a. For instrument approaches with a missed approach gradient greater than 2.5%. an operator should verify that the expected landing mass of the aeroplane allows a missed approach with a climb gradient equal to or greater than the applicable missed approach gradient in the one-engine inoperative missed approach configuration and speed (CS 25.121(d) / JAR-25.121(d)); and

   b. For instrument approaches with decision heights below 200 ft, an operator should verify that the expected landing mass of the aeroplane allows a missed approach gradient of climb, with the critical engine failed and with the speed and configuration used for go-around of at least 2.5%, or the published gradient, whichever is the greater (CS-AWO 243 / JAR-AWO 243).

4. For Performance Class C aeroplanes, the maximum landing mass specified for the altitude and the ambient temperature expected for the estimated time of landing at the destination and alternate aerodrome is the one specified in the AFM.

Appendix 1 to AMC OPS.CAT.316.A(a)(4) Performance General – Aeroplanes

RUNWAY SLOPE IN THE DIRECTION OF TAKE-OFF FOR PERFORMANCE CLASS B AND CLASS C AEROPLANES

Unless otherwise specified in the AFM or other performance or operating manuals from the manufacturer, the take-off distance should be increased by 5% for each 1% of upslope except that correction factors for runways with slopes in excess of 2% should only be applied when the operator has demonstrated to the competent authority that he/she has the necessary data in the AFM, the Operations Manual (OM) contain the appropriated procedures and the crew is training to take-off in runway with slopes in excess of 2%.

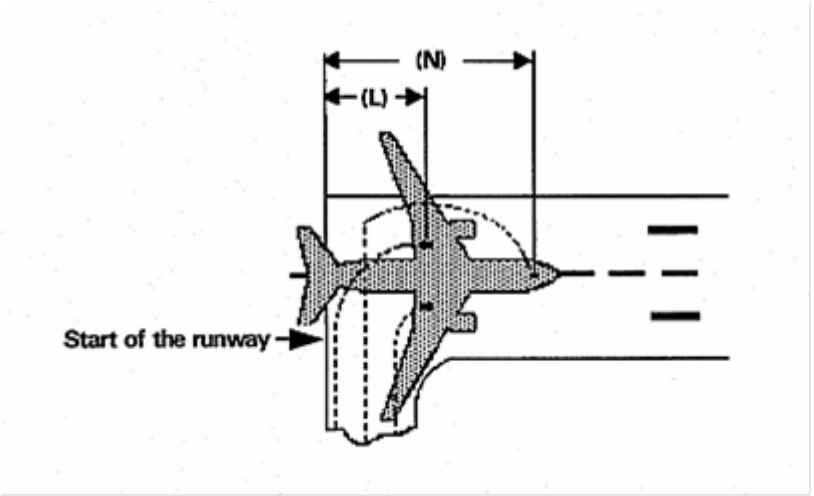
Appendix 2 to AMC OPS.CAT.316.A(a)(4) Performance General – Aeroplanes

LOSS OF RUNWAY LENGTH DUE TO ALIGNMENT FOR TAKE-OFF - PERFORMANCE CLASS A AND C AEROPLANES

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

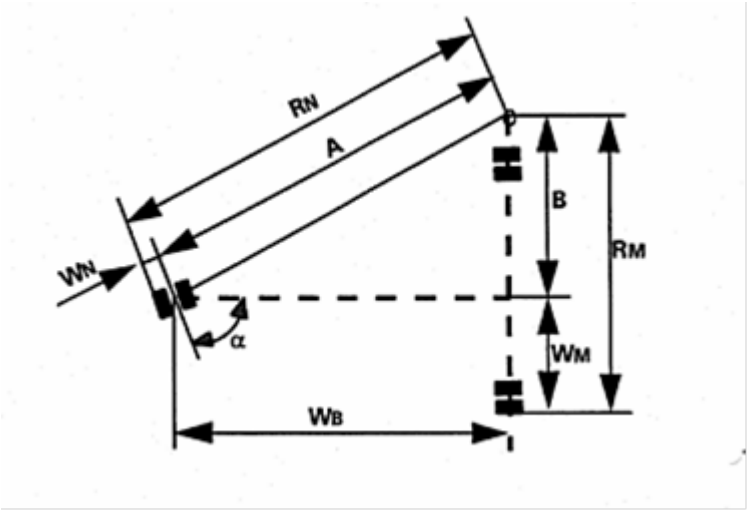
   a. The minimum distance of the main wheels from the start of the runway for determining TODA and TORA,"L"; and

   b. The minimum distance of the most forward wheel(s) from the start of the runway for determining ASDA,"N".



Where the aeroplane manufacturer does not provide the appropriate data, the calculation method given in 2. below may be used to determine the alignment distance.

2. Alignment Distance Calculation



The distances mentioned in a. and b. of 1. above are:

	90° ENTRY	180° TURNAROUND
L=	RM + X	RN + Y
N=	RM + X + WB	RN + Y + WB

$$\text{where:} \quad RN = A + WN = \frac{WB}{\cos(90°-\alpha)} + WN$$

$$\text{and} \quad RM = B + WM = WB \tan(90°-\alpha) + WM$$

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

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

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

RN = Radius of turn of outer nose wheel

RM = Radius of turn of outer main wheel

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

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

WB = Wheel base

α = Steering angle

AMC OPS.CAT.316.A(c) Performance General – Aeroplanes

TAKE-OFF AND LANDING CLIMB FOR CLIMB CRITERIA FOR PERFORMANCE CLASS B AEROPLANES

1. The climb criteria should be those required by the applicable airworthiness code (e.g. CS 23.63(c)(1); CS 23.63(c)(2) or equivalent).

2. Take-off Climb

a. All Engines Operating (AEO)

The steady gradient of climb after take-off should be at least 4% with:

i. take-off power on each engine;

ii. the landing gear extended except that if the landing gear can be retracted in not more than 7 seconds, it may be assumed to be retracted;

iii. the wing flaps in the take-off position(s); and

iv. a climb speed not less than the greater of 1.1 V_{MC} and 1.2 V_{S1}.

b. One Engine Inoperative (OEI)

i. The steady gradient of climb at an altitude of 400 ft above the take-off surface should be measurably positive with:

A. the critical engine inoperative and its propeller in the minimum drag position;

B. the remaining engine at take-off power;

C. the landing gear retracted;

D. the wing flaps in the take-off position(s); and

E. a climb speed equal to that achieved at 50 ft.

ii. The steady gradient of climb should be not less than 0.75% at an altitude of 1 500 ft above the take-off surface with:

A. the critical engine inoperative and its propeller in the minimum drag position;

B. the remaining engine at not more than maximum continuous power;

C. the landing gear retracted;

D. the wing flaps retracted; and

E. a climb speed not less than 1.2 V_{S1}.

3. Landing Climb

a. AEO

The steady gradient of climb should be at least 2.5% with:

i. not more than the power or thrust that is available 8 seconds after initiation of movement of the power controls from the minimum flight idle position;

ii. the landing gear extended;

iii. the wing flaps in the landing position; and

iv. a climb speed equal to V_{REF}.

b. OEI

The steady gradient of climb should be not less than 0.75% at an altitude of 1 500 ft above the landing surface with:

i. the critical engine inoperative and its propeller in the minimum drag position;

ii. the remaining engine at not more than maximum continuous power;

iii. the landing gear retracted;

iv. the wing flaps retracted; and

v. a climb speed not less than 1.2 V_{S1}.

GM OPS.CAT.316.A(c) Performance General – Aeroplanes

TAKE-OFF AND LANDING CLIMB FOR PERFORMANCE CLASS B SINGLE-ENGINED AEROPLANES

Limitations on the operation of single-engined aeroplanes are covered by the applicable operational procedures.

AMC1 OPS.CAT.326.A Take-off requirements - Aeroplanes

TAKE-OFF DISTANCES

1. Operators of Performance Class A aeroplanes and for such Performance Class C aeroplanes, for which take-off field length data accounts for engine failures in their AFM, should meet the following when determining the maximum take-off mass:
   a. the accelerate-stop distance should not exceed the accelerate-stop distance available;
   b. the take-off distance should not exceed the take-off distance available, with a clearway distance not exceeding half of the take-off run available;
   c. the take-off run should not exceed the take-off run available; and
   d. compliance with this AMC should be shown using a single value of V1 for the rejected and continued take-off.
2. Operators of Performance Class C aeroplanes for which the AFM does not include engine failure accountability, the distance from the start of the take-off roll required to reach a height of 50 ft above the surface with AEO within the maximum take-off power conditions specified, should not exceed the take-off run available, when multiplied by a factor of either:
   a. 1,33 for aeroplanes having two engines; or
   b. 1,25 for aeroplanes having three engines; or
   c. 1,18 for aeroplanes having four engines.
3. Operators of Performance Class B aeroplanes should ensure that the unfactored take-off distance, as specified in the AFM does not exceed:
   a. when multiplied by a factor of 1.25, the take-off run available; or
   b. when stopway and/or clearway is available, the following:
      i. the take-off run available;
      ii. when multiplied by a factor of 1.15, the take-off distance available; and
      iii. when multiplied by a factor of 1.3, the accelerate-stop distance available.

AMC2 OPS.CAT.326.A Take-off requirements - Aeroplanes

RUNWAY SURFACE CONDITION FOR PERFORMANCE CLASS B AEROPLANES

1. Unless otherwise specified in the AFM or other performance or operating manuals from the manufacturer, the variables affecting the take-off performance and the associated factors that should be applied to the AFM data are shown in the table below. They should be applied in addition to the operational factors in 3. of AMC1 OPS.CAT.326.A.

Surface type	Condition	Factor
Grass (on firm soil) up to 0.2 m long	Dry	1.2
	Wet	1.3
Paved	Wet	1.0

Notes:

1. The soil is firm when there are wheel impressions but no rutting.

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

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

GM1 OPS.CAT.326.A Take-off requirements - Aeroplanes

RUNWAY SURFACE CONDITION FOR PERFORMANCE CLASS B AEROPLANES

1. Due to the inherent risks, operations from contaminated runways are inadvisable and should be avoided whenever possible. Therefore, it is advisable to delay the take-off until the runway is cleared.

2. Where this is impracticable, the pilot-in-command should also consider the excess runway length available including the criticality of the overrun area.

GM2 OPS.CAT.326.A Take-off requirements - Aeroplanes

RUNWAY SURFACE CONDITION FOR PERFORMANCE CLASS A AND CLASS C AEROPLANES

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

2. An adequate overall level of safety will only be maintained if operations in accordance with AMC 25.1591 or equivalent are limited to rare occasions. Where the frequency of such operations on contaminated runways is not limited to rare occasions, operators should provide additional measures ensuring an equivalent level of safety. Such measures could include special crew training, additional distance factoring and more restrictive wind limitations.

AMC1 OPS.CAT.327.A Take-off obstacle clearance - Aeroplanes

GENERAL CONSIDERATIONS

1. When showing compliance with the take-off obstacle clearance requirements, an operator should take account of the following:

   a. the mass of the aeroplane at the commencement of the take-off run;

   b. the pressure altitude at the aerodrome;

   c. the ambient temperature at the aerodrome; and

   d. not more than 50% of the reported head-wind component or not less than 150% of the reported tail-wind component.

2. Adequate allowance should be made for the effect of bank angle (Appendix 1 to AMC1 OPS.CAT.327.A) on operating speeds and flight path including the distance increments resulting from increased operating speeds.

3. For Performance Class B aeroplanes, it should be assumed that:

   a. failure of the critical engine occurs at the point on the all engine take-off flight path where visual reference for the purpose of avoiding obstacles is expected to be lost;

   b. the gradient of the take-off flight path from 50 ft to the assumed engine failure height is equal to the average all-engine gradient during climb and transition to the en-route configuration, multiplied by a factor of 0.77; and

   c. the gradient of the take-off flight path from the height reached above to the end of the take-off flight path is equal to the OEI en-route climb gradient shown in the AFM.

AMC2 OPS.CAT.327.A Take-off obstacle clearance - Aeroplanes

DETERMINATION OF THE HORIZONTAL, VERTICAL AND LATERAL DISTANCES FOR THE TAKE-OFF FLIGHT PATH OBSTACLE CLEARANCES

1. Horizontal distances or vertical margins. Operators should ensure that the take-off flight path clears all obstacles by horizontal or vertical distances as following:

   a. for aeroplanes with a wingspan of 60 m or more, by a horizontal distance of at least 90 m plus 0.125 x D, where D is the horizontal distance the aeroplane has travelled from the end of the take-off distance available or the end of the take-off distance if a turn is scheduled before the end of the take-off distance available;

   b. for aeroplanes with a wingspan of less than 60 m, by a horizontal distance of half the aeroplane wingspan plus 60 m, plus 0.125 x D; or

   c. for Performance Class A aeroplanes (Appendix 1 to AMC2 OPS.CAT.327.A), by a vertical margin of at least 35 ft and for any part of the net take-off flight path in which the aeroplane is banked by more than 15° by a vertical margin of at least 50 ft; or

   d. for Performance Class B (Appendix 2 to AMC2 OPS.CAT.327.A) and Performance Class C aeroplanes, by a vertical margins of at least 50 ft.

2. Where the intended take-off flight path does not require track changes of more than 15°, an operator does not need to consider those obstacles which have a lateral distance greater than:

   a. 300 m, if the pilot is able to maintain the required navigational accuracy (Appendix 3 to AMC2 OPS.CAT.327.A) through the obstacle accountability area; or

   b. 600 m, for flights under all other conditions.

3. Where the intended take-off flight path does require track changes of more than 15°, an operator does not need to consider those obstacles which have a lateral distance greater than:

   a. 600 m, if the pilot is able to maintain the required navigational accuracy (Appendix 3 to AMC2 OPS.CAT.327.A) through the obstacle accountability area; or

   b. 900 m for flights under all other conditions.

4. For the compliance with 1. to 3. above, it should be assumed that:

   a. track changes are not allowed up to the point at which:

      i. the take-off flight path for Performance Class B and C aeroplanes is not less than 50 ft above the elevation of the end of the take-off run available; and

ii. the net take-off flight path for Performance Class A aeroplanes has achieved a height equal to one half the wingspan but not less than 50 ft above the elevation of the end of the take-off run available.

b. thereafter, up to a height of 400 ft the aeroplane is banked by no more than 15°;

c. above 400 ft, the aeroplane is banked by no more than 25° for Performance Class A and C aeroplanes.

5. Operators of Performance Class A aeroplanes may use special procedures, to apply increased bank angles (Appendix 4 to AMC2 OPS.CAT.327.A) of not more than 20º between 200 ft and 400 ft, or not more than 30º above 400 ft.

6. For showing compliance with 2.a. and 3.b above, operators of Performance Class B aeroplanes should ensure that the flight is conducted under conditions allowing visual course guidance navigation, or if navigational aids are available, enabling the pilot to maintain the intended flight path with the same accuracy.

GM1 OPS.CAT.327.A Take-off obstacle clearance - Aeroplanes

OBSTACLE CLEARANCE IN LIMITED VISIBILITY FOR PERFORMANCE CLASS B AEROPLANES

1. Unlike the airworthiness codes applicable for Performance Class A aeroplanes, those for Performance Class B aeroplanes do not necessarily provide for engine failure in all phases of flight. It is accepted that performance accountability for engine failure need not be considered until a height of 300 ft is reached.

2. The weather minima given up to and including 300 ft imply that if a take-off is undertaken with minima below 300 ft a OEI flight path should be plotted starting on the all-engine take-off flight path at the assumed engine failure height. This path should meet the vertical and lateral obstacle clearance specified AMC2 OPS.CAT.327.A. Should engine failure occur below this height, the associated visibility is taken as being the minimum which would enable the pilot to make, if necessary, a forced landing broadly in the direction of the take-off. At or below 300 ft, a circle and land procedure is extremely inadvisable. The weather minima requirements specify that, if the assumed engine failure height is more than 300 ft, the visibility should be at least 1 500 m and, to allow for manoeuvring, the same minimum visibility should apply whenever the obstacle clearance criteria for a continued take-off cannot be met.

Appendix 1 to AMC1 OPS.CAT.327.A Take-off obstacle clearance - Aeroplanes

EFFECT OF BANK ANGLES

1. The AFM generally provides a climb gradient decrement for a 15° bank turn.

2. Unless otherwise specified in the AFM or other performance or operating manuals from the manufacturer, acceptable adjustments to assure adequate stall margins and gradient corrections are provided by the following:

BANK	SPEED	GRADIENT CORRECTION
15°	V_2	1 x AFM 15° Gradient Loss
20°	V_2 + 5 kt	2 x AFM 15° Gradient Loss
25°	V_2 + 10 kt	3 x AFM 15° Gradient Loss

3. For bank angles of less than 15°, a proportionate amount should be applied, unless the manufacturer or the AFM provides other data.

Appendix 1 to AMC2 OPS.CAT.327.A Take-off obstacle clearance - Aeroplanes

TAKE-OFF OBSTACLE CLEARANCE FOR PERFORMANCE CLASS A AEROPLANES

1. In accordance with the definitions used in preparing the take-off distance and take-off flight path data provided in the AFM:

   a. The net take-off flight path is considered to begin at a height of 35 ft above the runway or clearway at the end of the take-off distance determined for the aeroplane in accordance with b. below.

   b. The take-off distance is the longest of the following distances:

      i. 115% of the distance with AEO from the start of the take-off to the point at which the aeroplane is 35 ft above the runway or clearway; or

      ii. the distance from the start of the take-off to the point at which the aeroplane is 35 ft above the runway or clearway assuming failure of the critical engine occurs at the point corresponding to the decision speed (V_1) for a dry runway; or

      iii. if the runway is wet or contaminated, the distance from the start of the take-off to the point at which the aeroplane is 15 ft above the runway or clearway assuming failure of the critical engine occurs at the point corresponding to the decision speed (V_1) for a wet or contaminated runway.

2. The net take-off flight path, determined from the data provided in the AFM in accordance with 1.a. and 1.b. above, should clear all relevant obstacles by a vertical distance of 35 ft. When taking off on a wet or contaminated runway and an engine failure occurs at the point corresponding to the decision speed (V_1) for a wet or contaminated runway, this implies that the aeroplane can initially be as much as 20 ft below the net take-off flight path in accordance with 1. above and, therefore, may clear close-in obstacles by only 15 ft. When taking off on wet or contaminated runways, the operator should exercise special care with respect to obstacle assessment, especially if a take-off is obstacle limited and the obstacle density is high.

Appendix 2 to AMC2 OPS.CAT.335.A Take-off obstacle clearance - Aeroplanes

TAKE-OFF FLIGHT PATH CONSTRUCTION FOR PERFORMANCE CLASS B AEROPLANES

1. For demonstrating that an aeroplane clears all obstacles vertically, a flight path should be constructed consisting of an all-engine segment to the assumed engine failure height, followed by an engine-out segment. Where the AFM does not contain the appropriate data, the approximation given in 2. below may be used for the all-engine segment for an assumed engine failure height of 200 ft, 300 ft, or higher.

2. Flight Path Construction

   a. All-Engines Segment (50 ft to 300 ft). The average all-engines gradient for the all-engines flight path segment starting at an altitude of 50 ft at the end of the take-off distance ending at or passing through the 300 ft point is given by the following formula:

      VICKI EQUATION

$$Y_{300} = \frac{0.57(Y_{ERC})}{1+(V_{ERC}^2 - V_2^2)/5647}$$

      where:

      Y_{300} = Average all-engines gradient from 50 ft to 300 ft

      Y_{ERC} = Scheduled all engines en-route gross climb gradient

V_{ERC} = En-route climb speed, all engines knots True Airspeed (TAS)

V_2 = Take-off speed at 50 ft, knots TAS

A graphical presentation is shown in Figure 4 below.

Note: The factor of 0.77 required in order to take into account the effect of engine failure is already included.

b. All-Engines Segment (50 ft to 200 ft). (May be used as an alternative to a. above where weather minima permits.) The average all-engine gradient for the all-engine flight path segment starting at an altitude of 50 ft at the end of the take-off distance ending at or passing through the 200 ft point is given by the following formula:

$$Y_{200} = \frac{0.51(Y_{ERC})}{1+(V_{ERC}^2 - V_2^2)/3388}$$

where:

Y_{200} = Average all-engines gradient from 50 ft to 200 ft

Y_{ERC} = Scheduled all engines en-route gross climb gradient

V_{ERC} = En-route climb speed, all engines, knots TAS

V_2 = Take-off speed at 50 ft, knots TAS

A graphical presentation is shown in Figure 5 below.

Note: The factor of 0.77 required in order to take into account the effect of engine failure is already included.

c. All-Engines Segment (above 300 ft). The all-engines flight path segment continuing from an altitude of 300 ft is given by the AFM en-route gross climb gradient, multiplied by a factor of 0•77.

d. The OEI Flight Path. The OEI flight path is given by the OEI gradient chart contained in the AFM.

3. Examples of the method described are the following:

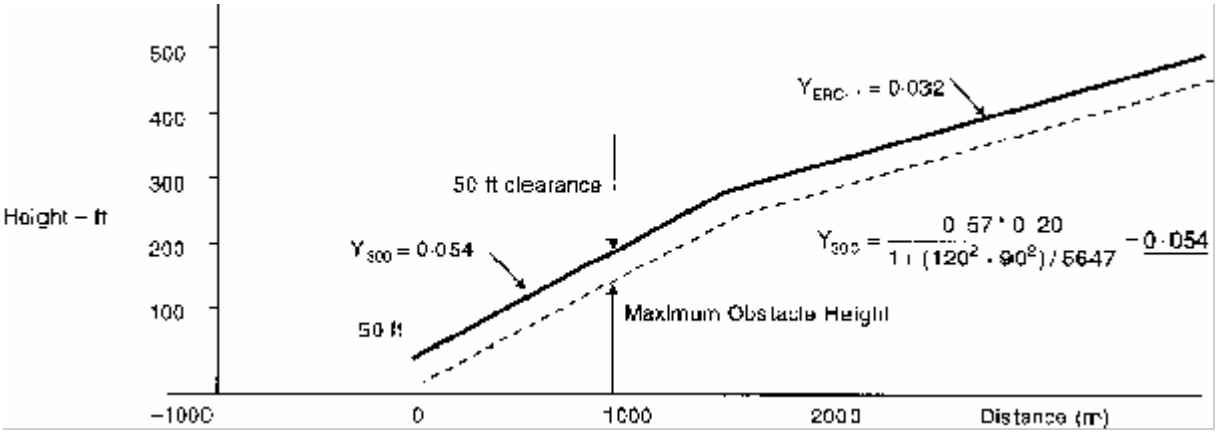
The examples shown below are based on an aeroplane for which the AFM shows, at a given mass, altitude, temperature and wind component the following performance data:

Factored take-off distance	=	1 000 m
Take-off speed, V_2	=	90 kt
En-route climb speed, V_{ERC}	=	120 kt
En-route all-engine climb gradient, Y_{ERC}	=	0•200
En-route OEI climb gradient, Y_{ERC}-1	=	0•032

a. Assumed Engine Failure Height 300 ft. The average all-engine gradient from 50 ft to 300 ft may be read from Figure 4 or calculated with the following formula:

$$Y_{300} = \frac{0.57(Y_{ERC})}{1+(V_{ERC}^2 - V_2^2)/5647}$$

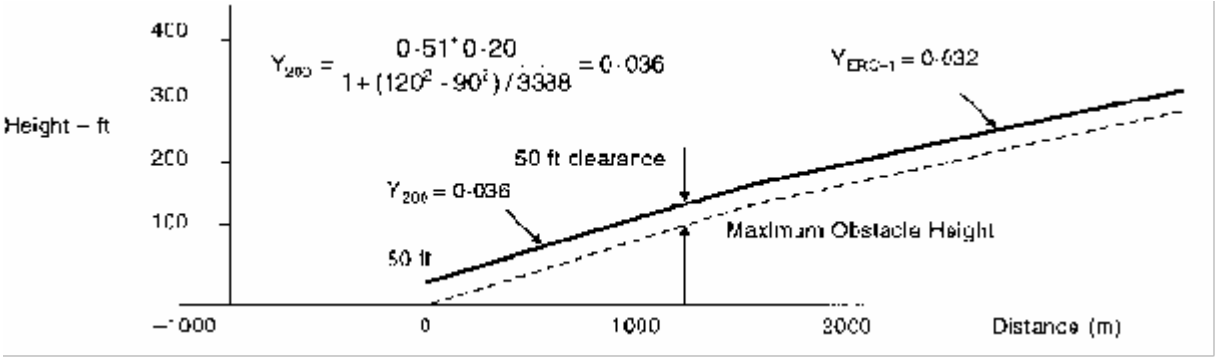
Figure 1



b. Assumed engine failure height 200 ft. The average all-engine gradient from 50 ft to 200 ft may be read from Figure 5 or calculated with the following formula:

$$Y_{200} = \frac{0.51(Y_{ERC})}{1+(V_{ERC}^2 - V_2^2)/3388}$$

Figure 2



c. Assumed engine failure height less than 200 ft. Construction of a take-off flight path is only possible if the AFM contains the required flight path data.

d. Assumed engine failure height more than 300 ft. The construction of a take-off flight path for an assumed engine failure height of 400 ft is shown in Figure 3.

Figure 3

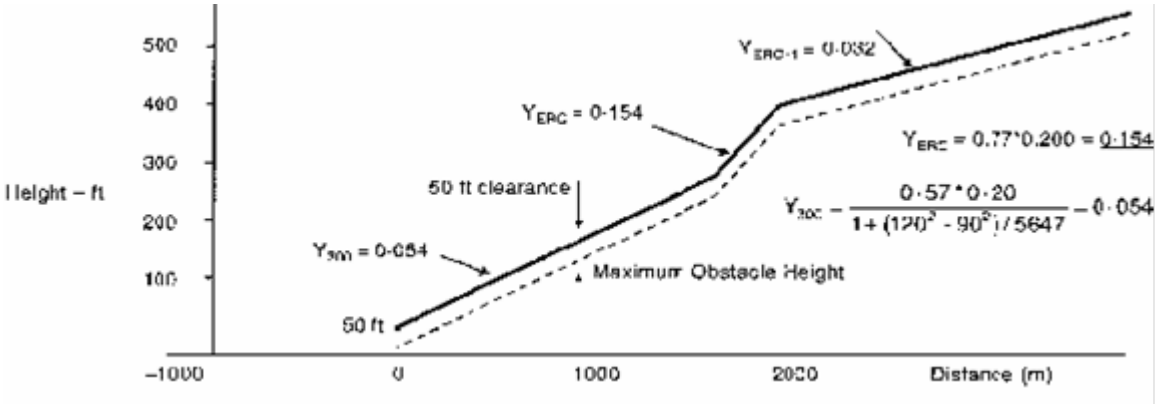


Figure 4

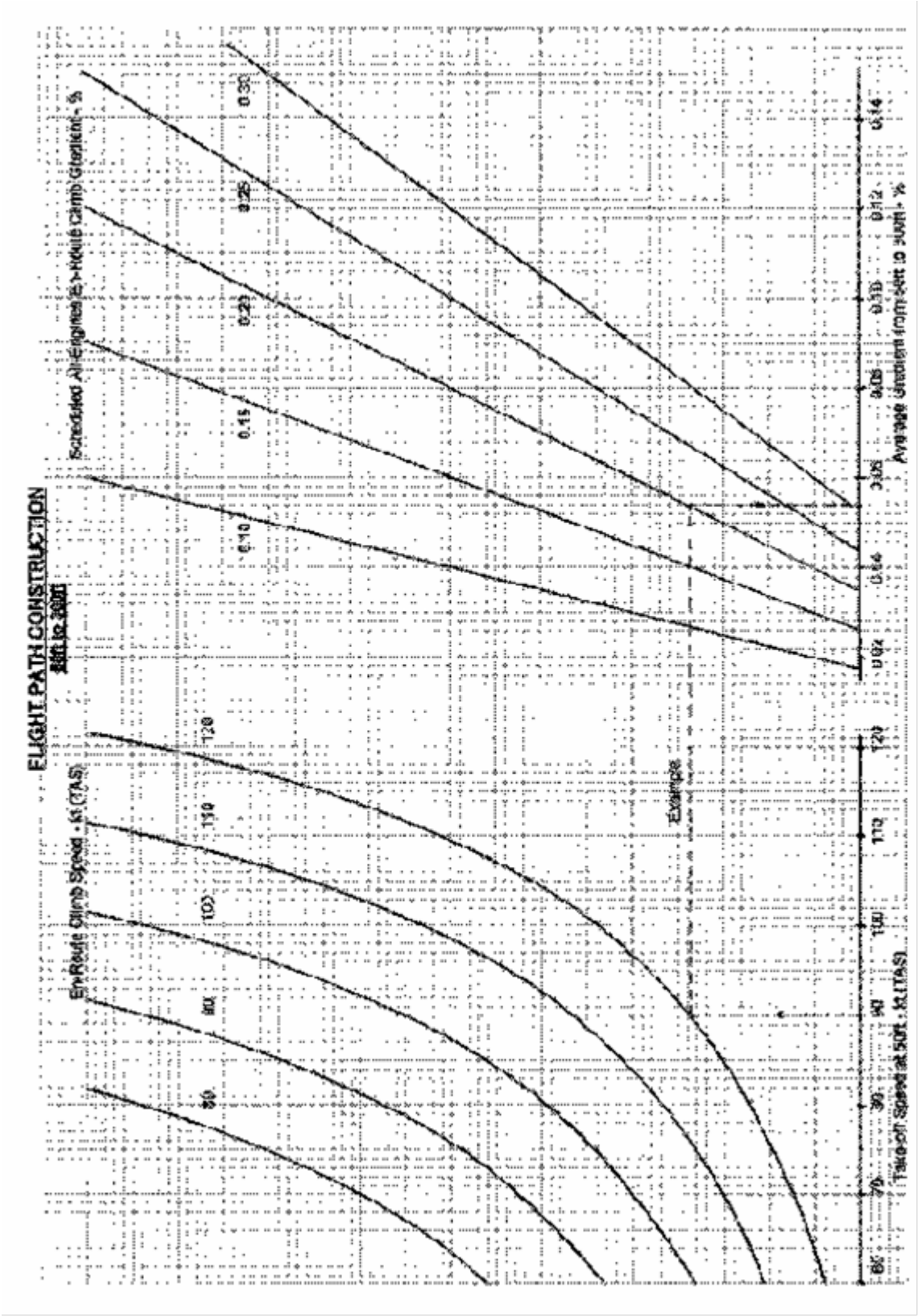
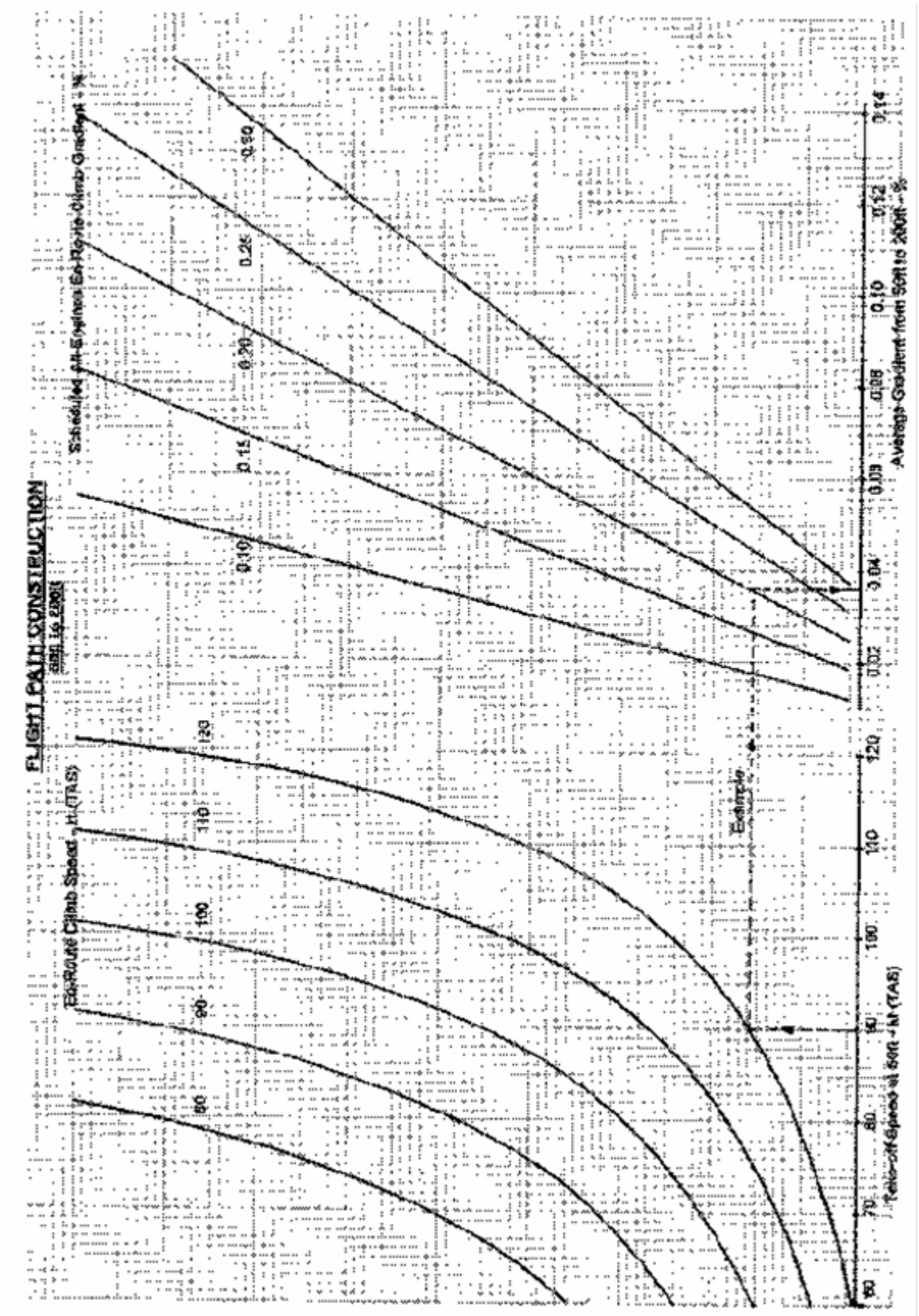

FLIGHT PATH CONSTRUCTION
En Route Climb Speed - kt (TAS)
Scheduled All-Engines (2) En-Route Climb Gradient - %
Example
Take-off Speed at 50ft - kt (TAS)
Average Gradient from 400ft to 3000ft - %

Figure 5


FLIGHT PATH CONSTRUCTION
Schedule of All Engines En Route Climb Gradient %
En Route Climb Speed - kt (TAS)
Average Gradient from 5000 to 2000ft - %
Example
Take-off Speed at 500ft - kt (TAS)

Appendix 3 to AMC2 OPS.CAT.327.A Take-off obstacle clearance - Aeroplanes

TAKE-OFF FLIGHT PATH – REQUIRED NAVIGATIONAL ACCURACY FOR PERFORMANCE CLASS A AND CLASS B AEROPLANES

1. Flight-deck systems. The obstacle accountability semi-widths of 300 m and 600 m may be used if the navigation system under OEI conditions provides a two standard deviation (2 s) accuracy of 150 m and 300 m respectively.

2. Visual Course Guidance

   a. The obstacle accountability semi-widths of 300 m may be used where navigational accuracy is ensured at all relevant points on the flight path by use of external references. These references may be considered visible from the flight deck if they are situated more than 45° either side of the intended track and with a depression of not greater than 20° from the horizontal.

   b. For visual course guidance navigation, an operator should ensure that the weather conditions prevailing at the time of operation, including ceiling and visibility, are such that the obstacle and/or ground reference points can be seen and identified. The OM should specify, for the aerodrome(s) concerned, the minimum weather conditions which enable the flight crew to continuously determine and maintain the correct flight path with respect to ground reference points, so as to provide a safe clearance with respect to obstructions and terrain as follows:

      i. the procedure should be well defined with respect to ground reference points so that the track to be flown can be analysed for obstacle clearance requirements;

      ii. the procedure should be within the capabilities of the aeroplane with respect to forward speed, bank angle and wind effects;

      iii. a written and/or pictorial description of the procedure should be provided for crew use;

      iv. the limiting environmental conditions (such as wind, the lowest cloud base, ceiling, visibility, day/night, ambient lighting, obstruction lighting) should be specified.

Appendix 4 to AMC 2 OPS.CAT.327.A Take-off obstacle clearance - Aeroplanes

APPROVAL OF INCREASED BANK ANGLES FOR PERFORMANCE CLASS A AEROPLANES

For the use of increased bank angles, the following criteria should be met:

1. the AFM should contain approved data for the required increase of operating speed and data to allow the construction of the flight path considering the increased bank angles and speeds;

2. visual guidance should be available for navigation accuracy;

3. weather minima and wind limitations should be specified for each runway and should be specified in the OM; and

4. training in accordance with the applicable training requirements for flight crew in Part-OR.

AMC OPS.CAT.340.A(a) En-Route requirements - Aeroplanes

SINGLE-ENGINED AEROPLANES

1. Operators should first increase the scheduled engine-inoperative gliding performance data by 0.5% gradient when verifying the en-route clearance of obstacles and the ability to reach a suitable place for a forced landing.

2. OPS.CAT.340.A subparagraph (a) requires an operator to ensure that in the event of an engine failure, the aeroplane should be capable of reaching a point from which a successful forced landing can be made. Unless otherwise specified by the competent authority, this point should be 1 000 ft above the intended landing area.

GM OPS.CAT.340.A(a) En-Route requirements - Aeroplanes

SINGLE-ENGINED AEROPLANES

1. In the event of an engine failure, single-engined aeroplanes have to rely on gliding to a point suitable for a safe forced landing. Such a procedure is clearly incompatible with flight above a cloud layer which extends below the relevant minimum safe altitude.

2. The altitude at which the rate of climb equals 300 ft per minute is not a restriction on the maximum cruising altitude at which the aeroplane can fly in practice; it is merely the maximum altitude from which the engine-inoperative procedure can be planned to start.

GM OPS.CAT.340.A(b) En-Route requirements - Aeroplanes

MINIMUM ALTITUDES FOR SAFE FLIGHT

The minimum altitudes for safe flight on each stage of the route to be flown or of any planned diversion therefrom should be specified in the OM.

AMC OPS.CAT.340.A(c) En-Route requirements - Aeroplanes

ONE ENGINE INOPERATIVE

1. For Performance Class A aeroplanes, the net flight path should take account of the following criteria:

   a. the flight path should clear obstacles (Appendix 1 to AMC OPS.CAT.340.A(c)) within 9.3 km (5 nautical miles (nm)) on either side of the intended track or by a vertical interval of at least 2 000 ft; and

   b. the necessary increase of the width margins of sub-paragraph a. to 18.5 km (10 nm) if the navigational accuracy does not meet the 95% containment level;

   c. the engine is assumed to fail at the most critical point along the route;

   d. account is taken of the effects of winds on the flight path;

   e. fuel jettisoning is permitted to an extent consistent with reaching the aerodrome with the required fuel reserves, if a safe procedure is used; and

   f. the aerodrome where the aeroplane is assumed to land after engine failure should meet the following criteria:

      i. the performance requirements at the expected landing mass are met; and

      ii. weather reports or forecasts, or any combination thereof, and field condition reports indicate that a safe landing can be accomplished at the estimated time of landing.

2. For Performance Class B aeroplanes, the flight path should take account of the following criteria:

   a. the relevant minimum altitudes for safe flight should be stated in the OM to a point 1 000 ft above an aerodrome;

   b. the aeroplane should not be assumed to be flying at an altitude exceeding that at which the rate of climb equals 300 ft per minute with AEO within the maximum continuous power conditions specified; and

c. the assumed en-route gradient with OEI should be the gross gradient of descent or climb, as appropriate, respectively increased by a gradient of 0.5%, or decreased by a gradient of 0.5%.

3. For Performance Class C aeroplanes, the flight path should take account of the following criteria:

a. the flight path should clear obstacles (Appendix 1 AMC OPS.CAT.340(c).A) within 9.3 km (5 nm) either side of the intended track by a vertical interval of at least:

i. 1 000 ft when the rate of climb is zero or greater; or

ii. 2 000 ft when the rate of climb is less than zero.

b. the necessary increase of the width margins of 3.a. above to 18.5 km (10 nm) if the navigational accuracy does not meet the 95% containment level;

c. the flight path should have a positive slope at an altitude of 450 m (1 500 ft) above the aerodrome where the landing is assumed to be made after the failure of one engine.

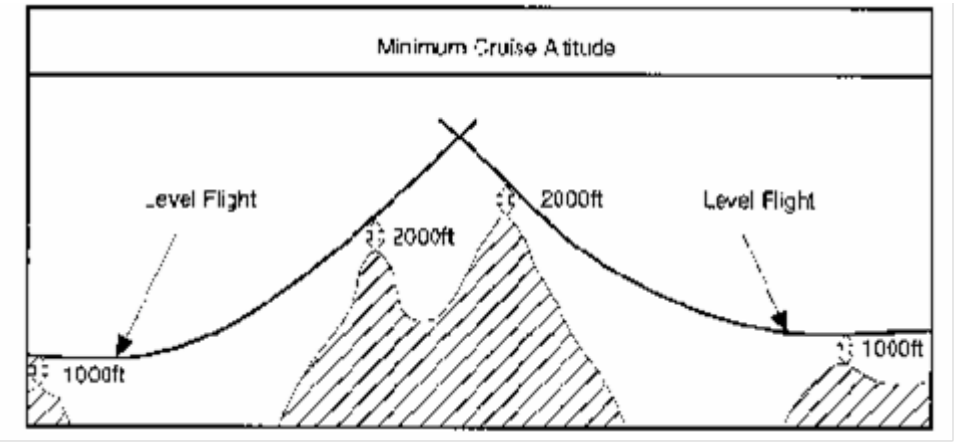
d. For the purpose of 3. the available rate of climb of the aeroplane should be taken to be 150 ft per minute less than the gross rate of climb specified; and

e. fuel jettisoning is permitted to an extent consistent with reaching the aerodrome with the required fuel reserves, if a safe procedure is used.

Appendix 1 AMC OPS.CAT.340.A(c) En-Route requirements - Aeroplanes

1. For performance class A and C aeroplanes, the high terrain or obstacle analysis required in AMC OPS.CAT.A.340(c) may be carried out by making a detailed analysis of the route. This should be made using contour maps of the high terrain and plotting the highest points within the prescribed corridor's width along the route. The next step is to determine whether it is possible to maintain level flight with OEI 1 000 ft above the highest point of the crossing. If this is not possible, or if the associated weight penalties are unacceptable, a drift down procedure should be worked out, based on engine failure at the most critical point and clearing critical obstacles during the drift down by at least 2 000 ft. The minimum cruise altitude is determined by the intersection of the two drift down paths, taking into account allowances for decision making (Figure 1).

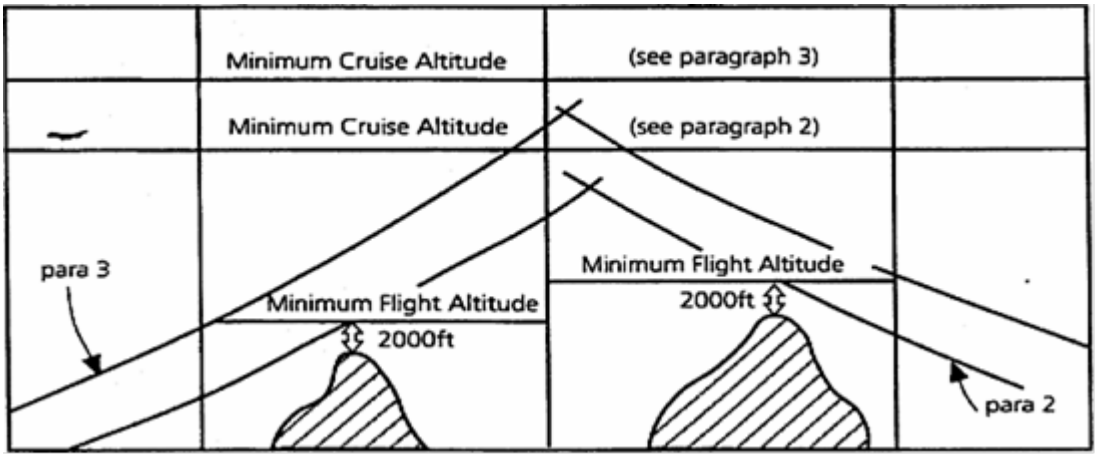
Figure 1



2. For Performance class A aeroplanes, the published minimum flight altitudes (Minimum En-route Altitude (MEA), or Minimum Off Route Altitude (MORA)) may also be used for determining whether OEI level flight is feasible at the minimum flight altitude or if it is necessary to use the published minimum flight altitudes as the basis for the drift down construction (Figure 2). This procedure avoids a detailed high terrain contour analysis but may be more penalising than taking the actual terrain profile into account as in 1.

above. One means of compliance with AMC OPS.CAT.340(c).A subparagraph 1.b. may be the use of MORA and MEA provided that the aeroplane meets the navigational equipment standard assumed in the definition of MEA.

Figure 2



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

AMC OPS.CAT.340.A(d) En-route requirements - aeroplanes

THREE- OR MORE-ENGINED AEROPLANES - TWO ENGINES INOPERATIVE

1. For Performance Class A aeroplanes:

   a. at altitudes and in meteorological conditions requiring ice protection systems to be operable, the effect of their use on the net flight path data should be taken into account; and

   b. the net flight path should have a positive gradient at 1 500 ft above the aerodrome where the landing is assumed to be made after the failure of two engines.

2. For Performance Class A and Class C aeroplanes, the net flight path or flight path respectively should take into account the following:

   a. the net flight path and flight path should clear vertically, by at least 2 000 ft all terrain and obstructions along the route within 9.3 km (5 nm) on either side of the intended track; and

   b. if the navigational accuracy does not meet the 95% containment level, an operator should increase the width margin given above to 18.5 km (10 nm).

3. The two engines are assumed to fail at the most critical point of that portion of the route where the aeroplane is more than 90 minutes, at the all engines long range cruising speed at standard temperature in still air, away from an aerodrome at which the performance requirements applicable at the expected landing mass are met.

4. Fuel jettisoning is permitted to an extent consistent with reaching the aerodrome with the required fuel reserves, if a safe procedure is used.

5. The expected mass of the aeroplane at the point where the two engines are assumed to fail should not be less than that which would include sufficient fuel to proceed to an aerodrome where the landing is assumed to be made, and to arrive there at least 1 500 ft directly over the landing area and thereafter to fly level for 15 minutes.

AMC1 OPS.CAT.345.A(a)(1) Landing requirements - Aeroplanes

DESTINATION AND ALTERNATE AERODROMES

1. For Performance Class A aeroplanes, the required missed approach gradient may not be achieved by all aeroplanes when operating at or near maximum certificated landing mass and in engine-out conditions. Operators of such aeroplanes should consider mass, altitude and temperature limitations and wind for the missed approach.

2. As an alternative method, the operator may use an increase in the decision altitude/height or minimum descent altitude/height and/or a contingency procedure (AMC1 OPS.GEN.320.A(b)) providing a safe route and avoiding obstacles.

AMC2 OPS.CAT.345.A(a)(1) Landing requirements - Aeroplanes

DRY RUNWAYS

1. To determine the landing distance, the operator should use either pressure altitude or geometric altitude for the operation and it should be reflected in the OM.

2. For Performance Class A and B aeroplanes, two considerations in determining should be taken into account for the maximum permissible landing mass at the destination and alternate aerodromes:

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

   b. the environmental conditions and circumstances at a particular aerodrome, e.g. the expected wind, or ATC and noise abatement procedures may indicate the use of a different runway. These factors may result in a lower landing mass than that permitted under the first consideration above, in which case, the dispatch should be based on this lesser mass. The expected wind is the wind expected to exist at the time of arrival.

3. For Performance Class B and C aeroplanes, unless otherwise specified in the AFM or other performance or operating manuals from the manufacturer, the variables affecting the landing performance and the associated factors to be applied to the AFM data are shown in the table below. It should be applied in addition to the factor specified in this AMC.

	SURFACE TYPE	FACTOR
Performance Class B	Grass (on firm soil up to 0.2 m long)	1,15
Performance Class C	Grass (on firm soil up to 0.13 m long)	1,20

Note: The soil is firm when there are wheel impressions but no rutting.

4. Threshold limit of the landing distance available. An operator of turbo-jet powered aeroplanes should ensure that the landing mass of that aeroplane for the estimated time of landing allows a full stop landing from 50 ft above the threshold within 60% of the landing distance available at the destination aerodrome and at any alternate aerodrome.

5. When ensuring that the aeroplane is able to operate a full stop landing from 50 ft above the threshold within 70% of the landing distance available at the destination, an operator should take account of the following:

   a. the altitude at the aerodrome;

b. not more than 50% of the head-wind component or not less than 150% of the tail-wind component;

c. the runway surface condition and the type of runway surface; and

d. the runway slope in the direction of landing.

6. When dispatching an aeroplane on a dry runway, an operator should assume that:

a. the aeroplane should land on the most favourable runway, in still air; and

b. the aeroplane should land on 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.

7. If an operator is unable to land on the runway most likely to be assigned considering the weather, the direction and other characteristic of the aeroplane, the aeroplane may be dispatched if an alternate aerodrome is designated which permits a safe landing.

8. If an operator of a Performance Class A aeroplanes is unable to land on the most favourable runway, in still air, for a destination aerodrome having a single runway where a landing depends upon a specified wind component, an aeroplane may be dispatched if 2 alternate aerodromes are designated which permit a safe landing. Before commencing an approach to land at the destination aerodrome, the pilot-in-command should ensure that a safe landing can be made.

9. For Performance Class B and C aeroplanes, the landing distances required should be increased by 5% for each 1% of downslope unless otherwise specified in the AFM, or other performance or operating manuals from the manufacturer. The correction factors for runways with slopes in excess of 2% should only be applied when the operator has demonstrated to the competent authority that he/she has the necessary data in the AFM, the OM contains the appropriated procedures and the crew is training to land in runway with slopes in excess of 2%. When an operator should take account of the runway slope in the direction of landing, that runway slope is applicable for Performance Class A aeroplanes only if it is greater than +/- 2%.

AMC OPS.CAT.345.A(a)(2) Landing requirements - Aeroplanes

WET AND CONTAMINATED RUNWAYS

1. For a Performance Class A aeroplane, the landing distance available in case of wet or contaminated runways at arrival should be at least 115% of the required landing distance, determined in accordance with the type of aeroplane that will operate the landing.

2. For a Performance Class A aeroplane, a landing distance on a wet runway shorter than that required by 1. above, but not less than that required for dry runways, may be used if the AFM includes specific additional information about landing distances on wet runways.

3. For a Performance Class A aeroplane, a landing distance on a specially prepared contaminated runway shorter than that required by 1. above, but not less than that required for dry runways, may be used if the AFM includes specific additional information about landing distances on contaminated runways.

4. For a Performance Class B and C aeroplane, the landing distance available in case of wet runways at arrival should be multiplied by a factor of 1.5.

5. The landing distance available in cases of contaminated runways at arrival should in all cases be determined by using appropriate data from the AFM or equivalent data from the aircraft manufacturer.

6. For a Performance Class B aeroplane, a landing distance on a wet runway shorter than that required by 4. and 5. above combined, but not less than that required for dry

runways may be used only if the AFM includes specific additional information about landing distances on wet runways.

GM OPS.CAT.345.A(a)(2) Landing requirements - Aeroplanes

WET AND CONTAMINATED RUNWAYS

The use of the wet factor (1.5) is, in case of doubt, recommended because it may not be possible for a pilot to determine accurately the degree of wetness (sometimes as much as 60%, 1.6 factor) of the grass, particularly when airborne.

AMC OPS.CAT.345.A(b) Landing requirements - Aeroplanes

STEEP APPROACH

1. For Steep Approach procedures, the operator should use landing distance data, as appropriate, based on a screen height of less than 50 ft, but not less than 35 ft.
2. For operators of Performance Class A aeroplanes, the following criteria should be considered:
   a. the AFM should state the maximum approved glideslope angle, any other limitations, normal, abnormal or emergency procedures for the steep approach as well as amendments to the field length data when using steep approach criteria;
   b. a suitable glidepath reference system comprising at least a visual glidepath indicating system should be available at each aerodrome at which steep approach procedures are to be conducted; and
   c. weather minima should be specified and approved for each runway to be used with a steep approach. Consideration should be given to the following:
      i. the obstacle situation;
      ii. the type of glidepath reference and runway guidance such as visual aids, Microwave landing system (MLS), 3D–NAV, Instrument Landing System (ILS), Localiser (LLZ), VHF Omnidirectional Radio Range (VOR), Non-directional Beacon (NDB);
      iii. the minimum visual reference to be required at Decision Height (DH) and Minimum Descent Altitude (MDA);
      iv. available airborne equipment;
      v. pilot qualification and special aerodrome familiarisation;
      vi. AFM limitations and procedures; and
      vii. missed approach criteria.

AMC OPS.CAT.345.A(c) Landing requirements - Aeroplanes

SHORT LANDING OPERATIONS

1. For operators of Performance Class A and B, the distance used for the calculation of the permitted landing mass may consist of the usable length of the declared safe area plus the declared landing distance available. The following criteria should be met:
   a. the use of the safe area should be approved by the airport authority;
   b. the useable length of the declared safe area should not exceed 90 m;
   c. the width of the declared safe area should not be less than twice the runway width or twice the wing span, whichever is the greater, centred on the extended runway centre line;

d. the declared safe area should be clear of obstructions or depressions which would endanger an aeroplane undershooting the runway and no mobile object should be permitted on the declared safety area while the runway is being used for short landing operations;

e. the slope of the declared safe area should not exceed 5% upward nor 2% downward in the direction of landing; and

f. for the purpose of this operation, the bearing strength requirement of the term "Landing distance available" need not apply to the declared safe area.

2. The following criteria for operators of Performance Class A may be needed to be applied to be able to conduct short landing operations:

a. Demonstration of the need for Short Landing Operations. There should be a clear public interest and operational necessity for the operation, either due to the remoteness of the airport or to physical limitations relating to extending the runway.

b. Aeroplane and Operational Criteria.

i. Short landing operation should only be used for aeroplanes where the vertical distance between the path of the pilot's eye and the path of the lowest part of the wheels, with the aeroplane established on the normal glide path, does not exceed 3 m;

ii. when establishing aerodrome operating minima the visibility/RVR should not be less than 1.5 km. In addition, wind limitations should be specified in the OM; and

iii. minimum pilot experience, training requirements and special aerodrome familiarisation should be specified for such operations in the OM.

c. It is assumed that the crossing height over the beginning of the usable length of the declared safe area is 50 ft.

d. Additional conditions that are deemed necessary for a safe operation taking into account the aeroplane type characteristics, topographic characteristics in the approach area, available approach aids and missed approach/baulked landing considerations may be required for type of operations. Such additional conditions may be, for instance, the requirement for Visual Approach Slope Indicator/Precision Approach Path Indicator (VASI/PAPI) – type visual slope indicator system.

3. The following criteria for operators of Performance Class B may be needed to be applied to be able to conduct short landing operations:

a. it is assumed that the crossing height over the beginning of the usable length of the declared safe area should not be less than 50 ft;

b. weather minima should be specified and approved for each runway to be used and should not be less than the greater of Visual Flight Rules (VFR) or non-precision approach minima;

c. pilot requirements should be specified;

d. Additional conditions that are necessary for safe operation taking into account the aeroplane type characteristics, approach aids and missed approach/baulked landing considerations may be required for the type of operations.

AMC1 OPS.CAT.355.H Performance applicability - Helicopters

PERFORMANCE CLASS 1 CRITERIA

1. Take-off

   a. The take-off mass should be such that:

      i. it is possible to reject the take-off and land on the Final Approach and Take-off Area (FATO) in case of the critical power-unit failure being recognised at or before the TDP (Take-off Decision Point);

      ii. the rejected take-off distance required does not exceed the rejected take-off distance available; and

      iii. the take-off distance required does not exceed the take-off distance available unless the helicopter can, when continuing the take-off, clear all obstacles to the end of the take-off distance required by a vertical margin of not less than 10.7 m (35 ft).

   b. The part of the take-off up to and including TDP should be conducted in sight of the surface such that a rejected take-off can be carried out.

   c. For take-off using a backup (lateral transition) procedure, with the critical power-unit inoperative, all obstacles in the back-up (lateral transition) area can be cleared by an adequate margin.

2. Take-off flight path

   From the end of the take-off distance required with the critical power-unit failure recognised at the TDP:

   a. The take-off mass should be such that the take-off flight path provides a vertical clearance of not less than 10.7 m (35 ft) for VFR operations and 10.7 m (35 ft) + 0.01 DR for Instrument Flight Rules (IFR) operations above all obstacles located in the climb path. Only obstacles as specified in OPS.CAT.365.H have to be considered.

   b. Where a change of direction of more than 15° is made, adequate allowance should be made for the effect of bank angle on the ability to comply with the obstacle clearance requirements. This turn should not be initiated before reaching a height of 61 m (200 ft) above the take-off surface unless permitted as part of an approved procedure in the Helicopter Flight Manual (HFM).

3. En-route – critical power-unit inoperative

   a. The en-route flight path with the critical power-unit inoperative, appropriate to the meteorological conditions expected for the flight should comply with either i., ii. or iii. below at all points along the route.

      i. When it is intended that the flight will be conducted at any time out of sight of the surface, the mass of the helicopter permits a rate of climb of at least 50 ft/min with the critical power-unit inoperative at an altitude of at least 300 m (1 000 ft), 600 m (2 000 ft) in areas of mountainous terrain, above all terrain and obstacles along the route within 9.3 km (5 nm) on either side of the intended track.

      ii. When it is intended that the flight will be conducted without the surface in sight, the flight path permits the helicopter to continue flight from the cruising altitude to a height of 300 m (1 000 ft) above a landing site where a landing can be made in accordance with 4. below. The flight path clears vertically, by at least 300 m (1 000 ft), 600 m (2 000 ft) in areas of mountainous terrain, all terrain and obstacles along the route within 9.3 km (5 nm) on either side of the intended track. Drift-down techniques may be used.

iii. When it is intended that the flight will be conducted in Visual Meteorological Conditions (VMC) with the surface in sight, the flight path permits the helicopter to continue flight from the cruising altitude to a height of 300 m (1 000 ft) above a landing site where a landing can be made in accordance with 4. below, without flying at any time below the appropriate minimum flight altitude, obstacles within 900 m on either side of the route need to be considered.

b. When showing compliance with 3.a.ii or 3.a.iii above:

i the critical power-unit should be assumed to fail at the most critical point along the route;

ii account should be taken of the effects of winds on the flight path;

iii fuel jettisoning should be planned to take place only to an extent consistent with reaching the aerodrome/operating site with the required fuel reserves and using a safe procedure; and

iv fuel jettisoning should not be planned below 1 000 ft above terrain.

c. The width margins of 3.a.i and 3.a.ii above should be increased to 18.5 km (10 nm) if the navigational accuracy cannot be met for 95% of the total flying time.

4. Landing

a. The landing mass should be such that:

i. in the event of the critical power-unit failure being recognised at any point at or before the Landing Decision Point (LDP), it is possible either to land and stop within the FATO, or to perform a balked landing and clear all obstacles in the flight path by a vertical margin of 10.7 m (35 ft). Only obstacles as specified in OPS.CAT.365.H have to be considered.

ii. in the event of the critical power-unit failure being recognised at any point at or after the LDP, it is possible to:

A. clear all obstacles in the approach path; and

B. land and stop within the FATO.

iii. that part of the landing from the LDP to touchdown, should be conducted in sight of the surface.

AMC2 OPS.CAT.355.H Performance applicability - Helicopters

PERFORMANCE CLASS 1 CRITERIA - EN-ROUTE – CRITICAL POWER-UNIT INOPERATIVE (FUEL JETTISON)

The presence of obstacles along the en-route flight path may preclude compliance with AMC1 OPS.CAT.355.H 3.a.i at the planned mass at the critical point along the route. In this case fuel jettison at the most critical point may be planned, provided that the procedures in AMC7 OPS.GEN.205.H paragraph 3 are complied with.

GM1 OPS.CAT.355.H Performance applicability - Helicopters

PERFORMANCE CLASS 1 CRITERIA - OBSTACLE CLEARANCE IN THE BACK-UP AREA

1. The requirement in AMC1 OPS.CAT.355.H 1.c has been established in order to take into account the following factors:

a. In the back-up; the pilot has few visual cues and has to rely upon the altimeter and sight picture through the front window (if flight path guidance is not provided) to achieve an accurate rearward flight path.

b. In the rejected take-off; the pilot has to be able to manage the descent against a varying forward speed whilst still ensuring an adequate clearance from obstacles until the helicopter gets in close proximity for landing on the FATO.

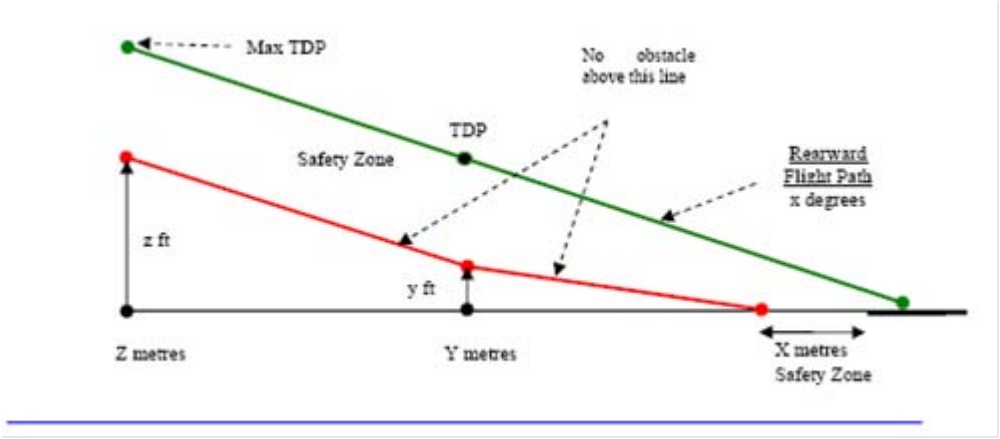
c. In the continued take-off; the pilot has to be able to accelerate to Vtoss whilst ensuring an adequate clearance from obstacles.

2. The requirements of AMC1 OPS.CAT.355.H 1.c. may be achieved by establishing that, in the backup area:

a. no obstacles are located within the safety zone below the rearward flight path when described in the HFM (see Figure 1); (in the absence of such data in the HFM, the operator should contact the manufacturer in order to define a safety zone); or

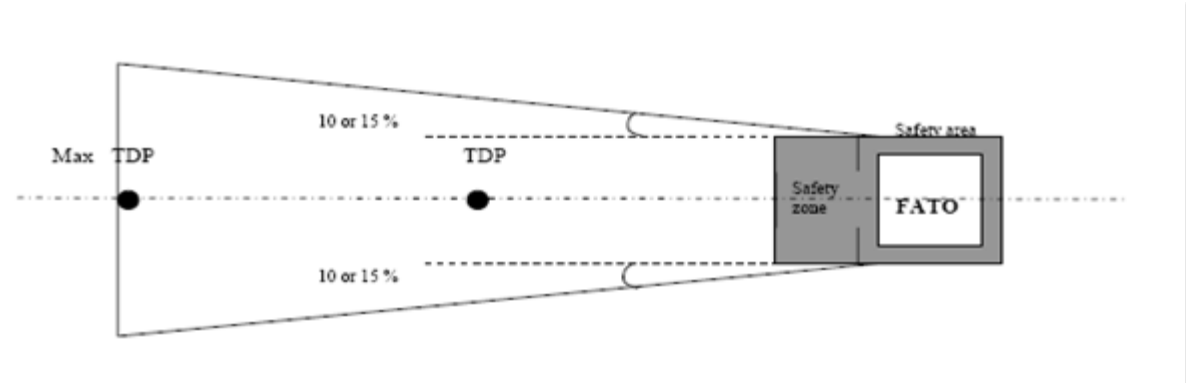
b. during the backup, the rejected take-off and the continued take-off manoeuvres, obstacle clearance has been demonstrated by a means acceptable to the authority.

Figure 1 – Rearward flight path



3. An obstacle, in the backup area, is considered if its lateral distance from the nearest point on the surface below the intended flight path is not further than half of the minimum FATO (or the equivalent term used in the HFM) width defined in the HFM (or, when no width is defined 0.75 D), plus 0.25 times D (or 3 m, whichever is greater); plus 0.10 for VFR day, or 0.15 for VFR night, of the distance travelled from the back of the FATO (see Figure 2).

Figure 2 – Obstacle accountability



GM2 OPS.CAT.355.H Performance applicability - Helicopters

PERFORMANCE CLASS 1 CRITERIA - APPLICATION OF ALTERNATIVE TAKE-OFF AND LANDING PROCEDURES

1. Discussion

A manufacturer's Category A procedure defines profiles and scheduled data for take-off, climb, performance at minimum operating speed and landing, under specific environmental conditions and masses.

Associated with these profiles and conditions are minimum operating surfaces, take-off distances, climb performance and landing distances; these are provided (usually in graphic form) with the take-off and landing masses and the TDP and LDP.

The landing surface and the height of the TDP are directly related to the ability of the helicopter - following a power-unit failure before or at TDP - to reject onto the surface under forced landing conditions. The main considerations in establishing the minimum size of the landing surface are the scatter during flight testing of the reject manoeuvre, with the remaining engine operating within approved limits, and the required usable cue environment.

Hence, an elevated site with few visual cues - apart from the surface itself - would require a greater surface area in order that the helicopter can be accurately positioned during the reject manoeuvre within the specified area. This usually results in the stipulation of a larger surface for an elevated site than for a ground level site (where lateral cues may be present).

This could have the unfortunate side-effect that a FATO which is built 3 m above the surface (and therefore elevated by definition) might be out of operational scope for some helicopters - even though there might be a rich visual cue environment where rejects are not problematical. The presence of elevated sites where ground level surface requirements might be more appropriate could be brought to the attention of the competent authority.

It can be seen that the size of the surface is directly related to the requirement of the helicopter to complete a rejected take-off following a power-unit failure. If the helicopter has sufficient power such that a failure before or at TDP will not lead to a requirement for rejected take-off, the need for large surfaces is removed; sufficient power for the application of alternative take-off and landing procedures is considered to be the power required for hover-out-of-ground-effect (HOGE) one-engine-inoperative (OEI).

Following a power-unit failure at or after the TDP, the continued take-off path provides OEI clearance from the take-off surface and the distance to reach a point from where climb performance in the first, and subsequent segments, is assured.

If HOGE OEI performance exists at the height of the TDP, it follows that the continued take-off profile, which has been defined for a helicopter with a mass such that a rejected take-off would be required following a power-unit failure at or before TDP, would provide the same, or better, obstacle clearance and the same, or less, distance to reach a point where climb performance in the first, and subsequent segments, is assured.

If the TDP is shifted upwards, provided that the HOGE OEI performance is established at the revised TDP, it will not affect the shape of the continued take-off profile but should shift the min-dip upwards by the same amount that the revised TDP has been increased - with respect to the basic TDP.

Such assertions are concerned only with the vertical or the back-up procedures and can be regarded as achievable under the following circumstances:

a. When the procedure is flown, it is based upon a profile contained in the HFM - with the exception of the necessity to perform a rejected take-off.

b. The HOGE OEI performance is specified as in AC 29-2C, MG 12 for the Human External Cargo (HEC) Class D requirements.

c. The TDP, if shifted upwards (or upwards and backward in the back-up procedure) will be the height at which the HOGE OEI performance is established.

d. If obstacles are permitted in the back-up area they should continue to be permitted with a revised TDP.

2. Methods of Application:

a. A reduction in the size of the take-off surface may be applied under the following conditions:

i. Compliance with the requirements of AMC1 OPS.CAT.355.H 1., 2. and 4. can be assured with:

A. a procedure based upon an appropriate Category A take-off and landing profile scheduled in the HFM;

B. a take-off or landing mass not exceeding the mass scheduled in the HFM for a HOGE OEI in compliance with HEC Class D performance requirements ensuring that:

1. following a power-unit failure at or before TDP, there are adequate external references to ensure that the helicopter can be landed in a controlled manner; and

2. following a power-unit failure at or after the LDP there are adequate external references to ensure that the helicopter can be landed in a controlled manner.

b. An upwards shift of the TDP and LDP may be applied under the following conditions:

i. Compliance with the requirements of AMC1 OPS.CAT.355.H 1., 2. and 4. can be assured with:

A. a procedure based upon an appropriate Category A take-off and landing profile scheduled in the HFM;

B. a take-off or landing mass not exceeding the mass scheduled in the HFM for a HOGE OEI in compliance with HEC Class D performance requirements ensuring that:

1. following a power-unit failure at or after TDP compliance with the obstacle clearance requirements of AMC1 OPS.CAT.355.H 1.a.iii and 2. can be met; and

2. following a power-unit failure at or before the LDP the balked landing obstacle clearance requirements of AMC1 OPS.CAT.355.H 4.a. and 2. can be met.

c. Alternatively, an operator may use the Category A ground level surface provisions for a specific elevated FATO when it can be demonstrated that the usable cue environment at that FATO would permit such a reduction.

AMC3 OPS.CAT.355.H Performance applicability - Helicopters

PERFORMANCE CLASS 2 CRITERIA

1. Take-off

a. The take-off mass should not exceed the maximum mass specified for a rate of climb of 150 ft/min at 300 m (1 000 ft) above the level of the aerodrome/operating site with the critical power unit inoperative and the remaining power units operating at an appropriate power rating.

b. The take-off should be conducted in such a way that a safe forced landing can be executed until the point where safe continuation of the flight is possible.

c. The part of the take-off before the provision of 2. is met should be conducted in sight of the surface.

2. Take-off Flight Path

An operator should ensure that from DPATO or no later than 200 ft above the take-off surface, with the critical power-unit inoperative the requirements of AMC1 OPS.CAT.355.H 2.a.i. and ii. are met.

3. En-route - Critical power unit inoperative.

An operator should ensure that the provision of AMC1 OPS.CAT.355.H 3. is met.

4. Landing

a. The landing mass at the estimated time of landing should not exceed the maximum mass specified for a rate of climb of 150 ft/min at 300 m (1 000 ft) above the level of the aerodrome/operating site with the critical power unit inoperative and the remaining power units operating at an appropriate power rating.

b. If the critical power unit fails at any point in the approach path:

i. a balked landing can be carried out meeting the provision of 2. above; or

ii. the helicopter can perform a safe forced landing.

c. The part of the landing after which the requirement of 2. above cannot be met should be conducted in sight of the surface.

GM3 OPS.CAT.355.H Performance applicability - Helicopters

PERFORMANCE CLASS 2 CRITERIA - OPERATIONS IN PERFORMANCE CLASS 2

1. Introduction

This guidance material describes Performance Class 2 and has been produced for the purpose of:

a. discussing the underlying philosophy of operations in Performance Class 2;

b. showing simple methods of compliance; and

c. explaining how to determine - with examples and diagrams:

i. the take-off and landing masses;

ii. the length of the safe-forced-landing area;

iii. distances to establish obstacle clearance; and

iv. entry point(s) into Performance Class 1.

It discusses the derivation of Performance Class 2 from ICAO Annex 6 Part III and describes an alleviation which may be approved in accordance with OPS.SPA.SFL following a Risk Assessment.

It reproduces relevant definitions; examines the basic requirements; discusses the limits of operation; and considers the benefits of the use of Performance Class 2.

It contains examples of Performance Class 2 in specific circumstances, and explains how these examples may be generalised to provide the operators with methods of calculating landing distances and obstacle clearance.

2. Definitions

To assist in the reading of this guidance material, the following definitions apply:

Defined point before landing (DPBL). The point within the approach and landing phase, after which the helicopter's ability to continue the flight safely, with the critical power unit inoperative, is not assured and a forced landing may be required.

Landing distance available (LDAH). The length of the final approach and take-off area plus any additional area declared available and suitable for helicopters to complete the landing manoeuvre from a defined height.

Landing distance required (LDRH). The horizontal distance required to land and come to a full stop from a point 15 m (50 ft) above the landing surface.

The following terms, which are not defined elsewhere in OPS.CAT.350.H, are used in the following text:

V_T A target speed at which to aim at the point of minimum ground clearance (min-dip) during acceleration from TDP to V_{TOSS}.

V_{50} A target speed and height utilised to establish a flight manual distance (in compliance with the requirement of CS/JAR 29.63) from which climbout is possible.

$V_{stay-up}$ A colloquial term used to indicate a speed at which a descent would not result following a power-unit failure. This speed is several knots lower than V_{TOSS} at the equivalent take-off mass.

3. What defines Performance Class 2

Performance Class 2 can be considered as Performance Class 3 take-off or landing, and Performance Class 1 climb, cruise and descent. It comprises an AEO obstacle clearance regime for the take-off or landing phases, and an OEI obstacle clearance regime for the climb, cruise, descent, approach and missed approach phases.

Note: For the purpose of performance calculations, the CS 29.67 Category A climb performance criteria is used:

- 150 ft/min at 1 000 ft (at V_y);

and depending on the choice of DPATO:

- 100 ft/min up to 200 ft (at V_{TOSS})

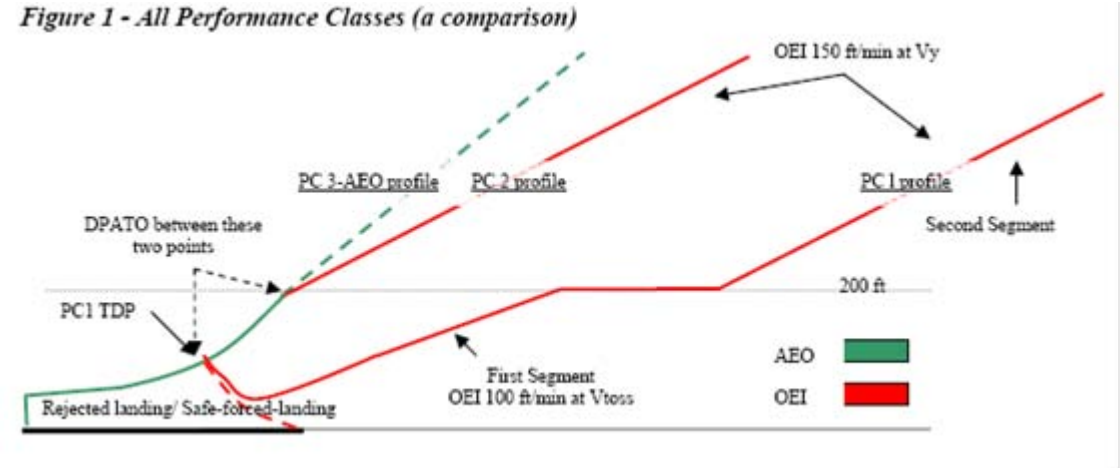
at the appropriate power settings.

3.1 Comparison of obstacle clearance in all Performance Classes

Figure 2 shows the profiles of the three Performance Classes - superimposed on one diagram.

Performance Class 1; from TDP, requires OEI obstacle clearance in all phases of flight; the construction of Category A procedures, provides for a flight path to the first climb segment, a level acceleration segment to V_y (which may be shown concurrent with the first segment), followed by the second climb segment from V_y at 200 ft (see Figure 1).

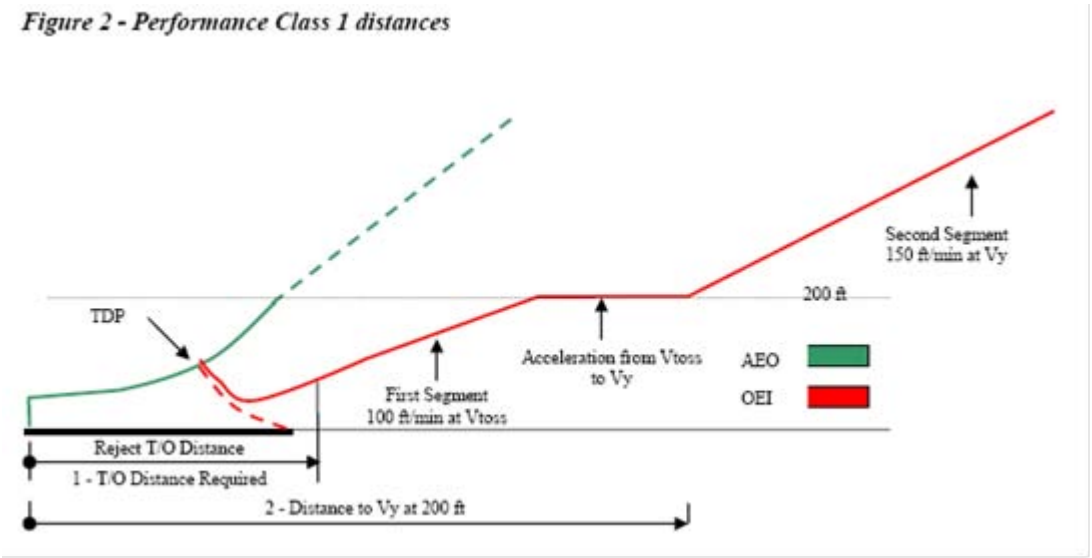
Figure 1 - All Performance Classes (a comparison)



a. Performance Class 2; requires AEO obstacle clearance to DPATO and OEI from then on. The take-off mass has the Performance Class 1 second segment climb performance at its basis therefore, at the point where V_y at 200 ft is reached, Performance Class 1 is achieved (see also Figure 3).

b. Performance Class 3; requires AEO obstacle clearance in all phases.

Figure 2 - Performance Class 1 distances



3.2 Comparison of the discontinued take-off in all Performance Classes

a. Performance Class 1 - requires a prepared surface on which a rejected landing can be undertaken (no damage); and

b. Performance Class 2 and 3 - require a safe-forced-landing surface (some damage can be tolerated but there must be a reasonable expectancy of no injuries to persons in the aircraft or third parties on the surface).

4. The derivation of Performance Class 2

Performance Class 2 is primarily based on the text of ICAO Annex 6 Part III Section II and its attachments - which provide for the following:

a. Obstacle clearance before DPATO; the helicopter should be able, with AEO, to clear all obstacles by an adequate margin until it is in a position to comply with b. below.

b. Obstacle clearance after DPATO; the helicopter should be able, in the event of the critical power-unit becoming inoperative at any time after reaching DPATO,

to continue the take-off clearing all obstacles along the flight path by an adequate margin until it is able to comply with en-route clearances.

c. Engine failure before DPATO; before the DPATO, failure of the critical power-unit may cause the helicopter to force land; therefore a safe-forced-landing should be possible (this is analogous to the requirement for a reject in Performance Class 1 but where some damage to the helicopter can be tolerated).

5. Benefits of Performance Class 2

Operations in Performance Class 2 permit advantage to be taken of an AEO procedure for a short period during take-off and landing - whilst retaining engine failure accountability in the climb, descent and cruise. The benefits include:

a. Ability to use (the reduced) distances scheduled for the AEO - thus permitting operations to take place at smaller aerodromes and allowing airspace requirements to be reduced.

b. Ability to operate when the safe-forced-landing distance available is located outside the boundary of the aerodromes.

c. Ability to operate when the take-off-distance required is located outside the boundary of the aerodromes.

d. Ability to use existing Category A profiles and distances when the surface conditions are not adequate for a reject but are suitable for a safe-forced-landing (for example when the ground is waterlogged).

6. Implementation of Performance Class 2

The following sections discuss the principles of the implementation of Performance Class 2.

6.1 Does ICAO spell it all out?

ICAO Annex 6 does not give guidance on how DPATO should be calculated nor does it require that distances be established for the take-off. However, it does require that, up to DPATO AEO, and from DPATO OEI, obstacle clearance is established (see Figure 3 and Figure 4 which are simplified versions of the diagrams contained in Annex 6 Part III, Attachment A).

Note: Annex 8 – Airworthiness of Aircraft (Part IV, Chapter 2.2.1.3.4) requires that an AEO distance be scheduled for all helicopters operating in Performance Classes 2 & 3. Annex 6 is dependent upon the scheduling of the AEO distances, required in Annex 8, to provide data for the location of DPATO.

When showing obstacle clearance, the divergent obstacle clearance height required for IFR is - as in Performance Class 1 - achieved by the application of the additional obstacle clearance of 0.01 DR (DR = the distance from the end of ‘take-off-distance-available’ - see the pictorial representation in Figure 4 and the definition in section 2. above).

As can also be seen from Figure 4, flight must be conducted in VFR until DPATO has been achieved (and deduced that if an engine failure occurs before DPATO, entry into IFR is not permitted (as the OEI climb gradient will not have been established)).

Figure 3 - Performance Class 2 Obstacle Clearance

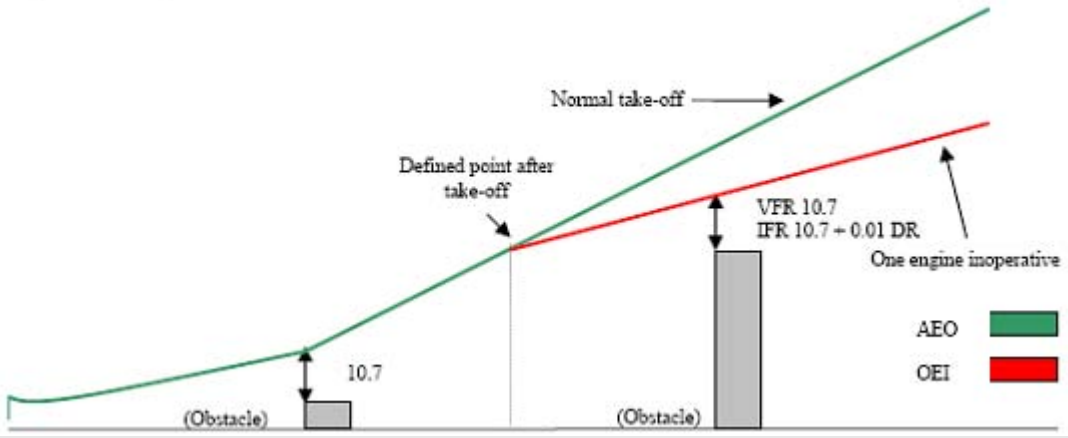
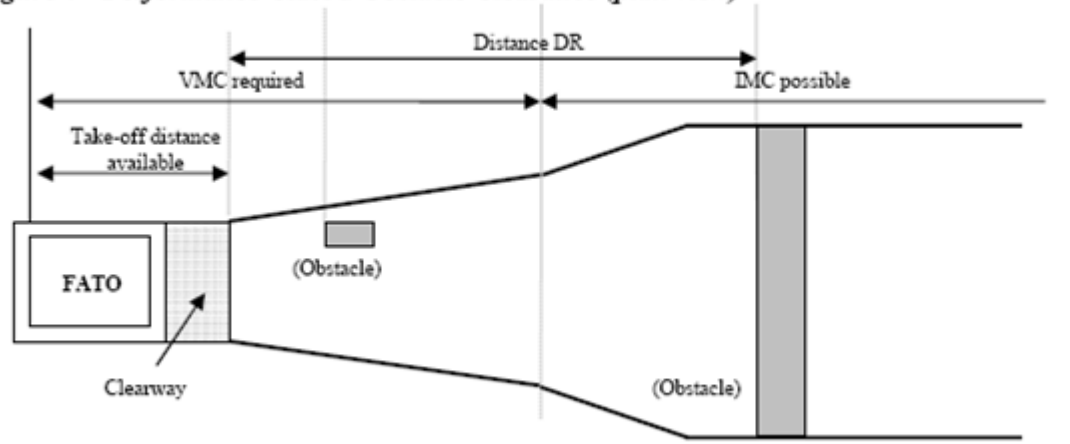


Figure 4 - Performance Class 2 Obstacle Clearance (plan view)



6.2 Function of DPATO

From the preceding paragraphs it can be seen that DPATO is germane to Performance Class 2. It can also be seen that, in view of the many aspects of DPATO, it has, potentially, to satisfy a number of requirements which are not necessarily synchronised (nor need to be).

It is clear that it is only possible to establish a single point for DPATO, satisfying the requirement of 4.b. and 4.c. above, when:

a. accepting the TDP of a Category A procedure; or

b.- extending the safe-forced-landing requirement beyond required distances (if data is available to permit the calculation of the distance for a safe-forced-landing from the DPATO).

It could be argued that the essential requirement for DPATO is contained in 4.b. - OEI obstacle clearance. From careful examination of the flight path reproduced in Figure 3 above, it may be reasonably deduced that DPATO is the point at which adequate climb performance is established (examination of Category A procedures would indicate that this could be (in terms of mass, speed and height above the take-off surface) the conditions at the start of the first or second segments - or any point between.)

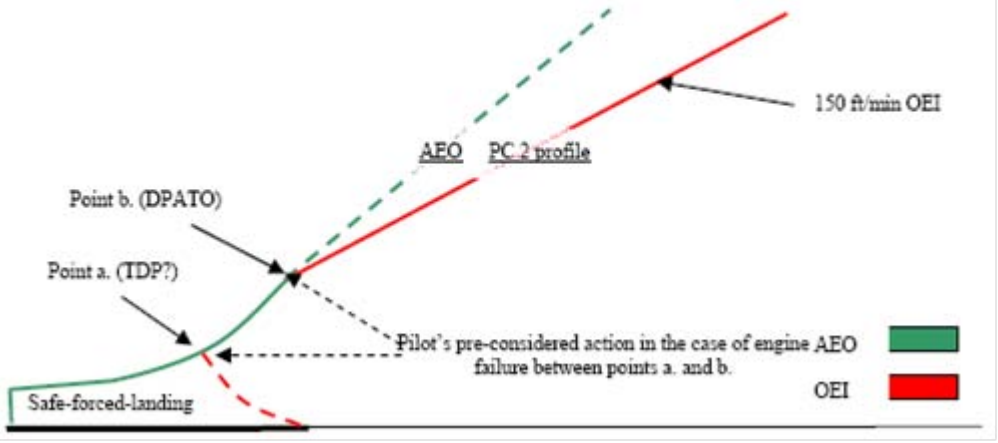
Note: The diagrams in Attachment A of ICAO Annex 6, do not appear to take account of drop down - permitted under Category A procedures; similarly with helideck departures, the potential for acceleration in drop down below deck level (once the deck edge has been cleared) is also not shown. These omissions could be regarded as a simplification of the diagram, as drop down is discussed and accepted in the accompanying ICAO text.

It may reasonably be argued that, during the take-off and before reaching an appropriate climb speed (V_{TOSS} or V_y), $V_{stay\text{-}up}$ will already have been achieved (where $V_{stay\text{-}up}$ is the ability to continue the flight and accelerate without descent - shown in some Category A procedures as V_T or target speed) and where, in the event of an engine failure, no landing would be required.

It is postulated that, to practically satisfy all the requirements of 4.a, b. and c. above, DPATO does not need to be defined at one synchronised point; provisions can be met separately - i.e. defining the distance for a safe-forced-landing, and then establishing the OEI obstacle clearance flight path.

As the point at which the helicopter's ability to continue the flight safely, with the critical power unit inoperative is the critical element, it is that for which DPATO is used in this text.

Figure 5 - The three elements in a PC 2 take-off



6.2.1 The three elements from the pilot's perspective

When seen from the pilot's perspective (see Figure 5), there are three elements of the Performance Class 2 take-off - each with associated related actions which need to be considered in the case of an engine failure:

a. action in the event of an engine failure - up to the point where a forced-landing will be required.

b. action in the event of an engine failure - from the point where OEI obstacle clearance is established (DPATO).

c. pre-considered action in the event of an engine failure - in the period between a. and b.

The action of the pilot in a. and b. is deterministic i.e. it remains the same for every occasion. For pre-consideration of the action at point c.; as is likely that the planned flight path will have to be abandoned (the point at which obstacle clearance using the OEI climb gradients not yet being reached) the pilot must (before take-off) have considered his options and the associated risks, and have in mind the course of action that will be pursued in the event of an engine failure during that short period. As it is likely that any action will involve turning manoeuvres, the effect of turns on performance must be considered.

Take-off mass for Performance Class 2

As previously stated, Performance Class 2 is an AEO take-off which, from DPATO, has to meet the requirement for OEI obstacle clearance in the climb and en-route phases. Take-off mass is therefore the mass that gives at least the minimum climb performance of 150 ft/min at V_y, at 1 000 ft above the take-off point, and obstacle clearance.

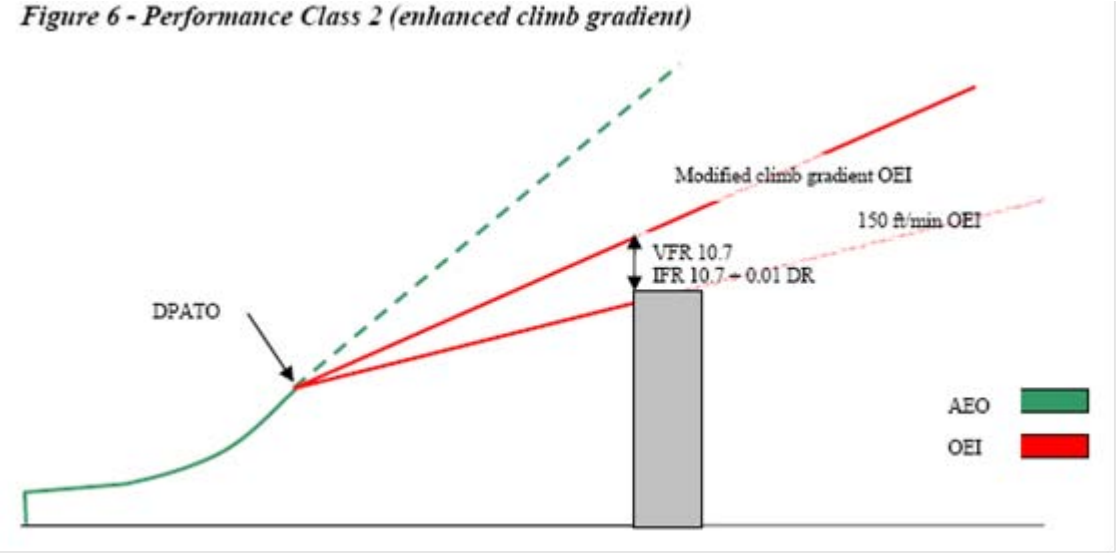
As can be seen in Figure 6 below, the take-off mass may have to be modified when it does not provide the required OEI clearance from obstacles in the take-off-flight path (exactly as in Performance Class 1). This could occur when taking off from an aerodrome where the flight path has to clear an obstacle such as a ridge line (or line of buildings) which can neither be:

a. flown around using VFR and seen and avoided; nor

b. cleared using the minimum climb gradient given by the take-off mass (150 ft/min at 1 000 ft)

In this case, the take-off mass has to be modified (using data contained in the HFM) to give an appropriate climb gradient.

Figure 6 - Performance Class 2 (enhanced climb gradient)



6.3 Do distances have to be calculated?

Distances do not have to be calculated if, by using pilot judgement or standard practice, it can be established that:

a. A safe-forced-landing is possible following an engine failure (notwithstanding that there might be obstacles in the take-off path); and

b. Obstacles can be cleared (or avoided) - AEO in the take-off phase and OEI in the climb.

If early entry (in the sense of cloud base) into IMC is expected - an IFR departure should be planned. However, standard masses and departures can be used when described in the OM.

6.4 The use of Category A data

In Category A procedures, TDP is the point at which either a rejected landing or a safe continuation of the flight, with OEI obstacle clearance, can be performed.

For Performance Class 2 (when using Category A data), only the safe-forced-landing (reject) distance depends on the equivalent of the TDP; if an engine fails between TDP and DPATO the pilot has to decide what action is required - it is not necessary for a safe-forced-landing distance to be established from beyond the equivalent of TDP (see Figure 5 and discussion in 6.2.1 above).

Category A procedures based on a fixed V_{TOSS} are usually optimised either for the reduction of the rejected take-off distance, or the take-off distance. Category A procedures based on a variable V_{TOSS} allow either a reduction in required distances (low V_{TOSS}) or an improvement in OEI climb capability (high V_{TOSS}). These optimisations may be beneficial in Performance Class 2 to satisfy the dimensions of the take-off site.

In view of the different requirements for Performance Class 2 (from Performance Class 1), it is perfectly acceptable for the two calculations (one to establish the safe-forced-landing distance and the other to establish DPATO) to be based upon different Category A procedures. However, if this method is used, the mass resulting from the calculation cannot be more than the mass from the more limiting of the procedures.

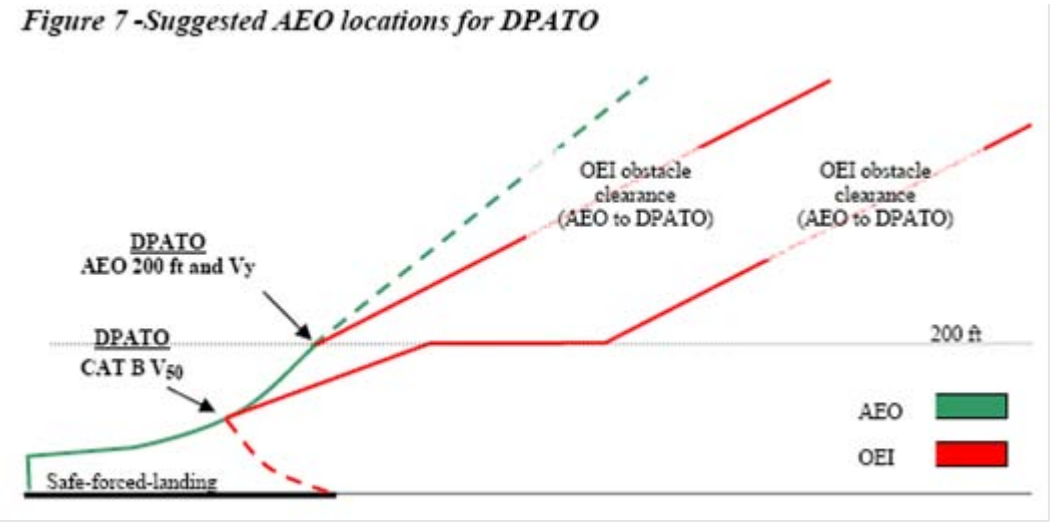
6.5 DPATO and obstacle clearance

If it is necessary for OEI obstacle clearance to be established in the climb, the starting point (DPATO) for the (obstacle clearance) gradient has to be established. Once DPATO is defined, the OEI obstacle clearance is relatively easy to calculate with data from the HFM.

6.5.1 DPATO based on AEO distance

In the simplest case; if provided, the scheduled AEO to 200 ft at V_y can be used (see Figure 7).

Figure 7 -Suggested AEO locations for DPATO

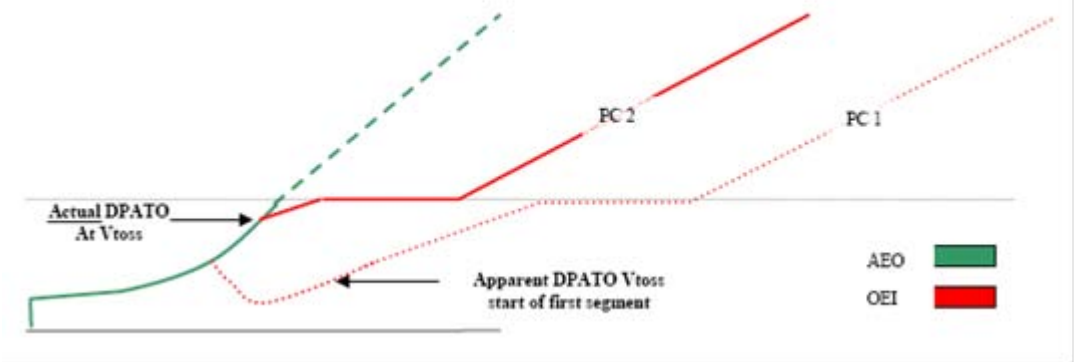


Otherwise, and if scheduled in the HFM, the AEO distance to 50 ft (V_{50}) – determined in accordance with CS 29.63 - can be used (see Figure 7). Where this distance is used, it will be necessary to ensure that the V_{50} climb out speed is associated with a speed and mass for which OEI climb data is available so that, from V_{50}, the OEI flight path can be constructed.

6.5.2 DPATO based on Category A distances

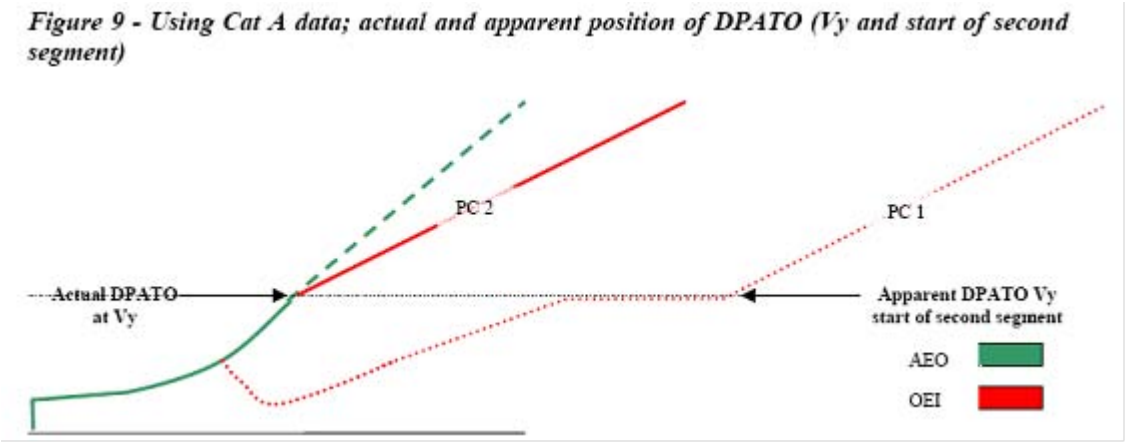
It is not necessary for specific AEO distances to be used (although for obvious reasons it is preferable); if they are not available, a flight path (with OEI obstacle clearance) can be established using Category A distances (see Figure 8 and Figure 9) - which will then be conservative.

Figure 8 - Using Cat A data; actual and apparent position of DPATO (Vtoss and start of first segment)



Note: the apparent DPATO is for planning purposes only in the case where AEO data is not available to construct the take-off flight path. The actual OEI flight path will provide better obstacle clearance than the apparent one (used to demonstrate the minimum requirement) - as seen from the firm and dashed lines in the above diagram.

Figure 9 - Using Cat A data; actual and apparent position of DPATO (Vy and start of second segment)



6.5.3 Use of most favourable Category A data

The use of AEO data is recommended for calculating DPATO. However, where an AEO distance is not provided in the flight manual, distance to V_y at 200 ft, from the most favourable of the Category A procedures, can be used to construct a flight path (provided it can be demonstrated that AEO distance to 200 ft at V_y is always closer to the take-off point than the Category A OEI flight path).

In order to meet the requirement of AMC3 OPS.CAT.355.H 2., the last point from where the start of OEI obstacle clearance can be shown is at 200 ft.

6.6 The calculation of DPATO - a summary

DPATO should be defined in terms of speed and height above the take-off surface and should be selected such that HFM data (or equivalent data) is available to establish the distance from the start of the take-off up to the DPATO (conservatively if necessary).

6.6.1 First method

DPATO is selected as the HFM Category B take-off distance (V_{50} speed or any other take-off distance scheduled in accordance with CS 29.63) provided that within the distance the helicopter can achieve:

a. One of the V_{TOSS} values (or the unique V_{TOSS} value if is not variable) provided in the HFM, selected so as to assure a climb capability according to Category A criteria; or

b. V_y.

Compliance with AMC3 OPS.CAT.355.H 2. would be shown from V_{50} (or the scheduled Category B take-off distance).

6.6.2 Second method

DPATO is selected as equivalent to the TDP of a Category A clear area take-off procedure conducted in the same conditions.

Compliance with AMC3 OPS.CAT.355.H 2.would be shown from the point at which V_{TOSS}, a height of at least 35 ft above the take-off surface and a positive climb gradient are achieved (which is the Category A clear area take-off distance).

Safe-forced-landing areas should be available from the start of the take-off, to a distance equal to the Category A “clear area” rejected take-off distance.

6.6.3 Third method

As an alternative; DPATO could be selected such that HFM OEI data is available to establish a flight path initiated with a climb at that speed. This speed should then be:

- One of the V_{TOSS} values (or the unique V_{TOSS} value if is not variable) provided in the HFM, selected so as to assure a climb capability according to Category A criteria; or
- V_y.

The height of the DPATO should be at least 35 ft and can be selected up to 200 ft. Compliance with AMC3 OPS.CAT.355.H 2. would be shown from the selected height.

6.7 Safe-forced-landing distance

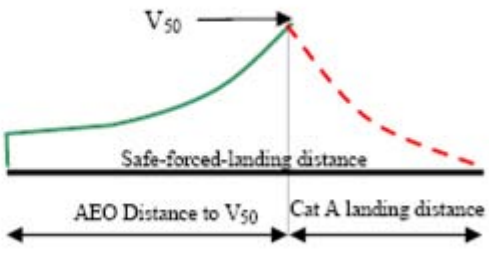
Except as provided in 6.6.2 above, the establishment of the safe-forced-landing distance could be problematical as is not likely that Performance Class 2 specific data will be available in the HFM.

By definition, the Category A reject distance may be used when the surface is not suitable for a reject, but may be satisfactory for a safe-force-landing (for example where the surface is flooded or is covered with vegetation).

Any Category A (or other accepted) data may be used to establish the distance – however, once established it remains valid only if the Category A mass (or the mass from the accepted data) is used and the Category A (or accepted) AEO profile to the TDP is flown. In view of these constraints, the likeliest Category A procedures are the clear area or the short field (restricted area/site) procedures.

From Figure 10, it can be seen that if the Category B V_{50} procedure is used to establish DPATO, the combination of the distance to 50 ft and the Category A 'clear area' landing distance, required by CS 29.81 (the horizontal distance required to land and come to a complete stop from a point 50 ft above the landing surface), will give a good indication of the maximum safe-forced-landing distance required (see also the discussion on Vstay-up above).

Figure 10 - Category B (V_{50}) safe-forced-landing distance



6.8 Performance Class 2 landing

For other than Performance Class 2 operations to elevated FATO's of helidecks (see the discussion in GM OPS.SPA.005.SFL(c) subparagraph 2.4.1), the principles for the landing case are much simpler. As the performance requirement for Performance Class 1 and Performance Class 2 landings are virtually identical, the condition of the landing surface is the main issue.

If the engine fails at any time during the approach, the helicopter is able either: to perform a go-around meeting the requirements of AMC3 OPS.CAT.355.H 2.; or perform a safe-forced-landing on the surface. In view of this, and if using Performance Class 1 data, the LDP should not be lower that the corresponding TDP (particularly in the case of a variable TDP).

The landing mass will be identical to the take-off mass for the same site (with consideration for any reduction due to obstacle clearance - as shown in Figure 6 above).

In the case of a balked landing (i.e. the landing site becomes blocked or unavailable during the approach); the full requirement for take-off obstacle clearance must be met.

GM4 OPS.CAT.355.H Performance applicability - Helicopters

PERFORMANCE CLASS 2 CRITERIA - OPERATIONS TO/FROM ELEVATED FATOS OR HELIDECKS

1. This GM describes types of operation to/from helidecks and elevated FATOs by helicopters operating in Performance Class 2, with an assured safe forced landing capability in the case of take-off and landing.

2. Take Off - Non-Hostile Environment

   a. Figure 1 shows a typical take-off profile for Performance Class 2 operations from a helideck or an elevated FATO in a non-hostile environment.

   b. If an engine failure occurs during the climb to the rotation point, compliance with AMC3 OPS.CAT.355.H 1.b. will enable a safe landing or a safe forced landing on the deck.

   c. If an engine failure occurs between the rotation point and the DPATO, compliance with AMC3 OPS.CAT.355.H 1.b. will enable a safe forced landing on the surface, clearing the deck edge.

   d. At or after the DPATO, the OEI flight path should clear all obstacles by the margins specified in AMC3 OPS.CAT.355.H 2..

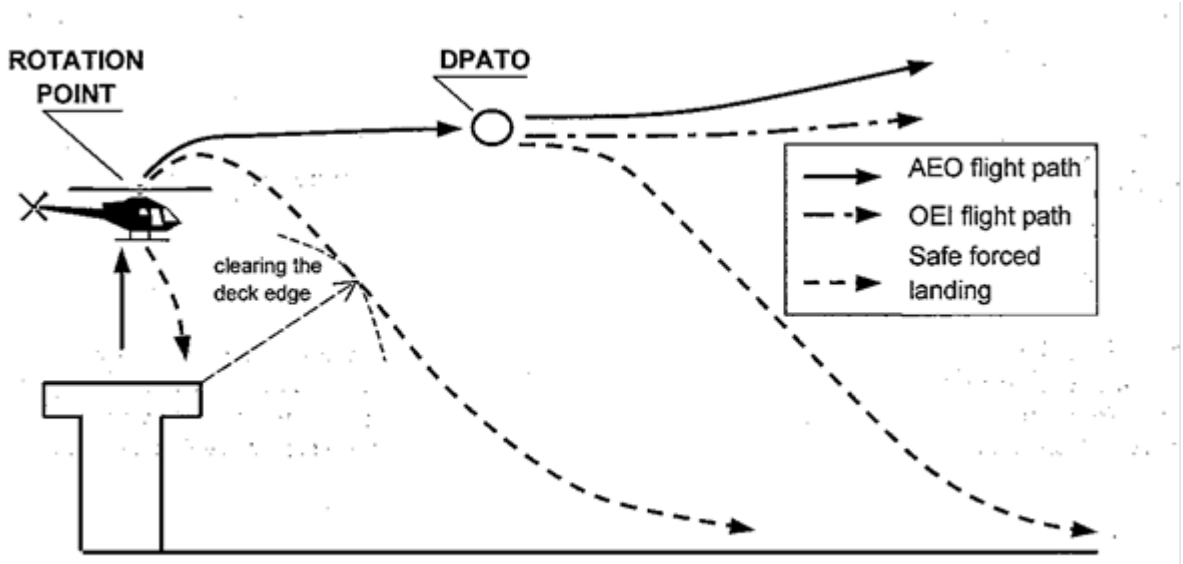


Figure 1

3. Landing - Non-Hostile Environment

   a. Figure 2 shows a typical landing profile for Performance Class 2 operations to a helideck or an elevated FATO in a non-hostile environment.

   b. The DPBL is defined as a “window” in terms of airspeed, rate of descent, and height above the landing surface. If an engine failure occurs before the DPBL, the pilot may elect to land or to execute a balked landing.

c. In the event of an engine failure being recognised after the DPBL and before the committal point, compliance with AMC3 OPS.CAT.355.H 4.b. will enable a safe force landing on the surface.

d. In the event of an engine failure at or after the committed point, compliance with AMC3 OPS.CAT.355.H 4.b. will enable a safe force landing on the deck.

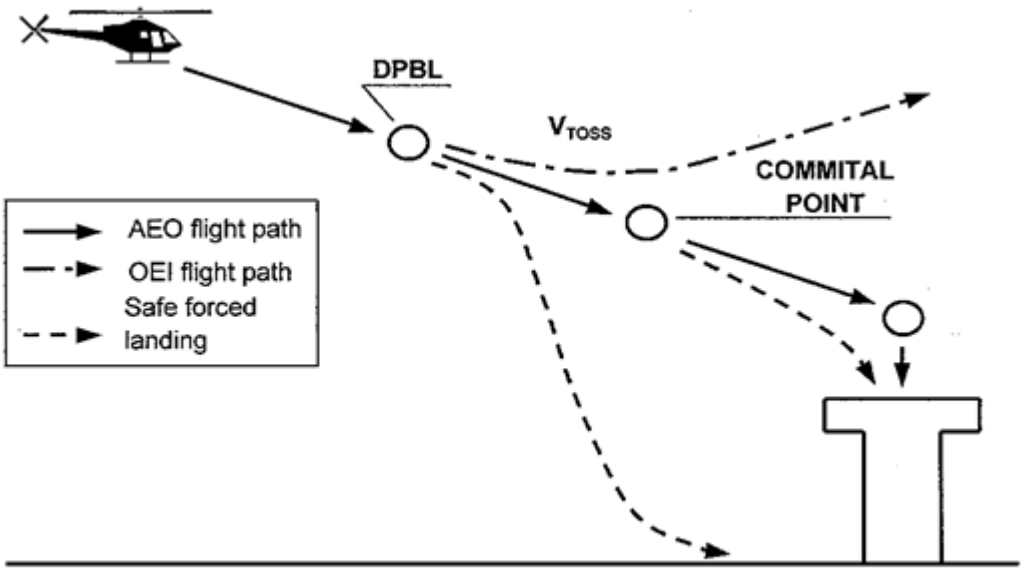


Figure 2

AMC4 OPS.CAT.355.H Performance applicability - Helicopters

PERFORMANCE CLASS 3 CRITERIA

1. Operations in Performance Class 3 should only be conducted:

   a. from/to those aerodromes/operating sites and over such routes, areas and diversions contained in a non-hostile environment;

   b. in sight of the surface;

   c. during day;

   d. when the ceiling is 600 ft or above; and

   e. when the visibility is 800 m or more.

2. Take-off

   a. The take-off mass should not exceed the maximum take-off mass specified for a hover in ground effect with all power units operating at take-off power. If conditions are such that a hover in ground effect is not likely to be established, the take-off mass should not exceed the maximum take-off mass specified for a hover out of ground effect with all power units operating at take-off power.

   b. In the event of a power unit failure, the helicopter should be able to perform a safe forced landing.

3. En-route

   a. The helicopter should be able, with all power units operating within the maximum continuous power conditions specified, to continue along its intended

route or to a planned diversion without flying at any point below the appropriate minimum flight altitude.

b. In the event of a power unit failure, the helicopter should be able to perform a safe forced landing.

4. Landing

a. The landing mass of the helicopter at the estimated time of landing should not exceed the maximum landing mass specified for a hover in ground effect, with all power units operating at take-off power. If conditions are such that a hover in ground effect is not likely to be established, the landing mass should not exceed the maximum landing mass specified for a hover out of ground effect with all power units operating at take-off power.

b. In the event of a power unit failure, the helicopter should be able to perform a safe forced landing.

AMC OPS.CAT.360.H(b)(3)(ii) Performance General - Helicopters

WIND COMPONENT FOR TAKE-OFF AND THE TAKE-OFF FLIGHT PATH

1. For take-off, take-off flight path and landing requirements, accountability for wind should be no more than 50% of any reported steady head wind component of 5 knots or more.

When precise wind measuring equipment enables accurate measurement of wind velocity over the point of take-off and landing, wind components in excess of 50% for take-off and the take-off flight path may be used provided:

a. the proximity to the FATO, and accuracy enhancements, of the wind measuring equipment is considered; and

b. appropriate procedures are contained in a supplement to the HFM; and

c. a safety case has been established.

2. Where take-off and landing with a tail wind component is permitted in the HFM, and in all cases for the take-off flight path, not less than 150% of any reported tail wind component should be taken into account.

AMC OPS.CAT.365.H(a)(2) Obstacle accountability - Helicopters

COURSE GUIDANCE

1. Standard course guidance includes Automatic Direction Finder (ADF) and VOR guidance.

2. Accurate course guidance includes ILS, MLS or other course guidance providing an equivalent navigational accuracy.

Section IV - Instruments, data and equipment

AMC OPS.CAT.405 Hand fire extinguishers – Motor-powered aircraft

HAND FIRE EXTINGUISHERS – NUMBER, LOCATION AND TYPE

1. The number and location of hand fire extinguishers should be such as to provide adequate availability for use, account being taken of the number and size of the passenger compartments, the need to minimise the hazard of toxic gas concentrations and the location of toilets, galleys etc. These considerations may result in the number of fire extinguishers being greater than the minimum prescribed.

2. There should be at least one fire extinguisher suitable for both flammable fluid and electrical equipment fires installed in the cockpit. Additional extinguishers may be required for the protection of other compartments accessible to the crew in flight. Dry chemical fire extinguishers should not be used in the cockpit, or in any compartment not separated by a partition from the cockpit, because of the adverse effect on vision during discharge and, if conductive, interference with electrical contacts by the chemical residues.

3. Where only one hand fire extinguisher is required in the passenger compartments it should be located near the cabin crew member's station, where provided.

4. Where two or more hand fire extinguishers are required in the passenger compartments and their location is not otherwise dictated by consideration of paragraph OPS.CAT.405(a), an extinguisher should be located near each end of the cabin with the remainder distributed throughout the cabin as evenly as is practicable.

5. 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.

6. The fire extinguishers located in the cockpit should contain Halon 1211 (bromochlorodifluoro-methane, CBrCIF2) or an equivalent extinguishing agent.

7. For aeroplanes with a maximum approved passenger seating configuration between 31 and 60, one of the required fire extinguishers located in the passenger compartment should contain Halon 1211 (bromochlorodi-fluoromethane, CBrCIF2) or an equivalent extinguishing agent.

8. For aeroplanes with a maximum approved passenger seating configuration of more than 61, at least two of the fire extinguishers located in the passenger compartment should contain Halon 1211 (bromochlorodi-fluoromethane, $CBrCIF_2$) or an equivalent extinguishing agent.

AMC OPS.CAT.406.A Safety harness - Aeroplanes

UPPER TORSO RESTRAINT SYSTEM

The safety harness should be an upper torso restraint system

AMC OPS.CAT.407.A Number of spare electrical fuses - Aeroplanes

SPARE ELECTRICAL FUSES

A spare electrical fuse means a replaceable fuse in the cockpit, not an automatic circuit breaker, or circuit breakers in the electric compartments.

AMC OPS.CAT.410 Flight instruments and equipment for VFR flights – Motor powered aircraft & OPS.CAT.415 Flight instruments and equipment for VFR night flights and IFR flights – Motor powered aircraft

All AMCs to OPS.GEN.410 and OPS.GEN.415 should be used to show compliance with OPS.CAT.410 and OPS.CAT.415 as applicable.

GM OPS.CAT.410.A Flight instruments and equipment for VFR flights – Motor powered aircraft & OPS.CAT.415.A Flight instruments and equipment for VFR night flights and IFR flights – Motor powered aircraft - Aeroplanes

NUMBERS OF EQUIPMENT

Guidance on implementation of OPS.CAT.410 and OPS.CAT.415 is given in Table 1 GM.OPS.CAT.410.A & 415.A - Aeroplanes.

Table 1A GM.OPS.CAT.410 & 415. - Aeroplanes

SERIAL		FLIGHTS UNDER VFR			FLIGHTS UNDER IFR OR AT NIGHT		
INSTRUMENT		SINGLE PILOT	TWO PILOTS REQUIRED	MAX T/O MASS AUTH>5 700 kg OR MAX PASS>9	SINGLE PILOT	TWO PILOTS REQUIRED	MAX T/O MASS AUTH>5 700 kg OR MAX PASS>9
(a)		(b)	(c)	(d)	(e)	(f)	(g)
1	Magnetic compass	1	1	1	1	1	1
2	Accurate time piece	1	1	1	1	1	1
3	OAT indicator	1	1	1	1	1	1
4	Sensitive pressure altimeter	1	2	2	2 *****	2 *****	2 *****
5	Air speed indicator	1	2	2	1	2	2
6	Heated pitot system			2	1	2	2
7	Pitot heat failure indicator						2
8	Vertical speed indicator	1	2	2	1	2	2
9	Turn and slip indicator or turn co-ordinator	1 *	2 * &**	2 * &**	1 ****	2 ****	2 ****
10	Attitude indicator	1 *	2 * &**	2 * &**	1	2	2
11	Gyroscopic	1	2	2	1	2	2

	direction indicator	*	* &**	* &**			
12	Standby attitude indicator						1
13	Mach number indicator	***					

* For local flights (A to A, 50 nm radius, not more than 60 minutes duration) the instruments at Serials 9(b) 10(b) and 11 (b) may be replaced by either a turn and slip indicator, or a turn co-ordinator, or both an attitude indicator and a slip indicator.

** The substitute instruments permitted by * above should be provided at each pilot's station.

*** Serial 13 - A Mach number indicator is required for each pilot whenever compressibility limitations are not otherwise indicated by airspeed indicators.

**** For IFR or at night, a turn and slip indicator, or a slip indicator and a third (standby) attitude indicator certificated according to CS 25.1303(b)(4) or equivalent, is required.

***** Neither three pointers, nor drum pointer altimeters satisfy the requirement.

GM OPS.CAT.410.H Flight instruments and equipment for VFR flights – Motor powered aircraft & OPS.CAT.415.H Flight instruments and equipment for VFR night flights and IFR flights – Motor powered aircraft - Helicopters

NUMBERS OF EQUIPMENT

Guidance on implementation of OPS.CAT.410 & 415 is given in Table 1 GM OPS.CAT.410.H & 415,H – Helicopters.

Table 1H GM OPS.CAT.410 & 415 - Helicopters

INSTRUMENT		FLIGHTS UNDER VFR		FLIGHTS UNDER IFR OR AT NIGHT	
		SINGLE PILOT	TWO PILOTS REQUIRED	SINGLE PILOT	TWO PILOTS REQUIRED
1	Magnetic direction indicator	1	1	1	1
2	Accurate time piece	1	1	1	1
3	OAT indicator	1	1	1	1
4	Sensitive pressure altimeter	1	2	2 *	2
5	Air speed indicator	1	2	1	2
6	Heated pitot system	1 **	2 **	1	2
7	Pitot heateat failure annuciator	-	-	1 ***	2 ***
8	Vertical speed indicator	1	2	1	2
9	Slip indicator	1	2	1	2
10	Attitude indicator	1 ****	2 ****	1	2
11	Gyroscopic direction indicator	1 ****	2 ****	1 *******	2 *******
12	Magnetic gyroscopic direction indicator	-	-	1 *******	2 *******

13	Standby attitude indicator	-	-	1 *****	1 *****
14	Alternate source of static pressure	-	-	1	1
15	Chart holder	-	-	1 *******	1 *******

* For single pilot night VFR night operation one sensitive pressure altimeter may be substituted by a radio altimeter.

** Required for helicopters with a maximum certificated take-off mass (MCTOM) exceeding 3 175 kg or having a maximum passenger seating configuration (MAPSC) of more than 9.

*** The pitot heater failure annunciation applies to any helicopter issued with an individual Certificate of Airworthiness after 1 August 1999. It also applies before that date when: the helicopter has a MCTOM exceeding 3 175 kg and a maximum approved passenger seating configuration greater than 9.

**** Required for helicopters with a maximum certificated take-off mass (MCTOM) exceeding 3 175 kg or required for any helicopters when operating over water; when out of sight of land or when the visibility is less than 1500 m .

***** For helicopters with a maximum certificated take-off mass (MCTOM) exceeding 3175 kg, CS-29 1303(g) may require either a gyroscopic rate-of-turn indicator combined with a slip-skid indicator (turn and bank indicator) or a standby attitude indicator satisfying the requirements. (However, the original type certification standard should be referred to determine the exact requirement.)

****** For IFR operation only

******* For VFR night operations only.]

AMC1 OPS.CAT.415(a)(2) Flight instruments and equipment for VFR night flights and IFR flights – Motor powered aircraft

MEANS OF INDICATING PITOT HEATER FAILURE

A combined means of indicating pitot heater failure is acceptable provided that is visible from each flight crew station and that there is a means to identify the failed heater in systems with two or more sensors.

AMC OPS.CAT.415.A(a) Flight instruments and equipment for VFR night flights and IFR flights – Motor powered aircraft

TURN AND SLIP INDICATORS FOR AEROPLANES WITH MCTOM ABOVE 5700 KG

If the standby attitude instrument system is certificated according to CS 25.1303(b)(4) or equivalent, the turn and slip indicators required by OPS.CAT.415 (a) may be replaced by slip indicators for aeroplanes.

AMC OPS.CAT.415(a)(4) Flight instruments and equipment for VFR night flights and IFR flights – Motor powered aircraft

STANDBY ALTITUDE INDICATOR

1. The standby attitude indicator (artificial horizon) should:

   a. be powered continuously during normal operation and, in the event of a total failure of the normal electrical generating system, be powered from a source independent of the normal electrical generating system;

b. for aeroplanes, provide reliable operation for a minimum of 30 minutes after total failure of the normal electrical generating system, taking into account other loads on the emergency power supply and operational procedures;

c. for helicopters, provide reliable operation for a minimum of 30 minutes or the time required to fly to a suitable alternate landing site, when operating over hostile terrain, or offshore, whichever is the greater, after total failure of the normal electrical generating system, taking into account other loads on the emergency power supply and operational procedures;

d. operate independently of any other attitude indicating system;

e. continue to operate automatically after total failure of the normal electrical generating system; and

f. be appropriately illuminated during all phases of operation.

2. Where the standby attitude indicator has its own dedicated power supply, there should be an associated indication, either on the instrument or on the instrument panel, when this supply is in use.

3. Aeroplanes involved in commercial air transport, with a maximum certificated take-off mass of 5 700 kg or less and already registered in the EU on 1 April 1995, should be equipped with a standby attitude indicator which may be located in the left-hand instrument panel.

AMC OPS.CAT.416 Airborne weather equipment

AIRBORNE WEATHER RADAR

The airborne weather equipment should be an airborne weather radar.

AMC OPS.CAT.417.A Windshield wipers - Aeroplanes

WINDSHIELD WIPERS

The means used to maintain a clear portion of the windshield during precipitation should be windshield wipers or an equivalent

AMC OPS.CAT.418.H Radio altimeters - Helicopters

AUDIO VOICE ALERTING DEVICE

The audio warning required in OPS.CAT.H.418 should be a voice warning.

AMC1 OPS.CAT.420.A(a) Flights over water – Motor powered aircraft

LIFE JACKETS – AEROPLANES

1. Landplanes should be equipped with life jackets incorporating a survivor locator light for each person on board when flying over water at a distance of more than 50 nautical miles from the shore.

2. Life jackets for infants may be substituted by other approved flotation devices equipped with a survivor locator light.

AMC2 OPS.CAT.420.A(a) Flights over water - Motor powered aircraft

LIFE –SAVING RAFTS AND EQUIPMENT FOR MAKING DISTRESS SIGNALS - AEROPLANES

1. The following should be readily available with each life-raft:

a. Means for maintaining buoyancy;

b. A sea anchor:

c. Life-lines and means of attaching one life-raft to another;

d. Paddles for life-rafts with a capacity of 6 or less;

e. Means of protecting the occupants from the elements;

f. A water resistant torch;

g. Signalling equipment to make the pyrotechnical distress signals described in ICAO Annex 2;

h. 100 g of glucose tablets for each 4, or fraction of 4, persons which the life-raft is designed to carry:

i. At least 2 litres of drinkable water provided in durable containers or means of making sea water drinkable or a combination of both; and

j. First-aid equipment.

2. As far as practicable, items listed in 1. should be contained in a pack.

GM OPS.CAT.420.H(b)(2) Flight over water - Motor powered aircraft

INTERNATIONAL REGULATIONS FOR PREVENTING COLLISIONS AT SEA - HELICOPTERS

International Regulations for Preventing Collisions at Sea are those which were published by the International Maritime Organization (IMO) in 1972.

AMC OPS.CAT.420.H(b) Flights over water - Motor powered aircraft

LIFE –SAVING RAFTS AND EQUIPMENT FOR MAKING DISTRESS SIGNALS - HELICOPTERS

1. Life-saving rafts in sufficient numbers to carry all persons on board should be:

   a. in the case of a helicopter carrying less than 12 persons, a minimum of one life-raft with a rated capacity of not less than the maximum number of persons on board; and

   b. in the case of a helicopter carrying more than 11 persons, a minimum of two life-rafts sufficient together to accommodate all persons capable of being carried on board. Should one life-raft of the largest rated capacity be lost, the overload capacity of the remaining life-raft(s) should be sufficient to accommodate all persons on the helicopter.

2. Each required life-saving raft should conform to the following specifications:

   a. be of an approved design and stowed so as to facilitate their ready use in an emergency;

   b. be radar conspicuous to standard airborne radar equipment;

   c. when carrying more than one life-raft on board, at least 50% should be able to be deployed by the crew while seated at their normal station, where necessary by remote control;

   d. life-rafts which 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.

3. Each required life-raft should contain at least the following:

   a. One approved survivor locator light;

   b. One approved visual signalling device;

c. One canopy (for use as a sail, sunshade or rain catcher) or other mean to protect occupants from the elements;

d. One radar reflector;

e. One 20 m retaining line designed to hold the life-raft near the helicopter but to release it if the helicopter becomes totally submerged;

f. One sea anchor;

g. 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. Seasickness tablets;

viii. One first-aid kit;

ix. One portable means of illumination;

x. One half litre of pure water and one sea water desalting kit;

xi. One comprehensive illustrated survival booklet in an appropriate language.

4. The equipment for making distress signal should be at least one survival Emergency Locator Transmitter (ELT(S)) for each life-raft carried (but not more than a total of 2 ELTs are required), capable of performing in accordance with AMC2 OPS.GEN.430.

GM OPS.CAT.426.H Crew Survival Suits - Helicopters

ESTIMATING SURVIVAL TIME

1. Introduction

a. A person accidentally immersed in cold seas (typically offshore Northern Europe) will have a better chance of survival if he 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.

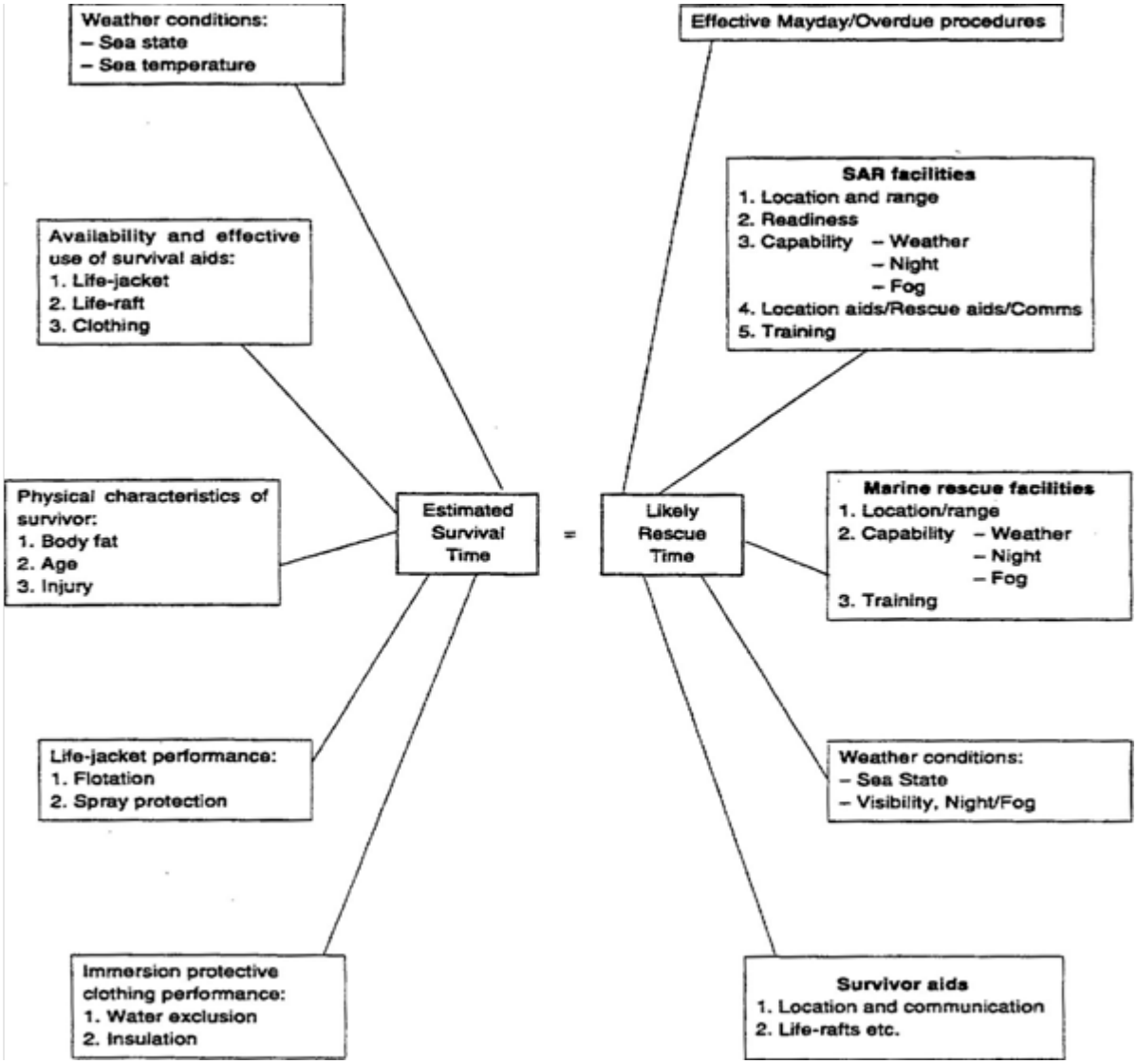
b. The complete survival suit system – suit, life-jacket and clothes worn under the suit – should be able to keep the wearer alive long enough for the rescue services to find and recover him/her. In practice the limit is about 3 hours. If a group of persons in the water cannot be rescued within this 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.

2. Survival times

a. The aim should be to ensure that a person in the water can survive long enough to be rescued, i.e. the survival time must be greater than the likely rescue time. The factors affecting both times are shown in Figure 1 of GM OPS.CAT.426.H.

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 of GM OPS.CAT.426.H - The survival equation



b. Broad estimates of likely survival times for the thin individual offshore are given in Table 1 of GM OPS.CAT.426.H. 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 of GM OPS.CAT.426.H - 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 1 ¼ 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 working clothes (with leakage inside suit)	0 -2	May well exceed 3 hours	May well exceed 3 hours
	3 – 4	Within 2 ¾ hours	May well exceed 3 hours
	5 and above	Significantly less than 2 ¾ hours. May well exceed 1 hour	May well exceed 3 hours

c. Consideration should also be given to escaping from the helicopter itself should it submerge or invert in the water. In this case escape time is limited to the length of time the occupants can hold their breath. The breath holding time can be greatly reduced by the effect of cold shock. Cold shock is caused by the sudden drop in skin temperature on immersion, and is characterised by a gasp reflex and uncontrolled breathing. The urge to breathe rapidly becomes overwhelming and, if still submerged, the individual will inhale water resulting in drowning. Delaying the onset of cold shock by wearing an immersion suit will extend the available escape time from a submerged helicopter.

d. The effects of water leakage and hydrostatic compression on the insulation quality of clothing are well recognised. In a nominally dry system the insulation is provided by still air trapped within the clothing fibres and between the layers of suit and clothes. It has been observed that many systems lose some of their insulative capacity either because the clothes under the 'waterproof' survival suit get wet to some extent or because of hydrostatic compression of the whole assembly. As a result of water leakage and compression, survival times will be shortened. The wearing of warm clothing under the suit is recommended.

e. Whatever type of survival suit and other clothing is provided, it should not be forgotten that significant heat loss can occur from the head.

GM OPS.CAT.427.H(b) Additional requirements for helicopters operating to or from helidecks located in a hostile sea area.

INSTALLATION OF THE LIFE RAFT SO AS TO BE USABLE IN THE SEA CONDITIONS

1. Projections on the exterior surface of the helicopter, which are located in a zone delineated by boundaries which are 1.22 m (4 ft) above and 0.61 m (2 ft) below the established static water line could cause damage to a deployed liferaft. Examples of projections which need to be considered are aerials, overboard vents, unprotected split-pin tails, guttering and any projection sharper than a three dimensional right angled corner.

2. While the boundaries specified in paragraph 1 are intended as a guide, the total area which should be considered should also take into account the likely behaviour of the life raft after deployment in all sea states up to the maximum in which the helicopter is capable of remaining upright.

3. Wherever a modification or alteration is made to a helicopter within the boundaries specified, the need to prevent the modification or alteration from causing damage to a deployed life raft should be taken into account in the design.

4. Particular care should also be taken during routine maintenance to ensure that additional hazards are not introduced by, for example, leaving inspection panels with sharp corners proud of the surrounding fuselage surface, or allowing door sills to deteriorate to a point where sharp edges become a hazard.

5. The same considerations apply in respect of emergency flotation equipment.

AMC1 OPS.CAT.432 Megaphones - Motor powered aircraft

LOCATION OF MEGAPHONES

1. Where one megaphone is required, it should be readily accessible at the assigned seat of a cabin crew member or crew members other than flight crew.

2. Where two or more megaphones are required, they should be suitably distributed in the passenger cabin(s) and readily accessible to crew members assigned to direct emergency evacuations.

3. Notwithstanding 1 and 2, this does not necessarily require megaphones to be positioned such that they can be physically reached by a crew member when strapped in a cabin crew member's seat.

AMC2 OPS.CAT.432 Megaphones - Motor powered aircraft

NUMBER OF MEGAPHONES - AEROPLANES

1. For each passenger deck:

Table 1A AMC OPS.CAT.432 Megaphones – Motor powered aircraft

Passenger seating configuration	Number of Megaphones
61 to 99	1
100 or more	2

2. For aeroplanes with more than one passenger deck, or in all cases when the maximum passenger seating configuration is more than 60, at least 1 megaphone should be carried.

AMC1 OPS.CAT.440 High altitude flights - Oxygen requirements - Motor powered aircraft

AEROPLANES AND HELICOPTERS

1. In the determination of oxygen for the routes to be flown, it is assumed that the aircraft will descend in accordance with the emergency procedures specified in the operations manual, without exceeding its operating limitations, to a flight altitude that will allow the flight to be completed safely (ie. flight altitudes ensuring adequate terrain clearance, navigational accuracy, hazardous weather avoidance etc.).

PRESSURISED AEROPLANES

2. The amount of oxygen should be determined on the basis of cabin pressure altitude, flight duration and, for pressurised aeroplanes, 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, and that, after the failure, the aircraft will descend in accordance with emergency procedures specified in the Aircraft Flight Manual to a safe altitude for the route to be flown that will allow continued safe flight and landing.

3. Following a cabin pressurisation failure, the cabin pressure altitude should be considered to be the same as the aeroplane pressure altitude, unless it can be demonstrated to the competent authority that no probable failure of the cabin or pressurisation system will result in a cabin pressure altitude equal to the aeroplane pressure altitude. Under these circumstances, the demonstrated maximum cabin pressure altitude may be used as a basis for determination of oxygen supply.

AMC2 OPS.CAT.440 High altitude flights - Oxygen requirements - Motor powered aircraft

OXYGEN REQUIREMENTS FOR COCKPIT SEAT OCCUPANTS AND CABIN CREW CARRIED IN ADDITION TO THE REQUIRED MINIMUM NUMBER OF CABIN CREW

1. When cockpit seat occupants are:
   a. supplied with oxygen from the flight crew source of oxygen, should be considered as flight crew members;
   b. not supplied with oxygen by the flight crew source of oxygen, should be considered as passengers.
2. Cabin crew members carried in addition to the minimum number of cabin crew and additional crew members should be considered as passengers for the purpose of oxygen supply.

GM1 OPS.CAT.440 High altitude flights - Oxygen requirements - Motor powered aircraft

CLARIFICATION OF THE OXYGEN REQUIREMENTS IN TABLE 1 OPS.CAT.440. AND TABLE 2 OPS.CAT.440.

1. The required minimum supply in Table 1 OPS.CAT.440. 5 and Table 2 OPS.CAT.440. 4 is the quantity of oxygen necessary for a constant rate of descent from the aeroplane's maximum certificated operating altitude to 10 000 ft in 10 minutes and followed by 20 minutes at 10 000 ft.
2. The required minimum supply in Table 2 OPS.CAT.440. 4 is the quantity of oxygen necessary for a constant rate of descent from the aeroplane's maximum certificated operating altitude to 10 000 ft in 10 minutes followed by 110 minutes at 10 000 ft.
3. Passenger numbers are passengers actually carried, including infants under the age of 2 years.
4. The required minimum supply in Table 1 OPS.CAT.440. 4 is the quantity of oxygen necessary for a constant rate of descent from the aeroplane's maximum certificated operating altitude to 15 000 ft in 10 minutes.

GM2 OPS.CAT.440 High altitude flights - Oxygen requirements - Motor powered aircraft

CREW MEMBERS OTHER THAN FLIGHT CREW

The crew members assisting flight crew in their duties are crew members other than flight crew and cabin crew. (e.g. HEMS crew members, hoist crew members).

GM OPS.CAT.440(b)(1) High altitude flights - Oxygen requirements - Motor powered aircraft

QUICK DONNING MASKS

Quick donning mask is a type of mask that:

1. can be placed on the face from its ready position, properly secured, sealed and supplying oxygen upon demand, with one hand and within five seconds and will thereafter remain in position, both hands being free;
2. can be donned without disturbing eye glasses and without delaying the flight crew member from proceeding with assigned emergency duties;
3. once donned, does not prevent immediate communication between the flight crew members and other crew members over the aircraft intercommunication system; and
4. does not inhibit radio communications.

AMC OPS.CAT.442.A Crew protective breathing equipment – Aeroplanes

PROTECTIVE BREATHING EQUIPMENT

1. While in use, a PBE should not inhibit communication.

2. The requirement for PBEs for flight crew may be met by the oxygen requirements.

AMC OPS.CAT.447.A First aid oxygen - Aeroplanes

TYPE AND QUANTITY OF FIRST AID OXYGEN

1. The amount of oxygen should be calculated using an average flow rate of at least 3 litres Standard Temperature Pressure Dry (STPD)/minute/person. It should be sufficient for the remainder of the flight after cabin depressurisation between a cabin altitude of 8000 ft and 15 000 ft, for at least 2% of the passengers carried, but not less than one person. There should be at least two dispensing units that may be portable.

2. The oxygen equipment should be capable of generating a mass flow to each user of at least four litres per minute, STPD. Means may be provided to decrease the flow to not less than two litres per minute, STPD, at any altitude.

GM OPS.CAT.447.A First aid oxygen – Aeroplanes

GENERAL

1. First aid oxygen is intended for those passengers who, having been provided with the oxygen required under OPS.CAT.440, still need to breathe undiluted oxygen when the amount of oxygen has been exhausted.

2. When calculating the amount of first-aid oxygen, an operator should take into account the fact that, following a cabin depressurisation, supplemental oxygen as calculated in accordance with Table 1 OPS.CAT.440 and Table 2 OPS.CAT.440 should be sufficient to cope with hypoxic problems for:

   a. all passengers when the cabin altitude is above 15 000 ft; and

   b. a proportion of the passengers carried when the cabin altitude is between 10 000 ft and 15 000 ft.

3. For the above reasons, the amount of first-aid oxygen should be calculated for the part of the flight after cabin depressurisation during which the cabin altitude is between 8000 ft and 15 000 ft, when supplemental oxygen may no longer be available.

4. Moreover, following cabin depressurisation an emergency descent should be carried out to the lowest altitude compatible with the safety of the flight. In addition, in these circumstances, the aeroplane should land at the first available aerodrome at the earliest opportunity.

5. The conditions above may reduce the period of time during which the first-aid oxygen may be required and consequently may limit the amount of first-aid oxygen to be carried on board.

AMC OPS.CAT.457.A Emergency medical kit – Aeroplanes

CONTENT OF EMERGENCY MEDICAL KIT

1. Emergency Medical Kits (EMKs) should be equipped with appropriate and sufficient medications and instrumentation. However, these kits should be adapted by the operator according to the characteristics of the operation (scope of operation, flight duration, number and demographics of passengers etc.).

2. The following should be included in the EMKs:

   a. Equipment:

i. Sphygmomanometer – non mercury

ii. Stethoscope

iii. Syringes and needles

iv. IV cannulae (if IV fluids are carried in the FAK a sufficient supply of IV cannulae should be stored there as well)

v. Oropharyngeal airways (3 sizes)

vi. Tourniquet

vii. Disposable gloves

viii. Needle disposal Box

ix. Urinary catheter (2 sizes) and anaesthetic gel

x. Basic delivery kit

xi. Bag-valve masks (masks 2 sizes: 1 for adults, 1 for children)

xii. Thermometer - non mercury

xiii. Forceps

xiv. Intubation set

xv. Aspirator

xvi. Blood glucose testing equipment

xvii. Scalpel

xviii. Automated external defibrillator.

b. Instructions:

The instructions should contain a list of contents (medications in trade names and generic names) in at least 2 languages. This should include information on the effects and side effects of medications carried. Basic instructions for use of the medications in the kit. ACLS Cards (summarising and depicting the current algorithm for Advanced Cardiac Life Support).

c. Medications:

i. Coronary vasodilator

ii. Anti-spasmodic

iii. Epinephrine/Adrenaline 1:1 000

iv. Adrenocortical steroid

v. Major analgesic

vi. Diuretic e.g. furosemide

vii. Antihistamine, oral and injectable form

viii. Sedative/anticonvulsant, injectable rectal and oral forms of sedative

ix. Medication for hypoglycaemia e.g. hypertonic glucose

x. Antiemetic

xi. Atropine

xii. Bronchial dilator – injectable and inhaled form

xiii. IV fluids, in appropriate quantity

xiv. Acetylsalicyl Acid (Aspirine) 300 mg in oral and / or injectable form

xv. Antiarrythmic

xvi. Antihypertensive medication

xvii. Injectable antibiotic

d. An automated external defibrillator should be carried on the aircraft however, not necessarily in the emergency medical kit.

e. For security reasons, items such as scissors should be stored securely.

AMC OPS.CAT.457.A(b) Emergency medical kit – Aeroplanes

QUALIFIED PERSONNEL

Qualified personnel means doctors, nurses or personnel with similar qualification.

AMC OPS.CAT.457.A(c)(2) Emergency medical kit – Aeroplanes

CARRYING UNDER SECURITY CONDITIONS

Where applicable the emergency medical kit should be carried on the flight deck.

AMC OPS.CAT.457.A(c)(3) Emergency medical kit – Aeroplanes

MAINTENANCE OF EMERGENCY MEDICAL KIT

In order to maintain the emergency medical kit the operator should ensure that the emergency medical kits are:

1. Inspected periodically to confirm, to the extent possible, that the contents are maintained in the condition necessary for their intended use; and
2. Replenished at regular intervals, in accordance with instructions contained on their labels, or as circumstances warrant.

AMC1 OPS.CAT.490.A Flight data recorder – Motor powered aircraft

LIST OF PARAMETERS TO BE RECORDED FOR AEROPLANES FIRST ISSUED WITH AN INDIVIDUAL CERTIFICATE OF AIRWORTHINESS ON OR AFTER 1 JANUARY 2010

The flight data recorder should record with reference to a timescale, the list of parameters in Table 1 AMC1 OPS.GEN.490.A and Table 2 AMC1 OPS.GEN.490.A, as applicable.

AMC2 OPS.CAT.490.A Flight data recorder– Motor powered aircraft

LIST OF PARAMETERS TO BE RECORDED FOR AEROPLANES FIRST ISSUED WITH AN INDIVIDUAL CERTIFICATE OF AIRWORTHINESS ON OR AFTER 1 APRIL 1998

1. The flight data recorder should record, with reference to a timescale:
   a. the parameters listed in Table 1a AMC2 OPS.CAT.490.A or Table 1b AMC2 OPS.CAT.490.A below, as applicable;
   b. the additional parameters listed in Table 2 AMC2 OPS.CAT.490.A below, for those aeroplanes with a maximum certificated take-off exceeding 27 000 kg;
   c. any dedicated parameters relating to novel or unique design or operational characteristics of the aeroplane as determined by the competent authority responsible for type or supplemental type certification; and
   d. the additional parameter listed in Table 3 AMC2 OPS.CAT.490.A below, for those aeroplanes equipped with electronic display system.

2. When determined by the competent authority responsible for type or supplemental type certification and agreed by the Agency, the flight data recorder of aeroplanes first issued with an individual Certificate of Airworthiness before 20 August 2002 and equipped with an electronic display system does not need to record those parameters listed in Table 3 AMC2 A OPS.CAT.490 below for which:

   a. The sensor is not available;

   b. The aeroplane system or equipment generating the data needs to be modified; or

   c. The signals are incompatible with the recording system;

3. The flight data recorder of aeroplanes first issued with an individual Certificate of Airworthiness on or after 1 April 1998 but not later than 1 April 2001, are not required to comply with 1. above if:

   a. Compliance with 1.a. cannot be achieved without extensive modification to the aeroplane system and equipment other than the flight recoding system.

   b. The flight data recorder of the aeroplane can comply with AMC3 A OPS.CAT.490 except that parameter 15b in Table 1 AMC2 A OPS.CAT.490 of this AMC need not to be recorded.

4. The operational performance requirements for Flight Data Recorders should be those laid down in EUROCAE Document ED55 (Minimum Operational Performance Specification for Flight Data Recorder Systems) dated May 1990.

5. The parameters to be recorded should meet, as far as practicable, the performance specifications (designated ranges, sampling intervals, accuracy limits and minimum resolution in read-out) defined in the relevant tables of EUROCAE Minimum Operational Performance Specification for Flight Data Recorder Systems, Document ED 55 dated May 1990. The remarks columns of those tables are acceptable means of compliance to the parameter specifications.

6. For aeroplanes with novel or unique design or operational characteristics, the additional parameters should be those required by the competent authority responsible for type or supplemental type certification.

7. If recording capacity is available, as many of the additional parameters specified in table A1.5 of Document ED 55 dated May 1990 as possible should be recorded.

Table 1a AMC2 OPS.CAT.490.A

AEROPLANES WITH A MAXIMUM CERTIFICATED TAKE-OFF MASS EXCEEDING 5 700 KG

No.*	Parameter
1	Time or relative time count
2	Pressure altitude
3	Indicated airspeed
4	Heading
5	Normal acceleration
6	Pitch attitude
7	Roll attitude
8	Manual radio transmission keying
9	Propulsive thrust/ power on each engine and cockpit thrust/power lever position if applicable
10	Trailing edge flap or cockpit control selection

11	Leading edge flap or cockpit control selection
12	Thrust reverse status
13	Ground spoiler position and/or speed brake selection
14	Total or outside air temperature
15	Autopilot, autothrottle and AFCS mode and engagement status
16	Longitudinal acceleration (Body axis)
17	Lateral acceleration

* The number in the left hand column reflects the Serial Numbers depicted in EUROCAE document ED55.

Table 1b AMC2 OPS.CAT.490.A

AEROPLANES WITH A MAXIMUM CERTIFICATED TAKE-OFF MASS OF 5 700 KG OR BELOW

No.*	Parameter
1	Time or relative time count
2	Pressure altitude
3	Indicated airspeed
4	Heading
5	Normal acceleration
6	Pitch attitude
7	Roll attitude
8	Manual radio transmission keying
9	Propulsive thrust/ power on each engine and cockpit thrust/power lever position if applicable
10	Trailing edge flap or cockpit control selection
11	Leading edge flap or cockpit control selection
12	Thrust reverse status
13	Ground spoiler position and/or speed brake selection
14	Total or outside air temperature
15	Autopilot/autothrottle engagement status
16	Angle of attack (if a suitable sensor is available)
17	Longitudinal acceleration (Body axis)

* The number in the left hand column reflects the Serial Numbers depicted in EUROCAE document ED55.

Table 2 AMC2 OPS.CAT.490.A

ADDITIONAL PARAMETERS FOR AEROPLANES WITH A MAXIMUM CERTIFICATED TAKE-OFF MASS OF OVER 27 000 KG

No.*	Parameter
18	Primary flight controls - Control surface position and/or pilot input (pitch, roll, yaw)
19	Pitch trim position

20	Radio altitude
21	Vertical beam deviation (ILS Glide path or MLS Elevation)
22	Horizontal beam deviation (ILS Localiser or MLS Azimuth)
23	Marker Beacon Passage
24	Warnings
25	Reserved (Navigation receiver frequency selection is recommended)
26	Reserved (DME distance is recommended)
27	Landing gear squat switch status or air/ground status
28	Ground Proximity Warning System
29	Angle of attack
30	Low pressure warning (hydraulic and pneumatic power)
31	Groundspeed
32	Landing gear or gear selector position

* The number in the left hand column reflects the Serial Numbers depicted in EUROCAE document ED55.

Table 3 AMC2 OPS.CAT.490.A

AEROPLANES EQUIPPED WITH ELECTRONIC DISPLAY SYSTEMS

No.	No.*	Parameter
33	6	Selected barometric setting (Each pilot station)
34	7	Selected altitude
35	8	Selected speed
36	9	Selected mach
37	10	Selected vertical speed
38	11	Selected heading
39	12	Selected flight path
40	13	Selected decision height
41	14	EFIS display format
42	15	Multi function /Engine / Alerts display format

* The number in the centre column reflects the Serial Numbers depicted in EUROCAE document ED55 table A1.5.

AMC3 OPS.CAT.490.A Flight data recorder– motor powered aircraft

LIST OF PARAMETERS TO BE RECORDED FOR AEROPLANES FIRST ISSUED WITH AN INDIVIDUAL CERTIFICATE OF AIRWORTHINESS ON OR AFTER 1 JUNE 1990 UP TO AND INCLUDING 31 MARCH 1998

1. The flight data recorder should, with reference to a timescale, record:

   a. the parameters listed in Table 1 AMC3 OPS.CAT.490.A below;

   b. the additional parameters listed in Table 2 AMC3 OPS.CAT.490.A below for those aeroplanes with a maximum certificated take-off mass exceeding 27 000 kg.

2. When determined by the competent authority responsible for type or supplemental type certification and agreed by the Agency, the flight data recorder of aeroplanes having a maximum certificated take-off mass of 27 000 kg or below do not need to record parameters 14 and 15b of Table 1 AMC3 OPS.CAT.490.A below if any of the following conditions are met:

   a. the sensor is not readily available;

   b. sufficient capacity is not available in the flight recorder system; and

   c. a change is required in the equipment that generates the data.

3. When determined by the competent authority responsible for type or supplemental type certification and agreed by the Agency, the flight data recorder of aeroplanes having a maximum certificated take-off mass exceeding 27 000 kg, does not need to record parameter 15b of Table 1 AMC3 OPS.CAT.490.A below, and parameters 23, 24, 25, 26, 27, 28, 29, 30 and 31 of Table 2 AMC3 OPS.CAT.490.A below, if any of the following conditions are met:

   a. the sensor is not readily available;

   b. sufficient capacity is not available in the flight data recorder system;

   c. a change is required in the equipment that generates the data;

   d. for navigational data (NAV frequency selection, DME distance, latitude, longitude, ground speed and drift) the signals are not available in digital form; and

   e. when the above conditions have been met and that compliance with this AMC would imply significant modifications to the aeroplane with a severe re-certification effort.

4. When determined by the competent authority responsible for type or supplemental type certification and agreed by the Agency, the flight data recorder does not need to record individual parameters that can be derived by calculation from the other recorded parameters.

Table 1 AMC3 OPS.CAT.490.A

AEROPLANES WITH A MAXIMUM CERTIFICATED TAKE-OFF MASS EXCEEDING 5 700 KG

No	Parameter
1	Time or relative time count
2	Pressure altitude
3	Indicated Airspeed
4	Heading
5	Normal Acceleration
6	Pitch attitude
7	Roll attitude
8	Manual radio transmission keying unless an alternate means to synchronise FDR and CVR recordings is provided
9	Power on each engine
10	Trailing edge flap or cockpit control selection
11	Leading edge flap or cockpit control selection
12	Thrust reverse position (for turbojet aeroplanes only)

13	Ground spoiler position and/or speed brake selection
14	Outside air temperature or Total Air Temperature
15a	Autopilot engagement status
15b	Autopilot operating modes, autothrottle and AFCS systems engagement status and operating modes.

Table 2 AMC3 OPS.CAT.490.A

ADDITIONAL PARAMETERS FOR AEROPLANES WITH A MAXIMUM CERTIFICATED TAKE-OFF MASS EXCEEDING 27000 KG

No	Parameter
16	Longitudinal acceleration
17	Lateral acceleration
18	Primary flight controls - Control surface position and/or pilot input (pitch, roll and yaw)
19	Pitch trim position
20	Radio altitude
21	Glide path deviation
22	Localiser deviation
23	Marker beacon passage
24	Master warning
25	NAV 1 and NAV 2 frequency selection
26	DME 1 and DME 2 distance
27	Landing gear squat switch status
28	Ground proximity warning system
29	Angle of attack
30	Hydraulics, each system (low pressure)
31	Navigation data
32	Landing gear or gear selector position

AMC4 OPS.CAT.490.A Flight data recorder

LIST OF PARAMETERS TO BE RECORDED FOR AEROPLANES FIRST ISSUED WITH AN INDIVIDUAL CERTIFICATE OF AIRWORTHINESS BEFORE 1 JUNE 1990

1. The flight data recorder should, with reference to a timescale, record:

   a. the parameters listed in Table 1 AMC4 OPS.CAT.490.A below;

   b. the additional parameters 6 to 15b of Table 2 AMC4 OPS.CAT.490.A below, for aeroplanes with a maximum certificated take-off mass exceeding 5 700 kg but not exceeding 27000 kg and first issued with an individual Certificate of Airworthiness on or after 1 January 1989, when the following conditions are met:

      i. sufficient capacity is available on a flight recorder system;

      ii. the sensor is readily available; and

iii. a change is not required in the equipment that generates the data.

c. the additional parameters from 6 to 15b of Table 2 AMC4 OPS.CAT.490.A below, for aeroplanes with a maximum certificated take-off mass exceeding 27 000 kg that are of a type first type certificated after 30 September 1969;

d. the additional parameters listed in Table 2 AMC4 OPS.CAT.490.A below for aeroplanes with a maximum certificated take off mass exceeding 27 000 kg and first issued with an individual Certificate of Airworthiness on or after 1 January 1987, when the following conditions are met:

i. sufficient capacity is available on a flight recorder system;

ii. the sensor is readily available; and

iii. a change is not required in the equipment that generates the data.

2. When determined by the competent authority responsible for type or supplemental type certification and agreed by the Agency, the flight data recorder of aeroplanes with a maximum certificated take-off mass exceeding 27 000 kg that are of a type first type certificated after 30 September 1969 does not need to record the parameters 13, 14 and 15b in Table 2 AMC4 OPS.CAT.490.A below, when any of the following conditions are met:

i. sufficient capacity is available on a flight recorder system;

ii. the sensor is readily available; and

iii. a change is not required in the equipment that generates the data.

3. When so determined by the competent authority responsible for type or supplemental type certification and agreed by the Agency, the flight data recorder does not need to record individual parameters that can be derived by calculation from the other recorded parameters.

Table 1 AMC4 OPS.CAT.490.A

AEROPLANES WITH A MAXIMUM CERTIFICATED TAKE-OFF MASS EXCEEDING 5 700 KG

No.	Parameter
1	Time or relative time count
2	Pressure altitude
3	Indicated Airspeed
4	Heading
5	Normal Acceleration

Table 2 AMC4 OPS.CAT.490.A

ADDITIONAL PARAMETERS FOR AEROPLANES WITH A MAXIMUM CERTIFICATED TAKE-OFF MASS EXCEEDING 27 000 KG

No	Parameter
6	Pitch attitude
7	Roll attitude
8	Manual radio transmission keying unless an alternate means to synchronise the FDR and CVR recordings is provided
9	Power on each engine
10	Trailing edge flap or cockpit control selection
11	Leading edge flap or cockpit control selection
12	Thrust reverse position (for turbojet aeroplanes only)
13	Ground spoiler position and/or speed brake selection
14	Outside air temperature or total air temperature
15a	Autopilot engagement status
15b	Autopilot operating modes, autothrottle and AFCS, systems engagement status and operating modes.
16	Longitudinal acceleration
17	Lateral acceleration
18	Primary flight controls – Control surface position and/or pilot input (pitch, roll and yaw)
19	Pitch trim position
20	Radio altitude
21	Glide path deviation
22	Localiser deviation
23	Marker beacon passage
24	Master warning
25	NAV 1 and NAV 2 frequency selection
26	DME 1 and DME 2 distance
27	Landing gear squat switch status

28	Ground proximity warning system
29	Angle of attack
30	Hydraulics, each system (low pressure)
31	Navigation data (latitude, longitude, ground speed and drift angle)
32	Landing gear or gear selector position

Appendix 1 to AMC3 CAT.490.A and AMC4 OPS.CAT.490.A Flight data recorder

PERFORMANCES SPECIFICATIONS FOR THE PARAMETERS TO BE RECORDED FOR AEROPLANES FIRST ISSUED WITH AN INDIVIDUAL CERTIFICATE OF AIRWORTHINESS BEFORE 1 APRIL 1998

The parameters to be recorded should meet the performance specifications (designated ranges, recording intervals and accuracy limits) defined in Table 1 of Appendix 1 to AMC3 GEN.490.A and AMC4 OPS.GEN.490.A.

AMC1 OPS.CAT.490.H Flight data recorder

LIST OF PARAMETERS TO BE RECORDED FOR HELICOPTERS FIRST ISSUED WITH AN INDIVIDUAL CERTIFICATE OF AIRWORTHINESS ON OR AFTER 1 JANUARY 2010

The flight data recorder should, with reference to a timescale, record the list of parameters in Table 1 AMC1 OPS.GEN.490.H and Table 2 AMC1 OPS.GEN.490.H, as applicable.

AMC2 OPS.CAT.490.H Flight data recorder

LIST OF PARAMETERS TO BE RECORDED FOR HELICOPTERS HAVING A MCTOM EXCEEDING 3175 KG AND FIRST ISSUED WITH AN INDIVIDUAL CERTIFICATE OF AIRWORTHINESS AFTER 31 JULY 1999 AND HELICOPTERS HAVING A MCTOM EXCEEDING 7 000 KG OR A MAXIMUM APPROVED PASSENGER SEATING CONFIGURATION OF MORE THAN 9 AND FIRST ISSUED WITH AN INDIVIDUAL CERTIFICATE OF AIRWORTHINESS AFTER 31 DECEMBER 1988

1. The flight data recorder should, with reference to a timescale, record:
   a. for helicopters with a maximum certificated take-off mass between 3 175 kg and 7 000 kg the parameters listed in Table 1 AMC2 OPS.CAT.490.H below;
   b. for helicopters with a maximum certificated take-off mass exceeding 7 000 kg, the parameters listed in Table 2 AMC2 OPS.CAT.490.H below;
   c. any dedicated parameters relating to novel or unique design or operational characteristics of the helicopter; and
   d. the parameters listed in Table 3 AMC2 OPS.CAT.490.H below, for helicopters equipped with electronic display system.
2. When determined by the competent authority responsible for type or supplemental type certification and agreed by the Agency, the flight data recorder of helicopters with a maximum certificated take-off mass exceeding 7 000 kg does not need to record parameter 19 of Table 2 AMC2 OPS.CAT.490.H below, if any of the following conditions are met:
   a. The sensor is not available; and
   b. A change is required in the equipment that generates the data.
3. Individual parameters that can be derived by calculation from the other recorded parameters, need not to be recorded, if agreed by the Agency.

4. The parameters to be recorded should meet, as far as practicable, the performance specifications (designated ranges, sampling intervals, accuracy limits and minimum resolution in read-out) defined in the relevant tables of EUROCAE Minimum Operational Performance Specification for Flight Data Recorder Systems, Document ED 55 dated May 1990. The remarks columns of those tables are acceptable means of compliance to the parameter specifications.

5. Table 1 AMC2 OPS.CAT.490.H refers to EUROCAE document ED-55 Table A1-4, Table 2 AMC2 OPS.CAT.490.H refers to ED-55 Table A1-2 and Table 3 AMC2 OPS.CAT.490.H refers to ED-55 Table A1-5 parameters 6 to 15.

6. If recording capacity is available, as many of the additional parameters specified in Table A1.5 of Document ED-55 dated May 1990 as possible should be recorded.

7. For the purpose of this AMC a sensor is considered “readily available” when it is already available or can be easily incorporated.

8. The term ‘where practicable’ used in the remarks column of Table A1.5 means that account should be taken of the following:

   a. If the sensor is already available or can be easily incorporated;

   b. Sufficient capacity is available in the flight recorder system;

   c. For navigational data (nav frequency selection, DME distance, latitude, longitude, groundspeed and drift) the signals are available in digital form;

   d. The extent of modification required;

   e. The down-time period;

   f. Equipment software development.

Table 1 AMC2 OPS.CAT.490.H

HELICOPTERS WITH A MAXIMUM CERTIFICATED TAKE-OFF MASS OF 7 000 KG OR LESS

No.	Parameter
1	Time or relative time count
2	Pressure altitude
3	Indicated airspeed
4	Heading
5	Normal acceleration
6	Pitch attitude
7	Roll attitude
8	Manual radio transmission keying
9	Power on each engine (free power turbine speed and engine torque)/cockpit power control position (if applicable)
10a	Main rotor speed
10b	Rotor brake (if installed)
11	Primary flight controls - Pilot input and control output position (if applicable)
11a	Collective pitch
11b	Longitudinal cyclic pitch
11c	Lateral cyclic pitch
11d	Tail rotor pedal

11e	Controllable stabilator
11f	Hydraulic selection
12	Warnings
13	Outside air temperature
14	Autopilot engagement status
15	Stability augmentation system engagement

Table 2 AMC2 OPS.CAT.490.H

HELICOPTERS WITH A MAXIMUM CERTIFICATED TAKE-OFF MASS OF EXCEEDING 7 000 KG

No.	Parameter
1	Time or relative time count
2	Pressure altitude
3	Indicated airspeed
4	Heading
5	Normal acceleration
6	Pitch attitude
7	Roll attitude
8	Manual radio transmission keying
9	Power on each engine (free power turbine speed and engine torque)/cockpit power control position (if applicable)
10a	Main rotor speed
10b	Rotor brake (if installed)
11	Primary flight controls - Pilot input and control output position (if applicable)
11a	Collective pitch
11b	Longitudinal cyclic pitch
11c	Lateral cyclic pitch
11d	Tail rotor pedal
11e	Controllable stabilator
11f	Hydraulic selection
12	Hydraulics low pressure
13	Outside air temperature
14	AFCS mode and engagement status
15	Stability augmentation system engagement
16	Main gear box oil pressure
17	Main gear box oil temperature
18	Yaw rate or yaw acceleration
19	Indicated sling load force (if installed)
20	Longitudinal acceleration (body axis)

21	Lateral acceleration
22	Radio altitude
23	Vertical beam deviation (ILS glide path or MLS elevation)
24	Horizontal beam deviation (ILS localiser or MLS azimuth)
25	Marker beacon passage
26	Warnings
27	Reserved (Nav receiver frequency selection is recommended)
28	Reserved (DME distance is recommended)
29	Reserved (navigation data is recommended)
30	Landing gear or gear selector position

Table 3 AMC2 OPS.CAT.490.H

HELICOPTERS EQUIPPED WITH ELECTRONIC DISPLAY SYSTEMS

No.	Parameter
6	Selected barometric setting (Each pilot station)
7	Selected altitude
8	Selected speed
9	Selected mach
10	Selected vertical speed
11	Selected heading
12	Selected flight path
13	Selected decision height
14	EFIS display format
15	Multi function /Engine / Alerts display format

AMC OPS.CAT.515.A MICROPHONES - AEROPLANESGENERAL

The boom microphone or throat microphones should be worn in a position which permits use for two-way radio communications.

AMC OPS.CAT.516 Crew member interphone system - Motor powered aircraft

CHARACTERISTICS

The crew member interphone system should:

1. Operate independently of the public address system except for handsets, headsets, microphones, selector switches and signalling devices;
2. Be operable at required cabin crew member stations close to floor level emergency exits;
3. Have an alerting system incorporating aural or visual signals for use by flight and cabin crew;
4. Have a means for the recipient of a call to determine whether it is a normal call or an emergency call as following:
   a. Lights of different colours;

b. Codes defined by the operator (e.g. different number of rings for normal and emergency calls);

c. Any other indicating signal acceptable to the competent authority responsible for type certification or supplemental type certification;

5. In the case of aeroplanes, provide two-way communication between:

a. the flight crew compartment and each passenger compartment;

b. the flight crew compartment and each galley located other than on a passenger deck level;

c. the flight crew compartment and each remote crew compartment and crew member station that is not on the passenger deck and is not accessible from a passenger compartment; and

d. ground personnel and at least two flight crew members. This interphone system for use by the ground personnel should be, where practicable, so located that the personnel using the system may avoid detection from within the aeroplane;

6. In the case of helicopters, provide two-way communication between each crew member station;

7. Be operable from each required flight crew station.

AMC OPS.CAT.517 Public address system - Motor powered aircraft

CHARACTERISTICS

The public address system should:

1. Operate independently of the interphone systems except for handsets, headsets, microphones, selector switches and signalling devices;

2. Be readily accessible for immediate use from each required from each required flight crew station;

3. Have, for each floor level passenger emergency exit which has an adjacent cabin crew seat, a microphone operable by the seated cabin crew member, except that one microphone may serve more than one exit, provided the proximity of exits allows unassisted verbal communication between seated cabin crew members;

4. Be operable within 10 seconds by a cabin crew member at each of those stations;

5. Be audible at all passenger seats, toilets, cabin crew seats and work stations;

6. In the case of helicopters, following a total failure of the normal electrical generating system, provide reliable operation for a minimum of 10 minutes.

AMC OPS.CAT.519.A Internal doors and curtains

PLACARDS' INDICATION

Placards on each internal door, or next to a curtain, that is the means of access to a passenger emergency exit, should indicate that it should be secured open during take off and landing.

AMC1 OPS.CAT.525 Communication and navigation equipment for VFR as controlled flights, night flights and IFR flights – Motor-powered aircraft

TWO INDEPENDENT COMMUNICATION MEANS

Whenever two independent means of communication are required, each system should have an independent antenna installation. Whenever rigidly supported non-wire antennae or other antenna installations of equivalent reliability are used, only one antenna may be required.

AMC2 OPS.CAT.525.A Communication and navigation equipment for VFR as controlled flights, night flights and IFR flights – Motor-powered aircraft

ACCEPTABLE NUMBER AND TYPE OF COMMUNICATION AND NAVIGATION EQUIPMENT FOR AEROPLANES

1. Aeroplanes should be equipped with:

   a. One VOR receiving system, one ADF system, one DME, except that an ADF system need not be installed provided that the use of ADF is not required in any phase of the planned flight;

   b. One ILS or MLS where ILS or MLS is required for approach navigation purposes;

   c. One Marker Beacon receiving system where a Marker Beacon is required for approach navigation purposes;

   d. Area Navigation equipment when area navigation is required for the route being flown (e.g. equipment required by OPS.SPA.001.SPN);

   e. An additional DME system on any route, or part thereof, where navigation is based only on DME signals;

   f. An additional VOR receiving system on any route, or part thereof, where navigation is based only on VOR signals; and

   g. An additional ADF system on any route, or part thereof, where navigation is based only on NDB signals.

2. An aeroplane may be operated without the navigation equipment specified in 1.e. and1 f. provided it is equipped with alternative equipment. The reliability and the accuracy of alternative equipment should allow safe navigation for the intended route.

3. For short haul operations (operations not crossing the North Atlantics) in the NAT MNPS airspace, an aeroplane may be equipped with only one Long Range Communication System (HF-system) if alternative communication procedures are published for the airspace concerned.

4. An operator should ensure that aeroplanes conducting ETOPS have a communication means capable of communicating with an appropriate ground station at normal and planned contingency altitudes. For ETOPS routes where voice communication facilities are available, voice communications shall be provided. For all ETOPS operations beyond 180 minutes, reliable communication technology, either voice based or data link, should be installed. Where voice communication facilities are not available and where voice communication is not possible or is of poor quality, communications using alternative systems should be ensured.

5. To perform IFR operations without an ADF system installed, an operator should consider the following guidelines on equipment carriage, operational procedures and training criteria.

   a. The removal/non installation of ADF equipment from an aeroplane may only be done where it is not essential for navigation, and provided that alternative equipment giving equivalent or enhanced navigation capability is carried. This may be accomplished by the carriage of an additional VOR receiver or a GNSS receiver approved for IFR operations.

   b. For IFR operations without ADF, an operator should ensure that:

      i. route segments that rely solely on ADF for navigation are not flown;

      ii. a firm commitment is made not to fly any ADF/NDB procedures;

      iii. that the MEL has been amended to take account of the non-carriage of ADF;

iv. that the Operations Manual does not reference any procedures based on NDB signals for the aeroplanes concerned; and

v. that flight planning and dispatch procedures are consistent with the above mentioned criteria.

c. The removal of ADF should be taken into account by the operator in the initial and recurrent training of flight crew.

6. VHF communication equipment, ILS Localiser and VOR receivers installed on aeroplanes to be operated in IFR should comply with the following FM immunity performance standards:

a. ICAO Annex 10 , Volume I - Radio Navigation Aids, and Volume III, Part II - Voice Communications Systems.

b. Acceptable equipment standards contained in EUROCAE Minimum Operational Performance Specifications, documents ED-22B for VOR receivers, ED-23B for VHF communication receivers and ED-46B for LOC receivers and the corresponding RTCA documents DO-186, DO-195 and DO-196.

AMC2 OPS.CAT.525.H Communication and navigation equipment for VFR as controlled flights, night flights and IFR flights – Motor-powered aircraft

ACCEPTABLE NUMBER AND TYPE OF COMMUNICATION AND NAVIGATION EQUIPMENT FOR HELICOPTERS

1. Helicopters should be equipped with:

a. Two VOR receiving systems on any route, or part thereof, where navigation is based only on VOR signals;

b. Two ADF systems on any route, or part thereof, where navigation is based only on NDB signals.

c. Area Navigation equipment when area navigation is required for the route being flown (e.g. equipment required by OPS.SPA.001.SPN)

2. A helicopter may be operated without the navigation equipment specified in 1.a. and 1.b. above provided it is equipped with alternative equipment. The reliability and the accuracy of alternative equipment should allow safe navigation for the intended route.

3. VHF communication equipment, ILS Localiser and VOR receivers installed on helicopters to be operated under IFR should comply with the following FM immunity performance standards:

a. ICAO Annex 10 , Volume I - Radio Navigation Aids, and Volume III, Part II - Voice Communications Systems.

b. Acceptable equipment standards contained in EUROCAE Minimum Operational Performance Specifications, documents ED-22B for VOR receivers, ED-23B for VHF communication receivers and ED-46B for LOC receivers and the corresponding RTCA documents DO-186, DO-195 and DO-196.

Subpart C - Commercial operations other than Commercial Air Transport

Section II - Operational procedures

AMC OPS.COM.116 Briefing of operational personnel

GENERAL

1. The purpose of operational briefing is to ensure that personnel involved in specialised tasks are familiar with all aspects of the operation, including their responsibilities.
2. Such briefing should include, as appropriate:
   a. behaviour on the ground and in-flight, including emergency procedures;
   b. procedures for boarding and disembarking;
   c. procedures for loading and unloading the aircraft;
   d. use of doors in normal and emergency operations;
   e. use of communication equipment and hand signals;
   f. precautions in case of a landing on sloping ground; and
   g. in addition to the items of AMC1 OPS.GEN.115, before take-off:
      i. location of emergency exits;
      ii. restrictions regarding smoking;
      iii. restrictions regarding the use of portable electronic equipment;
      iv. stowage of tools and hand baggage; and
      v. restrictions on the freedom of movement in the cabin.
3. 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 OPS.COM.270 Standard operating procedures - specialised operations other than the transport of persons, cargo or mail

DEVELOPMENT OF STANDARD OPERATING PROCEDURE (SOP)

1. Procedures relating to specialised operations other than the transport of persons, cargo or mail should be developed to a standard format in accordance with AMC 2 OPS.COM.270 (SOP Template) and taking into account the results of the risk assessment process.
2. Procedures should be based on a systematic risk assessment in accordance with this part 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.
3. Procedures developed in accordance with this method should be considered as alternative means to establish compliance with the implementing rules in accordance with OR.GEN.005. The procedure described in OR.GEN.005 should therefore be followed.
4. For certain activities, acceptable means of compliance are defined in the appendix to this AMC.

AMC2 OPS.COM.270 Standard operating procedures - specialised operations other than the transport of persons, cargo or mail

STANDARD OPERATING PROCEDURE (SOP) TEMPLATE

1. Scope and complexity of the activity:

   a. The nature of the activity and exposure. The nature of the flight and the risk exposure (e.g. low height) should be described.

   b. 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 personal protective equipment which should be provided for persons involved.

   c. The operational environment and geographical area. The operational environment and geographical area over which the operation takes place should be described, such as:

      i. congested hostile environment: helicopter 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.

   d. The application of risk assessment and evaluation. The method of application of 1.a. to c. 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 for the operational risk management performed during flight;

      ii. contain limitations, where required, such as weather, altitudes, speeds, power margins, masses, landing site size, etc; and

      iii. list functions required to monitor the operation. Special monitoring requirements besides the normal functions should be described in the SOPs.

2. Aircraft and equipment:

   a. 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/NOTAR equipped). In particular, for helicopters, the necessary level of performance certification (Category A/B) should be specified.

   b. 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.

3. Crew members:

   a. The crew composition, including the following, should be specified:

      i. Minimum flight crew (according to the Aircraft Flight Manual (AFM));

      ii. Additional flight crew;

      iii. Crew other than flight crew.

   b. 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);

      iii. Recent experience requirement and/or recurrent training (volume and content of the training).

      The criteria listed in 3.b.i to iii should take into account the operational environment and the complexity of the activity and should be detailed in the training programmes.

   c. Whenever a crew member other than flight crew 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);

      iii. Recent experience requirement and/or recurrent training (volume and content of the training).

      The criteria listed in 3.c.i to iii should take into account the specialisation of this crew member and should be detailed in the training programmes.

   d. There are a large number of activities for which other operations personnel are required. This chapter should detail the following for such personnel:

      i. Specialisation;

      ii. Previous experience;

      iii. Training or briefing.

      Briefing or specific training for personnel referred to in 3.d.i to iii should be detailed in the training programmes.

4. Performance:

   This chapter should detail the specific performance requirements to be applied, in order to ensure an adequate power margin.

5. Normal procedures:

   a. Operating procedures. The operating procedures to be applied by the flight crew, including crew co-ordination with crew members other than flight crew and other operations personnel, and co-ordination between the flight crew and ground specialists should be described.

   b. Ground procedures. The procedures to be applied by the ground specialists should be described, e.g. loading/unloading, cargo hook operation. This includes safety on the ground (around aircraft with engines/rotor in motion or hovering) and co-ordination with the aircraft crew.

6. Emergency procedures:

   a. Operating procedures. The emergency procedures to be applied by the flight crew, including crew co-ordination with crew members other than flight crew and

other operations personnel, and co-ordination between the flight crew and the ground specialists should be described.

b. Ground procedures. The emergency procedures to be applied by the ground specialists (e.g. in case of a forced landing) should be specified.

7. Ground equipment:

This chapter should detail the nature, number and location of ground equipment required for the activity, such as:

a. refuelling facilities, dispenser and storage;

b. fire fighting equipment;

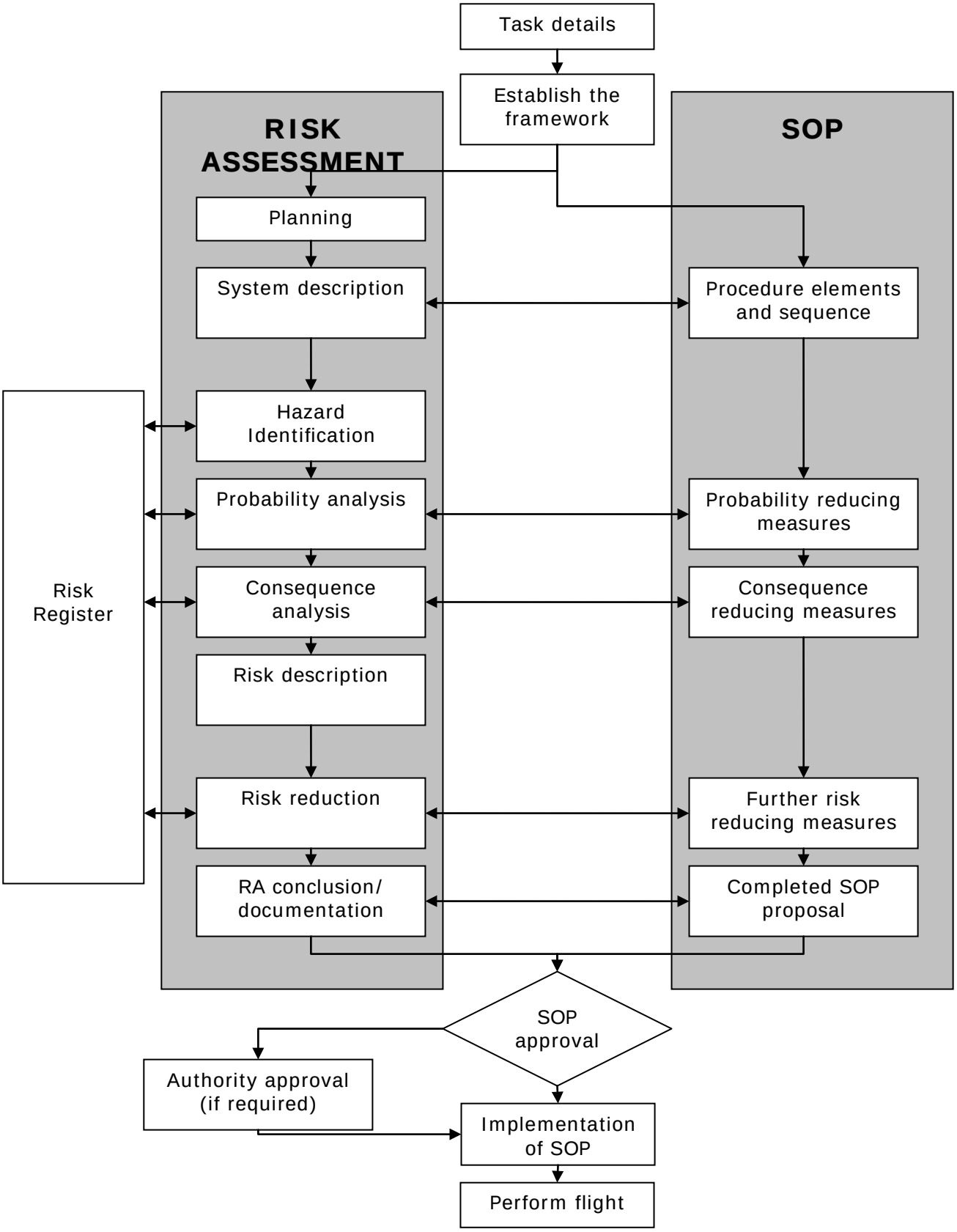
c. size of the operating site (landing surface, loading/unloading area); and

d. ground markings.

8. Records:

It should be determined which records specific to these flight(s), 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, are to be kept.

DIAGRAM 1 - DEVELOPMENT OF A SOP BASED ON A RISK ASSESSMENT (RA)



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	Haz ref	Hazard / accidental event	Cause / threat	Current Treatment Measures (TM)	Further treatment required	TM ref	Comment

Legend:

Haz ref: A unique number for hazards, e.g., for use in a database

TM ref: A unique number for the treatment method

TEMPLATE FORM C - RISK ASSESSMENT (RA)

Date: ..... RA of ..... Responsible: .....

Phase of operation	Haz ref	Hazard/accidental event	Current Treatment Measures (TM)/controls	TM ref	L	C	Further treatment required

Legend:

Haz ref: A unique number for hazards, e.g., for use in a database

TM ref: A unique number for the treatment method

L: Likelihood (probability)

C: Consequence

TEMPLATE REGISTER A - RISK REGISTER

Updated: .....

Ref	Operation / Procedure	Ref	Generic hazard	Ref	Accidental event	Treatment / control	L	C	Monitoring

Legend:

L: Likelihood (probability)

C: Consequence

Appendix 1 to AMC OPS.COM.270 Standard operating procedures - specialised operations other than the transport of persons, cargo or mail

HELICOPTER EXTERNAL LOAD OPERATIONS (HELO)

1. Scope and complexity of the activity:

a. 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 performed as low level flights.

Human cargo operations are excluded from this AMC.

b. 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.

For the purpose of this AMC, 4 load types are defined, as follows:

i. Load type 1: short line, 10 metres (m) or less;

ii. Load type 2: long line, more than 10 m;

iii. Load type 3: construction;

iv. Load type 4: wire stringing, cable laying.

c. Operational environment and geographical area:

HELO 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; and

v. desert.

2. Helicopter and equipment:

a. The helicopter:

The helicopter should be certificated according to CS/JAR/FAR 27 or 29 Category B standards; and for operations over a congested hostile environment according to CS/JAR/FAR 27 Category A standards. The helicopter should be operated in accordance with the performance requirements and applicable AMC OPS.COM material.

b. Equipment:

A helicopter performing HELO should be equipped with at least:

i. one cargo safety mirror or alternative means to see the hook(s); and

ii. one load meter, unless there is another method of determining the weight of the load.

The helicopter may be equipped with:

A. additional mirror(s);

B. a bubble window; and

C. supplementary hook(s) or multi-hook device(s).

Non-assisted vertical reference operations may require additional engine monitoring in the pilot line of vision or an audio warning system.

All additional equipment used for HELO, e.g. ropes, cables, mechanical hooks, swivel hooks, nets, buckets, chainsaws, baskets, containers, should be manufactured to officially recognised standards. The operator is responsible for maintaining the serviceability of this equipment.

Adequate radio communication equipment (e.g. VHF, UHF, FM) should be installed in the helicopter for co-ordination with the personnel on the ground involved in the operation.

Personnel on the ground involved in the operation should be equipped with hand-held communication equipment, protective helmets with integrated earphones and boom or throat microphones.

3. Crew members:

a. Crew composition:

The minimum flight crew is stated in the approved AFM. For operational or training purposes, an additional crew member may assist the pilot-in-command in a single pilot operation.

For safety and/or operational purposes, a crew member other than flight crew may be required by the operator to fulfil the task (e.g. to establish vertical reference).

b. Flight crew:

For operations with a maximum external load mass of less than 1 500 kg, the pilot-in-command should have at least the following experience:

i. 200 hours helicopter flight experience as pilot-in-command, which should be increased to 300 hours experience as pilot-in-command for mountain operations and 20 hours of relevant experience for other areas of operation (desert, sea, jungle, etc.);

ii. 10 hours flight experience on the helicopter type;

iii. 30 hours on the helicopter type, performing load type 1 and 2 operations, before acting as pilot-in-command in a load type 3 or 4 operation.

For operations with a maximum external load mass of 1 500 kg and above, the pilot-in-command should have at least the following experience:

A. 1 000 hours helicopter flight experience as pilot-in-command, which should be increased to 1 500 hours experience as pilot-in-command for mountain operations and 20 hours of relevant experience for other areas of operation (desert, sea, jungle, etc.) and 300 hours HELO;

B. 50 hours flight experience on the helicopter type;

C. 100 hours on the helicopter type, performing load type 1 and 2 operations, before acting as pilot-in-command in a load type 3 or 4 operation.

Before acting as pilot-in-command, the pilot should demonstrate to the operator that he/she has the required skill and knowledge, as follows:

1. The pilot should undergo initial training, including:

A. theoretical knowledge, as follows:

i. Load rigging techniques;

ii. External load procedures;

iii. Site organisation;

iv. Short line, long line, construction, wire stringing or cable laying flying techniques, as required for the operation; and

B. practical training to meet the experience requirements above.

2. The pilot should undergo recurrent training, including:

A. review of the load rigging techniques;

B. external load procedures; and

C. review of the applicable flying techniques.

A pilot who has performed 40 hours of relevant HELO in the same operating environment and helicopter type within the past 24 months may not need any further training other than in accordance with Part-FCL.

c. Crew members other than flight crew:

i Other crew members may be required on board or on the ground.

In addition to AMC OPS.COM.116, the briefing or initial training of these crew members should include at least:

A. behaviour in a rotor turning environment; and

B. location and use of fire extinguishers.

The personal safety equipment appropriate to the operational environment and complexity of the activity should be described in the OM.

ii HELO personnel on the ground involved in the operation 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; and

B. restricted access to the pick-up and drop-off site.

If more than one person is required for a task, one should be nominated as leading the activities specialist. This person should act as main link between flight crew and other personnel involved in the operation and is responsible for:

i. ground personnel co-ordination and activities; and

ii. safety of the working area (loading and fuelling).

Personnel should be trained in ground safety and emergency procedures including load rigging, helicopter marshalling signals, radio communication, selection and preparation of pick-up and drop-off sites and relevant training for the helicopter type.

Briefings on the organisation and coordination between flight crew and personnel on the ground involved in the operation should take place prior to each operation. These briefings should include at least the following:

1. Location and size of pick-up and drop-off site, operating altitude;

2. Location of refuelling site and procedures to be applied;

3. Load sequence, danger areas, performance and limitations, emergency procedures.

4. Performance:

HELO should be performed with the following power margins:

a. Load type 1 and 2: The mass of the helicopter should not exceed the Maximum Take-off Mass (MTOM) permitted at the pick-up or drop-off site, whichever is higher, as stated in the AFM.

b. Load type 3 and 4: The mass of the helicopter should not exceed the MTOM permitted at the pick-up or drop-off site, whichever is higher, as stated in the AFM, reduced by 10%.

5. Normal procedures:

a. Operating procedures:

HELO should be performed in accordance with the AFM and appropriate operating procedures. These procedures should include, for each type of operation:

i. crew personal 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.

b. 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 oepration;

xii. third party risk management; and

xiii. environmental protection.

6. Emergency procedures:

a. Operating procedures (flight crew):

In addition to the emergency procedures published in the AFM and 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 OM.

b. Ground procedures :

The operator should ensure that the personnel 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 OM; and

iv. prevents, as far as possible, environmental pollution.

7. Ground equipment:

The operator should specify the use of ground equipment, such as fuel trucks, cables, strops etc. in the OM, including at least:

a. minimum size of the operating site;

b. surface condition;

c. positioning of ground equipment on the operating site;

d. fuel handling;

e. environment protection plan; and

f. location and use of fire suppression equipment.

8. Operations in a congested hostile environment:

For operations in a congested hostile environment, helicopters should be operated in accordance with OPS.COM.50(a). Particular attention should be given to operations with jettisoning of loads (cargo hook).

Section III – Aircraft performance and operating limitations

AMC OPS.COM.350.H Performance criteria helicopter

GENERAL

1. When showing compliance with OPS.COM.350.H(a)-(d), account should be taken of the following parameters:
   a. pressure altitude;
   b. ambient temperature;
   c. other prevailing conditions in accordance with 2 and 3.
2. Even when the surface allows a hover in ground effect (IGE), the likelihood of, for example, dust or blowing snow may necessitate hover out of ground effect (OGE) performance.
3. 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.

AMC OPS.COM.350.H(a)(1) and (b) Performance criteria helicopter

CATEGORY A AND CATEGORY B

See AMC OPS.GEN.010(a)(8)&(9).

AMC OPS.COM.350.H(a)(2) Performance criteria helicopter

SUSTAINING LEVEL FLIGHT

1. The helicopter should sustain level flight with any load carried.
2. OPS.COM.350.H(a)(2) requires to sustain level flight without endangering persons on the ground. Level flight may only be achieved by jettisoning the load. This may require that the aircraft has out of ground effect hover performance (without the load), following a critical power unit failure. Jettisoning the load is only permitted when prior approval is obtained from the owner(s) of property under the flight path.

AMC OPS.COM.350.H(c) Performance criteria helicopter

OPERATIONAL PROCEDURES AND TRAINING PROGRAMME

1. The operational procedures should be based on the manufacturer's recommended procedures where they exist.
2. The crew member training programme should include briefing, demonstration or practice, as appropriate, of the operational procedures necessary to minimise the consequences of a power unit failure.

Section IV - Instruments, data and equipment

AMC.OPS.COM.406 Restraining devices

PARACHUTE FLIGHTS

Where restraint devices have been fitted, they should be used during take-off and landing or otherwise when required by the Flight Manual of its Supplement.

AMC OPS.COM.465.A Terrain Awareness Warning System (TAWS) - Aeroplanes

DISABLING THE TAWS

The procedures for disabling the TAWS should be included in a checklist, which should be available during flight.

GM OPS.COM.486 Emergency egress from the cockpit

GENERAL

This requirement may be fulfilled by the carriage of a crash axe or crowbar, which should be located out of sight of passengers.

AMC OPS.COM.487 Crash mitigation equipment

TYPES OF CRASH MITIGATION EQUIPMENT

Crash mitigation equipment should be certified in accordance with a recognised standard. It should include items which are necessary for reducing the consequences of a crash and should include such items as crash-absorbing seats and self-sealing fuel tanks.

GM OPS.COM.488 Personal protective equipment

TYPES OF INDIVIDUAL PROTECTIVE EQUIPMENT

Personal protective equipment should include, but is not limited to: flying suits, gloves, helmets, protective shoes, etc.

Subpart D - Operations requiring specific approvals

Section I - General Requirements

AMC OPS.SPA.020.GEN (b)(4) Application for a specific approval

OPERATIONAL PREOCEDURES

If an operations manual is not required by Annex IV to Regulation (EC) No 216/2008 (Essential requirements for air operations), operational procedures may be described in a procedures manual.

Section II - Operations in areas with specified navigation performance

AMC OPS.SPA.001.SPN(c)(3) Operations in areas with specified performance based navigation

OPERATIONAL PROCEDURES

These operational procedures should be an integral part of the operations manual.

GM1 OPS.SPA.001.SPN Operations in areas with specified performance based navigation

GENERAL

1. There are two kinds of Navigation Specifications: Radar Navigation (RNAV) specifications and Required Navigation Performance (RNP) specifications. Indeed, a RNP system is an RNAV system which has an onboard navigation performance monitoring and alerting function. This function allows the flight crew to detect when the RNP system is not achieving, or cannot guarantee with a sufficient level of integrity, the navigation performance (both lateral and longitudinal). The navigation performance is characterised by the Total System Error (TSE).

2. RNAV and RNP specifications are designated as RNAV X (e.g. RNAV 1) or RNP X (e.g. RNP 4). If two Navigation Specifications share the same value for X, they may be distinguished by use of a prefix, e.g. Advanced-RNP 1 and Basic-RNP 1. For both RNAV and RNP designations the expression 'X' refers to the lateral navigation accuracy in nautical miles that is expected to be achieved at least 95 percent of the flight time by the population of aircraft operating within the airspace, route or procedure. The existing navigation specifications are the relative requirements are summarised in table 1 and table 2 below.

3. Guidance material for the global performances specifications, approval process, aircraft requirement (e.g. generic system performances, accuracy, integrity, continuity, signal-in-space, RNP navigation specifications required for the on-board performance monitoring and alerting system), requirements for specific sensor technologies, functional requirements, operational procedures, flight crew knowledge and training and navigation databases integrity requirements, can be found in:

   a. ICAO Doc 9613 Performance Based Navigation Manual,

   b. EASA AMC 20 as indicated in table 3 below.

Table 1 – List of existing Navigation specifications and summary of relative requirements

	RNAV 10	RNAV 5	RNAV 1	RNP 4	BASIC RNP 1	RNP APCH
	Identical to existing RNP 10	Worldwide standardisation of the European B-RNAV	Worldwide harmonisation of the European P-RNAV and US RNAV Type B	RNP 4	New standard	Identical to the existing ICAO "RNAV (GNSS) Approach"
PBN Requirements - Accuracy (cross-track and along-track)	10NM 95%	5NM 95%	1NM 95%	4NM 95%	1NM 95%	1-0.3NM 95%
- Equipment malfunction	Major	Major	Major	Major	Major	Major
- Continuity	Major	Minor	Minor	Major	Minor	Minor
- Navigation error due to GNSS Signal in Space error	Error > 20 NM, Prob < 10-7/h	Error > 10 NM, Prob < 10-7/h	Error > 2 NM, Prob < 10-7/h	Error > 8 NM, Prob < 10-7/h	Error > 2 NM, Prob < 10-7/h	Error > 2-0.6 NM, Prob < 10-7/h
On Board Performance Monitoring and Alerting				Error > 8NM, Prob < 10-5	Error > 2NM, Prob < 10-5	Error > 2-0,6NM, Prob < 10-5
Minimum equipment	2 long range navigation systems using one or a combination of: - GNSS - IRS	1 navigation system using one or a combination of: - GNSS - DME/DME - VOR/DME - IRS	2 navigation system using: - GNSS - DME/DME - DME/DME/IRS	2 long range navigation systems using (at least): - GNSS	Navigation system using (at least): - GNSS	Navigation system using (at least): - GNSS
Specific requirements concerning the positioning function	- GNSS - IRS - 2IRS + GNSS approved	- GNSS - DME/DME - VOR/DME - IRS	- GNSS - DME/DME - DME/DME/IRS			

	"primary means in oceanic"					

Table 2 – List of existing Navigation specifications and summary of relative requirements

	RNAV 10	RNAV 5	RNAV 1	RNP 4	BASIC RNP 1	RNP APCH
Functional requirements - Display	No	Yes[1]	Yes[1] +	Yes[1]	Yes[1] +	Yes[1] ++
Navigation Functionalities	No	No	Yes[2]	Yes[2]	Yes[2]	Yes[2]
Operating procedures	Yes	Yes	Yes	Yes	Yes	Yes
Flight crew knowledge and training	Yes[3]	Yes[3]	Yes[3]	Yes[3]	Yes[3]	Yes[3]
Navigation databases			LOA[4]	LOA[4]	LOA[4]	LOA[4]
Oversight of operators	Yes[5]	Yes[5]	Yes[5]	Yes[5]	Yes[5]	Yes[5]

No : No requirement for this item.

Yes : There are requirements

1234 or 5 : The requirements are similar

+ or ++ : There are additional requirements for the specific Navigation Specification

Table 3 Acceptable means of compliance for existing navigation specifications contained in EASA AMC 20

Area of application	Navigation accuracy	Designation of Navigation Standard	Designation of Navigation Specification	EASA material
Oceanic / Remote	10 NM	RNP 10	RNAV 10	AMC 20-12 "Recognition of FAA order 8400.12a for RNP 10 Operations"
	4 NM	RNP 4	RNP 4	No document
En Route Continental	5 NM	B-RNAV	RNAV 5	AMC 20-4 "Airworthiness Approval and Operational Criteria For the Use of Navigation Systems in European Airspace Designated For Basic RNAV Operations"
Terminal	1 NM	P-RNAV USRNAV type B	RNAV 1	AMC 20-16 "Airworthiness and operational approval for Precision RNAV operations in designated European airspace"
		N/A	Basic-RNP 1	No document
		N/A	Advanced-RNP 1 (provision only)	No document
Approach	0.3 NM	RNAV (GNSS)	RNP APCH	AMC 20-27 "Airworthiness and operational approval for RNP approach (RNP APCH) operations"
	0.3-0.1 NM	RNP SAAAR	RNP AR APCH	AMC 20-26 "Airworthiness and operational approval for RNP AR approach (RNP AR APCH) operations"

GM2 OPS.SPA.001.SPN Operations in areas with specified performance based navigation

GENERAL

The equipment carriage requirements, operational and contingency procedures and operator specific provision relating to designated airspace or on routes where, based on ICAO Regional Air Navigation Agreements, minimum navigation performance specifications are established, can be found in:

1. The applicable Community legislation within the context of the Single European Sky and its implementing rules;
2. ICAO Doc 7030; and
3. Eurocontrol related documentation.

AMC OPS.SPA.010.MNPS Equipment requirements for operations in MNPS areas

GENERAL

1. For operation in MNPS airspace along notified special routes, the aircraft should be equipped with one Long Range Navigation System (LRNS), unless otherwise specified in the ICAO air navigation agreements.

2. For unrestricted operations in MNPS areas, the aircraft should be equipped with two independent Long Range Navigation Systems (LRNS).

Section III - Operations in airspace with reduced vertical separation minima

AMC OPS.SPA.001.RVSM(b)(2)(ix) Operations in RVSM airspace

OPERATIONAL PROCEDURES – INCIDENT REPORTING

1. In-flight defect reporting procedures should be defined to aid identification of altimetry system error sources. Such procedures could cover acceptable differences between primary and alternate static sources, and others as appropriate. This reporting shall be in addition to the reporting referred to in Part-OR, and these reports of occurrences involving poor height keeping should be submitted to the responsible authority within 72 hours. The incidence of height keeping errors that can be tolerated in an RVSM environment is small. Height keeping errors fall into two broad categories:

   a. errors caused by malfunction of aircraft equipment; and

   b. operational errors.

2. Each operator should take immediate action to rectify the conditions that cause an error. A report of such actions should be submitted to the competent authority, including an initial analysis of causal factors and measures taken to prevent repeat occurrences. Where necessary the need for follow up reports should be determined together with the competent authority. Occurrences that should be reported and investigated are errors of:

   a. TVE equal to or greater than ±90 m (±300 ft),

   b. ASE equal to or greater than ±75 m (±245 ft), and

   c. Assigned altitude deviation equal to or greater than ±90 m (±300 ft).

GM OPS.SPA.001.RVSM(b)(2) Operations in RVSM airspace

OPERATIONAL PROCEDURES

1. Flight planning

1.1 During flight planning the flight crew should pay particular attention to conditions that may affect operation in RVSM airspace. These include, but may not be limited to:

   a. verifying that the airframe is approved for RVSM operations;

   b. reported and forecast weather on the route of flight;

   c. minimum equipment requirements pertaining to height keeping and alerting systems; and

   d. any airframe or operating restriction related to RVSM approval.

2. Pre-flight procedures

2.1 The following actions should be accomplished during the pre-flight procedure:

   a. Review technical logs and forms to determine the condition of equipment required for flight in the RVSM airspace. Ensure that maintenance action has been taken to correct defects to required equipment;

   b. During the external inspection of aircraft, particular attention should be paid to the condition of static sources and the condition of the fuselage skin near each static source and any other component that affects altimetry system accuracy. This check may be accomplished by a qualified and authorised person other than the pilot (e.g. a flight engineer or ground engineer);

c. Before takeoff, the aircraft altimeters should be set to the QNH of the airfield and should display a known altitude, within the limits specified in the aircraft operating manuals. The two primary altimeters should also agree within limits specified by the aircraft operating manual. An alternative procedure using QFE may also be used. Any required functioning checks of altitude indicating systems should be performed. The maximum value for these checks should not exceed 23 m (75 ft).

d. before take-off, equipment required for flight in RVSM airspace should be operative, and any indications of malfunction should be resolved.

3. Prior to RVSM airspace entry

3.1 The following equipment should be operating normally at entry into RVSM airspace:

a. Two primary altitude measurement systems.

b. One automatic altitude-control system.

c. One altitude-alerting device.

d. Operating Transponder. An operating transponder may not be required for entry into all designated RVSM airspace. The operator should determine the requirement for an operational transponder in each RVSM area where operations are intended. The operator should also determine the transponder requirements for transition areas next to RVSM airspace.

3.2 Should any of the required equipment fail prior to the aircraft entering RVSM airspace, the pilot should request a new clearance to avoid entering this airspace.

4. In-flight procedures

4.1 The following practices should be incorporated into flight crew training and procedures:

a. Flight crews will need to comply with any aircraft operating restrictions, if required for the specific aircraft group, e.g. limits on indicated Mach number, given in the RVSM airworthiness approval.

b. Emphasis should be placed on promptly setting the sub-scale on all primary and standby altimeters to 1013.2 (hPa) /29.92 in.Hg when passing the transition altitude, and rechecking for proper altimeter setting when reaching the initial cleared flight level;

c. In level cruise it is essential that the aircraft is flown at the cleared flight level. This requires that particular care is taken to ensure that Air Traffic Control clearances (ATC) are fully understood and followed. The aircraft should not intentionally depart from cleared flight level without a positive clearance from ATC unless the crew are conducting contingency or emergency manoeuvres;

d. When changing levels, the aircraft should not be allowed to overshoot or undershoot the cleared flight level by more than 45 m (150 ft). If installed, the level off should be accomplished using the altitude capture feature of the automatic altitude-control system.

e. An automatic altitude-control system should be operative and engaged during level cruise, except when circumstances such as the need to re-trim the aircraft or turbulence require disengagement. In any event, adherence to cruise altitude should be done by reference to one of the two primary altimeters. Following loss of the automatic height keeping function, any consequential restrictions will need to be observed.

f. Ensure that the altitude-alerting system is operative;

g. At intervals of approximately one hour, cross-checks between the primary altimeters should be made. A minimum of two will need to agree within ±60 m

(±200 ft). Failure to meet this condition will require that the altimetry system be reported as defective and notified to ATC;

i. The usual scan of flight deck instruments should suffice for altimeter crosschecking on most flights.

ii. Before entering RVSM airspace, the initial altimeter cross check of primary and standby altimeters should be recorded.

h. In normal operations, the altimetry system being used to control the aircraft should be selected for the input to the altitude reporting transponder transmitting information to ATC.

i. If the pilot is advised in real time that the aircraft has been identified by a height monitoring system as exhibiting a TVE greater than ±90 m (±300 ft) and/or an ASE greater than ±75 m (±245 ft) then the pilot should follow established regional procedures to protect the safe operation of the aircraft. This assumes that the monitoring system will identify the TVE or ASE within the set limits for accuracy.

j. If the pilot is notified by ATC of an assigned altitude deviation which exceeds ±90 m (±300 ft) then the pilot should take action to return to cleared flight level as quickly as possible.

4.2 Contingency procedures after entering RVSM airspace are:

a. The pilot should notify ATC of contingencies (equipment failures, weather) which affect the ability to maintain the cleared flight level, and co-ordinate a plan of action appropriate to the airspace concerned. Detailed guidance on contingency procedures is contained in the relevant publications dealing with the airspace. Refer to specific regional procedures.

b. Examples of equipment failures which should be notified to ATC are:

i. failure of all automatic altitude-control systems aboard the aircraft;

ii. loss of redundancy of altimetry systems;

iii. loss of thrust on an engine necessitating descent; or

iv. any other equipment failure affecting the ability to maintain cleared flight level.

c. The pilot should notify ATC when encountering greater than moderate turbulence.

d. If unable to notify ATC and obtain an ATC clearance prior to deviating from the cleared flight level, the pilot should follow any established contingency procedures and obtain ATC clearance as soon as possible.

5. Post flight procedures

5.1 In making technical log entries against malfunctions in height keeping systems, the pilot should provide sufficient detail to enable maintenance to effectively troubleshoot and repair the system. The pilot should detail the actual defect and the crew action taken to try to isolate and rectify the fault.

5.2 The following information should be recorded when appropriate:

a. Primary and standby altimeter readings.

b. Altitude selector setting.

c. Subscale setting on altimeter.

d. Autopilot used to control the aircraft and any differences when an alternative autopilot system was selected.

e. Differences in altimeter readings, if alternate static ports selected.

f. Use of air data computer selector for fault diagnosis procedure.

g. The transponder selected to provide altitude information to ATC and any difference noted when an alternative transponder was selected.

6. Crew training

6.1 The following items should also be included in flight crew training programmes:

a. knowledge and understanding of standard ATC phraseology used in each area of operations;

b. importance of crew members cross checking to ensure that ATC clearances are promptly and correctly complied with;

c. use and limitations in terms of accuracy of standby altimeters in contingencies. Where applicable, the pilot should review the application of static source error correction/position error correction through the use of correction cards; such correction data should be available on the flight deck.

d. problems of visual perception of other aircraft at 300 m (1 000 ft) planned separation during darkness, when encountering local phenomena such as northern lights, for opposite and same direction traffic, and during turns;

e. characteristics of aircraft altitude capture systems which may lead to overshoots;

f. relationship between the aircraft's altimetry, automatic altitude control and transponder systems in normal and abnormal conditions; and

g. any airframe operating restrictions, if required for the specific aircraft group, related to RVSM airworthiness approval.

7. Specific regional procedures

7.1 The areas of applicability (by Flight Information Region) of RVSM airspace in identified ICAO regions is contained in the relevant sections of ICAO Document 7030/4. In addition these sections contain operational and contingency procedures unique to the regional airspace concerned, specific flight planning requirements, and the approval requirements for aircraft in the designated region.

7.2 For the North Atlantic Minimum Navigation Performance Specification (MNPS) airspace, where RVSM have been in operation since 1997, further guidance (principally for State Approval Agencies) is contained in ICAO Document NAT 001 T13/5NB.5 with comprehensive operational guidance (aimed specifically at aircraft operators) in the North Atlantic MNPS Airspace Operational Manual.

7.3 Comprehensive guidance on operational matters for European RVSM Airspace is contained in EUROCONTROL Document ASM ET1.ST.5000 entitled “The ATC Manual for a Reduced Vertical Separation (RVSM) in Europe” with further material included in the relevant State Aeronautical Publications.

Section IV – Low visibility operations

GM1 OPS.SPA.001.LVO Low visibility operations (LVO)

GENERAL - TERMINOLOGY

1. Low Visibility Operations include, as applicable:

   a. Manual take-off (with or without electronic guidance systems or Head-Up Guidance Landing System (HUDLS)/Hybrid Head-up display (HUD)/HUDLS);

   b. Auto-coupled approach to below Decision Height (DH), with manual flare, hover, landing and roll-out;

   c. Approach flown with the use of a HUDLS/Hybrid HUD/HUDLS and/or Enhanced Vision system (EVS);

   d. Auto-coupled approach followed by auto-flare, hover, auto landing and manual roll-out; and

   e. Auto-coupled approach followed by auto-flare, hover, auto landing and auto-roll-out, when the applicable Runway Visual Range (RVR) is less than 400 m.

Note 1: A hybrid system may be used with any of these modes of operations.

Note 2: Other forms of guidance systems or displays may be certificated and approved.

2. Terms used have the following meaning:

   a. Flight control system. A system which includes an automatic landing system and/or a hybrid landing system;

   b. Fail-Passive flight control system. A flight control system is fail-passive if, in the event of a failure, there is no significant out-of-trim condition or deviation of flight path or attitude but the landing is not completed automatically. For a fail-passive automatic flight control system the pilot assumes control of the aeroplane after a failure;

   c. Fail-Operational flight control system. A flight control system is fail-operational if, in the event of a failure below alert height, the approach, flare and landing, can be completed automatically. In the event of a failure, the automatic landing system will operate as a fail passive system;

   d. Fail-operational hybrid landing system. A system which consists of a primary fail-passive automatic landing system and a secondary independent guidance system enabling the pilot to complete a landing manually after failure of the primary system;

   e. Head-Up Display (HUD). A display system which presents flight information into the pilot's forward external field of view and which does not significantly restrict the external view;

   f. Head-Up Guidance Landing System (HUDLS). The total airborne system which provides head-up guidance to the pilot during the approach and landing and/or go-around. It includes all sensors, computers, power supplies, indications and controls. A HUDLS is typically used for primary approach guidance to decision heights of 50 ft;

   g. Hybrid Head-Up Display Landing System (Hybrid HUDLS). A system which consists of a primary fail-passive automatic landing system and a secondary independent HUD/HUDLS enabling the pilot to complete a landing manually after failure of the primary system;

Note: Typically, the secondary independent HUD/HUDLS provides guidance which normally takes the form of command information, but it may alternatively be situation (or deviation) information.

h. Lower than Standard Category I Operation. A Category I Instrument Approach and Landing Operation using Category I DH, with an RVR lower than would normally be associated with the applicable DH;

i. Other than Standard Category II Operation. A Category II Instrument Approach and Landing Operation to a runway where some or all of the elements of the ICAO Annex 14 Precision Approach Category II lighting system are not available.

GM2 OPS.SPA.001.LVO Low visibility operations (LVO)

DOCUMENTS CONTAINING INFORMATION RELATED TO LOW VISIBILITY OPERATIONS

The following documents provide information related to LVO.

1. ICAO Annex 2 / Rules of the Air;
2. ICAO Annex 6 / Operation of Aircraft;
3. ICAO Annex 10 / Telecommunications Vol 1;
4. ICAO Annex 14 / Aerodromes Vol 1;
5. ICAO Doc 8186 / PANS - OPS Aircraft Operations;
6. ICAO Doc 9365 / AWO Manual;
7. ICAO Doc 9476 / SMGCS Manual (Surface Movement Guidance and Control Systems);
8. ICAO Doc 9157 / Aerodrome Design Manual;
9. ICAO Doc 9328 / Manual for RVR Assessment;
10. ECAC Doc 17, Issue 3 (partly incorporated in this Part OPS); and
11. CS-AWO (Airworthiness Certification).

AMC OPS.SPA.001.LVO(b)(1) Low visibility operations (LVO)

FLIGHT CREW TRAINING

1. General. An operator should ensure that flight crew member training programmes for Low Visibility Operations include structured courses of ground, flight simulator and/or flight training. The operator may abbreviate the course content as prescribed by 1.2 and 1.3 below.

1.1 Flight crew members with no Category II or Category III experience should complete the full training programme prescribed in 2, 3 and 4 below.

1.2 Flight crew members with Category II or Category III experience with a similar type of operation (auto-coupled/auto-land, HUDLS/Hybrid HUDLS or EVS) or Category II with manual land if appropriate with another community operator may undertake an:

a. Abbreviated ground-training course if operating a different type/class from that on which the previous Category II or Category III experience was gained;

b. Abbreviated ground, Flight Simulator and/or flight training course if operating the same type/class and variant of the same type or class on which the previous Category II or Category III experience was gained. The abbreviated course is to include at least the provisions of 4.1, 4.2 a. or 4.2 b. as appropriate and 4.3 a. The operator may reduce the number of approaches/landings stated in 4.2 a. if the type/class or the variant of the type or class has the same or similar:

i. Level of technology - Flight control/guidance system (FGS);

ii. Operational Procedures;

iii. Handling characteristics (see 4. below);

iv. Use of HUDLS/Hybrid HUDLS;

v. Use of EVS;

as the previously operated type or class, otherwise 4.2 a. should be met in full.

1.3 Flight crew members with Category II or Category III experience with the operator may undertake an abbreviated ground, Flight Simulator and/or flight training course. The abbreviated course when changing:

a. aircraft type/class is to include at least the provisions of 4.1, 4.2 a. or 4.2 b. as appropriate and 4.3 a.;

b. to a different variant of aircraft within the same type or class rating that has the same or similar:

i. level of technology - flight control/guidance system (FGS); and

ii. operational procedures- integrity;

iii. handling characteristics (see 1.4 below);

iv. use of HUDLS/Hybrid HUDLS;

v. use of EVS;

as the previously operated type or class, then a difference course or familiarisation appropriate to the change of variant fulfils the abbreviated course provisions.

c. to a different variant of aircraft within the same type or class rating that has a significantly different:

i. level of technology - flight control/guidance system (FGS);

ii. operational procedures- integrity;

iii. handling characteristics (see 1.4 below);

iv. use of HUDLS/Hybrid HUDLS;

v use of EVS;

then the provisions of 4.1, 4.2 a. or 4.2 b. as appropriate and 4.3 a. should be fulfilled. The operator may reduce the number of approaches/landings stated in 4.2 a.

1.4 An operator should ensure when undertaking Category II or Category III operations with different variant(s) of aircraft within the same type or class rating that the differences and/or similarities of the aircraft concerned justify such operations, taking account at least the following:

a. The level of technology, including the:

i. FGS and associated displays and controls;

ii. the Flight Management System and its integration or not with the FGS;

iii. use of HUD/HUDLS with hybrid systems and/or EVS.

b. Operational procedures, including:

i. fail passive/fail operational, alert height;

ii. manual landing/automatic landing;

iii. no decision height operations;

iv. use of HUD/HUDLS with hybrid systems.

c. Handling characteristics, including:

i. manual landing from automatic HUDLS and/or EVS guided approach;

ii. manual go-around from automatic approach;

iii. automatic/manual roll out.

2. Ground Training. The initial ground training course for LVO should cover at least:

a. the characteristics and limitations of the ILS and/or MLS;

b. the characteristics of the visual aids;

c. the characteristics of fog;

d. the operational capabilities and limitations of the particular airborne system to include HUD symbology and EVS characteristics if appropriate;

e. the effects of precipitation, ice accretion, low level wind shear and turbulence;

f. the effect of specific aircraft/system malfunctions;

g. the use and limitations of RVR assessment systems;

h. the principles of obstacle clearance requirements;

i. recognition of and action to be taken in the event of failure of ground equipment;

j. the procedures and precautions to be followed with regard to surface movement during operations when the RVR is 400 m or less and any additional procedures required for take-off in conditions below 150 m (200 m for Category D aeroplanes);

k. the significance of decision heights based upon radio altimeters and the effect of terrain profile in the approach area on radio altimeter readings and on the automatic approach/landing systems;

l. the importance and significance of Alert Height if applicable and the action in the event of any failure above and below the Alert Height;

m. the qualification requirements for pilots to obtain and retain approval to conduct Low Visibility Take-offs and Category II or III operations; and

n. the importance of correct seating and eye position.

3. Flight Simulator training and/or flight training

3.1 Flight Simulator and/or flight training for LVO should include:

a. checks of satisfactory functioning of equipment, both on the ground and in flight;

b. effect on minima caused by changes in the status of ground installations;

c. monitoring of:

i. automatic flight control systems and autoland status annunciators with emphasis on the action to be taken in the event of failures of such systems; and

ii. HUD/HUDLS/EVS guidance status and annunciators as appropriate, to include Head Down Displays.

d. actions to be taken in the event of failures such as engines, electrical systems, hydraulics or flight control systems;

e. the effect of known unserviceabilities and use of minimum equipment lists;

f. operating limitations resulting from airworthiness certification;

g. guidance on the visual cues required at decision height together with information on maximum deviation allowed from glide path or localiser; and

h. the importance and significance of Alert Height, if applicable, and the action in the event of any failure above and below the Alert Height.

3.2 An operator should ensure that each flight crew member is trained to carry out his duties and instructed on the coordination required with other crew members. Maximum use should be made of suitably equipped Flight Simulators for this purpose.

3.3 Training should be divided into phases covering normal operation with no aircraft or equipment failures but including all weather conditions which may be encountered and detailed scenarios of aircraft and equipment failure which could affect Category II or III operations. If the aircraft system involves the use of hybrid or other special systems (such as HUD/HUDLS or enhanced vision equipment) then flight crew members should practise the use of these systems in normal and abnormal modes during the Flight Simulator phase of training.

3.4 Incapacitation procedures appropriate to Low Visibility Take-offs and Category II and III operations should be practised.

3.5 For aircraft with no Flight Simulator available to represent that specific aircraft operators should ensure that the flight training phase specific to the visual scenarios of Category II operations is conducted in a Flight Simulator approved for that purpose by the competent authority. Such training should include a minimum of 4 approaches. The training and procedures that are type specific should be practised in the aircraft.

3.6 Initial Category II and III training should include at least the following exercises:

a. Approach using the appropriate flight guidance, autopilots and control systems installed in the aircraft, to the appropriate decision height and to include transition to visual flight and landing;

b. Approach with all engines operating using the appropriate flight guidance systems, autopilots, HUDLS and/or EVS and control systems installed in the aircraft down to the appropriate decision height followed by missed approach; all without external visual reference;

c. Where appropriate, approaches utilising automatic flight systems to provide automatic flare, hover, landing and roll-out; and

d. Normal operation of the applicable system both with and without acquisition of visual cues at decision height.

3.7 Subsequent phases of training should include at least:

a. approaches with engine failure at various stages on the approach;

b. approaches with critical equipment failures (e.g. electrical systems, auto flight systems, ground and/or airborne ILS/MLS systems and status monitors);

c. approaches where failures of auto flight equipment and/or HUD/HUDLS/EVS at low level require either:

i. reversion to manual flight to control flare, hover, landing and roll out or missed approach; or

ii. reversion to manual flight or a downgraded automatic mode to control missed approaches from, at or below decision height including those which may result in a touchdown on the runway;

d. failures of the systems which will result in excessive localiser and/or glide slope deviation, both above and below decision height, in the minimum visual conditions authorised for the operation. In addition, a continuation to a manual landing should be practised if a head-up display forms a downgraded mode of the automatic system or the head-up display forms the only flare mode; and

e. failures and procedures specific to aircraft type or variant.

3.8 The training programme should provide practice in handling faults which require a reversion to higher minima.

3.9 The training programme should include the handling of the aircraft when, during a fail passive Category III approach, the fault causes the autopilot to disconnect at or below decision height when the last reported RVR is 300 m or less.

3.10 Where take-offs are conducted in RVRs of 400 m and below, training should be established to cover systems failures and engine failure resulting in continued as well as rejected take-offs.

3.11 The training programme should include, where appropriate, approaches where failures of the HUDLS and/or EVS equipment at low level require either:

a. Reversion to head down displays to control missed approach; or

b. Reversion to flight with no, or downgraded, HUDLS Guidance to control missed approaches from decision height or below, including those which may result in a touchdown on the runway.

3.12 An operator should ensure that when undertaking Low Visibility Take-off, Lower than Standard Category I, Other than Standard Category II, and Category II and III Operations utilising a HUD/HUDLS or Hybrid HUD/HUDLS or an EVS, that the training and checking programme includes, where appropriate, the use of the HUD/HUDLS in normal operations during all phases of flight.

4. Conversion Training provisions to conduct Low Visibility Take-off, Lower than Standard Category I, Other than Standard Category II, Approach utilising EVS and Category II and III Operations. Each flight crew member should complete the following Low Visibility Procedures training if converting to a new type/class or variant of aircraft in which Low Visibility Take-off, Lower than Standard Category I, Other than Standard Category II Approaches utilising EVS with an RVR of 800 m or less and Category II and III Operations will be conducted. The necessary flight crew member experience to undertake an abbreviated course is prescribed in 1.2, 1.3 and 1.4 above.

4.1 Ground Training. The appropriate provisions prescribed in 2. above, taking into account the flight crew member's Category II and Category III training and experience.

4.2 Flight Simulator Training and/or Flight training:

a. A minimum of 6 (8 for HUDLS with or without EVS) approaches and/or landings in a Flight Simulator approved for the purpose. The 8 HUDLS approaches may be reduced to 6 when conducting Hybrid HUDLS operations. See 4.4a. below;

b. Where no Flight Simulator is available to represent that specific aircraft, a minimum of 3 (5 for HUDLS and/or EVS) approaches including at least 1 go-around should be flown on the aircraft. For Hybrid HUDLS operations a minimum of 3 approaches should be flown, including at least 1 go-around;

c. Appropriate additional training if any special equipment is required such as head-up displays or enhanced vision equipment. When approach operations utilising EVS are conducted with an RVR of less than 800 m, a minimum of 5 approaches, including at least one go-around should be flown on the aircraft.

4.3 Flight Crew Qualification is specific to the operator and the type of aircraft operated.

a. The operator should ensure that each flight crew member completes a check before conducting Category II or III operations.

b. The check prescribed in 4.3 a. above may be replaced by successful completion of the Flight Simulator and/or flight training prescribed in 4.2 above.

4.4 Line Flying under Supervision. An operator should ensure that each flight crew member undergoes the following line flying under supervision (LIFUS):

a. For Category II when a manual landing or a HUDLS approach to touchdown is required, a minimum of:

i. 3 landings from autopilot disconnect;

ii. 4 landings with HUDLS used to touchdown;

except that only 1 manual landing (2 using HUDLS to touchdown) is required when the training in 4.2 above has been carried out in a Flight Simulator qualified for zero flight time conversion.

b. For Category III, a minimum of 2 auto lands except that:

i. only 1 auto land is required when the training in 4.2 above has been carried out in a Flight Simulator qualified useable for zero flight time conversion;

ii. no auto land is required during LIFUS when the training in 4.2 above has been carried out in a Flight Simulator qualified for Zero Flight Time (ZFT) conversion and the flight crew member successfully completed the ZFT type rating conversion course;

iii. the flight crew member, trained and qualified in accordance with 4.4b.ii. above, is qualified to operate during the conduct of LIFUS to the lowest approved DA(H) and RVR as stipulated in the Operations Manual.

c. For Category III approaches using HUDLS to touchdown a minimum of 4 approaches.

5. Type and command experience.

5.1 Before commencing Category II operations, the following additional provisions are applicable to the pilot-in-command, or pilots to whom conduct of the flight may be delegated, who are new to the aircraft type/class:

a. 50 hours or 20 sectors on the type, including line flying under supervision; and

b. 100 m should be added to the applicable Category II RVR minima when the operation requires a Category II manual landing or use of HUDLS to touchdown until:

i. a total of 100 hours or 40 sectors, including LIFUS has been achieved on the type; or

ii. a total of 50 hours or 20 sectors, including LIFUS has been achieved on the type where the flight crew member has been previously qualified for Category II manual landing operations with a Community operator.

iii. For HUDLS operations the sector requirements in 5.1 and 5.2 a. should always be applicable, the hours on type/class does not fulfil the requirement.

5.2 Before commencing Category III operations, the following additional provisions are applicable to the pilot-in-command, or pilots to whom conduct of the flight may be delegated, who are new to the aircraft type:

a. 50 hours or 20 sectors on the type, including line flying under supervision; and

b. 100 m should be added to the applicable Category II or Category III RVR minima unless he has previously qualified for Category II or III operations with a Community operator, until a total of 100 hours or 40 sectors, including line flying under supervision, has been achieved on the type.

6. Low Visibility Take-Off with RVR less than 150/200 m.

6.1 Prior to authorisation to conduct take-offs in RVRs below 150 m (below 200 m for Category D aeroplanes) the following training should be carried out:

a. Normal take-off in minimum authorised RVR conditions;

b. Take-off in minimum authorised RVR conditions with an engine failure:

i. for aeroplanes between V_1 and V_2, or as soon as safety considerations permit;

ii. For helicopters at or after Take-off decision point (TDP); and

c. Take-off in minimum authorised RVR conditions with an engine failure:

i. for aeroplanes before V_1 resulting in a rejected take-off;

ii. for helicopters before the TDP.

6.2 The training described in 6.1 above should be carried out in an approved Flight Simulator. This training should include the use of any special procedures and equipment. Where no approved Flight Simulator is available to represent that specific aircraft, such training may be conducted in an aircraft without the requirement for minimum RVR conditions.

6.3 A flight crew member should have completed a check before conducting low visibility take-offs in RVRs of less than 150 m (less than 200 m for Category D aeroplanes), if applicable. The check may only be replaced by successful completion of the Flight Simulator and/or flight training prescribed in 6.1 on initial conversion to an aircraft type.

7. Recurrent Training and Checking – Low Visibility Operations

7.1 An operator should ensure that, in conjunction with the normal recurrent training and operator proficiency checks, a pilot's knowledge and ability to perform the tasks associated with the particular category of operation, including Low Visibility Take-Off (LVTO), for which he/she is authorised is checked. The number of approaches to be undertaken in the Flight Simulator within the validity period of the operator proficiency check is to be a minimum of 2 (4 when HUDLS and/or EVS is utilized to touchdown) one of which should be a landing at the lowest approved RVR; in addition 1 (2 for HUDLS and/or operations utilising EVS) of these approaches may be substituted by an approach and landing in the aircraft using approved Category II or III procedures. One missed approach should be flown during the conduct of the operator proficiency check. If the operator is authorised to conduct take-off with RVR less than 150/200 m, at least one LVTO to the lowest applicable minima should be flown during the conduct of the operator proficiency check. (See GM OPS.SPA.001.LVO (b)(1).)

The number of approaches to be conducted during such recurrent training is to be a minimum of two, one of which is to be a missed approach and at least one low visibility take-off to the lowest applicable minima. The period of validity for this check should be 6 months including the remainder of the month of issue.

7.2 For Category III operations an operator should use a Flight Simulator approved for that purpose.

7.3 For Category III operations on aircraft with a fail passive flight control system, including HUDLS, a missed approach should be completed at least once over the period of three consecutive operator proficiency checks as the result of an autopilot failure at or below decision height when the last reported RVR was 300 m or less.

7.4 The competent authority may authorise recurrent training and checking for Category II and LVTO operations in an aircraft type where no approved Flight Simulator to represent that specific aircraft or an acceptable alternate is available.

Recency for LVTO and Category II/III based upon automatic approaches and/or auto-lands is maintained by the recurrent training and checking as prescribed in this paragraph.

8. Additional training provisions for operators conducting Lower than Standard Category I, Approaches utilising EVS and Other than Standard Category II Operations

8.1 Operators conducting Lower than Standard Category I operations should comply with this Acceptable Means of Compliance (AMC) applicable to Category II operations to include the provisions applicable to HUDLS (if appropriate). The operator may combine these additional provisions, where appropriate, provided that the operational procedures are compatible. During conversion training the total number of approaches should not be additional to the requirements of Part-OR, provided the training is conducted utilising the lowest applicable RVR. During recurrent training and checking the operator may also combine the separate provisions provided the above operational procedure provision is met, provided that at least one approach using Lower than Standard Category I minima is conducted at least once every 18 months.

8.2 Operators conducting Other than Standard Category II operations should comply with this AMC applicable to Category II operations to include the provisions applicable to HUDLS (if appropriate). The operator may combine these additional provisions, where appropriate, provided that the operational procedures are compatible. During conversion training the total number of approaches should not be less than those to complete Category II training utilising a HUD/HUDLS. During recurrent training and checking the operator may also combine the separate provisions provided the above operational procedure provision is met, provided that at least one approach using Other than Standard Category II minima is conducted at least once every 18 months.

8.3 Operators conducting Approach Operations utilising EVS with RVR of 800 m or less should comply with this AMC applicable to Category II operations to include the requirements applicable to HUD (if appropriate). The operator may combine these additional provisions, where appropriate, provided that the operational procedures are compatible. During conversion training the total number of approaches should not be less than those to complete Category II training utilising a HUD. During recurrent training and checking the operator may also combine the separate provisions provided the above operational procedure provision is met, provided that at least one approach utilising EVS is conducted at least once every 12 months.

GM OPS.SPA.001.LVO(b)(1) Low visibility operations (LVO)

FLIGHT CREW TRAINING

The number of approaches referred to in AMC OPS.SPA.001.LVO (b)(1) 7.1 includes one approach and landing that may be conducted in the aircraft using approved Category II/III procedures. This approach and landing may be conducted in normal line operation or as a training flight.

AMC OPS.SPA.001.LVO(b)(2) Low visibility operations (LVO)

USE OF ENHANCED VISION SYSTEMS (EVS)

1. A pilot using a certificated enhanced vision system in accordance with the procedures and limitations of the approved flight manual may:

   a. continue an approach below DH or MDH to 100 feet above the threshold elevation of the runway provided that at least one of the following visual references is displayed and identifiable on the enhanced vision system:

      i. Elements of the approach lighting; or

      ii. The runway threshold, identified by at least one of the following: the beginning of the runway landing surface, the threshold lights, the threshold identification lights; and the touchdown zone, identified by at least one of the following: the runway touchdown zone landing surface,

the touchdown zone lights, the touchdown zone markings or the runway lights.

b. reduce the calculated RVR/CMV for the approach from the value in column 1 of Table 1 below to the value in column 2:

Table 1 –Approach utilising EVS RVR/CMV Reduction vs Normal RVR/CMV

RVR/CMV Normally required	RVR/CMV for approach utilising EVS
550	350
600	400
650	450
700	450
750	500
800	550
900	600
1000	650
1100	750
1200	800
1300	900
1400	900
1500	1000
1600	1100
1700	1100
1800	1200
1900	1300
2000	1300
2100	1400
2200	1500
2300	1500
2400	1600
2500	1700
2600	1700
2700	1800
2800	1900
2900	1900
3000	2000
3100	2000
3200	2100
3300	2200
3400	2200

3500	2300
3600	2400
3700	2400
3800	2500
3900	2600
4000	2600
4100	2700
4200	2800
4300	2800
4400	2900
4500	3000
4600	3000
4700	3100
4800	3200
4900	3200
5000	3300

2. Paragraph 1 above may only be used for Instrument Landing System (ILS), Microwave Landing System (MLS), Precision Approach Radar (PAR), GNSS Landing System (GLS) and Approaches with Vertical Guidance (APV) Operations with a DH no lower than 200 feet or an approach flown using approved vertical flight path guidance to a MDH or DH no lower than 250 feet.

3. A pilot may not continue an approach below 100 feet above runway threshold elevation for the intended runway, unless at least one of the visual references specified below is distinctly visible and identifiable to the pilot without reliance on the enhanced vision system:

   a. The lights or markings of the threshold; or

   b. The lights or markings of the touchdown zone.

GM OPS.SPA.001.LVO(b)(2) Low visibility operations (LVO)

USE OF ENHANCED VISION SYSTEMS (EVS)

1. Introduction

1.1 Enhanced vision systems use sensing technology to improve a pilot's ability to detect objects, such as runway lights or terrain, which may otherwise not be visible. The image produced from the sensor and/or image processor can be displayed to the pilot in a number of ways including use of a head up display. The systems can be used in all phases of flight and can improve situational awareness. In particular, infrared systems can display terrain during operations at night, improve situational awareness during night and low-visibility taxiing, and may allow earlier acquisition of visual references during instrument approaches.

2. Background to EVS provisions

2.1 The provisions for EVS were developed after an operational evaluation of two different EVS systems, along with data and support kindly provided by the FAA. Approaches using EVS were flown in a variety of conditions including fog, rain and snow showers, as

well as at night to aerodromes located in mountainous terrain. The infrared EVS performance can vary depending on the weather conditions encountered. Therefore, the provisions take a conservative approach to cater for the wide variety of conditions which may be encountered. It may be necessary to amend the provisions in the future to take account of greater operational experience.

2.2 Provisions for the use of EVS during take-off have not been developed. The systems evaluated did not perform well when the RVR was below 300 metres. There may be some benefit for use of EVS during take off with greater visibility and reduced lighting; however, such operations would need to be evaluated.

2.3 Provisions have been developed to cover use of infrared systems only. Other sensing technologies are not intended to be excluded; however, their use will need to be evaluated to determine the appropriateness of this, or any other provision. During the development, it was envisaged what minimum equipment should be fitted to the aircraft. Given the present state of technological development, it is considered that a HUD is an essential element of the EVS equipment.

2.4 In order to avoid the need for tailored charts for approaches utilising EVS, it is envisaged that an operator will use AMC OPS.SPA.001.LVO(b)(2) Table 1 – Approach utilising EVS RVR/CMV Reduction vs. Normal RVR/CMV to determine the applicable RVR at the commencement of the approach.

3. Additional operational considerations

3.1 Enhanced vision system equipment should have:

a. a head-up display system (capable of displaying, airspeed, vertical speed, aircraft attitude, heading, altitude, command guidance as appropriate for the approach to be flown, path deviation indications, flight path vector, and flight path angle reference cue and the EVS imagery);

b. for two-pilot operation, a head-down view of the EVS image, or other means of displaying the EVS-derived information easily to the pilot monitoring the progress of the approach.

If the aircraft is equipped with a radio altimeter, it should be used only as enhanced terrain awareness during approach using EVS and should not be taken into account for the operational procedures development.

4. Two-pilot operations

4.1 For operations in RVRs below 550 m, two-pilot operation is required.

4.2 The provision for a head-down view of the EVS image is intended to cover for multi-pilot philosophy. The pilot not-flying (PNF) is kept in the ‘loop’ and Crew Resource Management (CRM) does not break down. The PNF can be very isolated from the information necessary for monitoring flight progress and decision making if the PF is the only one to have the EVS image.

AMC OPS.SPA.001.LVO(b)(2)(iii) Low visibility operations (LVO)

NORMAL PROCEDURES

1. An operator should establish procedures and instructions to be used for Low Visibility Take-Off, approaches utilising EVS, Lower than Standard Category I, Other than Standard Category II and Category II and III operations. These procedures should be included in the operations manual and contain the duties of flight crew members during taxiing, take-off, approach, flare, the hover, landing, roll-out and missed approach, as appropriate.

2. An operator should specify the detailed operating procedures and instructions in the operations manual. The instructions should be compatible with the limitations and

mandatory procedures contained in the Flight Manual and cover the following items in particular:

a. Checks for the satisfactory functioning of the aircraft equipment, both before departure and in flight;

b. Effect on minima caused by changes in the status of the ground installations and airborne equipment;

c. Procedures for the take-off, approach, flare, hover, landing, roll-out and missed approach;

d. Procedures to be followed in the event of failures, warnings to include HUD/HUDLS/EVS and other non-normal situations;

e. The minimum visual reference required;

f. The importance of correct seating and eye position;

g. Action which may be necessary arising from a deterioration of the visual reference;

h. Allocation of crew duties in the carrying out of the procedures according to 2.a to 2.d and 2.f above, to allow the pilot-in-command to devote himself mainly to supervision and decision making;

i. The requirement for all height calls below 200 ft to be based on the radio altimeter and for one pilot to continue to monitor the aircraft instruments until the landing is completed;

j. The requirement for the ILS Sensitive Area to be protected;

k. The use of information relating to wind velocity, wind shear, turbulence, runway contamination and use of multiple RVR assessments;

l. Procedures to be used for:

   i. Lower than Standard Category I;

   ii. Other than Standard Category II;

   iii. Approaches utilising EVS; and

   iv. Practice approaches and landing on runways at which the full Category II or Category III aerodrome procedures are not in force;

m. Operating limitations resulting from airworthiness certification; and

n. Information on the maximum deviation allowed from the ILS glide path and/or localiser.

GM1 OPS.SPA.001.LVO(b)(2)(iii) Low visibility operations (LVO)

NORMAL PROCEDURES

The precise nature and scope of procedures and instructions given depend upon the airborne equipment used and the cockpit procedures followed. An operator should clearly define flight crew member duties during take-off, approach, flare, hover, roll-out and missed approach in the Operations Manual. Particular emphasis should be placed on flight crew responsibilities during transition from non-visual conditions to visual conditions, and on the procedures to be used in deteriorating visibility or when failures occur. Special attention should be paid to the distribution of flight deck duties so as to ensure that the workload of the pilot making the decision to land or execute a missed approach enables him to devote himself to supervision and the decision making process.

GM2 OPS.SPA.001.LVO(b)(2)(iii) Low visibility operations (LVO)

NORMAL PROCEDURES – USE OF AUTOLAND SYSTEMS WHEN LOW VISIBILITY PROCEDURES ARE NOT IN FORCE

1. Introduction

a. Most Instrument Landing System (ILS) installations are subject to signal interference by either surface vehicles or aircraft. To prevent this interference ILS critical areas are established near each localizer and glide slope antenna. For Category II and III ILS installations, additionally an ILS sensitive area is established. The critical areas are restricted from all vehicle or aircraft operation when the ILS is being used, or at least when an aircraft is inside the Outer Marker (OM) or equivalent position. At US airports the Localisor (LLZ) and GP critical areas will be protected when weather at the airport is reported less than 800 feet ceiling and/or visibility is less than 2 miles with an aircraft inside the OM or equivalent position.

b. The ILS sensitive area is protected from all surface vehicles and aircraft when ILS Category II or III operations are conducted or anticipated. This typically takes place when landing operations are conducted with Runway Visual Range (RVR) less than 600 m or with a ceiling of less than 200 feet. At US airports the sensitive area is called the “ILS critical area” (not to be confused with the LLZ or GP critical areas which are smaller). The US ILS critical area is protected during the corresponding conditions. The operators need to inform their pilots about the differences in terminology which are summarised in the following Table:

EU / EASA	US / FAA
ILS Critical Area(s)	LLZ & GP Critical Areas
ILS Sensitive Area	ILS Critical Area

c. LVPs on an aerodrome basically have two main objectives: to prevent collisions involving an aircraft on the aerodrome and to ensure that the ILS sensitive area is protected. To find out if LVPs are in force, the pilots need to contact Air Traffic Control (ATC) or listen to the Air Traffic Information System (ATIS).

d. When the LVPs are not in force, ILS beam bends may occur because of vehicle or aircraft interference. Sudden and unexpected flight control movements may occur at a very low altitude or during the landing and roll-out when the autopilot attempts to follow the beam bends. A Category I ILS is not required to support autoland operations although it is recognised that some Category I ILS facilities can support autoland operations. Unless specifically mentioned in the Aeronautical Information Publication (AIP), it must be assumed that ILS signals to Category I runways are not flight inspected below 100 feet Above Ground Level (AGL), and therefore guidance signal anomalies may be encountered below this altitude without advance warnings.

2. Auto land operational considerations

a. Auto land operations are performed as follows:

i. For actual Category III operations;

ii. For actual Category II operations with Category D aircrafts when using an RVR less than 350 metres;

iii. For crew qualification and recency;

iv. For operational demonstration and in-service proving; or

v. For system verification (scheduled maintenance and corrective maintenance).

b. Additionally, operators recommend their pilots to perform auto land operations in order to reduce crew work load, in particular during marginal weather conditions.

c. Cases 2.a.i. and 2.a.ii. above require the full protection of the ILS, whereas in the other cases, Category I standard is acceptable, provided that the pilot-in-command is informed. In the latter cases the crew will be expected to have sufficient visual references to detect and correct any deviations form the expected flight path.

d. For case 2.a.iii. Flight Simulators may be used instead.

e. For case 2.a.iv., a proportion of the number of automatic landings required by the operators when introducing a new aircraft type may be done on Cat I facilities for practical reasons. This reduces the number of auto lands significantly. As a compensation, this work includes a requirement to verify the auto land capability for all combinations of airframe/onboard equipment and runways and ground equipment. These automatic landings will need to be done in Category I or II conditions. In order to reduce the burden on operators and aerodromes, it would be beneficial if operators using the same type of airframe/equipment/procedures could take credit for each other experiences.

3. The problems and potential risks of performing auto-land operations on ILS facilities or runways not meeting CAT II/III standards:

a. Where the ILS Auto land system is to be used on an ILS facility not meeting the CAT II/III standards, it should be realised that a number of factors may influence the accuracy of the localiser signal:

i. Since the ILS sensitive area protection is not assured, other aircraft and vehicles may cause disturbance to the localiser signal;

ii. Switch-over time of the ground aids may not be in accordance with the requirements for Cat III;

iii. The pre-threshold terrain may contain irregularities which may cause abnormal autopilot behaviour.

b. The quality of the ILS signal may not support an automatic coupling since this is not a requirement for a CAT I ILS. In some cases where known inadequacies of the ILS are present, this will be mentioned in the AIP.

c. Sudden and unexpected flight control movements may occur at a very low altitude or during the landing and rollout when the autopilot attempts to follow the beam bends.

4. Operational procedures to ensure the safety of auto land:

a. when auto land operations are conducted, the operational procedures should be used fully regardless of the weather conditions;

b. Flight crews should be alert to the possibility of abnormal autopilot behaviour and guard the flight controls (control wheel, rudder pedals, and thrust levers) throughout all automatic approaches and landings. They should be prepared to disconnect the autopilot and manually land or go-around. Attempts to override the autopilot in lieu of a disconnect is not recommended due to the forces required to overpower the autopilot servos;

c. The ATC should be informed about the intention to conduct an auto land. Such information should not be taken as a request for or expectation of the protection of the ILS but is merely given to enhance the possibility for ATC to inform the flight crew of any known or anticipated disturbance;

Note: In some States, the hours where practice auto land operations can expect full protection of the ILS sensitive area, are published in the AIP.

d. The operator should include the appropriate instructions in the Operations Manual.

AMC1 OPS.SPA.001.LVO(b)(3) Low visibility operations (LVO)

OPERATIONAL DEMONSTRATION AND DATA COLLECTION/ANALYSIS

1. Operational Demonstration for aeroplanes

1.1 The purpose of the operational demonstration is to determine or validate the use and effectiveness of the applicable aircraft flight guidance systems, including HUDLS if appropriate, training, flight crew procedures, maintenance programme, and manuals applicable to the Category II/III programme being approved.

a. At least 30 approaches and landings should be accomplished in operations using the Category II/III systems installed in each aircraft type if the requested Decision Height (DH) is 50 ft or higher. If the DH is less than 50 ft, at least 100 approaches and landings should be accomplished.

b. If an operator has different variants of the same type of aircraft utilising the same basic flight control and display systems, or different basic flight control and display systems on the same type of aircraft, the operator should show that the various variants have satisfactory performance, but the operator need not conduct a full operational demonstration for each variant. The number of approach and landings may be reduced based on the experience gained by another Community operator using the same aeroplane type or variant and procedures.

c. If the number of unsuccessful approaches exceeds 5 % of the total (e.g. unsatisfactory landings, system disconnects) the evaluation programme should be extended in steps of at least 10 approaches and landings until the overall failure rate does not exceed 5 %.

1.2 Data collection for operational demonstrations. Each applicant should develop a data collection method (e.g. a form to be used by the flight crew) to record approach and landing performance. The resulting data and a summary of the demonstration data should be made available to the competent authority for evaluation.

1.3 Data analysis. Unsatisfactory approaches and/or automatic landings should be documented and analysed.

2. Operational demonstration for helicopters

2.1 The operator should comply with the provisions prescribed in 2.2 below when introducing a helicopter type which is new to the Community into Category II or III service.

For helicopter types already used for Category II or III operations in another Member State, the in-service proving programme in 2.4 should be used instead.

a. Operational reliability. The Category II and III success rate should not be less than that required by CS-AWO or its equivalent.

b. Criteria for a successful approach. An approach is regarded as successful if:

i. The criteria are as specified in CS-AWO or its equivalent;

ii. No relevant helicopter system failure occurs.

2.2 Data Collection during Airborne System Demonstration - General

a. An operator should establish a reporting system to enable checks and periodic reviews to be made during the operational evaluation period before the operator is approved to conduct Category II or III operations. The reporting system should cover all successful and unsuccessful approaches, with reasons for the

latter, and include a record of system component failures. This reporting system should be based upon flight crew reports and automatic recordings as prescribed in 2.3 and 2.4 below.

b. The recordings of approaches may be made during normal line flights or during other flights performed by the operator.

2.3 Data Collection during Airborne System Demonstration – Operations with DH not less than 50 ft

a. For operations with DH not less than 50 ft, data should be recorded and evaluated by the operator and evaluated by the competent authority when necessary.

b. It is sufficient for the following data to be recorded by the flight crew:

i. FATO and runway used;

ii. Weather conditions;

iii. Time;

iv. Reason for failure leading to an aborted approach;

v. Adequacy of speed control;

vi. Trim at time of automatic flight control system disengagement;

vii. Compatibility of automatic flight control system, flight director and raw data;

viii. An indication of the position of the helicopter relative to the ILS centreline when descending through 30 m (100 ft); and

ix. Touchdown position.

c. The number of approaches made during the initial evaluation should be sufficient to demonstrate that the performance of the system in actual airline service is such that a 90 % confidence and a 95 % approach success will result.

2.4 Data Collection during Airborne System Demonstration – Operations with DH less than 50 ft or no DH:

a. For operations with DH less than 50 ft or no DH, a flight data recorder, or other equipment giving the appropriate information, should be used in addition to the flight crew reports to confirm that the system performs as designed in actual airline service. The following data should be recorded:

i. Distribution of ILS deviations at 30 m (100 ft), at touchdown and, if appropriate, at disconnection of the roll-out control system and the maximum values of the deviations between those points; and

ii. Sink rate at touchdown.

b. Any landing irregularity should be fully investigated using all available data to determine its cause.

2.5 In-service proving

An operator fulfilling the provisions of 2.2 above will be deemed to have met the in-service proving contained in this paragraph.

a. The system should demonstrate reliability and performance in line operations consistent with the operational concepts. A sufficient number of successful landings should be accomplished in line operations, including training flights, using the auto land and roll-out system installed in each helicopter type.

b. The demonstration should be accomplished using a Category II or Category III ILS. Demonstrations may be made on other ILS facilities if sufficient data is recorded to determine the cause of unsatisfactory performance.

c. If an operator has different variants of the same type of helicopter utilising the same basic flight control and display systems, or different basic flight control and display systems on the same type of helicopter, the operator should show that the variants comply with the basic system performance criteria, but the operator need not conduct a full operational demonstration for each variant.

d. Where an operator introduces a helicopter type which has already been approved by the competent authority of any Member State for Category II and/or III operations a reduced proving programme may be approved.

3. All aircraft

3.1 Continuous Monitoring

a. After obtaining the initial authorisation, the operations should be continuously monitored by the operator to detect any undesirable trends before they become hazardous. Flight crew reports may be used to achieve this.

b. The following information should be retained for a period of 12 months:

i. The total number of approaches, by aircraft type, where the airborne Category II or III equipment was utilised to make satisfactory, actual or practice, approaches to the applicable Category II or III minima; and

ii. Reports of unsatisfactory approaches and/or automatic landings, by aerodrome and aircraft registration, in the following categories:

A. Airborne equipment faults;

B. Ground facility difficulties;

C. Missed approaches because of ATC instructions; or

D. Other reasons.

c. An operator should establish a procedure to monitor the performance of the automatic landing system or HUDLS to touchdown performance, as appropriate, of each aircraft.

3.2 Transitional periods

a. Operators with no previous Category II or III experience:

i. An operator without previous Category II or III operational experience may be approved for Category II or IIIA operations, having gained a minimum experience of 6 months of Category I operations on the aircraft type.

ii. On completing 6 months of Category II or IIIA operations on the aircraft type the operator may be approved for Category IIIB operations. When granting such an approval, the competent authority may impose higher minima than the lowest applicable for an additional period. The increase in minima will normally only refer to RVR and/or a restriction against operations with no decision height and shall be selected such that they will not require any change of the operational procedures.

b. Operators with previous Category II or III experience:

i. An operator with previous Category II or III experience may obtain a reduced transition period.

ii. An operator authorised for Category II or III operations using auto-coupled approach procedures, with or without auto-land, and

subsequently introducing manually flown Category II or III operations using a HUDLS should be considered to be a "New Category II/III operator" for the purposes of the demonstration period provisions.

3.3 Maintenance of Category II, Category III and LVTO equipment. Maintenance instructions for the on-board guidance systems shall be established by the operator, in liaison with the manufacturer, and included in the operator's aircraft maintenance programme in accordance with Part-M.

3.4 Eligible Aerodromes and Runways

a. Each aircraft type/runway combination should be verified by the successful completion of at least one approach and landing in Category II or better conditions, prior to commencing Category III operations.

b. For runways with irregular pre-threshold terrain or other foreseeable or known deficiencies, each aircraft type/runway combination should be verified by operations in standard Category I or better conditions, prior to commencing Lower than Standard Category I, Category II, or Other than Standard Category II.

c. If an operator has different variants of the same type of aircraft in accordance with 3.4 d. below, utilising the same basic flight control and display systems, or different basic flight control and display systems on the same type of aircraft in accordance with 3.4 d. below, the operator should show that the variants have satisfactory operational performance, but the operator need not conduct a full operational demonstration for each variant/runway combination.

d. For the purpose of paragraph 3.4, an aircraft type or variant of an aircraft type is deemed to be the same type/variant of aircraft if that type/variant has the same or similar:

i. level of technology, including the:

A. FGS and associated displays and controls;

B. the FMS and level of integration with the FGS;

C. use of HUDLS.

ii. operational procedures, including:

A. alert height;

B. manual landing /automatic landing;

C. no decision height operations;

D. use of HUD/HUDLS in hybrid operations.

iii. handling characteristics, including:

A. manual landing from automatic or HUDLS guided approach;

B. manual go-around from automatic approach;

C. automatic/manual roll out.

e. Operators using the same aircraft type/class or variant of a type in accordance with 3.4 d. above may take credit from each others' experience and records in complying with this paragraph.

f. Operators conducting Other than Standard Category II operations should comply with the requirements of this section applicable to Category II operations.

AMC2 OPS.SPA.001.LVO(b)(3) Low visibility operations (LVO)

OPERATIONAL DEMONSTRATION AND DATA COLLECTION/ANALYSIS

1. General

1.1 Demonstrations may be conducted in line operations or any other flight where the Operator's procedures are being used.

1.2 In unique situations where the completion of 100 successful landings could take an unreasonably long period of time due to factors such as a small number of aircraft in the fleet, limited opportunity to use runways having Category II/III procedures, or inability to obtain Air Traffic Services (ATS) sensitive area protection during good weather conditions, and equivalent reliability assurance can be achieved, a reduction in the required number of landings may be considered on a case-by-case basis. Reduction of the number of landings to be demonstrated requires a justification for the reduction. However, at the operator's option, demonstrations may be made on other runways and facilities. Sufficient information should be collected to determine the cause of any unsatisfactory performance (e.g. sensitive area was not protected).

1.3 If an operator has different variants of the same type of aircraft utilising the same basic flight control and display systems, or different basic flight control and display systems on the same type/classes of aircraft, the operator should show that the various variants have satisfactory performance, but the operator need not conduct a full operational demonstration for each variant.

1.4 Not more than 30 % of the demonstration flights should be made on the same runway.

2. Data collection for operational demonstrations

2.1 Data should be collected whenever an approach and landing is attempted utilising the Category II/III system, regardless of whether the approach is abandoned, unsatisfactory, or is concluded successfully.

2.2 The data should, as a minimum, include the following information:

a. Inability to initiate an approach. Identify deficiencies related to airborne equipment which preclude initiation of a Category II/III approach.

b. Abandoned approaches. Give the reasons and altitude above the runway at which approach was discontinued or the automatic landing system was disengaged.

c. Touchdown or touchdown and roll-out performance. Describe whether or not the aircraft landed satisfactorily (within the desired touchdown area) with lateral velocity or cross track error which could be corrected by the pilot or automatic system so as to remain within the lateral confines of the runway without unusual pilot skill or technique. The approximate lateral and longitudinal position of the actual touchdown point in relation to the runway centreline and the runway threshold, respectively, should be indicated in the report. This report should also include any Category II/III system abnormalities which required manual intervention by the pilot to ensure a safe touchdown or touchdown and roll-out, as appropriate.

3. Data Analysis

3.1 Unsuccessful approaches due to the following factors may be excluded from the analysis:

a. ATS Factors. Examples include situations in which a flight is vectored too close to the final approach fix/point for adequate localiser and glide slope capture, lack of protection of ILS sensitive areas, or ATS requests the flight to discontinue the approach.

b. Faulty Navaid Signals. Navaid (e.g. ILS localiser) irregularities, such as those caused by other aircraft taxiing, over-flying the navaid (antenna).

c. Other Factors. Any other specific factors that could affect the success of Category II/ III operations that are clearly discernible to the flight crew should be reported.

GM OPS.SPA.001.LVO(b)(3) Low visibility operations (LVO)

CRITERIA FOR A SUCCESFUL CAT II/III APPROACH AND AUTOMATIC LANDING

1. The purpose of this guidance material is to provide operators with supplemental information regarding the criteria for a successful approach and landing to facilitate fulfilling the requirements prescribed in OPS.SPA.001.LVO(b)(3).

2. An approach may be considered to be successful if:

2.1 From 500 feet to start of flare:

a. Speed is maintained as specified in AMC-AWO 231, paragraph 2 'Speed Control'; and

b. No relevant system failure occurs; and

2.2 From 300 feet to DH:

a. no excess deviation occurs; and

b. no centralised warning gives a go-around command (if installed).

3. An automatic landing may be considered to be successful if:

a. no relevant system failure occurs;

b. no flare failure occurs;

c. no de-crab failure occurs (if installed);

d. longitudinal touchdown is beyond a point on the runway 60 metres after the threshold and before the end of the touchdown zone lighting (900 metres from the threshold);

e. lateral touchdown with the outboard landing gear is not outside the touchdown zone lighting edge;

f. sink rate is not excessive;

g. bank angle does not exceed a bank angle limit; and

h. no roll-out failure or deviation (if installed) occurs.

4. More details can be found in CS-AWO 131, CS-AWO 231 and AMC-AWO 231.

AMC1 OPS.SPA.020.LVO LVO operating minima

GENERAL

1. An operator should establish, for each aerodrome planned to be used, aerodrome operating minima that are not lower than the values given in Appendix 1, 2, 3 and 4 to this AMC. The method of determination of such minima should be included in the operations manual.

2. Such minima should not be lower than minima that may be established for such aerodromes by the State in which the aerodrome is located, except when specifically approved by that State.

3. The use of HUD, HUDLS or EVS may allow operations with lower visibilities than normally associated with the aerodrome operating minima. States which promulgate

aerodrome operating minima may also promulgate regulations for reduced visibility minima associated with the use of HUD or EVS.

4. In establishing the aerodrome operating minima which will apply to any particular operation, an operator should take full account of:

   a. the type, performance and handling characteristics of the aircraft;

   b. the composition of the flight crew, their competence and experience;

   c. the dimensions and characteristics of the FATO's/runways which may be selected for use;

   d. the adequacy and performance of the available visual and non-visual ground aids (see AMC 4 OPS.SPA.020.LVO);

   e. the equipment available on the aircraft for the purpose of navigation and/or control of the flight path, as appropriate, during the take-off, the approach, the flare, the hover, the landing, roll-out and the missed approach;

   f. the obstacles in the approach, missed approach and the climb-out areas required for the execution of contingency procedures and necessary clearance;

   g. the obstacle clearance altitude/height for the instrument approach procedures;

   h. the means to determine and report meteorological conditions; and

   i. the flight technique to be used during the final approach.

Appendix 1 to AMC1 OPS.SPA.020.LVO LVO operating minima

LOWER THAN STANDARD CAT I OPERATIONS

1. The decision height should not be lower than the highest of:

   a. the minimum decision height specified in the AFM, if stated; or

   b. the minimum height to which the precision approach aid can be used without the required visual reference; or

   c. the OCH for the category of aircraft; or

   d. the decision height to which the flight crew is authorised to operate; or

   e. 200 ft.

2. An ILS/MLS which supports a Lower than Standard Category I operation should be an unrestricted facility with a straight-in course ($\leq 3^{o}$ offset) and the ILS should be certificated to:

   a. class I/T/1 for operations to a minimum of 450 m RVR; or,

   b. class II/D/2 for operations to less than 450 m RVR.

   Single ILS facilities are only acceptable if Level 2 performance is provided.

3. Required RVR/CMV.

   The lowest minima to be used by an operator for Lower than Standard Category I operations are stipulated in Table 1 below:

Table 1 - Lower than Standard Category I Minimum RVR/CMV vs. Approach Light System

Lower than Standard Category I Minima				
DH (ft)	Class of Lighting Facility			
	FALS	IALS	BALS	NALS
	RVR/CMV (Metres)			
200 - 210	400	500	600	750
211 – 220	450	550	650	800
221 – 230	500	600	700	900
231 – 240	500	650	750	1 000
241 – 249	550	700	800	1 100

The visual aids comprise standard runway day markings, approach lighting, runway edge lights, threshold lights, runway end lights and, for operations below 450 m, should include touch-down zone and/or runway centre line lights.

4. Visual reference. A pilot should not continue an approach below decision height unless visual reference containing a segment of at least 3 consecutive lights being the centre line of the approach lights, or touchdown zone lights, or runway centre line lights, or runway edge lights, or a combination of these is attained and can be maintained. This visual reference should include a lateral element of the ground pattern, i.e. an approach lighting crossbar or the landing threshold or a barrette of the touchdown zone lighting unless the operation is conducted utilising an approved HUDLS useable to at least 150 ft.

5. To conduct Lower than Standard Category I operations:

   a. The approach should be flown auto-coupled to an auto-land; or an approved HUDLS should be used to at least 150ft above the threshold.

   b. The aircraft should be certificated in accordance to CS-AWO to conduct Category II operations;

   c. The auto-land system should be approved for Category IIIA operations;

   d. In service proving requirements should be completed in accordance with AMC1 OPS.SPA.001.LVO(b)(3) 3.4;

   e. Training specified in AMC OPS.LVO.001(b)(1)8. should be completed, this should include training and checking in a Flight Simulator using the appropriate ground and visual aids at the lowest applicable RVR; and

   f. The Operator should ensure that Low Visibility procedures are established and in operation at the intended aerodrome of landing.

Appendix 2 to AMC1 OPS.SPA.020.LVO LVO operating minima

CAT II AND OTHER THAN STANDARD CAT II OPERATIONS

1. General

   a. A Category II operation is a precision instrument approach and landing using ILS or MLS with:

      i. A decision height below 200 ft but not lower than 100 ft; and

      ii. A runway visual range of not less than 300 m.

b. An other than Standard Category II operation is a precision instrument approach and landing using ILS or MLS which meets facility requirements as established in c. below with:

i. A decision height below 200 ft but not lower than 100 ft (see Table 2 below); and

ii. A runway visual range of not less than 350/400 m (see Table 2 below).

c. The ILS/MLS that supports other than a Standard Category II operation should be an unrestricted facility with a straight in course (≤ 3º offset) and the ILS should be certificated to:

i. Class I/T/1 for operations down to 450 m RVR and to a DH of 200 ft or more; or

ii. Class II/D/2 for operations in RVRs of less than 450 m or to a DH of less than 200 ft.

Single ILS facilities are only acceptable if Level 2 performance is provided.

2. The decision height should not be lower than the highest of:

a. The minimum decision height specified in the Aircraft Flight Manual, if stated; or

b. The minimum height to which the precision approach aid can be used without the required visual reference; or

c. The OCH for the category of aircraft; or

d. The OCH/OCL for the category of helicopter; or

e. The decision height to which the flight crew is authorised to operate; or

f. 100 ft.

3. Visual reference. A pilot may not continue an approach below either the Category II or the other than Standard Category II decision height determined in accordance with 2. above unless visual reference containing a segment of at least 3 consecutive lights being the centre line of the approach lights, or touchdown zone lights, or FATO/runway centre line lights, or FATO/runway edge lights, or a combination of these is attained and can be maintained. This visual reference should include a lateral element of the ground pattern, i.e. an approach lighting crossbar or the landing threshold or a barrette of the touchdown zone lighting unless the operation is conducted utilising an approved HUDLS to touchdown.

4. The lowest minima to be used by an operator for

a. Category II operations are:

Table 1 – RVR for Cat II Operations vs DH

Category II Minima			
DH (ft)	RVR Auto-coupled/Approved HUDLS to below DH*		
	Aeroplane Category A, B & C	Aeroplane Category D	Helicopters operated in Performance Class 1
100 – 120	300 m	300 / 350 m**	300 m
121 – 140	400 m	400 m	400 m
141 and above	450 m	450 m	450 m

* The reference to 'auto-coupled to below DH/Approved HUDLS' in this table means continued use of the automatic flight control system or the HUDLS down to a height of 80 % of the applicable DH. Thus airworthiness requirements may, through minimum engagement height for the automatic flight control system, affect the DH to be applied.

** 300 m may be used for a Category D aeroplane conducting an auto-land. (See GM2 to Appendix 3 to AMC 1 OPS.SPA.020.LVO).

b. other than Standard Category II operations are:

Table 2 - Other than Standard Category II Minimum RVR vs. Approach Light System

Other than Standard Category II Minima					
DH (ft)	Auto land or Approved HUDLS utilised to touchdown				
	Class of Lighting Facility				
	FALS		IALS	BALS	NALS
	See AMC6 A OPS.GEN.150 5., 6. and 10. about RVR < 750 m				
	CAT A - C	CAT D	CAT A - D	CAT A - D	CAT A – D
	RVR (m)				
100 – 120	350	400	450	600	700
121 – 140	400	450	500	600	700
141 – 160	450	500	500	600	750
161 – 199	450	500	550	650	750

The visual aids required to conduct Other than Standard Category II Operations comprise standard runway day markings and approach and runway lighting (runway edge lights, threshold lights, runway end lights). For operations in RVR of 400 m or less, centre line lights should be available. The approach light configurations are classified and listed in Table 1 of AMC6 A OPS.GEN.150.

5. To conduct other than Standard Category II operations the operator should ensure that appropriate Low Visibility procedures are established and in operation at the intended aerodrome of landing.

Appendix 3 to AMC1 OPS.SPA.020.LVO LVO operating minima

PRECISION APPROACH - CAT III OPERATIONS

1. General

Category III operations are subdivided as follows:

a. Category III A operations. A precision instrument approach and landing using ILS or MLS with:

i. A decision height lower than 100 ft; and

ii. A runway visual range not less than 200 m.

b. Category III B operations. A precision instrument approach and landing using ILS or MLS with:

i. A decision height lower than 100 ft, or no decision height; and

ii. A runway visual range lower than 200 m but not less than 75 m.

Where the decision height (DH) and runway visual range (RVR) do not fall within the same Category, the RVR will determine in which Category the operation is to be considered.

2. Decision Height

For operations in which a decision height is used, an operator should ensure that the decision height is not lower than:

a. The minimum decision height specified in the AFM, if stated; or

b. The minimum height to which the precision approach aid can be used without the required visual reference; or

c. The decision height to which the flight crew is authorised to operate.

3. No Decision Height Operations

Operations with no decision height may only be conducted if:

a. the operation with no decision height is authorised in the AFM;

b. the approach aid and the aerodrome facilities can support operations with no decision height; and

c. the operator has an approval for CAT III operations with no decision height.

In the case of a CAT III runway it may be assumed that operations with no decision height can be supported unless specifically restricted as published in the AIP or NOTAM.

4. Visual reference

4.1 For Category IIIA operations, and for Category IIIB operations conducted either with fail-passive flight control systems, or with the use of an approved HUDLS, a pilot may not continue an approach below the decision height determined in accordance with 2. above unless a visual reference containing a segment of at least 3 consecutive lights being the centreline of the approach lights, or touchdown zone lights, or runway centreline lights, or runway edge lights, or a combination of these is attained and can be maintained.

4.2 For Category IIIB operations conducted either with fail-operational flight control systems or with a fail operational hybrid landing system (comprising e.g. a HUDLS) using a decision height a pilot may not continue an approach below the Decision Height, determined in accordance with Appendix 1 to AMC1 OPS.SPA.020.LVO 2., unless a visual reference containing at least one centreline light is attained and can be maintained.

5. The lowest required RVR minima to be used by an operator should be:

Table 1 – RVR for Cat III Operations vs. DH and roll-out control/guidance system

Category III Minima			
Category	Decision Height (ft)***	Roll-Out Control / Guidance System	RVR (m)
IIIA	< 100	Not required	200*
IIIB	< 100	Fail-passive	150*,**
IIIB	< 50	Fail-passive	125
IIIB	< 50 or no DH	Fail-operational****	75

* For fail-passive operations see GM1 Appendix 3 to AMC1 OPS.SPA.020.LVO.

** For aircraft certificated in accordance with CS-AWO 321(b)(3) or equivalent.

*** Flight control system redundancy is determined under CS-AWO by the minimum certificated decision height.

**** The fail operational system referred to may consist of a fail operational hybrid system. (GM2 Appendix 3 to AMC1 OPS.SPA.020.LVO)

Appendix 4 to AMC1 OPS.SPA.020.LVO LVO operating minima

AERODROME MINIMA – TAKE-OFF MINIMA

Refer to AMC3 OPS.GEN.150 paragraph 3

GM1 Appendix 3 to AMC1 OPS.SPA.020.LVO LVO operating minima

CREW ACTIONS IN CASE OF AUTOPILOT FAILURE AT OR BELOW DECISION HEIGHT IN FAIL-PASSIVE CATEGORY III OPERATIONS

For operations to actual RVR values less than 300 m, a go-around is assumed in the event of an autopilot failure at or below DH. This means that a go-around is the normal action. However, the wording recognises that there may be circumstances where the safest action is to continue the landing. Such circumstances include the height at which the failure occurs, the actual visual references, and other malfunctions. This would typically apply to the late stages of the flare. In conclusion, it is not forbidden to continue the approach and complete the landing when the pilot-in-command or the pilot to whom the conduct of the flight has been delegated, determines that this is the safest course of action. The operator's policy and the operational instructions should reflect this information.

GM2 Appendix 3 to AMC1 OPS.SPA.020.LVO LVO operating minima

ESTABLISHMENT OF MINIMUM RVR FOR CATEGORY II AND III OPERATIONS

1. General

1.1 When establishing minimum RVR for Category II and III Operations, operators should pay attention to the following information which originates in ECAC Doc 17 3rd Edition, Subpart A. It is retained as background information and, to some extent, for historical purposes although there may be some conflict with current practices.

1.2 Since the inception of precision approach and landing operations various methods have been devised for the calculation of aerodrome operating minima in terms of decision height and runway visual range. It is a comparatively straightforward matter to establish the decision height for an operation but establishing the minimum RVR to be associated with that decision height so as to provide a high probability that the required visual reference will be available at that decision height has been more of a problem.

1.3 The methods adopted by various States to resolve the DH/RVR relationship in respect of Category II and Category III operations have varied considerably. In one instance there has been a simple approach which entailed the application of empirical data based on actual operating experience in a particular environment. This has given satisfactory results for application within the environment for which it was developed. In another instance a more sophisticated method was employed which utilised a fairly complex computer programme to take account of a wide range of variables. However, in the latter case, it has been found that with the improvement in the performance of visual aids, and the increased use of automatic equipment in the many different types of new aircraft, most of the variables cancel each other out and a simple tabulation can be constructed which is applicable to a wide range of aircraft. The basic principles which are observed in establishing the values in such a table are that the scale of visual reference required by a pilot at and below decision height depends on the task that he has to carry out, and that the degree to which his vision is obscured depends on the obscuring medium, the general rule in fog being that it becomes more dense with increase in height. Research using flight simulators coupled with flight trials has shown the following:

a. Most pilots require visual contact to be established about 3 seconds above decision height though it has been observed that this reduces to about 1 second when a fail-operational automatic landing system is being used;

b. To establish lateral position and cross-track velocity most pilots need to see not less than a 3 light segment of the centre line of the approach lights, or runway centre line, or runway edge lights;

c. For roll guidance most pilots need to see a lateral element of the ground pattern, i.e. an approach lighting cross bar, the landing threshold, or a barrette of the touchdown zone lighting; and

d. To make an accurate adjustment to the flight path in the vertical plane, such as a flare, using purely visual cues, most pilots need to see a point on the ground which has a low or zero rate of apparent movement relative to the aircraft.

e. With regard to fog structure, data gathered in the United Kingdom over a twenty-year period have shown that in deep stable fog there is a 90 % probability that the slant visual range from eye heights higher than 15 ft above the ground will be less that the horizontal visibility at ground level, i.e. RVR. There are at present no data available to show what the relationship is between the Slant Visual Range and RVR in other low visibility conditions such as blowing snow, dust or heavy rain, but there is some evidence in pilot reports that the lack of contrast between visual aids and the background in such conditions can produce a relationship similar to that observed in fog.

2. Category II Operations

2.1 The selection of the dimensions of the required visual segments which are used for Category II operations is based on the following visual requirements:

a. A visual segment of not less than 90 metres will need to be in view at and below decision height for pilot to be able to monitor an automatic system;

b. A visual segment of not less than 120 metres will need to be in view for a pilot to be able to maintain the roll attitude manually at and below decision height; and

c. For a manual landing using only external visual cues, a visual segment of 225 metres will be required at the height at which flare initiation starts in order to provide the pilot with sight of a point of low relative movement on the ground.

Before using a Category II ILS for landing, the quality of the localiser between 50 ft and touchdown should be verified.

3. Category III fail passive operations

3.1 Category III operations utilising fail-passive automatic landing equipment were introduced in the late 1960's and it is desirable that the principles governing the establishment of the minimum RVR for such operations be dealt with in some detail.

3.2 During an automatic landing the pilot needs to monitor the performance of the aircraft system, not in order to detect a failure which is better done by the monitoring devices built into the system, but so as to know precisely the flight situation. In the final stages he/she should establish visual contact and, by the time he/she reaches decision height, he/she should have checked the aircraft position relative to the approach or runway centre-line lights. For this he/she will need sight of horizontal elements (for roll reference) and part of the touchdown area. He/she should check for lateral position and cross-track velocity and, if not within the pre-stated lateral limits, he/she should carry out a go-around. He/she should also check longitudinal progress and sight of the landing threshold is useful for this purpose, as is sight of the touchdown zone lights.

3.3 In the event of a failure of the automatic flight guidance system below decision height, there are two possible courses of action; the first is a procedure which allows the pilot to complete the landing manually if there is adequate visual reference for him/her to do so, or to initiate a go-around if there is not; the second is to make a go-around

mandatory if there is a system disconnect regardless of the pilot's assessment of the visual reference available:

a. if the first option is selected then the overriding requirement in the determination of a minimum RVR is for sufficient visual cues to be available at and below decision height for the pilot to be able to carry out a manual landing. Data presented in Doc 17 showed that a minimum value of 300 metres would give a high probability that the cues needed by the pilot to assess the aircraft in pitch and roll will be available and this should be the minimum RVR for this procedure.

b. the second option, to require a go-around to be carried out should the automatic flight-guidance system fail below decision height, will permit a lower minimum RVR because the visual reference requirement will be less if there is no need to provide for the possibility of a manual landing. However, this option is only acceptable if it can be shown that the probability of a system failure below decision height is acceptably low. It should be recognised that the inclination of a pilot who experiences such a failure would be to continue the landing manually but the results of flight trials in actual conditions and of simulator experiments show that pilots do not always recognise that the visual cues are inadequate in such situations and present recorded data reveal that pilots' landing performance reduces progressively as the RVR is reduced below 300 metres. It should further be recognised that there is some risk in carrying out a manual go-around from below 50 ft in very low visibility and it should therefore be accepted that if an RVR lower than 300 metres is to be authorised, the flight deck procedure should not normally allow the pilot to continue the landing manually in such conditions and the aircraft system should be sufficiently reliable for the go-around rate to be low.

3.4 These criteria may be relaxed in the case of an aircraft with a fail-passive automatic landing system which is supplemented by a head-up display which does not qualify as a fail-operational system but which gives guidance which will enable the pilot to complete a landing in the event of a failure of the automatic landing system. In this case it is not necessary to make a go-around mandatory in the event of a failure of the automatic landing system when the RVR is less than 300 metres.

4. Category III fail operational operations - with a Decision Height

4.1 For Category III operations utilising a fail-operational landing system with a Decision Height, a pilot should be able to see at least 1 centre line light.

4.2 For Category III operations utilising a fail-operational hybrid landing system with a Decision Height, a pilot should have a visual reference containing a segment of at least 3 consecutive lights of the runway centre line lights.

5. Category III fail operational operations - with No Decision Height

5.1 For Category III operations with No Decision Height the pilot is not required to see the runway prior to touchdown. The permitted RVR is dependent on the level of aircraft equipment.

5.2 A CAT III runway may be assumed to support operations with no Decision Height unless specifically restricted as published in the AIP or NOTAM.

AMC2 OPS.SPA.020.LVO LVO operating minima

EFFECT ON LANDING MINIMA OF TEMPORARILY FAILED OR DOWNGRADED GROUND EQUIPMENT

1. Operations with no Decision Height (DH)

1.1 An operator should ensure that, for aircraft authorised to conduct no DH operations with the lowest RVR limitations, the following applies in addition to the content of Tables 1, below:

a. RVR. At least one RVR value should be available at the aerodrome;

b. FATO/Runway lights

i. No FATO/runway edge lights, or no centre lights – Day – RVR 200 m; Night – Not allowed;

ii. No TDZ lights – No restrictions;

iii. No standby power to FATO/runway lights – Day – RVR 200 m; Night – not allowed.

2. Conditions applicable to Table 1:

a. Multiple failures of runway/final approach and take-off area (FATO) lights other than indicated in Table 1 are not acceptable.

b. Deficiencies of approach and runway/FATO lights are treated separately.

c. Category II or III operations. A combination of deficiencies in FATO/runway lights and RVR assessment equipment is not allowed.

d. Failures other than Instrument Landing System (ILS) affect runway visual range (RVR) only and not decision height (DH).

TABLE 1 - Failed or downgraded equipment - effect on landing minima

<table>
<tr><td rowspan="2">FAILED OR DOWNGRADED EQUIPMENT (note 1)</td><td colspan="4">EFFECT ON LANDING MINIMA</td></tr>
<tr><td>CAT III B (No DH)</td><td>CAT III B</td><td>CAT III A</td><td>CAT II</td></tr>
<tr><td>ILS Standby Transmitter</td><td>Not Allowed</td><td>RVR 200m</td><td colspan="2">No Effect</td></tr>
<tr><td>Outer Marker</td><td colspan="4">No effect if replaced by equivalent position</td></tr>
<tr><td>Middle Marker</td><td colspan="4">No effect</td></tr>
<tr><td>RVR Assessment Systems</td><td>At least one RVR value must be available on the aerodrome</td><td colspan="3">On runways equipped with 2 or more RVR Assessment Units, one may be inoperative</td></tr>
<tr><td>Approach lights</td><td>No effect</td><td colspan="2">Not allowed for operations with DH > 50 ft.</td><td>Not allowed</td></tr>
<tr><td>Approach lights except the last 210 m</td><td colspan="3">No effect</td><td>Not allowed</td></tr>
<tr><td>Approach lights except the last 420 m</td><td colspan="4">No effect</td></tr>
<tr><td>Standby power for approach lights</td><td colspan="4">No effect</td></tr>
<tr><td>Edge lights, threshold lights and runway end lights</td><td colspan="2">No effect</td><td>Day - No effect
Night - Min RVR 550 m</td><td>Day - no effect
Night – Not allowed</td></tr>
</table>

Centreline lights	Day - RVR 200m Night - not allowed	Not allowed	Day - RVR 300m Night – RVR 400m	Day - RVR 350m Night – RVR 550m (400m with HUDLS or Auto-land)
Centreline lights spacing increased to 30 m	RVR 150 m		No effect	
Touch Down Zone lights	No effect	Day - RVR 200m Night – RVR 300m	Day - RVR 300m Night – RVR 550m; 350m with HUDLS or auto-land	
Taxiway light system	No effect			

Section V - Transport of dangerous goods

AMC OPS.SPA.001.DG(b)(1) Approval to transport dangerous goods

TRAINING PROGRAMME

1. The operator should indicate for the approval of the training programme how the training will be carried out. For formal training courses, the course objectives, the training programme syllabus/curricula and examples of the written examination to be undertaken should be included.

2. Instructors should have knowledge of training techniques as well as in the field of transport of dangerous goods by air so that the subject is covered fully and questions can be adequately answered.

3. Training intended to give general information and guidance may be by any means including handouts, leaflets, circulars, slide presentations, videos, etc, and may take place on-the-job or off-the-job. The person being trained should receive an overall awareness of the subject. This training should include a written or oral examination covering all areas of the training programme, showing that a required minimum level of knowledge has been acquired.

4. Training intended to give an in-depth and detailed appreciation of the whole subject or particular aspects of it should be by formal training courses, which should include a written examination, the successful passing of which will result in the issue of the proof of qualification. The course may be by means of tuition or as a self-study program or a mixture of both. The person being trained should gain knowledge so as to be able to apply the detailed requirements of the Technical Instructions.

5. Training in emergency procedures should include as a minimum:

   a. For personnel other than crew members:

      i. Dealing with damaged or leaking packages; and

      ii. Other actions in the event of ground emergencies arising from dangerous goods;

   b. For flight crew members:

      i. Actions in the event of emergencies in flight occurring in the passenger cabin or in the cargo compartments; and

      ii. The notification to Air Traffic Services should an in-flight emergency occur.

   c. For crew members other than flight crew members:

      i. Dealing with incidents arising from dangerous goods carried by passengers; or

      ii. Dealing with damaged or leaking packages in flight.

6. Training should be conducted at intervals of not longer than 2 years.

AMC OPS.SPA.001.DG(b)(2)(ii) Approval to transport dangerous goods

ACCEPTANCE OF DANGEROUS GOODS

1. An operator should not accept dangerous goods unless:

   a. the package, overpack or freight container has been inspected in accordance with the acceptance procedures in the Technical Instructions;

b. except when otherwise specified in the Technical Instructions, they are accompanied by two copies of a dangerous goods transport document; and

c. the English language is used for:

i. package marking and labelling; and

ii. the dangerous goods transport document

in addition to any other language requirements.

2. An operator or his handling agent should use an acceptance check list which allows for:

a. all relevant details to be checked; and

b. the recording of the results of the acceptance check by manual, mechanical or computerised means.

AMC OPS.SPA.001.DG(b)(2)(iv) Approval to transport dangerous goods

PROVISION OF INFORMATION IN THE EVENT OF AN IN-FLIGHT EMERGENCY

If an in-flight emergency occurs the pilot-in-command should, as soon as the situation permits, inform the appropriate air traffic services unit of any dangerous goods carried as cargo on board the aircraft as specified in the Technical Instructions.

AMC OPS.SPA.001.DG(b)(2)(v) Approval to transport dangerous goods

REMOVAL OF CONTAMINATION

1. An operator should ensure that:

a. Any contamination found as a result of resulting from the leakage from or damage to articles or packages containing dangerous goods is removed without delay and steps are taken to nullify any hazard as specified in the Technical Instructions; and

b. An aircraft which has been contaminated by radioactive materials is immediately taken out of service and not returned until the radiation level at any accessible surface and the non-fixed contamination are not more than the values specified in the Technical Instructions.

2. In the event of a non-compliance with any limit in the Technical Instructions applicable to radiation level or contamination,

a. the operator should:

i. ensure the shipper is informed if the non-compliance is identified during transport;

ii. take immediate steps to mitigate the consequences of the non-compliance;

iii. communicate the non-compliance to the shipper and relevant competent authority(ies), respectively, as soon as practicable and immediately whenever an emergency situation has developed or is developing;

b. the operator should also, within the scope of his responsibilities:

i. investigate, the non-compliance and its causes, circumstances and consequences;

ii. take appropriate action, to remedy the causes and circumstances that led to the non-compliance and to prevent a recurrence of similar circumstances that led to the non-compliance;

iii. communicate to the relevant competent authority(ies) on the causes of the non-compliance and on corrective or preventative actions taken or to be taken.

AMC OPS.SPA.001.DG(b)(2)(vii) Approval to transport dangerous goods

INSPECTION FOR DAMAGE, LEAKAGE OR CONTAMINATION

An operator should ensure that:

1. Packages, overpacks and freight containers are inspected for evidence of leakage or damage immediately prior to loading on an aircraft, as specified in the Technical Instructions;
2. Leaking or damaged packages, overpacks or freight containers are not loaded on an aircraft;
3. Any package of dangerous goods found on an aircraft and which appears to be damaged or leaking is removed or arrangements made for its removal by an appropriate authority or organisation. In this case the remainder of the consignment shall be inspected to ensure it is in a proper condition for transport and that no damage or contamination has occurred to the aircraft or its load; and
4. Packages, overpacks and freight containers are inspected for signs of damage or leakage upon unloading from a aircraft and, if there is evidence of damage or leakage, the area where the dangerous goods were stowed is inspected for damage or contamination.

GM OPS.SPA.001.DG(b)(1) Approval to transport dangerous goods

PERSONNEL

Personnel include all persons involved in the transport of dangerous goods, whether they are employees of the operator or not.

AMC OPS.SPA.040.DG(b) Dangerous goods information and documentation

INFORMATION TO PASSENGERS AND OTHER PERSONS

1. An operator should ensure that information is promulgated as required by the Technical Instructions so that passengers are warned as to the types of goods which they are forbidden from transporting aboard an aircraft; and
2. An operator and, where applicable, his handling agent should ensure that notices are provided at acceptance points for cargo giving information about the transport of dangerous goods.

AMC OPS.SPA.040.DG(c) Dangerous goods information and documentation

INFORMATION TO THE PILOT-IN-COMMAND

If the volume of information provided to the pilot-in-command is such that it would be impracticable to transmit it in the event of an in-flight emergency, a summary of the information should be provided to the pilot-in-command by the operator, containing at least the quantities and class or division of the dangerous goods in each cargo compartment.

Section VI - Helicopter operations without an assured safe forced landing capability

GM OPS.SPA.001.SFL(b) Operations without an assured safe forced landing capability

HELICOPTER FLIGHT MANUAL LIMITATIONS

The approved performance data contained in the Helicopter Flight Manual should be used to determine compliance with the requirements of the appropriate performance class, supplemented as necessary with other data acceptable to the competent authority as may be prescribed in the relevant requirements. When applying the factors prescribed for the appropriate performance class, account should be taken of any operational factors already incorporated in the Helicopter Flight Manual performance data to avoid double application of these factors.

AMC OPS.SPA.001.SFL(b)(1) and (b)(2) Operations without an assured safe forced landing capability

POWERPLANT RELIABILITY STATISTICS

1. Except in the case of new engines, power plant reliability should show sudden power loss from the set of in-flight shutdown (IFSD) events not exceeding 1 per 100,000 engine hours in a 5 year moving window. A rate in excess of this value, but not exceeding 3 per 100,000 engine hours, may be accepted by the competent authority after an assessment showing an improving trend.
2. New engines should be assessed on a case-by-case basis.
3. After the initial assessment, updated statistics should be periodically reassessed; any adverse sustained trend will require an immediate evaluation to be accomplished by the operator in consultation with the competent authority and the manufacturers concerned. The evaluation may result in corrective action or operational restrictions being applied.

GM OPS.SPA.001.SFL(b)(1) and (b)(2) Operations without an assured safe forced landing capability

DETERMINATION OF SUDDEN POWER LOSS RATE

1. The purpose of this paragraph is to provide guidance on how the in-service power plant sudden power loss rate is determined.
    a. Share of roles between the helicopter and engine Type Certificate Holders (TCH).
        i. The provision of documents establishing the in-service sudden power loss rate for the helicopter/engine installation; the interface with the operational authority of the State of Design should be the Engine TCH or the Helicopter TCH depending on the way they share the corresponding analysis work.
        ii. The Engine TCH should provide the Helicopter TCH with a document including: the list of in-service power loss events, the applicability factor for each event (if used), and the assumptions made on the efficiency of any corrective actions implemented (if used);
        iii. The Engine or Helicopter TCH should provide the operational authority of the State of Design or, where this authority does not take responsibility, the competent authority, with a document that details the calculation results - taking into account:

A. the events caused by the engine and the events caused by the engine installation;

B. the applicability factor for each event (if used), the assumptions made on the efficiency of any corrective actions implemented on the engine and on the helicopter (if used); and

C. the calculation of the power plant power loss rate.

b. Documentation.

The following documentation should be updated every year:

i. The document with detailed methodology and calculation as distributed to the authority of the State of Design;

ii. A summary document with results of computation as made available on request to any competent authority;

iii. A Service Letter establishing the eligibility for such operation and defining the corresponding required configuration as provided to the operators.

c. Definition of the “sudden in-service power loss”.

The sudden in-service power loss is an engine power loss:

i. larger than 30 % of the take-off power;

ii. occurring during operation; and

iii. without the occurrence of an early intelligible warning to inform and give sufficient time for the pilot to take any appropriate action.

d. Data base documentation.

Each power loss event should be documented, by the engine and/or helicopter TCH’s, as follows:

i. incident report number;

ii. engine type;

iii. engine serial number;

iv. helicopter serial number;

v. date;

vi. event type (demanded IFSD, un-demanded IFSD);

vii. presumed cause;

viii. applicability factor when used; and

ix. reference and assumed efficiency of the corrective actions that will have to be applied (if any).

e. Counting methodology.

Various methodologies for counting engine power loss rate have been accepted by authorities. The following is an example of one of these methodologies:

i. The events resulting from:

A. unknown causes (wreckage not found or totally destroyed, undocumented or unproven statements); or

B. where the engine or the elements of the engine installation have not been investigated (for example when the engine has not been returned by the customer); or

C. an unsuitable or non representative use (operation or maintenance) of the helicopter or the engine;

are not counted as engine in-service sudden power loss and the applicability factor is 0 %.

ii. The events caused by:

A. the engine or the engine installation; or

B. the engine or helicopter maintenance, when the applied maintenance was compliant with the Maintenance Manuals;

are counted as engine in-service sudden power loss and the applicability factor is 100 %.

iii. For the events where the engine or an element of the engine installation has been submitted to investigation which did not allow defining a presumed cause, the applicability factor is 50 %.

f. Efficiency of corrective actions.

The corrective actions made by the engine and helicopter manufacturers on the definition or maintenance of the engine or its installation could be defined as mandatory for specific commercial air transport (CAT) operations. In this case, the associated reliability improvement could be considered as mitigating factor for the event.

A factor defining the efficiency of the corrective action could be applied to the applicability factor of the concerned event.

g. Method of calculation of the power plant power loss rate.

The detailed method of calculation of the power plant power loss rate should be documented by engine or helicopter TCH and accepted by the relevant authority.

AMC OPS.SPA.001.SFL(b)(3)(ii) Operations without an assured safe forced landing capability

SITE SPECIFIC PROCEDURES

1. Site specific procedures should be established and included in the Operations Manual to minimise the period during which there would be danger to helicopter occupants and persons on the surface in the event of a power unit failure during take-off and landing at a public interest site.

2. Part C of the Operations Manual should therefore contain for each public interest site a diagram or annotated photograph showing the main aspects, the dimensions, the non-conformance with performance class 1 requirements, the main risks and the contingency plan should an incident occur.

AMC OPS.SPA.001.SFL(b)(4) and (b)(5) Operations without an assured safe forced landing capability

SET OF CONDITIONS TO BE IMPLEMENTED TO OBTAIN AND MAINTAIN THE APPROVAL

To obtain an approval under this section, an operator conducting operations without an assured safe forced landing capability should implement the following:

1. Attain and then maintain the helicopter/engine modification standard defined by the manufacturer that has been designated to enhance reliability during the take-off and landing phases.

2. Conduct the preventive maintenance actions recommended by the helicopter or engine manufacturer as follows:

a. Engine oil spectrometric and debris analysis - as appropriate;

b. Engine trend monitoring, based on available power assurance checks;

c. Engine vibration analysis (plus any other vibration monitoring systems where fitted).

d. Oil consumption monitoring.

3. The Usage Monitoring System should fulfil at least the following:

a. Recording of the following data:

i. Date and time of recording, or a reliable means of establishing these parameters;

ii. Amount of flight hours recorded during the day plus total flight time;

iii. N_1 (gas producer RPM) cycle count;

iv. N_2 (power turbine RPM) cycle count (if the engine features a free turbine);

v. Turbine temperature exceedance: value, duration;

vi. Power-shaft torque exceedance: value, duration (if a torque sensor is fitted); and

vii. Engine shafts speed exceedance: value, duration.

b. Data storage of the above parameters, if applicable, covering the maximum flight time in a day, and not less than 5 flight hours, with an appropriate sampling interval for each parameter.

c. The system should include a comprehensive self-test function with a malfunction indicator and a detection of power-off or sensor input disconnection.

d. A means should be available for downloading and analysis of the recorded parameters. Frequency of downloading should be sufficient to ensure data is not lost through over-writing.

e. The analysis of parameters gathered by the usage monitoring system, the frequency of such analysis and subsequent maintenance actions should be described in the maintenance documentation.

f. The data should be stored in an acceptable form and accessible to the authority, for at least 24 months.

4. Include take-off and landing procedures in the operations manual, where they do not already exist in the Helicopter Flight Manual.

5. Establish training for flight crew which should include the discussion, demonstration, use and practice of the techniques necessary to minimise the risks;

6. Report to the manufacturer any loss of power control, engine shutdown (precautionary or otherwise) or power unit failure for any cause (excluding simulation of power unit failure during training). The content of each report should provide:

a. Date and time;

b. Operator (and Maintenance organisations where relevant);

c. Type of helicopter and description of operations;

d. Registration and serial number of airframe;

e. Engine type and serial number;

f. Power unit modification standard where relevant to failure;

g. Engine position;

h. Symptoms leading up to the event.

i. Circumstances of power unit failure including phase of flight or ground operation;

j. Consequences of the event;

k. Weather/environmental conditions;

l. Reason for power unit failure – if known;

m. In case of an In Flight Shut Down (IFSD), nature of the IFSD (Demanded/Un-demanded);

n. Procedure applied and any comment regarding engine restart potential;

o. Engine hours and cycles (from new and last overhaul);

p. Airframe flight hours;

q. Rectification actions applied including, if any, component changes with part number and serial number of the removed equipments; and

r. Any other relevant information.

AMC OPS.SPA.005.SFL(b) and (c) Applicability

ADDITIONAL TAKE-OFF AND LANDING CONDITIONS

1. In addition to AMC3 OPS.CAT.355.H 1.a.:

   a. the take-off mass should not exceed the maximum mass specified in the Helicopter Flight Manual for an all engine operative (AEO) outside ground effect (OGE) hover in still air with all power units operating at an appropriate power setting.

   b. for operations to/from a helideck in a hostile environment and, for a helicopter with a maximum passenger seating configuration (MPSC) of more than 19, a non-hostile environment, the take-off mass, with the critical power unit(s) inoperative and the remaining power unit(s) operating at an appropriate power setting, should take into account:

      i. the procedure used;

      ii. deck-edge miss; and

      iii. drop down appropriate to the height of the helideck.

2. In addition to AMC3 OPS.CAT.355.H 4.a.:

   a. the landing mass should not exceed the maximum mass specified in the Helicopter Flight Manual for an all engine operative (AEO) outside ground effect (OGE) hover in still air with all power units operating at an appropriate power setting.

   b. for operations to/from a helideck in a hostile environment and, for a helicopter with a MPSC of more than 19, a non-hostile environment, the landing mass, with the critical power unit(s) inoperative and the remaining power unit(s) operating at an appropriate power setting, should take into account:

      i. the procedure used; and

      ii. drop down appropriate to the height of the helideck.

GM1 OPS.SPA.005.SFL(b) Applicability

PROCEDURE FOR CONTINUED OPERATIONS TO HELIDECKS

1. Factors to be considered when taking off from or landing on a helideck

In order to take account of the considerable number of variables associated with the helideck environment, each take-off and landing may require a slightly different profile. Factors such as helicopter mass and centre of gravity, wind velocity, turbulence, deck size, deck elevation and orientation, obstructions, power margins, platform gas turbine exhaust plumes etc., will influence both the take-off and landing. In particular, for the landing, additional considerations such as the need for a clear go-around flight path, visibility and cloud base etc., will affect the pilot-in command's decision on the choice of landing profile. Profiles may be modified, taking account of the relevant factors noted above and the characteristics of individual helicopter types.

2. Performance

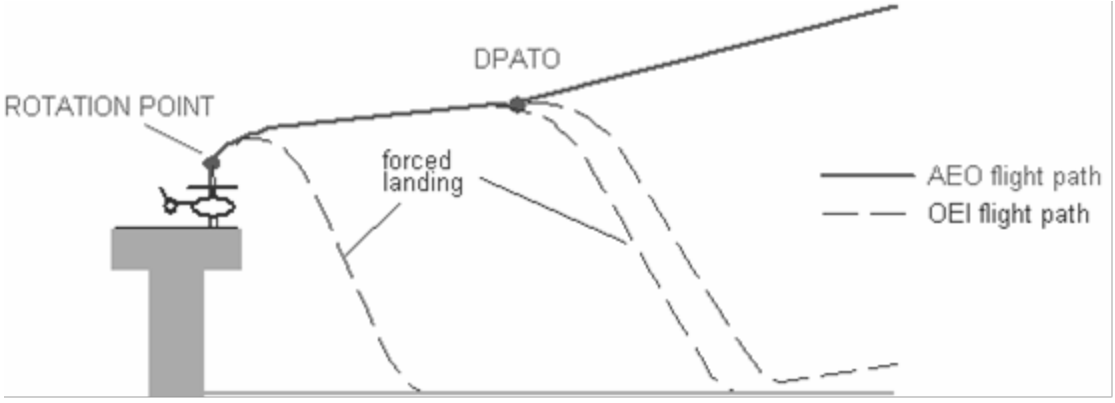
To perform the following take-off and landing profiles, adequate all engines operating (AEO) hover performance at the helideck is required. In order to provide a minimum level of performance, data (derived from the Flight Manual AEO out of ground effect (OGE), with wind accountability) should be used to provide the maximum take-off or landing mass. Where a helideck is affected by downdrafts or turbulence or hot gases, or where the take-off or landing profile is obstructed, or the approach or take-off cannot be made into wind, it may be necessary to decrease this take-off or landing mass by using a suitable calculation method recommended by the manufacturer or established by the operator. The helicopter mass should not exceed that stated in AMC3 OPS.CAT.355.H 1.a. and 4.a.

3. Take-off profile

a. The take-off should be performed in a dynamic manner ensuring that the helicopter continuously moves vertically from the hover to the Rotation Point (RP) and thence into forward flight. If the manoeuvre is too dynamic then there is an increased risk of losing spatial awareness (through loss of visual cues) in the event of a rejected take-off, particularly at night.

b. If the transition to forward flight is too slow, the helicopter is exposed to an increased risk of contacting the deck edge in the event of an engine failure at or just after the point of cyclic input (RP).

c. It has been found that the climb to RP is best made between 110 % and 120 % of the power required in the hover. This power offers a rate of climb which assists with deck-edge clearance following power unit failure at RP, whilst minimising ballooning following a failure before RP. Individual types will require selection of different values within this range.



4. Selection of a lateral visual cue

In order to obtain the maximum performance in the event of an engine failure being recognised at or just after RP, the RP must be at its optimum value, consistent with maintaining the necessary visual cues. If an engine failure is recognised just before RP, the helicopter, if operating at a low mass, may 'balloon' a significant height before the reject action has any effect. It is, therefore, important that the Pilot Flying selects a lateral visual marker and maintains it until the RP is achieved, particularly on decks with few visual cues. In the event of a rejected take-off, the lateral marker will be a vital visual cue in assisting the pilot to carry out a successful landing.

5. Selection of the rotation point

a. The optimum RP should be selected to ensure that the take-off path will continue upwards and away from the deck with All Engines Operating (AEO), but minimising the possibility of hitting the deck edge due to the height loss in the event of an engine failure at or just after RP.

b. The optimum RP may vary from type to type. Lowering the RP will result in a reduced deck edge clearance in the event of an engine failure being recognised at or just after RP. Raising the RP will result in possible loss of visual cues, or a hard landing in the event of an engine failure just prior to RP.

6. Pilot reaction times

Pilot reaction time is an important factor affecting deck edge clearance in the event of an engine failure prior to or at RP. Simulation has shown that a delay of one second can result in a loss of up to 15 ft in deck edge clearance.

7. Variation of wind speed

Relative wind is an important parameter in the achieved take-off path following an engine failure; wherever practicable, take-off should be made into wind. Simulation has shown that a 10 knot wind can give an extra 5 ft deck edge clearance compared to a zero wind condition.

8. Position of the helicopter relative to the deck edge

a. It is important to position the helicopter as close to the deck edge (including safety nets) as possible whilst maintaining sufficient visual cues, particularly a lateral marker.

b. The ideal position is normally achieved when the rotor tips are positioned at the forward deck edge. This position minimises the risk of striking the deck edge following recognition of an engine failure at or just after RP. Any take-off heading which causes the helicopter to fly over obstructions below and beyond the deck edge should be avoided if possible. Therefore, the final take-off heading and position will be a compromise between the take-off path for least obstructions, relative wind, turbulence and lateral marker cue considerations.

9. Actions in the event of an engine failure at or just after RP

Once committed to the continued take-off, it is important, in the event of an engine failure, to rotate the aircraft to the optimum attitude in order to give the best chance of missing the deck edge. The optimum pitch rates and absolute pitch attitudes should be detailed in the profile for the specific type.

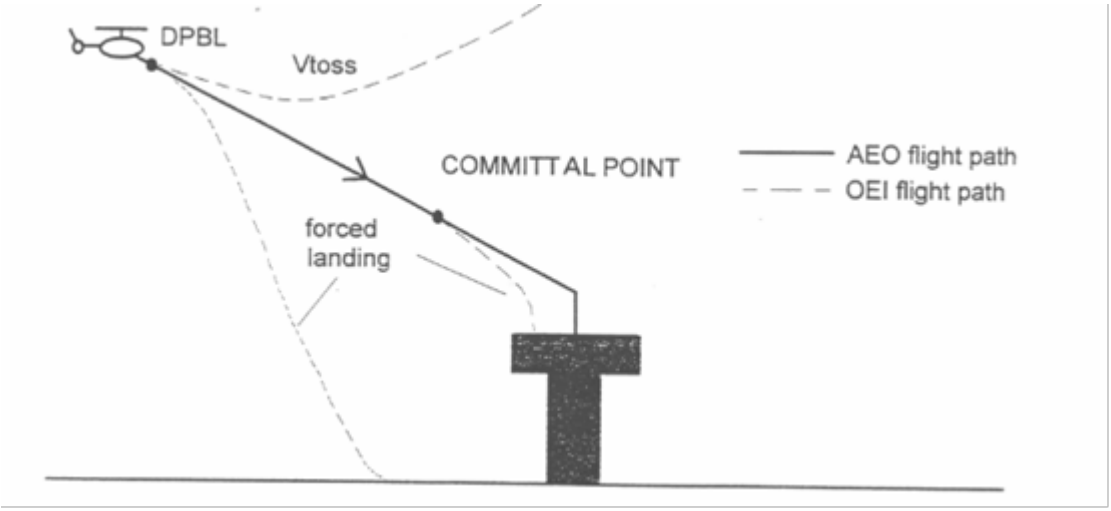
10. Take-off from helidecks which have significant movement

a. This technique should be used when the helideck movement and any other factors, e.g. insufficient visual cues, makes a successful rejected take-off unlikely. Weight should be reduced to permit an improved one engine inoperative capability, as necessary.

b. The optimum take-off moment is when the helideck is level and at its highest point, e.g. horizontal on top of the swell. Collective pitch should be applied positively and sufficiently to make an immediate transition to climbing forward flight. Because of the lack of a hover, the take-off profile should be planned and briefed prior to lift off from the deck.

11. Standard landing profile

The approach should be commenced into wind to a point outboard of the helideck. Rotor tip clearance from the helideck edge should be maintained until the aircraft approaches this position at the requisite height (type dependent) with approximately 10 knots ground-speed and a minimal rate of descent. The aircraft is then flown on a flight path to pass over the deck edge and into a hover over the safe landing area.



12. Offset landing profile

If the normal landing profile is impracticable due to obstructions and the prevailing wind velocity, the offset procedure may be used. This should involve flying to a hover position, approximately 90° offset from the landing point, at the appropriate height and maintaining rotor tip clearance from the deck edge. The helicopter should then be flown slowly but positively sideways and down to position in a low hover over the landing point. Normally, CP will be the point at which helicopter begins to transition over the helideck edge.

13. Training

These techniques should be covered in the training required by Part-OR.

GM2 OPS.SPA.005.SFL(b) Applicability

OPERATIONS TO/FROM ELEVATED FATO'S OR HELIDECKS

1. This GM describes types of operation to/from helidecks and elevated FATO's by helicopters operating in performance class 2, without an assured safe forced landing capability in the case of take-off and landing. Exposure time is used, where the probability of a power unit failure is regarded as extremely remote, but if a power unit failure (engine failure) occurs during the exposure time a safe force landing may not be possible.

2. Take Off - Non-Hostile Environment

a. Figure 1 shows a typical take-off profile for performance class 2 operations from a helideck or an elevated FATO in a non-hostile environment (with exposure time).

b. If an engine failure occurs after the exposure time and before DPATO, compliance with AMC OPS.SPA.005.SFL(b) and (c) 1. will enable a safe force landing on the surface.

c. At or after the DPATO, the OEI flight path should clear all obstacles by the margins specified in AMC3 OPS.CAT.H.355 2.

Note: An engine failure outside of exposure time should result in a safe-forced-landing or safe continuation of the flight.

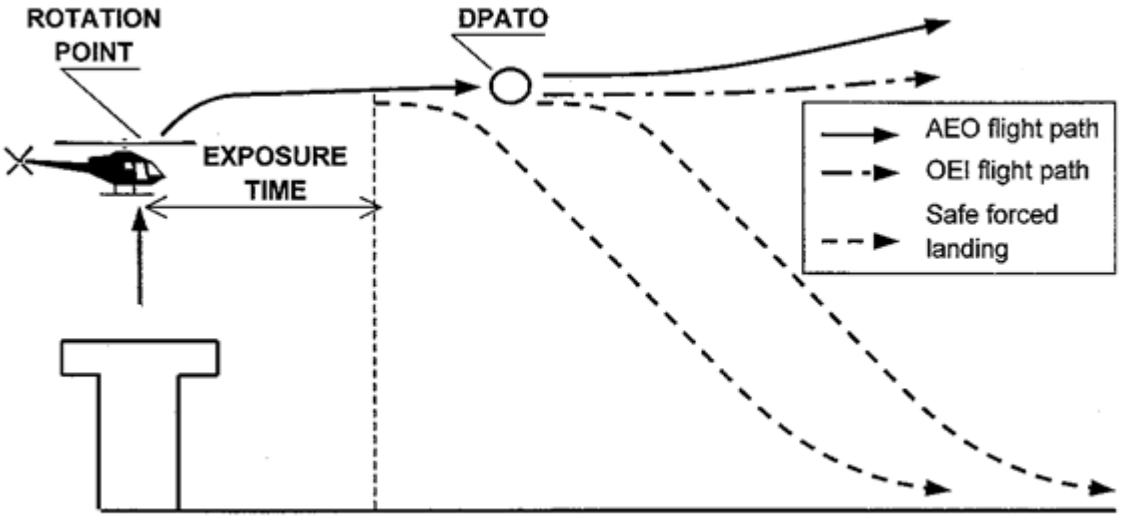


Figure 1

3. Take Off - Non-Congested Hostile Environment

a. Figure 2 shows a typical take off profile for performance class 2 operations from a helideck or an elevated FATO in a non-congested hostile environment (with exposure time).

b. If an engine failure occurs after the exposure time the helicopter is capable of continuing the flight.

c. At or after the defined point after take-off (DPATO), the OEI flight path should clear all obstacles by the margins specified in AMC3 OPS.CAT.H.355 2.

Note: an engine failure outside of exposure time should result in a safe-forced-landing or safe continuation of the flight.

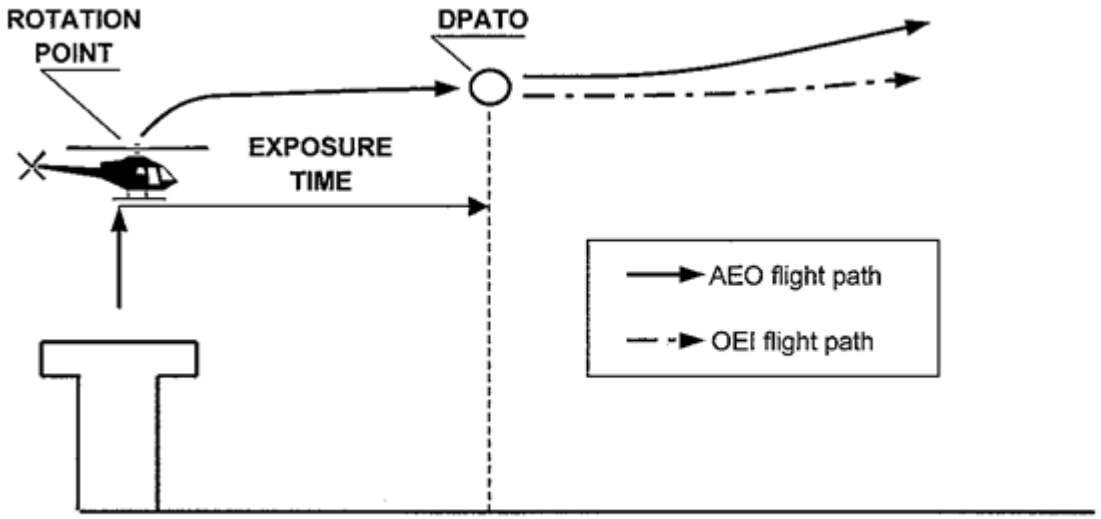


Figure 2

4. Landing - Non-Hostile Environment

a. Figure 3 shows a typical landing profile for performance class 2 operations to a helideck or an elevated FATO in a non-hostile environment (with exposure time).

b. The DPBL is defined as a “window” in terms of airspeed, rate of descent, and height above the landing surface. If an engine failure occurs before the DPBL, the pilot may elect to land or to execute a balked landing.

c. In the event of an engine failure being recognised before the exposure time compliance with AMC OPS.SPA.005.SFL(b) and (c) 2. will enable a safe force landing on the surface.

d. In the event of an engine failure after the exposure time, compliance with AMC AMC OPS.SPA.005.SFL(b) and (c) 2. will enable a safe force landing on the deck.

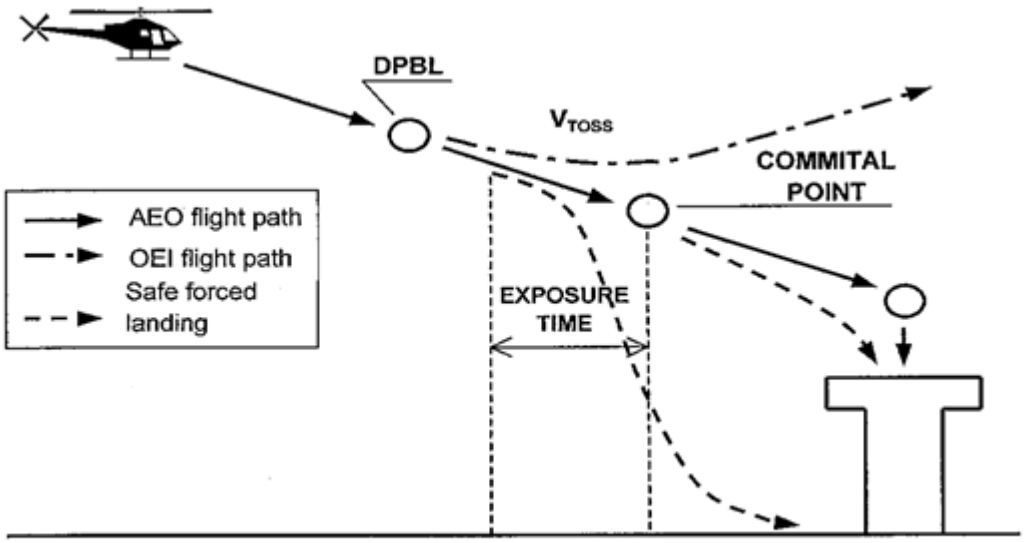


Figure 3

5. Landing - Non-Congested Hostile

a. Figure 4 shows a typical landing profile for Performance Class 2 operations to a helideck or an elevated FATO in a non-congested hostile environment (with exposure time).

b. In the event of an engine failure at any point during the approach and landing phase up to the start of exposure time, compliance with AMC OPS.SPA.005.SFL (b) and (c) 2. will enable the helicopter, after clearing all obstacles under the flight path, to continue the flight.

c. In the event of an engine failure after the exposure time, compliance with AMC OPS.SPA.005.SFL (b) and (c) 2. will enable a safe force landing on the deck.

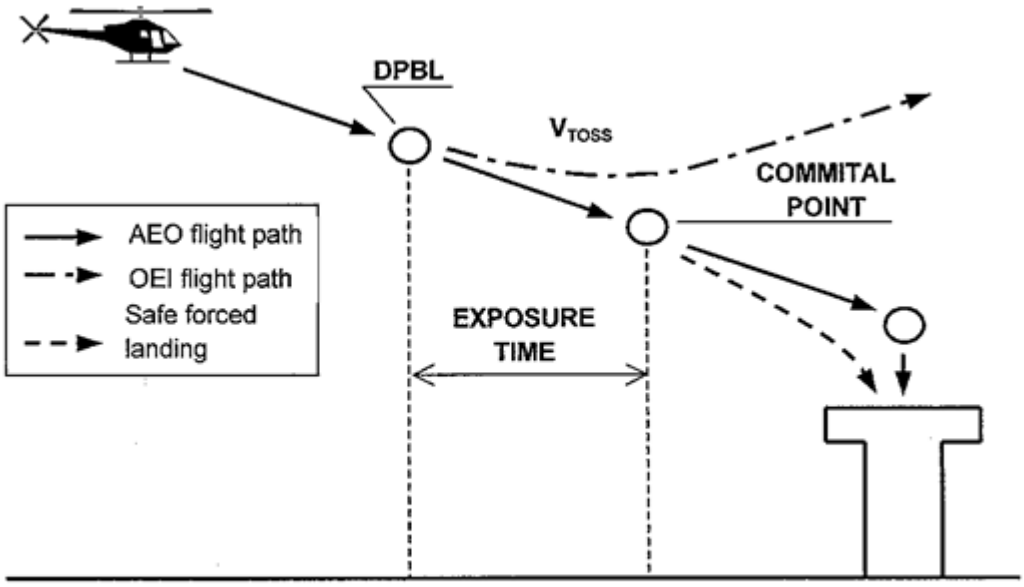


Figure 4

GM OPS.SPA.005.SFL(c) Applicability

PERFORMANCE CLASS 2 - THE TAKE-OFF AND LANDING PHASE

1. BENEFITS OF PERFORMANCE CLASS 2 WITH EXPOSURE

Following a Risk Assessment when the use of exposure is approved the benefits are:

a. ability to operate when a safe-forced landing is not assured in the take-off phase;

b. ability to penetrate the HV curve for short periods during take-off or landing.

Risk Assessment used for fulfilment of this proposed standard should be consistent with principles described in 'AS/NZS 4360:1999'.

Note: Terms used in this text and defined in the AS/NZS Standard are shown in Sentence Case e.g. Risk Assessment or Risk Reduction.

2. OPERATIONS IN PERFORMANCE CLASS 2 WITH EXPOSURE

OPS.SPA.005.SFL (c) offers an opportunity to discount the requirement for an assured safe-forced-landing area in the take-off or landing phase - subject to an approval.

2.1 Limit of Exposure

As stated in GM3 OPS.CAT.H.355, performance class 2 has to ensure AEO obstacle clearance to DPATO and OEI obstacle clearance from that point. This does not change with the application of exposure.

It can therefore be stated that operations with exposure are concerned only with alleviation from the requirement for the provision of a safe-forced-landing.

The absolute limit of exposure is 200 ft - from which point OEI obstacle clearance should be shown.

2.2 The principle of Risk Assessment

ICAO Annex 6 Part III Chapter 3.1.2 (Sixth Edition July 2007) states:

"3.1.2 In conditions where the safe continuation of flight is not ensured in the event of a critical power unit failure, helicopter operations shall be conducted in a manner that gives appropriate consideration for achieving a safe-forced-landing."

Although a safe-forced-landing may no longer be the (absolute) Standard, it is considered that Risk Assessment is obligatory to satisfy the requirement for 'appropriate consideration'.

2.3 The application of Risk Assessment to Performance Class 2

Under circumstances where no risk attributable to engine failure (beyond that inherent in the safe-forced-landing) is present, operations in performance class 2 may be conducted in accordance with GM3 OPS.CAT.H.355 - and a safe-forced-landing will be possible.

Under circumstances where such risk would be present i.e.: operations to an elevated FATO (deck edge strike); or, when permitted, operations from a site where a safe-forced-landing cannot be accomplished because the surface is inadequate; or where there is penetration into the Height Velocity (HV) curve for a short period during take-off or landing (a limitation in CS 29 HFM's), operations have to be conducted under a specific approval.

Provided such operations are Risk Assessed and can be conducted to an established safety target - they may be approved.

2.3.1 The elements of the Risk Management

The approval process consists of an operational Risk Assessment and the application of four principles:

a. a safety target;

b. a helicopter reliability assessment;

c. continuing airworthiness; and

d. mitigating procedures.

2.3.2 The safety target

The main element of the Risk Assessment when exposure was initially introduced into JAR-OPS 3 (NPA OPS-8), was the assumption that turbine engines in helicopters would have failure rates of about 1:100 000 per flying hour; which would permit (against the agreed safety target of 5 x 10-8 per event) an exposure of about 9 seconds for twins during the take-off or landing event. (When choosing this target it was assumed that the majority of current well maintained turbine powered helicopters would be capable of meeting the event target - it therefore represents the Residual Risk.)

Note: Residual Risk is considered to be the risk that remains when all mitigating procedures - airworthiness and operational - are applied (see sections 2.3.4 and 2.3.5 below).

2.3.3 The reliability assessment

The reliability assessment was initiated to test the hypothesis (stated in 2.3.2 above) that the majority of turbine powered types would be able to meet the safety target. This hypothesis could only be confirmed by an examination of the manufacturers' power-loss data.

2.3.4 Mitigating procedures (airworthiness)

Mitigating procedures consist of a number of elements:

a. the fulfilment of all manufacturers' safety modifications;

b. a comprehensive reporting system (both failures and usage data); and

c. the implementation of a Usage Monitoring System (UMS).

Each of these elements is to ensure that engines, once shown to be sufficiently reliable to meet the safety target, will sustain such reliability (or improve upon it).

The monitoring system is felt to be particularly important as it had already been demonstrated that when such systems are in place it inculcates a more considered approach to operations. In addition the elimination of 'hot starts', prevented by the UMS, itself minimises the incidents of turbine burst failures.

2.3.5 Mitigating procedures (operations)

Operational and training procedures, to mitigate the risk - or minimise the consequences - are required of the operator. Such procedures are intended to minimise risk by ensuring that: the helicopter is operated within the exposed region for the minimum time; and simple but effective procedures are followed to minimise the consequence should an engine failure occur.

2.4 Operation with Exposure - the alleviation and the requirement

When operating with exposure, there is alleviation from the requirement to establish a safe-forced-landing area (which extends to landing as well as take-off); however, the requirement for obstacle clearance - AEO in the take-off and from DPATO OEI in the climb and en-route phases - remains (both for take-off and landing).

The take-off mass is obtained from the more limiting of the following:

a. the climb performance of 150 ft/min at 1000 ft above the take-off point; or

b. obstacle clearance (in accordance with GM3 OPS.CAT.H.355 6.5); or

c. AEO hover out of ground effect (HOGE) performance at the appropriate power setting. (AEO HOGE is required to ensure acceleration when (near) vertical dynamic take-off techniques are being used. Additionally for elevated FATO's/helidecks, it ensures a power reserve to offset ground cushion dissipation; and ensures that, during the landing manoeuvre, a stabilised HOGE is available - should it be required.)

2.4.1 Operations to elevated FATO or helideck

Performance class 2 operations to elevated FATO or helideck are a specific case of operations with exposure. In these operations, the alleviation covers the possibility of:

a. a deck-edge strike if the engine fails early in the take-off or late in the landing; and

b. penetration into the HV Curve during take-off and landing; and

c. forced landing with obstacles on the surface (hostile water conditions) below the elevated FATO (helideck). The take-of mass is as stated above and relevant techniques are as described in AMC OPS.SPA.005.SFL(b).

Note: It is unlikely that the DPATO will have to be calculated with operations to helidecks (due to the absence of obstacles in the take-off path).

2.4.2 Additional requirements for operations to Helidecks in a Hostile Environment

For a number of reasons (e.g. the deck size, and the helideck environment – including obstacles and wind vectors), it is not anticipated that operations in performance class 1 would be technically feasible or economically justifiable (OEI HOGE could have provided a method of compliance but this would have resulted in a severe and unwarranted restriction on payload/range).

However, due to the severe consequences of an engine failure to helicopters involved in take-off and landings to helidecks located in hostile sea areas (such as the North Sea or the North Atlantic), a policy of Risk Reduction is called for. As a result, enhanced performance class 2 take-off and landing masses together with techniques that provide a high confidence of safety due to: deck-edge avoidance; and, drop-down that provides continued flight clear of the sea, are seen as practical measures.

For helicopters which have a Category A elevated helideck procedure, certification is satisfied by demonstrating a procedure and adjusted masses (adjusted for wind as well as temperature and pressure) which assure a 15 ft deck edge clearance on take-off and landing. It is therefore recommended that manufacturers, when providing enhanced performance class 2 procedures, use the provision of this deck-edge clearance as their benchmark.

As the height of the helideck above the sea is a variable, drop down has to be calculated; once clear of the helideck, a helicopter operating in performance class 1 would be expected to meet the 35 ft obstacle clearance. Under circumstances other than open sea areas and with less complex environmental conditions, this would not present difficulties. As the provision of drop down takes no account of operational circumstances, standard drop down graphs for enhanced performance class 2 - similar to those in existence for Category A procedures - are anticipated.

Under conditions of offshore operations, calculation of drop down is not a trivial matter - the following examples indicate some of the problems which might be encountered in hostile environments:

a. Occasions when tide is not taken into account and the sea is running irregularly - the level of the obstacle (i.e. - the sea) is indefinable making a true calculation of drop down impossible.

b. Occasions when it would not be possible - for operational reasons - for the approach and departure paths to be clear of obstacles - the ‘standard’ calculation of drop-down could not be applied.

Under these circumstances, practicality indicates that drop-down should be based upon the height of the deck AMSL and the 35 ft clearance should be applied.

There are however, other and more complex issues which will also affect the deck-edge clearance and drop down calculations:

c. When operating to moving decks on vessels, a recommended landing or take-off profile might not be possible because the helicopter might have to hover alongside in order that the rise and fall of the ship is mentally mapped; or, on take-off re-landing in the case of an engine failure might not be an option.

Under these circumstances, the pilot-in-command might adjust the profiles to address a hazard more serious or more likely than that presented by an engine failure.

It is because of these and other (unforeseen) circumstances that a prescriptive requirement is not used. However, the target remains a 15 ft deck-edge clearance and a 35ft obstacle clearance and data should be provided such that, where practically possible, these clearances can be planned.

As accident/incident history indicates that the main hazard is collision with obstacles on the helideck due to human error, simple and reproducible take-off and landing procedures are recommended.

In view of the reasons stated above, the future requirement for performance class 1 was replaced by the new requirement that the take-off mass takes into account: the procedure; deck-edge miss; and drop down appropriate to the height of the helideck. This will require calculation of take-off mass from information produced by manufacturers reflecting these elements. It is expected that such information will be produced by performance modelling/simulation using a model validated through limited flight testing.

2.4.3 Operations to helidecks for helicopters with a MPSC of more than 19

The original requirement for operations of helicopters with a MPSC of more than 19 was performance class 1 (as set out in OPS.CAT.355.H (a)(2)).

However, when operating to helidecks, the problems enumerated in 2.4.2 above are equally applicable to these helicopters. In view of this, but taking into account that increased numbers are (potentially) being carried, such operations may be permitted in enhanced performance class 2 (OPS.CAT.355.H (a)(3)) but, in all helideck environments (both hostile and non-hostile), have to satisfy, the additional requirements, set out in 2.4.2 above.

GM OPS.SPA.005.SFL(d) Applicability

PERFORMANCE CLASS 3 - THE TAKE-OFF AND LANDING PHASE

1. To understand the use of ground level exposure in performance class 3, it is important first to be aware of the logic behind the use of 'take-off and landing phases'; once this is clear, it is easier to appreciate the aspects and limits of the use of ground level exposure. This GM shows the derivation of the term from the ICAO definition of the 'en-route phase' and then gives practical examples of the use, and limitations on the use, of ground level exposure in OPS.SPA.005.SFL (d).

2. The take-off phase in performance class 1 and 2 may be considered to be bounded by 'the specified point in the take-off' from which the take-off flight path begins.

   a. In performance class 1 this specified point is defined as "the end of the take-off distance required".

   b. In performance class 2 this specified point is defined as "DPATO or, as an alternative, no later than 200 ft above the take-off surface".

   c. There is no simple equivalent point for bounding of the landing in performance class 1 and 2.

3. Take-off flight path is not used in performance class 3 and, consequently, the term 'take-off and landing phases' is used to bound the limit of exposure. For the purpose of performance class 3, the take-off and landing phases are considered to be bounded by:

   a. for the take-off no later than 200 ft above the take-off surface; and

   b. for the landing 200 ft above the landing surface.

Note: in ICAO Annex 6 Part III, En-route phase is defined as being "That part of the flight from the end of the take-off and initial climb phase to the commencement of the approach and landing phase." The use of take-off and landing phase in this text is used to distinguish the take-off from the initial climb, and the landing from the approach: they are considered to be complimentary and not contradictory.

4. Ground level exposure – and exposure for elevated FATO's or helidecks in a non-hostile environment – is permitted for operations under an approval in accordance with section OPS.SPA.SFL. Exposure in this case is limited to the 'take-off and landing phases'.

What is the practical effect of this bounding of exposure? Consider a couple of examples:

a. A clearing: an operator may consider a take-off/landing in a clearing when there is sufficient power, with all engines operating, to clear all obstacles in the take-off path by an adequate margin (this, in ICAO, is meant to indicate 35 ft). Thus, the clearing may be bounded by bushes, fences, wires and, in the extreme, by power lines, high trees etc. Once the obstacle has been cleared – by using a steep or a vertical climb (which itself may infringe the HV diagram) - the helicopter reaches 200 ft, and from that point a safe forced landing must be possible. The effect is that whilst operation to a clearing is possible, operation to a clearing in the middle of a forest is not (except when operated in accordance with OPS.SPA.005.SFL (d)(3)).

b. An aerodrome surrounded by rocks: the same applies when operating to a landing site that is surrounded by rocky ground. Once 200 ft has been reached, a safe forced landing must be possible.

c. An elevated FATO or helideck: when operating to an elevated FATO or helideck in Performance Class 3, exposure is considered to be twofold: firstly, to a deck-edge strike if the engine fails after the decision to transition has been taken; and secondly, to operations in the HV diagram due to the height of the elevated FATO or helideck. Once the take-off surface has been cleared and the helicopter has reached the knee of the HV diagram, the helicopter should be capable of making a safe forced landing.

5. Operation in accordance with OPS.SPA.005.SFL (d) does not permit excursions into a hostile environment such as and is specifically concerned with the absence of space to abort the take-off or landing when the take-off and landing space are limited; or when operating in the HV diagram.

6. Specifically, the use of this exception to the requirement for a safe forced landing (during take-off or landing) does not permit semi-continuous operations over a hostile environment such as a forest or hostile sea area. It can therefore be seen as a limited alleviation from AMC4 OPS.CAT.355.H 1.a. which states that: “operations are only conducted to/from those aerodromes/operating sites and over such routes, areas and diversions contained in a non-hostile environment…”.

AMC OPS.SPA.005.SFL(e) Applicability

OPERATIONS AT A PUBLIC INTEREST SITE

The exemption specified in OPS.SPA.005.SFL (e) should only be approved by the competent authority provided the helicopter mass does not exceed the maximum mass specified in the Helicopter Flight Manual for a climb gradient of 8 % in still air; at the appropriate take-off safety speed (V_{TOSS}) with the critical power units operating at an appropriate power rating.

GM1 OPS.SPA.005.SFL(e) Applicability

HELICOPTER MASS LIMITATIONS FOR OPERATIONS AT A PUBLIC INTEREST SITE

1. The helicopter mass limitation at take-off or landing specified in AMC OPS.SPA.005.SFL (e) should be determined using the climb performance data from 35 ft to 200 ft at V_{TOSS} (First segment of the take-off flight path) contained in the Category A supplement of the Helicopter Flight Manual (or equivalent manufacturer data acceptable to the EASA according to AMC OPS.GEN.010(a)(9)&(10)).

2. The first segment climb data to be considered is established for a climb at the take-off safety speed V_{TOSS}, with the landing gear extended (when the landing gear is retractable), with the critical power unit inoperative and the remaining power units operating at an appropriate power rating (the 2 min 30 sec or 2 min One Engine

Inoperative power rating, depending on the helicopter type certification). The appropriate V_{TOSS}, is the value specified in the Category A performance section of the Helicopter Flight Manual for vertical take-off and landing procedures (VTOL or equivalent).

3. The ambient conditions at the aerodrome or operating site (pressure-altitude and temperature) should be taken into account.

4. The data is usually provided in charts one of the following ways:

   a. Height gain in ft over a horizontal distance of 100 ft in the first segment configuration (35 ft to 200 ft, V_{TOSS}, 2 min 30 sec / 2 min OEI power rating). This chart should be entered with a height gain of 8 ft per 100 ft horizontally travelled, resulting in a mass value for every pressure-altitude/temperature combination considered.

   b. Horizontal distance to climb from 35 ft to 200 ft in the first segment configuration (V_{TOSS}, 2 min 30 sec / 2 min OEI power rating). This chart should be entered with a horizontally distance of 628 m (2 062 ft), resulting in a mass value for every pressure-altitude/temperature combination considered.

   c. Rate of climb in the first segment configuration (35 ft to 200 ft, V_{TOSS}, 2 min 30 sec / 2 min OEI power rating). This chart can be entered with a rate of climb equal to the climb speed (V_{TOSS}) value in knots (converted to True Airspeed) multiplied by 8.1, resulting in a mass value for every pressure-altitude/temperature combination considered.

GM2 OPS.SPA.005.SFL(d) Applicability

HELICOPTER OPERATIONS TO/FROM A PUBLIC INTEREST SITE

1. General

Appendix 1 to JAR-OPS 3.005(i) - contained alleviations for public interest sites - was introduced in January 2002 to address problems that had been encountered by States at hospital (and lighthouse) sites due to the applicable performance requirements of performance class 1 and 2. These problems were enumerated in ACJ to Appendix 1 to JAR-OPS 3.005(d) paragraph 8, part of which is reproduced below.

"8 Problems with hospital sites

During implementation of JAR-OPS 3, it was established that a number of States had encountered problems with the impact of performance rules where helicopters were operated for HEMS. Although States accept that progress should be made towards operations where risks associated with a critical power unit failure are eliminated, or limited by the exposure time concept, a number of landing sites exist which do not (or never can) allow operations to Performance Class 1 or 2 requirements.

These sites are generally found in a congested hostile environment:

- in the grounds of hospitals; or
- on hospital buildings.

The problem of hospital sites is mainly historical and, whilst the authority could insist that such sites not be used - or used at such a low weight that critical power unit failure performance is assured, it would seriously curtail a number of existing operations.

Even though the rule for the use of such sites in hospital grounds for HEMS operations (Appendix 1 to JAR-OPS 3.005(d) sub-paragraph (c)(2)(i)(A)) attracted alleviation until 2005, it was only partial and will still impact upon present operations.

Because such operations are performed in the public interest, it was felt that the authority should be able to exercise its discretion so as to allow continued use of such sites provided that it is satisfied that an adequate level of safety can be maintained -

notwithstanding that the site does not allow operations to Performance Class 1 or 2 standards. However, it is in the interest of continuing improvements in safety that the alleviation of such operations be constrained to existing sites, and for a limited period."

As stated in that ACJ and embodied in the text of the appendix, the solution was short term (until 31 December 2004). During the comment period of NPA 18, representations were made to the JAA that the alleviation should be extended to 2009. The review committee, in not accepting this request, had in mind that this was a short-term solution to address an immediate problem, and a permanent solution should be sought.

2. Public Interest Sites after 1 January 2005

Although elimination of such sites would remove the problem, it is recognized that phasing out, or rebuilding existing hospital and lighthouses, is a long-term goal which may not be cost-effective, or even possible, in some Member States.

It should be noted, however, that existing paragraph (e)(3) of OPS.SPA.005.SFL (which is transferred from JAR-OPS 3) limits the problem by confining approvals to public interest sites established before 1 July 2002 (established in this context means either: built before that date; or brought into service before that date – this precise wording was used to avoid problems associated with a ground level where no building would be required). Thus, the problem of these sites is contained and reducing in severity. This date was set approximately 6 months after the intended implementation of this original appendix.

EASA adopted the JAA philosophy that from 1st January 2005 the approval of a public interest site would be confined to those sites where a CAT A procedure alone cannot solve the problem. The determination of whether the helicopter can or cannot be operated in accordance performance class 1 criteria should be established with the helicopter at a realistic payload and fuel to complete the mission. However, in order to reduce the risk at those sites, AMC OPS.SPA.005.SFL (e) should be applied.

Additionally and in order to promote understanding of the problem, the text contained in paragraph (e) of the JAR-OPS 3 appendix had been amended to refer to performance class 1 and not to Annex 14 as in the original appendix. Thus Part C of the Operations Manual should reflect the non-conformance with that Subpart.

The following paragraphs discuss the problem and solutions.

3. The problem associated with public interest sites

There are a number of problems: some of which can be solved with the use of appropriate helicopters and procedures; and others which, because of the size of the FATO or the obstacle environment, cannot.

They consist of:

a. Helicopters that could not meet the required performance class 1;

b. The size of the FATO of the public interest site (smaller than that required by the manufacturers' procedure);

c. An obstacle environment that prevents the use of the manufacturers procedure (obstacles in the back-up area);

d. An obstacle environment that does not allow recovery following a power unit failure in the critical phase of take-off (a line of buildings requiring a demanding gradient of climb) at a realistic payload and fuel to complete the mission; or

e. A ground level public interest site (exposure is not permitted).

3.1 Problems associated with a; it was recognised at the time of the adoption of the original appendix that, although the number of helicopters not meeting the absolute performance criteria of a. above were dwindling, existing HEMS and lighthouse fleets

could not be replaced until 2005. The limited alleviations should at the time of implementation of the Community Implementing Rules be non existent.

3.2 Problems associated with b.; the inability to climb and conduct a rejected landing back to the public interest site following an engine failure before the Decision Point (DP).

3.3 Problems associated with c.; as in b.

3.4 Problems associated with d; climb into an obstacle following an engine failure after DP.

3.5 Problems associated with e.; may be related to:

a. the size of the FATO which is too small for the manufacturers' procedure;

b. no room for back-up;

c. an obstacle in the take-off path; or

d. a mixture of all three.

With the exception of case a., problems cannot be solved in the immediate future but can, when mitigated with the use of the latest generation of helicopters (operated at a weight that can allow useful payloads and endurance), minimise exposure to risk.

4. Long Term Solution

Although not offering a complete solution, it was felt that a significant increase in safety could be achieved by applying an additional performance margin to such operations. This solution could also be seen as mitigation proportional to the problem and would allow the time restriction of 2004 to be removed.

The required performance level of 8 % climb gradient in the first segment, reflects ICAO Annex 14 Volume II in Table 4-3 – Dimensions and slopes of obstacle limitations surfaces for performance class 2.

The performance delta is achieved without the provision of further manufacturer's data by using existing graphs to provide the Reduced take-off mass (RTOM).

4.1 Solution with relation to b.; although the problem still exists, the safest procedure is a dynamic take-off reducing the time taken to achieve Vstayup and thus allowing Visual Flight Rules (VFR) recovery – if the failure occurs at or after Vy and 200 feet, an Instrument Flight Rules (IFR) recovery is possible.

4.2 Solution with relation to c.; as in b. above.

4.3 Solution with relation to d.; once again this does not give a complete solution, however the performance delta minimise the time during which a climb over the obstacle cannot be achieved.

4.4 Solution with relation to e.; as in 4.1 to 4.3 above.

GM3 OPS.SPA.005.SFL(e) Applicability

IMPROVEMENT PROGRAMME FOR PUBLIC INTEREST SITES

1. General

Although it is accepted that there will be a number of public interest sites that will remain for some time, it is in the interest of safety that the numbers are reduced and eventually, as a goal, all sites eliminated. A reduction of sites can be achieved in two ways:

a. By an improvement in the performance of helicopters such that HOGE OEI (Hover out of ground effect one engine inoperative) is possible at weights where the mission can be performed.

b. By the use of a site improvement programme: to take out of service those sites where the exposure is greatest; or by improving sites such that the performance requirement can be met.

2. Improvement in performance

The advent of more powerful modern twin-engine helicopters has put into reach the ability to achieve the aim stated in 1.a. above. Today, most of these helicopters are at the point where HOGE OEI with mission payload is possible.

3. Improvement of Sites

Where a site could be improved by redevelopment, for example by increasing the size of the FATO, it should be done; where the problems of a site are due to the obstacle environment, a programme to re-site the facility or remove the obstacle(s) should be undertaken as a priority.

4. Summary

As stated in paragraph 1. above, it is in the interest of States to reduce the risk of an accident due to an engine failure on take-off or landing. This could be achieved with a combination of policies:

a. the use of more appropriate helicopters;

b. improvement by redevelopment of a site; or

c. the re-siting of facilities to alternative locations.

The improvement policy should be achieved in a reasonable time horizon – and this should be an element of the compliance program.

The approval to operate to public interest sites could be conditional upon such improvement programs being put into place. Unless such a policy is instituted, there will be no incentive for public interest sites to be eliminated in a reasonable time horizon.

Section VII – Helicopter operations with night vision imaging systems

AMC OPS.SPA.001.NVIS(b)(1) Night Vision Imaging System (NVIS) operations

TRAINING PROGRAMME

1. The specific NVIS training and checking programme for Flight Crew Members should contain at least the following:

1.1 Training

a. NVIS working principles, eye physiology, vision at night, limitations and techniques to overcome these limitations;

b. preparation and testing of NVIS equipment;

c. preparing the helicopter for NVIS operations;

d. normal and emergency procedures including all NVIS failure modes;

e. maintenance of conventional night flying training and recency;

f. crew co-ordination concept specific to NVIS operations;

g. practice of the transition to and from night vision goggle procedures; and

h. awareness of specific dangers relating to the operating environment;

1.2 Checking:

a. Night Proficiency Checks as appropriate including emergency procedures to be used on NVIS operations.

b. Line checks with special emphasis on the following:

i. local area meteorology;

ii. NVIS flight planning;

iii. NVIS in flight procedures;

iv. transitions to and from NVGs;

v. normal NVIS procedures; and

vi. crew co-ordination.

2. NVIS technical crew members. The specific NVIS training and checking programme for NVIS technical crew member should contain at least the following:

a. NVIS working principles, eye physiology, vision at night, limitations and techniques to overcome these limitations.

b. Duties in the NVIS role, with and without night vision goggles.

c. The NVIS installation.

d. Operation and use of the NVIS equipment.

e. Preparing the helicopter and specialist equipment for NVIS operations.

f. Normal and emergency procedures.

g. Crew co-ordination concepts specific to NVIS operations.

h. Awareness of specific dangers relating to the operating environment.

GM OPS.SPA.001.NVIS(b)(1) Night Vision Imaging System (NVIS) operations

TRAINING PROGRAMME

1. PURPOSE

The purpose of this Guidance Material is to recommend the minimum training guidelines and any associated considerations necessary for the safe operation of a helicopter while operating with night vision imaging systems.

To provide an appropriate level of safety, training procedures should accommodate the capabilities and limitations of the NVIS and associated systems as well as the restraints of the operational environment.

2. ASSUMPTIONS

The following assumptions were used in the creation of this document:

2.1 Most civilian operators may not have the benefit of formal NVIS training, similar to that offered by the military. Therefore, the stated considerations are predicated on that individual who has no prior knowledge of NVIS or how to use them in flight. The degree to which other applicants who have had previous formal training should be exempted from this training will be dependant on their prior NVIS experience.

2.2 While NVIS are principally an aid to VFR night flight, the 2 dimensional nature of the NVG image necessitates frequent reference to the flight instruments for spatial and situational awareness information. The reduction of peripheral vision and increased reliance on focal vision exacerbates this requirement to monitor flight instruments. Therefore, any basic NVIS training syllabus should include some instruction on basic instrument flight.

3. TWO TIERED APPROACH: BASIC & ADVANCED TRAINING

To be effective, the NVIS training philosophy would be based on a two-tiered approach: basic and advanced NVIS training. The basic NVIS training would serve as the baseline standard for all individuals seeking an NVIS endorsement. The content of this initial training would not be dependent on any operational requirements. The training required for any individual pilot should take into account the previous NVIS flight experience. The advanced training would build on the basic training by focusing on developing specialized skills required to operate a helicopter during NVIS operations in a particular operational environment. Furthermore, while there is a need to stipulate minimum flight hour requirements for an NVIS endorsement, the training should also be event based. This necessitates that operators be exposed to all of the relevant aspects, or events, of NVIS flight in addition to acquiring a minimum number of flight hours. NVIS training should include flight in a variety of actual ambient light and weather conditions.

4. TRAINING REQUIREMENTS

4.1 Flight Crew Ground Training

The ground training necessary to initially qualify a pilot to act as the pilot of a helicopter using night vision goggles should include at least the following subjects:

4.1.1 Applicable aviation regulations that relate to NVIS limitations and flight operations.

4.1.2 Aero medical factors relating to the use of NVGs to include how to protect night vision, how the eyes adapt to operate at night, self imposed stresses that affect night vision, effects of lighting (internal and external) on night vision, cues utilized to estimate distance and depth perception at night, and visual illusions.

4.1.3 NVG performance and scene interpretation.

4.1.4 Normal, abnormal, and emergency operations of NVGs.

4.1.5 NVIS operations flight planning to include night terrain interpretation and factors affecting terrain interpretation.

The ground training should be the same for flight crew and crew members other than flight crew. An example of a ground training syllabus is presented in Table 1.

4.2 Flight Crew Flight Training

The flight training necessary to initially qualify a pilot to act as the pilot of a helicopter using NVGs may be performed in a helicopter or STD approved for the purpose, and should include at least the following subjects:

4.2.1 Preparation and use of internal and external helicopter lighting systems for NVIS operations.

4.2.2 Pre-flight preparation of NVGs for NVIS operations.

4.2.3 Proper piloting techniques (during normal, abnormal, and emergency helicopter operations) when using NVGs during the takeoff, climb, en-route, descent, and landing phases of flight that includes unaided flight and aided flight.

4.2.4 Normal, abnormal, and emergency operations of the NVIS during flight.

Crew members other than flight crew should be involved in relevant parts of the flight training. An example of a flight training syllabus is presented in Table 2.

4.3 Training crew members other than flight crew

Crew members other than flight crew should be trained to operate around helicopter employing NVIS. These individuals should complete all phases of NVIS ground training that is given to flight crew. Due to the importance of crew coordination, it is imperative that all crew members are familiar with all aspects of NVIS flight. Furthermore, these crew members may have task qualifications specific to their position in the helicopter or areas or responsibility. To this end, they should demonstrate competency in those areas, both on the ground and in flight.

4.4 Ground personnel training

Non-flying personnel who support NVIS operations should also receive adequate training in their areas of expertise. The purpose is to ensure, for example, that correct light discipline is used when helicopters are landing in a remote area.

4.5 Instructor Qualifications

A NVIS flight instructor should at least have the following licenses and qualifications:

4.5.1 Is at least FI(H) or TRI(H) with the applicable type rating on which NVIS training will be given;

4.5.2 Is qualified as Pilot-in-command for NVIS operations on the appropriate type and operation;

4.5.3 Has logged at least one hundred NVIS flights as Pilot-in-command.

4.6 NVIS Equipment Minimum Requirements (training)

While minimum equipment lists and standard NVIS equipment requirements may be stipulated elsewhere, the following procedures and minimum equipment requirements should also be considered:

4.6.1 NVIS: the following is recommended for minimum NVIS equipment and procedural requirements:

a. Back-up power supply;

b. NVIS adjustment kit or eye lane;

c. Use of helmet with the appropriate NVG attachment;

d. Both the instructor and student should wear the same NVG type, generation and model.

4.6.2 Helicopter NVIS Compatible Lighting, Flight Instruments, and Equipment: Given the limited peripheral vision cues and the need to enhance situational awareness, the following is recommended for minimum compatible lighting requirements:

a. NVIS compatible instrument panel flood lighting that can illuminate all essential flight instruments;

b. NVIS compatible hand-held utility lights;

c. Portable NVIS compatible flashlight;

d. For helicopter operations, IR landing or searchlight;

e. A means for removing or extinguishing internal NVIS non-compatible lights.

4.7 NVIS Pre-flight briefing/checklist

An example of a NVIS pre-flight briefing/checklist is added as Table 3.

4.8 Training References

A number of training references are available, some of which are listed below:

a. United States Marine Corp MAWTS-1 Night Vision Device (NVD) Manual;

b. U.S. Army Night Flight (TC 1-204);

c. U.S. Army NVIS Operations, Exportable Training Package;

d. U.S. Army TM 11-5855-263-10;

e. Air Force TO 12S10-2AVS6-1;

f. Navy NAVAIR 16-35AVS-7;

g. U.S. Border Patrol, Helicopter NVIS Ground and Flight Training Syllabus.

There may also be further documents available from European military sources.

Table 1 Ground Training Areas of Instruction

A detailed example of possible subjects to be instructed in a NVIS ground instruction is included below. (The exact details may not always be applicable, e.g. due to goggle configuration differences.)

Item	Subject Area	Subject Details	Recommended Time
1	General Anatomy and Characteristics of the Eye	Anatomy: • Overall structure of the eye: • Cones • Rods Visual Deficiencies: • Myopia; • Hyperopia; • Astigmatism; • Presbyopia. Effects of Light on Night Vision & NV Protection Physiology: • Light levels ~ Illumination;	1 hour

		~ Luminance; ~ Reflectance; ~ Contrast. • Types of vision: ~ photopic; ~ mesopic; ~ scotopic. • Day versus night vision • Dark adaptation process: ~ Dark Adaptation; ~ Pre-adaptive State. • Purkinje Shift • Ocular Chromatic Aberration • Photochromatic Interval	
2	Night Vision Human Factors	• Night blind spot (as compared to day blind spot) • Field of view and peripheral vision • Distance estimation and depth perception: ~ Monocular cues; ~ Motion parallax; ~ Geometric perspective; ~ Size constancy; ~ Overlapping contours or interposition of objects. • Aerial perspective: ~ Variations in colour or shade; ~ Loss of detail or texture; ~ Position of light source; and ~ Direction of shadows. • Binocular cues • Night vision techniques: ~ Off-centre vision; ~ Scanning; ~ Shapes and silhouettes. • Vestibular Illusions • Somatogyral Illusions: ~ Leans; ~ Graveyard Spin; ~ Coriolis Illusion.	1 hour

		• Somatogravic Illusions: ~ Oculographic Illusions; ~ Elevator Illusion; ~ Oculoagravic Illusions. • Proprioceptive Illusions • Dealing with Spatial Disorientation • Visual Illusions: ~ Auto kinetic illusion; ~ Confusion with ground lights; ~ Relative motion; ~ Reversible perspective illusion; ~ False vertical and horizontal cues; ~ Altered planes of reference; ~ Height /Depth perception illusion; ~ Flicker vertigo; ~ Fascination (Fixation); ~ Structural illusions; and ~ Size-distance illusion. • Helicopter Design Limitations: ~ Windscreen condition; ~ Helicopter instrument design; ~ Helicopter structural obstruction; ~ Interior lights; and ~ Exterior lights. • Self-imposed stresses: ~ Drugs; ~ Exhaustion; ~ Alcohol; ~ Tobacco; ~ Hypoglycaemia; ~ Injuries; ~ Physical Fitness. • Stress & Fatigue: ~ Acute vs. Chronic; ~ Prevention. • Hypoxia Issues and Night Vision • Weather/Environmental conditions: ~ Snow (white-out);	

		~ Dust (brown-out); ~ Haze; ~ Fog; ~ Rain; ~ Light levels. • Astronomical Lights (moon, star, northern lights); and • Effects of cloud cover.	
3	NVIS General Characteristics	• Definitions and types of NVIS: ~ Light spectrum; ~ Types of NVIS. • Thermal-imaging devices • Image-intensifier devices • Image-intensifier operational theory • Types of Image intensifier systems: ~ Generation 1; ~ Generation 2; ~ Generation 3; ~ Generation 4; ~ Type I / II; ~ Class A & B Minus Blue Filter. • NVIS Equipment ~ Shipping and storage case; ~ Carrying case; ~ Binocular Assembly; ~ Lens Caps; ~ Lens Paper; ~ Operators Manual; ~ Power Pack (Dual Battery); and ~ Batteries. • Characteristics of NVIS: ~ Light amplification; ~ Light intensification; ~ Frequency sensitivity; ~ Visual range acuity; ~ Unaided peripheral vision; ~ Weight; ~ Flip-up device;	1 hour

		~ Break-away feature; ~ Neck cord; ~ Maintenance Issues ~ Human Factor Issues • Description and Functions of NVIS components: ~ Helmet visor cover and extension strap; ~ Helmet NVIS mount and attachment points; ~ Different Mount options for various helmets; ~ Lock release button; ~ Vertical adjustment knob; ~ Low battery indicator; ~ Binocular assembly; ~ Monocular Tubes; ~ Fore and aft adjustment knob; ~ Eye span knob; ~ Tilt adjustment Lever; ~ Objective focus rings; ~ Eyepiece focus rings; and ~ Battery pack.	
4	NVIS Care & Cleaning	• Handling procedures; • NVIS operating instructions: ~ Pre-mounting inspection; ~ Mounting procedures; ~ Focusing procedures; ~ Faults. • Post-Flight Procedures; • Deficiencies: Type and Recognition of Faults: ~ Acceptable faults: - Black spots; - Chicken wire; - Fixed pattern noise (honeycomb effect); - Output brightness variation; - Bright spots; - Image disparity; - Image distortion ;	1 hour

		- Emission points. ~ Unacceptable faults: - Shading; - Edge glow; - Fashing, flickering or intermittent operation. • Cleaning Procedures; • Care of Batteries; • Hazardous Material Considerations;	
5	Pre & Post Flight Procedures	• Inspect NVIS; • Carrying case condition; • Nitrogen purge due date; • Collimation test due date; and • Screens diagram(s) of any faults; • NVIS kit: complete; • NVIS binocular assembly condition; • Battery pack and quick disconnect condition; and • Batteries life expended so far. • Mount battery pack onto helmet: ~ Verify no LED showing (good battery); and ~ Fail battery by opening cap and L.E.D. illuminates (both compartments). • Mount NVIS onto helmet; • Adjust and focus NVIS; • Eye-span to known inter-pupillary distance; • Eye piece focus ring to Zero; • Adjustments: ~ Vertical; ~ Fore and aft; ~ Tilt; and ~ Eye-span (fine-tuning). • Focus (one eye at a time at 20 Ft, then at 30 Ft from an eye chart); ~ Objective focus ring; ~ Eye piece focus ring; ~ Verify both images are harmonised; and ~ Read eye-chart 20/40 line from 20 feet.	1 hour

		• NVIS Mission Planning; • NVIS Light Level Planning; • NVIS Risk Assessment;	
6	NVIS Terrain Interpretation and Environmental Factors	• Night Terrain Interpretation; • Light sources: ~ Natural; ~ Lunar; ~ Solar; ~ Starlight; ~ Northern lights; ~ Artificial; ~ Cultural; ~ Infra-red. • Meteorological conditions: ~ Clouds/Fog; ~ Indications of restriction to visibility: ~ Loss of celestial lights; ~ Loss of ground lights; ~ Reduced ambient light levels; ~ Reduced visual acuity; ~ Increase in video noise; and ~ Increase in halo effect. • Cues for visual recognition: ~ Object size; ~ Object shape; ~ Contrast; ~ Ambient light; ~ Colour; ~ Texture; ~ Background; and ~ Reflectivity. • Factors affecting terrain interpretation: ~ Ambient light; ~ Flight Altitudes; ~ Terrain Type. • Seasons; • Night Navigation cues: ~ Terrain relief;	1 hour

		~ Vegetation; ~ Hydrographical features; and ~ Cultural features.	
7	NVIS Training and Equipment Requirements	Cover the relevant regulations and guidelines that pertain to night and NVIS flight to include as a minimum: • Crew experience requirements; • Crew training requirements; • Airspace requirements; • Night / NVIS MEL; • NVIS / night weather limits; • NVIS equipment minimum standard requirements.	1 hour
8	NVIS Emergency Procedures	Cover relevant emergency procedures: • Inadvertent IMC procedures; • NVIS goggle failure; • Helicopter emergencies; ~ With goggles; ~ Transition from goggles.	1 hour
9	NVIS Flight Techniques	Respective flight techniques for each phase of flight for the type and class of helicopter used for NVIS training	1 hour
10	Basic Instrument Techniques	Present and confirm understanding of basic instrument flight techniques: • Instrument scan; • Role of instruments in NVIS flight; • Unusual attitude recovery procedures.	1 hour
11	Blind Cockpit Drills	Perform Blind Cockpit Drills • Switches; • Circuit Breakers; • Exit mechanisms; • External / Internal Lighting; • Avionics.	1 hour

Table 2 Flight Training Areas of Instruction

A detailed example of possible subjects to be instructed in a NVIS flight instruction is included below.

Item	Subject Area	Subject Details	Recommended Time
1	Ground Operations	• NVIS equipment assembly; • Pre-flight Inspection of NVISs;	1 hour

		• Helicopter pre-flight; • NVIS flight planning: ~ Light Level Planning; ~ Meteorology; ~ Obstacles and known hazards ; ~ Risk analysis matrix; ~ CRM concerns; ~ NVIS EP Review. • Start-up/Shut down; • Goggling and Degoggling.	
2	General Handling	• Level turns, climbs, and descents; • For helicopters, confined areas and sloped landings; • Operation specific flight tasks; • Transition from aided to unaided flight; • Demonstration of NVIS related ambient and cultural effects.	1 hour
3	Takeoffs and Landings	• At both improved illuminated areas such as airports/airfields and unimproved unlit areas such as open fields; • Traffic pattern; • Low speed manoeuvres for helicopters.	1 hour
4	Navigation	• Navigation over variety of terrain and under different cultural lighting conditions.	1 hour
5	Emergency Procedures	• Goggle failure; • Helicopter emergencies; • Inadvertent IMC; • Unusual attitude recovery.	1 hour

Table 3 NVIS Pre-Flight briefing/Checklist

Item	Subject
1	Weather: • METAR/Forecast; • Cloud cover/dew point spread/precipitation.
2	OPS Items: • NOTAM's; • IFR publications backup/Maps; • Goggles adjusted using test set (RTCA Document DO-275 [NVIS MOPS] Appendices G & H gives suggested NVG pre-flight and adjustment procedures and a ground test checklist).
3	Ambient Light:

	• Moon rise/set/phase/position/elevation; • % illumination and MLX for duration of flight; • Recommended minimum MLX: 1.5.
4	Mission: • Mission outline; • Terrain appreciation; • Detailed manoeuvres; • Flight timings; • Start/airborne/debrief; • Airspace coordination for NVIS; • Obstacles/minimum safe altitude; • NVIS goggle up/degoggle location/procedure; • Instrument IFR checks.
5	Crew: • Crew day/experience; • Crew position; • Equipment: NVIS, case, video, flashlights; • Lookout duties: LS – left 90 to R45, RS – right 90 to L45; • Calling of hazards/movements landing light; • Transfer of control terminology; • Below 100 ft AGL – NFP ready to assume control.
6	Helicopter: • Helicopter configuration; • Fuel & CG.
7	Emergencies: • NVIS failure: cruise and low level flight; • Inadvertent IMC/IFR Recovery; • Helicopter Emergency: critical & non-critical.

AMC OPS.SPA.010.NVIS(a) Equipment requirements for NVIS operations

RADIO ALTIMETER

1. For NVIS operations a radio altimeter and low height warning system is required. It is recommended that these have the following characteristics:

1.1 The radio altimeter should:

a. be of an analogue type display presentation giving both an instantaneous impression of absolute height and also rate of change of height that requires minimal interpretation;

b. be positioned to be instantly visible and discernable from each cockpit crew station (this may require more than one display);

c. have an integral visual low height warning that operates at a height selectable by the pilot;

d. have an integral fail/no track indicator with repeater light to give unambiguous warning of radio altimeter fail or no track conditions.

1.2 The visual warning system should:

a. provide clear visual warning at each cockpit crew station of height below the pilot selectable warning height;

b. have an instrument panel coaming repeater light at each cockpit crew station to ensure adequate attention getting capability for head up operations.

1.3 The audio warning system should:

a. be unambiguous and readily cancellable. Voice warnings have been found to be effective and unambiguous;

b. not extinguish any visual low height warnings when cancelled;

c. operate at the same pilot selectable height as the visual warning.

AMC OPS.SPA.030.NVIS Crew requirements for NVIS operations

GENERAL

1. The following should apply to the crew for NVIS operations:

1.1 Selection. The procedures manual or operations manual, where required, should contain criteria for the selection of crew members for the NVIS task. A pilot-in-command should have at least 20 hours PIC night VMC flying before commencing training.

1.2 Qualification. Successful completion of training in accordance with the procedures contained in the Procedures Manual or operations manual, where required.

1.3 Recency. All pilots and NVIS technical crew members conducting NVIS operations should have completed 3 night NVIS flights in the last 90 days. Recency may be re-established on an NVIS proficiency check in a helicopter or an FSTD approved for the purpose.

Section VIII – Helicopter hoist operations

AMC OPS.SPA.001.HHO(b)(3) Helicopter hoist operations (HHO)

TRAINING PROGRAMME

1. Flight Crew Members.

1.1 The specific HHO training programme for flight crew members should include the following subjects:

a. Fitting and use of the hoist;

b. Preparing the helicopter and hoist equipment for HHO;

c. Normal and emergency hoist procedures by day and, when required, by night;

d. Crew co-ordination concept specific to HHO;

e. Practice of HHO procedures; and

f. The dangers of static electricity discharge.

1.2 Flight crew member proficiency checks should include procedures likely to be used at HHO sites with special emphasis on:

a. Local area meteorology;

b. HHO flight planning;

c. HHO departures;

d. A transition to and from the hover at the HHO site;

e. Normal and simulated emergency HHO procedures; and

f. Crew co-ordination.

These checks should also be conducted by night if night HHO operations are undertaken by the operator.

2. HHO Technical Crew Member.

The specific HHO training programme for technical crew members who perform assigned duties relating to the operation of a hoist should include the following additional items:

a. Duties in the HHO role;

b. Fitting and use of the hoist;

c. Operation of hoist equipment;

d. Preparing the helicopter and specialist equipment for HHO;

e. Normal and emergency procedures;

f. Crew co-ordination concepts specific to HHO;

g. Operation of inter-communications and radio equipment;

h. Knowledge of emergency hoist equipment;

i. Techniques for handling HHO passengers;

j. Effect of the movement of personnel on the centre of gravity and mass during HHO;

k. Effect of the movement of personnel on performance during normal and emergency flight conditions;

l. Techniques for guiding pilots over HHO sites;

m. Awareness of specific dangers relating to the operating environment; and

n. The dangers of static electricity discharge.

AMC OPS.SPA.001.HHO(b)(4) Helicopter hoist operations (HHO)

OPERATING PROCEDURES

1. The Helicopter.

During HHO, the helicopter should be capable of sustaining a critical power unit failure with the remaining engine(s) at the appropriate power setting, without hazard to the suspended person(s)/cargo, third parties, or property.

2. The Crew.

2.1 Selection.

The operations manual should contain criteria for the selection of flight crew members for the HHO task, taking previous experience into account.

2.2 Experience.

2.2.1 The experience considered should take into account the geographical characteristics (sea, mountain, big cities with heavy traffic, etc.).

2.2.2 The minimum experience level for a pilot-in-command conducting HHO flights should not be less than:

a. Offshore:

i. 1 000 hours pilot-in-command of helicopters or 1 000 hours as co-pilot in HHO operations of which 200 hours is as pilot-in-command under supervision; and

ii. 50 hoist cycles conducted offshore, of which 20 cycles should be at night if night operations are being conducted.

b. Onshore:

i. 500 hours pilot-in-command of helicopters or 500 hours as co-pilot in HHO operations of which 100 hours is as pilot-in-command under supervision;

ii. 200 hours operating experience in helicopters gained in an operational environment similar to the intended operation; and

iii. 50 hoist cycles, of which 20 cycles should be at night if night operations are being conducted.

c. Successful completion of training in accordance with the procedures contained in the operations manual and relevant experience in the role and environment under which HHO is conducted.

2.3 Recency.

All pilots and technical crew members conducting HHO should, in addition to the recency requirements in Part OR.OPS, have completed in the last 90 days:

a. When operating by day: Any combination of 3 day or night hoist cycles, each of which should include a transition to and from the hover.

b. When operating by night: 3 night hoist cycles, each of which should include a transition to and from the hover.

2.4 Crew Composition

2.4.1 The minimum crew for day or night operations should be as stated in the operations manual and will be dependent on the type of helicopter, the weather conditions, the type of task, and, in addition for offshore operations, the HHO site environment, the sea state and the movement of the vessel.

2.4.2 A crew of two pilots should be used when:

a. The weather conditions are below Visual Flight Rules (VFR) minima at the offshore vessel or structure.

b. There are adverse weather conditions at the HHO site (i.e. turbulence, vessel movement, visibility).

c. The type of helicopter requires a second pilot to be carried because of:

i. cockpit visibility;

ii. handling characteristics; or

iii lack of automatic flight control systems.

3. The Manual

When required in the interest of safety, relevant extracts from the operations manual should be made available to the organisation for which the HHO is being provided.

4. Passenger briefing

Prior to any HHO flight, or series of flights, HHO passengers should be briefed and made aware of the dangers of static electricity discharge and other HHO considerations.

AMC OPS.SPA.010.HHO(a) Equipment requirements for HHO

AIRWORTHINESS APPROVAL FOR HUMAN EXTERNAL CARGO

1. Hoist installations which have been certificated according to any of the following standards should be considered to satisfy the airworthiness criteria for Human External Cargo (HEC) operations:

a. CS 27.865 or CS 29.865;

b. JAR 27 Amendment 2 (27.865) or JAR 29 Amendment 2 (29.865) or later;

c. FAR 27 Amendment 36 (27.865) or later - including compliance with CS 27.865(c)(6);

d. FAR 29 Amendment 43 (29.865) or later.

2. Hoist installations which have been certificated prior to the issuance of the airworthiness criteria for HEC as defined in paragraph 1 may be considered as eligible for HHO operations provided that following a risk assessment either:

a. The service history of the hoist installation is found satisfactory to the competent authority; or

b. For hoist installations with an unsatisfactory service history, additional substantiation to allow acceptance by the competent authority should be provided by the Hoist Installation Certificate Holder (TC or STC) on the basis of the following requirements:

i. The hoist 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 aircraft 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 operations or flight manual contains one-engine-inoperative hover performance data and procedures for the weights, altitudes, and temperatures throughout the flight envelope for which hoist operations are accepted.

iv. Information concerning the inspection intervals and retirement life of the hoist cable should be provided in the instructions for continued airworthiness.

v. Any airworthiness issue reported from incidents or accidents and not addressed by i., ii., iii. and iv. should be addressed.

Section IX - Helicopter emergency medical service operations

GM OPS.SPA.001.HEMS(a) Helicopter emergency medical service operations (HEMS)

THE HEMS PHILOSOPHY

1. Introduction

This Guidance Material (GM) outlines the HEMS philosophy. Starting with a description of acceptable risk and introducing a taxonomy used in other industries, it describes how risk has been addressed in OPS.HEMS to provide a system of safety to the appropriate standard. It discusses the difference between HEMS, Air Ambulance and SAR - in regulatory terms. It also discusses the application of Operations to Public Interest Sites in the HEMS context.

2. Acceptable risk

The broad aim of any aviation legislation is to permit the widest spectrum of operations with the minimum risk. In fact it may be worth considering who/what is at risk and who/what is being protected. In this view three groups are being protected:

a. Third parties (including property) - highest protection.

b. Passengers (including patients).

c. Crew members (including technical crew members) – lowest.

It is for the Legislator to facilitate a method for the assessment of risk - or as it is more commonly known, safety management (refer to Part-OR).

3. Risk management

Safety management textbooks describe four different approaches to the management of risk. All but the first have been used in the production of this section and, if it is considered that the engine failure accountability of Performance Class 1 equates to zero risk, then all four are used (this of course is not strictly true as there are a number of helicopter parts - such as the tail rotor which, due to a lack of redundancy, cannot satisfy the criteria):

a. Applying the taxonomy to HEMS gives:

i. Zero Risk; no risk of accident with a harmful consequence – Performance Class 1 (within the qualification stated above) - the HEMS Operating Base.

ii. De Minimis; minimised to an acceptable safety target - for example the exposure time concept where the target is less than 5 x 10-8 (in the case of elevated landing sites at hospitals in a congested hostile environment the risk is contained to the deck edge strike case - and so in effect minimised to an exposure of seconds).

iii. Comparative Risk; comparison to other exposure - the carriage of a patient with a spinal injury in an ambulance that is subject to ground effect compared to the risk of a HEMS flight (consequential and comparative risk).

iv. As Low as Reasonably Practical; where additional controls are not economically or reasonably practical - operations at the HEMS operating site (the accident site).

It is stated in OPS.SPA.001.HEMS (b)(2) that "...the operator shall comply with the requirements contained in OPS.GEN, OPS.CAT and Part-OR, except for the variations contained in this Section."

b. In simple terms there are three areas in HEMS operations where risk, beyond that allowed in OPS.GEN, OPS.CAT and Part-OR is defined and accepted:

i. in the en-route phase; where alleviation is given from height and visibility rules;

ii. at the accident site; where alleviation is given from the performance and size requirement; and

iii. at an elevated hospital site in a congested hostile environment; where alleviation is given from the deck edge strike - providing elements of the OPS.SPA.SFL. are satisfied.

In mitigation against these additional and considered risks, experience levels are set, specialist training is required (such as instrument training to compensate for the increased risk of inadvertent entry into cloud); and operation with two crew (two pilots, or one pilot and a HEMS technical crew member) is mandated. (HEMS crews - including medical passengers - are also expected to operate in accordance with good CRM principles.)

4. Air ambulance

In regulatory terms, air ambulance is considered to be a normal transport task where the risk is no higher than for operations to the full OPS.GEN, OPS.CAT and Part-OR compliance. This is not intended to contradict/complement medical terminology but is simply a statement of policy; none of the risk elements of HEMS should be extant and therefore none of the additional requirements of HEMS need be applied.

If we can provide a road ambulance analogy:

a. If called to an emergency; an ambulance would proceed at great speed, sounding its siren and proceeding against traffic lights - thus matching the risk of operation to the risk of a potential death (= HEMS operations).

b. For a transfer of a patient (or equipment) where life and death (or consequential injury of ground transport) is not an issue; the journey would be conducted without sirens and within normal rules of motoring - once again matching the risk to the task (= air ambulance operations).

The underlying principle is; the aviation risk should be proportional to the task.

It is for the medical professional to decide between HEMS or air ambulance - not the pilot! For that reason, medical staff who undertake to task medical sorties should be fully aware of the additional risks that are (potentially) present under HEMS operations (and the pre-requisite for the operator to hold a HEMS approval). (For example in some countries, hospitals have principle and alternative sites. The patient may be landed at the safer alternative site (usually in the grounds of the hospital) thus eliminating risk - against the small inconvenience of a short ambulance transfer from the site to the hospital.)

Once the decision between HEMS or air ambulance has been taken by the medical professional, the pilot-in-command makes an operational judgement over the conduct of the flight.

Simplistically, the above type of air ambulance operations could be conducted by any operator holding an AOC (HEMS operators hold an AOC) - and usually are when the carriage of medical supplies (equipment, blood, organs, drugs etc.) is undertaken and when urgency is not an issue.

5. Operating under a HEMS approval

There are only two possibilities; transportation as passengers or cargo under the full auspices of OPS.GEN, OPS.CAT and Part-OR (this does not permit any of the alleviations of part OPS.SPA.HEMS - landing and take-off performance must be in

compliance with the performance subparts of Part OPS.CAT); or operations under a HEMS approval as contained in this section.

6. HEMS operational sites

The HEMS philosophy attributes the appropriate levels of risk for each operational site; this is derived from practical considerations and in consideration of the probability of use. The risk is expected to be inversely proportional to the amount of use of the site. The types of site are:

a. HEMS operating base; from which all operations will start and finish. There is a high probability of a large number of take-offs and landings at this HEMS operating base and for that reason no alleviation from operating procedures or performance rules are contained in this section.

b. HEMS operating site; because this is the primary pick up site related to an incident or accident, its use can never be pre-planned and therefore attracts alleviations from operating procedures and performance rules, when appropriate.

c. The hospital site; is usually at ground level in hospital grounds or, if elevated, on a hospital building. It may have been established during a period when performance criteria were not a consideration. The amount of use of such sites depends on their location and their facilities; normally, it will be greater than that of the HEMS operating site but less than for a HEMS operating base. Such sites attract some alleviation under this section.

7. Problems with hospital sites

During implementation of the original HEMS rules contained in JAR-OPS 3, it was established that a number of States had encountered problems with the impact of performance rules where helicopters were operated for HEMS. Although States accept that progress should be made towards operations where risks associated with a critical power unit failure are eliminated, or limited by the exposure time concept, a number of landing sites exist which do not (or never can) allow operations to Performance Class 1 or 2 requirements.

These sites are generally found in a congested hostile environment:

a. in the grounds of hospitals; or

b. on hospital buildings.

The problem of hospital sites is mainly historical and, whilst the authority could insist that such sites not be used - or used at such a low weight that critical power unit failure performance is assured, it would seriously curtail a number of existing operations.

Because such operations are performed in the public interest, it was felt that the authority should be able to exercise its discretion so as to allow continued use of such sites provided that it is satisfied that an adequate level of safety can be maintained - notwithstanding that the site does not allow operations to Performance Class 1 or 2 standards. However, it is in the interest of continuing improvements in safety that the alleviation of such operations be constrained to existing sites, and for a limited period.

It is felt that the use of public interest sites should be controlled. This will require that a State directory of sites be kept and approval given only when the operator has an entry in the route manual section of the operations manual.

The directory (and the entry in the OM) should contain for each approved site; the dimensions; any non-conformance with Annex 14; the main risks; and, the contingency plan should an incident occur. Each entry should also contain a diagram (or annotated photograph) showing the main aspects of the site.

8. Summary

In summary, the following points are considered to be germane to the HEMS philosophy and HEMS regulations:

a. Absolute levels of safety are conditioned by society.

b. Potential risk must only be to a level appropriate to the task.

c. Protection is afforded at levels appropriate to the occupants.

d. This section addresses a number of risk areas and mitigation is built in.

e. Only HEMS operations are dealt with by this section.

f. There are three main categories of HEMS sites and each is addressed appropriately.

g. State alleviation from the requirement at a hospital site is available but such alleviations should be strictly controlled by a system of registration.

9. References

Managing the Risks of Organizational Accidents - Professor James Reason.

AMC OPS.SPA.001.HEMS(b)(4) Helicopter emergency medical service operations (HEMS)

OPERATING PROCEDURES

1. The crew.

1.1 Selection.

The operations manual should contain specific criteria for the selection of flight crew members for the HEMS task, taking previous experience into account.

1.2 Experience.

The minimum experience level for a pilot-in-command conducting HEMS flights should take into account the geographical characteristics of the operation (sea, mountain, big cities with heavy traffic, etc.) and should not be less than:

a. Either:

i. 1 000 hours pilot-in-command of aircraft of which 500 hours is as pilot-in-command on helicopters; or

ii. 1 000 hours as co-pilot in HEMS operations of which 500 hours is as pilot-in-command under supervision; and, 100 hours pilot-in-command of helicopters.

b. 500 hours operating experience in helicopters gained in an operational environment similar to the intended operation; and

c. For pilots engaged in night operations, 20 hours Visual Meteorological Conditions (VMC) at night as pilot-in-command; and

d. Successful completion of training in accordance with 1.5.1.

1.3 Recency.

All pilots conducting HEMS operations should have completed a minimum of 30 minutes flight by sole reference to instruments in a helicopter or in a synthetic training device (STD) within the last 6 months. This recency may be obtained in a Visual Flight Rules (VFR) helicopter using vision limiting devices such as goggles or screens, or in a STD.

1.4 Crew composition.

a. Day flight.

The minimum crew by day should be one pilot and one HEMS technical crew member. This can be reduced to one pilot only in exceptional circumstances.

b. Night flight.

The minimum crew by night should be two pilots. However, one pilot and one HEMS technical crew member may be employed in specific geographical areas defined by the operator in the operations manual taking into account the following:

i. Adequate ground reference;

ii. Flight following system for the duration of the HEMS mission;

iii. Reliability of weather reporting facilities;

iv. HEMS minimum equipment list;

v. Continuity of a crew concept;

vi. Minimum crew qualification, initial and recurrent training;

vii. Operating procedures, including crew co-ordination;

viii. Weather minima;

ix. Additional considerations due to specific local conditions.

1.5 Crew training and checking

1.5.1 Flight crew members

a. The specific HEMS training programme for the flight crew members should include the following subjects:

i. Meteorological training concentrating on the understanding and interpretation of available weather information;

ii. Preparing the helicopter and specialist medical equipment for subsequent HEMS departure;

iii. Practice of HEMS departures;

iv. The assessment from the air of the suitability of HEMS operating sites; and

v. The medical effects air transport may have on the patient.

b. Flight crew member checking

i. VMC day proficiency checks, or also at night if night HEMS operations are undertaken by the operator, including flying landing and take-off profiles likely to be used at HEMS operating sites.

ii. Line checks, with special emphasis on the following:

A. Local area meteorology;

B. HEMS flight planning;

C. HEMS departures;

D. The selection from the air of HEMS operating sites;

E. Low level flight in poor weather; and

F. Familiarity with established HEMS operating sites in operators local area register.

Where due to the size, the configuration, or the performance of the helicopter, the line check cannot be conducted on an operational flight; it may be conducted on a specially arranged representative flight. This flight may be immediately adjacent to, but not simultaneous with, one of the biannual proficiency checks.

1.5.2 HEMS Technical crew member

The specific HEMS training programme for technical crew members who perform assigned duties relating to assisting the pilot in his duties should include the following items in addition to Part-OR:

a. Duties in the HEMS role;

b. Navigation (map reading, navigation aid principles and use);

c. Operation of radio equipment;

d. Use of onboard medical equipment;

e. Preparing the helicopter and specialist medical equipment for subsequent HEMS departure;

f. Instrument reading, warnings, use of normal and emergency check lists in assistance of the pilot as required;

g. Basic understanding of the helicopter type in terms of location and design of normal and emergency systems and equipment;

h. Crew coordination;

i. Practice of response to HEMS call out;

j. Conducting refuelling and rotors running refuelling;

k. HEMS operating site selection and use;

l. Techniques for handling patients, the medical consequences of air transport and some knowledge of hospital casualty reception;

m. Marshalling signals;

n. Underslung load operations as appropriate;

o. Winch operations as appropriate;

p. The dangers to self and others of rotor running helicopters including loading of patients;

q. The use of the helicopter inter-communications system.

2. Medical passenger

Prior to any HEMS flight, or series of flights, the medical passenger should be briefed on the following:

a. Familiarisation with the helicopter type(s) operated;

b. Entry and exit under normal and emergency conditions both for self and patients;

c. Use of the relevant onboard specialist medical equipment;

d. The need for the pilot-in-command’s approval prior to use of specialised equipment;

e. Method of supervision of other medical staff;

f. The use of helicopter inter-communication systems; and

g. Location and use of onboard fire extinguishers.

3. Ground emergency service personnel

3.1 An operator should take all reasonable measures to ensure that ground emergency service personnel are familiar with the following:

a. Two way radio communication procedures with helicopters;

b. The selection of suitable HEMS operating sites for HEMS flights;

c. The physical danger areas of helicopters;

d. Crowd control in respect of helicopter operations; and

e. The evacuation of helicopter occupants following an on-site helicopter accident.

3.2 The task of training large numbers of emergency service personnel is formidable. Wherever possible, helicopter operators should afford every assistance to those persons responsible for training emergency service personnel in HEMS support.

4. Operations manual. When required in the interest of safety, relevant extracts from the operations manual should be made available to the organisation for which the HEMS is being provided.

GM1 OPS.SPA.001.HEMS(b)(4) Helicopter emergency medical service operations (HEMS)

OPERATING PROCEDURES

A flight following system (as referred to in AMC OPS.SPA.001.HEMS (b)(4) 1.4. b. ii.) is a system providing contact with the helicopter throughout its operational area.

GM2 OPS.SPA.001.HEMS(b)(4) Helicopter emergency medical service operations (HEMS)

OPERATING PROCEDURES

1. When the crew is composed of one pilot and one technical crew member, the latter should be seated in the front seat (co-pilot seat) during the flight, so as to be able to accomplish the tasks that the pilot-in-command may delegate, as necessary:

a. Assistance in navigation;

b. Assistance in radio communication/radio navigation means selection;

d. Monitoring of parameters;

e. Collision avoidance;

f. Assistance in the selection of the landing site;

g. Assistance in the detection of obstacles during approach and take-off phases.

2. The pilot-in-command may also delegate to the technical crew member tasks on the ground:

a. Assistance in preparing the helicopter and dedicated medical specialist equipment for subsequent HEMS departure.

b. Assistance in the application of safety measures during ground operations with rotors turning (including: crowd control, embarking and disembarking of passengers, refuelling etc.).

3. When a technical crew member is carried it is his/her primary task to assist the pilot-in-command. However, there are occasions when this may not be possible:

a. At a HEMS operating site a pilot-in-command may be required to fetch additional medical supplies, the technical crew member may be left to give assistance to ill or injured persons whilst the pilot-in-command undertakes this flight. (This is to

be regarded as exceptional and is only to be conducted at the discretion of the pilot-in-command, taking into account the dimensions and environment of the HEMS operating site.)

b. After arriving at the HEMS Operating Site, the installation of the stretcher may preclude the technical crew member from occupying the front seat.

c. The medical passenger requires the assistance of the technical crew member in flight.

d. In the cases described in a., b. or c. above, reduction of operating minima contained in Table 1 of OPS.SPA.020.HEMS. should not be used.

e. With the exception of a. above, a pilot-in-command should not land at a HEMS operating site without the technical crew member assisting from the front seat (co-pilot seat).

4. When two pilots are carried, there is no requirement for a technical crew member, provided that the pilot non-flying (PNF) performs the aviation tasks of a technical crew member.

GM OPS.SPA.020.HEMS(a) HEMS Operating Minima

REDUCED VISIBILITY

In the rule the ability to reduce the visibility for short periods has been included. This will allow the pilot-in-command to assess the risk of flying temporarily into reduced visibility against the need to provide emergency medical service, taking into account the advisory speeds included in the AMC. Since every situation is different it was not felt appropriate to define the short period in terms of absolute figures. It is for the pilot-in-command to assess the risk to third parties, the crew and the aircraft in comparison to the mission parameters, using the principles of GM OPS.SPA.001.HEMS(a).

AMC OPS.SPA.025.HEMS(b)(3) Performance requirements for HEMS operations

HEMS OPERATING SITE DIMENSIONS

1. When selecting a HEMS operating site it should have a minimum dimension of at least 2D. For night operations, unsurveyed HEMS operating sites should have dimensions of at least 4D in length and 2D in width.

2. For night operations, the illumination may be either from the ground or from the helicopter.