CAR SPO - SPECIALISED OPERATIONS

FOREWORD

CONTENTS

REVISION RECORD

LIST of EFFECTIVE PAGES

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FOREWORD

(a) The Republic of San Marino Civil Aviation Authority, known in these regulations as the "Authority" has implemented CAR SPO (Civil Aviation Regulations – Specialised Operations) as the technical requirements and administrative procedures applicable to aircraft.

(b) CAR SPO is known in these regulations as SPO.

(c) The Authority has adopted associated compliance wherever possible and, unless specifically stated otherwise, clarification will be based on this material or other internationally acceptable documentation.

(d) Unless otherwise stated, applicable CAR DEF definitions and abbreviations are used throughout this document.

(e) The editing practices used in this document are as follows:

(1) 'Shall' is used to indicate a mandatory requirement.

(2) 'Should' is used to indicate a recommendation.

(3) 'May' is used to indicate discretion by the Authority, the industry or the applicant, as appropriate.

Note: The use of the male gender implies the female gender and vice versa.

(f) The phrase "acceptable to the Authority" has been used throughout these regulations and acceptability shall be determined by the operator procedures specified in the operations manual.

(g) Paragraphs and sub-paragraphs with new, amended and corrected text will be enclosed within brackets until a subsequent "amendment" is issued.

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REVISION RECORD

REVISION NO.	EFFECTIVE DATE	ENTERED BY *(hardcopy only)*
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Revision 01	01 January 2026	

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I-B-1 to I-B-11	01 Aug 2020
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LIST OF TABLES AND FIGURES

PART I - REGULATIONS

SUBPART A - APPLICABILITY

SPO.001 Applicability

(See AMC1 SPO.001 Applicability & AC1 SPO.001 List of Specialised Operations & AC2 SPO.001 Applicability*)*

(a) CAR SPO prescribes the requirements applicable to the operation of any civil aircraft for the purpose of specialised operations where the aircraft is used for specialised activities such as, agriculture, construction, photography, surveying, calibration flights, observation and patrol or aerial advertisement by any operator where the State of Registry is San Marino.

(b) CAR SPO does not apply to aircraft when used in military, customs, polices services, or firefighting flights.

SPO.002 Exemptions

The Authority may exceptionally grant an exemption from the provisions of CAR SPO and any other applicable CAR, when satisfied that there is a need and subject to compliance with any supplementary condition the Authority considers necessary in order to ensure an acceptable level of safety in the particular case.

SPO.003 Scope

(a) A commercial specialised operator and a non-commercial specialised operator with complex motor powered aircraft shall comply with CAR SPO.

(b) A non-commercial specialised operator with non-complex motor powered aircraft shall comply with CAR OPS 2A and/or CAR OPS 2H as applicable.

(c) Notwithstanding point (b), the following operations with non-complex motor-powered aircraft may be conducted in accordance with CAR OPS 2A and/or CAR OPS 2H

(1) competition flights or flying displays, on the condition that the remuneration or any valuable consideration given for such flights is limited to recovery of direct costs and a proportionate contribution to annual costs, as well as prizes of no more than a value specified by the authority.

(2) parachute dropping, sailplane towing with an aeroplane or aerobatic flights performed either by a training organisation having its principal place of business in San Marino, or by an organisation created with the aim of promoting aerial sport or leisure aviation, on the condition that the aircraft is operated by the organisation on the basis of ownership or dry lease, that the flight does not generate profits distributed outside of the organisation, and that whenever non-members of the organisation are involved, such flights represent only a marginal activity of the organisation.

SPO.004 Declaration

(See Appendix 1 to SPO.004 Declaration of specialised operations & AC1 SPO.004 Declaration

The operator of any aircraft engaged in commercial SPO or the operator of a complex motor-powered aircraft engaged in non-commercial SPO shall:

(a) Provide the Authority with all relevant information prior to commencing operations, using the form contained in *Appendix 1 to SPO.004 Declaration of specialised operations* to this subpart;

(b) Notify to the Authority a list of the alternative means of compliance used;

(c) Maintain compliance with the applicable requirements and with the information given in the declaration;

(d) Notify the Authority without delay of any changes to its declaration or the means of compliance it uses; through submission of an amended declaration using the form contained in Appendix 1 to SPO.004 Declaration of specialised operations to this subpart; and

(e) notify the Authority when it ceases operation.

Note: A new declaration should be submitted before the change becomes effective indicating the date as of which the change would apply.

SPO.005 Authorisation of high risk commercial specialised operations

(See Appendix 2 to SPO.004 Application for commercial specialised operations authorisation, Appendix 1 to SPO.005 Authorisation of specialised operations & AMC1 SPO.005 Authorisation of high risk commercial specialised operations)

(a) A commercial specialised operator shall apply for and obtain an authorisation issued by the Authority of the operator prior to commencing a high risk commercial specialised operation:

(1) that is carried out over an area where the safety of third parties on the ground is likely to be endangered in the event of an emergency, or

(2) that, as determined by the Authority of the place where the operation is conducted, due to its specific nature and the local environment in which it is conducted, poses a high risk, in particular to third parties on the ground.

(b) The operator shall provide the following information to the Authority:

(1) the official name and business name, address, and mailing address of the applicant;

(2) a description of the management system, including organisational structure;

(3) a description of the proposed operation, including the type(s), and number of aircraft to be operated;

(4) the risk assessment documentation and related standard operating procedures, required by *SPO.OP.266 Standard operating procedures*;

(5) a statement that all the documentation sent to the Authority has been verified by the operator and found in compliance with the applicable requirements.

(c) The application for an authorisation or its amendment shall be made as established in Appendix 2 to SPO.004 Application for commercial specialised operations authorisation.

(d) Upon receiving the application for the issue of a commercial high risk specialised operations authorisation, the Authority shall review the operator's risk assessment documentation and standard operating procedures (SOP), related to one or more planned operations and developed in accordance with the relevant requirements.

(e) When satisfied with the risk assessment and SOP, the Authority shall issue the authorisation, as established in Appendix 1 to SPO.005 Authorisation of specialised operations. The authorisation may be issued for a limited or for unlimited duration. The conditions under which an operator is authorised to conduct one or more specialised operations shall be specified in the authorisation.

(f) Upon receiving an application for a change to the authorisation, the Authority shall comply with (d) and (e). It shall prescribe the conditions under which the operator may operate during the change, unless the Authority determines that the authorisation needs to be suspended.

(g) Upon receiving an application for the renewal of the authorisation, the Authority shall comply with (d) and (e). It may take into account the past authorisation process and oversight activities.

(h) Without prejudice to any additional enforcement measures, when the operator implements changes without having submitted an amended risk assessment and SOP, the Authority shall suspend, limit or revoke the authorisation.

(i) Upon receiving the declaration for the issue of an authorisation for a cross-border specialised operation, the Authority shall review the operator's risk assessment documentation and standard operating procedures (SOP) in coordination with the authority of the place where the operation is planned to be conducted. When both authorities are satisfied with the risk assessment and SOP, the Authority shall issue the authorisation.

SPO.006 Continued validity

(a) An operator holding a specialised operation authorisation shall comply with the scope and privileges defined in the authorisation.

(b) The operator's authorisation shall remain valid subject to:

(1) the operator remaining in compliance with all the relevant regulations;

(2) the Authority being granted access to the operator to determine continued compliance with the relevant regulations; and

(3) the authorisation not being surrendered or revoked.

(c) Upon revocation or surrender the authorisation shall be returned to the Authority without delay.

SPO.007 Changes

(a) Any change affecting the scope of the authorisation or the authorised operations shall require prior approval of the Authority. Any change not covered by the initial risk assessment, shall require the submission of an amended risk assessment and SOP to the Authority.

(b) The declaration for approval of a change shall be submitted before any such change takes place, in order to enable the Authority to determine continued compliance with its Regulations and to amend, if necessary, the authorisation. The operator shall provide the Authority with any relevant documentation.

(c) The change shall only be implemented upon receipt of formal approval by the Authority.

(d) The operator shall operate under the conditions prescribed by the Authority during such changes, as applicable.

Appendix 1 to SPO.004 Declaration of specialised operations

1. APPLICANT DETAILS *(Owner or Operator)*			
Company Name:		Trading name:	
Telephone No.:		Email:	
2. PRINCIPAL PLACE OF BUSINESS [1]			
Address:			
Telephone No.:		Email:	
3. ACCOUNTABLE MANAGER			
Name:			
Telephone No.:		Email:	
4. AIRCRAFT OPERATION *(use other side for additional information if required)* [2]			
Type of Operation:	Commercial ☐ Non-Commercial ☐ Complex ☐ Non-Complex ☐		
Start-up / change date:			
Category of Aircraft:	☐ Aeroplane ☐ Helicopter ☐ Other, specify		

Aircraft Serial Number	Aircraft Designation /Type	Aircraft Registration	Main Base	Type(s) of operations [3] [4]	Organisation or person responsible for continuing airworthiness management [5]

[1] Please insert the principal place of business for the specialised operation.

2 If there is insufficient space, please add a separate sheet dated and signed by the Accountable Manager.

3 If the aircraft is registered with an AOC holder, specify the AOC number and name of AOC holder if different.

4 Specify the type of operation, e.g., agriculture, construction, photography, surveying, observation and patrol, aerial advertisement, inspection and validation flights, calibration flights.

5 Insert the name of the organisation or person, address and approval reference (as applicable).

Specific Approvals held[6]:	☐ RVSM ☐ EDTO ☐ NAT HLA ☐ EFB ☐ AWO
Permission/Exemptions held:[7]	
Geographic areas/routes:	
Description of specialised operation	

5. APPLICANTS DECLARATION

I declare the management system documentation, including the operations manual comply with the requirements of CAR OPS 1 ☐ CAR OPS 2A ☐ CAR OPS 2H ☐ CAR OPS 3 ☐ (select as applicable) and also comply with the requirements of CAR SPO, CAR GEN, CAR 21 and CAR AIR (if applicable for aircraft operated under CAR OPS 2A or CAR OPS 2H).

☐ I declare all aircraft operated hold a valid certificate of airworthiness in accordance with CAR AIR or meet the specific airworthiness requirements applicable to aircraft registered in a third country and subject to a lease agreement.

☐ I declare all flight crew members hold a licence that has been validated by the Authority and are trained in accordance with the regulations applicable to the state of licence issue.

☐ I declare that I will notify to the Authority any changes in circumstances affecting its compliances status as declared to the Authority through this declaration.

I hereby declare to the Authority; that to the best of my knowledge and belief, the particulars given in this declaration are true in every respect.

Date:		Position in Company:	**ACCOUNTABLE MANAGER**
Name of Applicant:		Signature of Applicant:	

6 Attach copies of approvals held.

7 Attach copies of exemption(s)/permission(s) held.

Appendix 2 to SPO.004 Application for commercial specialised operations authorisation

1. APPLICANT DETAILS *(Owner or Operator)*			
Company Name:		Trading name:	
Telephone No.:		Email:	
2. PRINCIPAL PLACE OF BUSINESS [1]			
Address:			
Telephone No.:		Email:	
3. ACCOUNTABLE MANAGER			
Name:			
Telephone No.:		Email:	
4. AIRCRAFT OPERATION *(use other side for additional information if required)* [2]			
Type of Operation:	Commercial ☐ Non-Commercial ☐ Complex ☐ Non-Complex ☐		
Start-up / change date:			
Category of Aircraft:	☐ Aeroplane ☐ Helicopter ☐ Other, specify		

Aircraft Serial Number	Aircraft Designation /Type	Aircraft Registration	Main Base	Type(s) of operations [3] [4]	Organisation or person responsible for continuing airworthiness management [5]

[1] *Please insert the principal place of business for the specialised operation.*

2 If there is insufficient space, please add a separate sheet dated and signed by the Accountable Manager.

3 If the aircraft is registered with an AOC holder, specify the AOC number and name of AOC holder if different.

4 Specify the type of operation, e.g., agriculture, construction, photography, surveying, observation and patrol, aerial advertisement, inspection and validation flights, calibration flights.

5 Insert the name of the organisation or person, address and approval reference (as applicable).

Specific Approvals required[6]:	☐ RVSM ☐ EDTO ☐ NAT HLA ☐ EFB ☐ AWO
Permission/Exemptions required:[7]	
Geographic areas/routes:	
Description of specialised operation	

5. APPLICANTS DECLARATION

I declare the management system documentation, including the operations manual comply with the requirements of CAR OPS 1 ☐ CAR OPS 2A ☐ CAR OPS 2H ☐ CAR OPS 3 ☐ (select as applicable) and also comply with the requirements of CAR SPO, CAR GEN, CAR 21 and CAR AIR (if applicable for aircraft operated under CAR OPS 2A or CAR OPS 2H).

☐ I declare all aircraft operated hold a valid certificate of airworthiness in accordance with CAR AIR or meet the specific airworthiness requirements applicable to aircraft registered in a third country and subject to a lease agreement.

☐ I declare all flight crew members hold a licence that has been validated by the Authority and are trained in accordance with the regulations applicable to the state of licence issue.

☐ I declare that I will notify to the Authority any changes in circumstances affecting its compliances status as declared to the Authority through this declaration.

I hereby apply for the grant of a commercial specialised operation authorisation and declare that, to the best of my knowledge and belief, the particulars given in this application are true in every respect.

Date:		Position in Company:	**ACCOUNTABLE MANAGER**
Name of Applicant:		Signature of Applicant:	

6 Attach copies of approvals already held.

7 Provide specific references to the regulations that you are requesting exemption or permission from and what level of easement you are requesting.

Appendix 1 to SPO.005 Authorisation of specialised operations

AUTHORISATION OF COMMERCIAL SPECIALISED OPERATIONS

Issued by the Civil Aviation Authority of the Republic of San Marino as the State of the Operator

Operator name: (1)

Operator address: (2)

Telephone: (3)

E-mail:

Aircraft model and registration marks: (4)

Authorised specialised operation: (5)

Authorised area or site of operation: (6)

Special limitations: (7)

This is to confirm that …….. is authorised to perform specialised operation(s) in accordance with this authorisation, operator's Standard Operating Procedures and CAR SPO

Date of issue (8): Eng. Marco Conti, Director General

Signature (9):

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(1) Insertion of the operator's registered name and the operator's trading name, if different. Insert "Dba" before the trading name (for "Doing business as").

(2) Operator's principal place of business address.

(3) Operator's principal place of business, telephone details, including the country code. Email to be provided if available.

(4) Insertion of the Commercial Aviation Safety Team (CAST)/ICAO designation of the aircraft make, model and series, or master series, if a series has been designated (e.g. Boeing-737-3K2 or Boeing- 777-232). The CAST/ICAO taxonomy is available at: http://www.intlaviationstandards.org/. The registration marks shall be either listed in the list of specific approvals or in the operations manual. In the latter case the list of specific approvals shall refer to the related page in the operation manual.

(5) Specify the type of operation, e.g., agriculture, construction, photography, surveying, observation and patrol, aerial advertisement, inspection and validation flights, calibration flights.

(6) Listing of geographical area(s) or site(s) of authorised operation (by geographical coordinates or flight information region or national or regional boundaries).

(7) Listing of applicable special limitations (e.g. VFR only, Day only, etc.).

(8) Issue date of the authorisation (dd-mm-yyyy).

(9) Title, name and signature of the Authority representative. In addition, an official stamp may be applied on the authorisation.

SUBPART B - GENERAL

SPO.105 Compliance with Laws, Regulations and Procedures

(a) The operator shall comply with the laws, regulations and procedures of those States in which operations are conducted.

(b) The operator of an aircraft, or in the case where it is leased, the lessee, shall ensure, in accordance with the applicable regulations contained in CAR AIR, CAR GEN or CAR 21 that:

(1) The aircraft, including any mission specific equipment required for the special operation, is maintained in an airworthy condition;

(2) The operational and emergency equipment necessary for an intended flight is serviceable; and

(3) The certificate of airworthiness of the aircraft remains valid.

(4) The aircraft Maintenance Programme adequately addresses any scheduled inspections/checks the specific special operation in question might consequently require.

(c) The operator shall have responsibility for operational control over any flight operated under the terms of its SPO authorisation or declaration.

(d) The operator shall ensure that flight crew members demonstrate the ability to speak and understand the English language.

(e) The operator shall ensure every flight shall be conducted in accordance with the provisions of the operations manual.

(f) The operator shall ensure that its aircraft are equipped and its crews are qualified as required for the area and type of operation.

(g) The operator shall ensure that all personnel assigned to, or directly involved in, ground and flight operations are properly instructed, have demonstrated their abilities in their particular duties and are aware of their responsibilities and the relationship of such duties to the operation as a whole.

(h) The operator shall establish procedures and instructions for the safe operation of each aircraft type, containing ground staff and crew member duties and responsibilities, for all types of operation on the ground and in flight. Those procedures and instructions shall not require crew members to perform any activities during critical phases of flight other than those required for the safe operation of the aircraft. Procedures and instructions for a sterile flight crew compartment shall also be included.

(i) The operator shall ensure that all personnel are made aware that they shall comply with the laws, regulations and procedures of those States in which operations are conducted and that are pertinent to the performance of their duties.

(j) The operator shall establish a checklist for each aircraft type to be used by crew members in all phases of flight under normal, abnormal and emergency conditions in order to ensure that the operating procedures in the operations manual are followed. The design and the usage of checklists shall observe human factors principles and take into account the latest relevant documentation from the design approval holder.

(k) The operator shall specify flight planning procedures to provide for the safe conduct of the flight based on considerations of aircraft performance, other operating limitations and relevant expected conditions on the route to be followed and at the aerodromes or operating sites concerned. These procedures shall be included in the operations manual.

SPO.110 Common Language

(l) The operator must ensure that all crew members and task specialists can communicate in a common language.

(m) The operator must ensure that all operations personnel are able to understand the language in which those parts of the Operations Manual which pertain to their duties and responsibilities are written.

SPO.115 Crew Members

(a) The crew members shall be responsible for the proper execution of his duties. Crew duties shall be specified in the standard operating procedures (SOP) and, where appropriate, in the operations manual.

(b) During critical phases of the flight or whenever deemed necessary by the pilot-in-command in the interest of safety, the crew member shall be restrained at his/her assigned station, unless otherwise specified in the SOP.

(c) During flight, not engage in any activity during a critical phase of flight which could distract any flight crewmember from the performance of his or her duties or which could interfere in any way with the proper conduct of those duties.

(d) During flight, the flight crew member shall keep his safety belt fastened while at his station.

(e) During flight, at least one qualified flight crew member shall remain at the controls of the aircraft at all times.

(f) A crew member shall not perform duties on an aircraft;

(1) while under the influence of any drug that may affect his/her faculties in a manner contrary to safety;

(2) following deep water diving except when a reasonable time period has elapsed;

(3) following blood donation except when a reasonable time period has elapsed;

(4) if applicable medical requirements are not fulfilled, or if he is in any doubt of being able to accomplish his assigned duties; or

(5) if he knows or suspects that he is suffering from fatigue or feels unfit to the extent that the flight may be endangered.

(g) A crew member shall be subject to appropriate requirements on the consumption of alcohol which shall be established by the operator and acceptable to the Authority, and which shall not be less restrictive than the following:

(1) No alcohol shall be consumed less than 8 hours prior to the specified reporting time for flight duty or the commencement of standby;

(2) The blood alcohol level shall not exceed 0·2 promille at the start of a flight duty period;

(3) No alcohol shall be consumed during the flight duty period or whilst on standby.

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

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

(2) any incident that endangered, or could have endangered, the safety of operation; and

SPO.120 Task Specialists Responsibilities

(a) The task specialist shall be responsible for the proper execution of his duties. Task specialists' duties shall be specified in the SOP.

(b) During critical phases of the flight or whenever deemed necessary by the pilot-in-command in the interest of safety, the task specialist shall be restrained at his assigned station, unless otherwise specified in the SOP.

(c) The task specialist shall ensure that he is restrained when carrying out specialised tasks with external doors opened or removed.

(d) The task specialist shall report to the pilot-in-command:

(1) any fault, failure, malfunction or defect, which he 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.

SPO.125 Pilot-in-Command Responsibilities and Authority

(See AMC1 SPO.125 Pilot-in-Command Responsibilities and Authority)

(a) The pilot-in-command shall be familiar with the laws, regulations and procedures, pertinent to the performance of his or her duties, prescribed for the areas to be traversed, the aerodromes to be used and the air navigation facilities relating thereto. The pilot-in-command shall ensure that other members of the crew and task specialists are familiar with such of these laws, regulations and procedures as are pertinent to the performance of their respective duties in the operation of the aircraft.

(b) If an emergency situation which endangers the safety or security of the aircraft or persons necessitates the taking of action which involves a violation of local regulations or procedures, the pilot-in-command shall notify the appropriate local authority without delay. If required by the State in which the incident occurs, the pilot-in-command shall submit a report on any such violation to the appropriate authority of such State; in that event, the pilot-in-command shall also submit a copy of it to the Authority, as the State of Registry of the aircraft. Such reports shall be submitted as soon as possible and normally within ten days.

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

(1) the safety of the aircraft and of all crew members, task specialists and cargo on board as soon as he arrives on board, until he leaves the aeroplane at the end of the flight;

(2) be responsible for the operation and safety of the aircraft;

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

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

(3) the initiation, continuation, termination or diversion of a flight in the interest of safety;

(4) ensuring that all operational procedures and checklists are complied with in accordance with the appropriate manual;

(5) the aircraft is airworthy, duly registered and that appropriate certificates with respect thereto are aboard the aircraft;

(6) the instruments and equipment installed in the aircraft are appropriate, taking into account the expected flight conditions;

(7) any necessary maintenance has been performed;

(8) the mass of the aircraft and centre of gravity location are such that the flight can be conducted safely, taking into account the flight conditions expected;

(9) any load carried is properly distributed and safely secured; and

(10) the aircraft operating limitations as specified in the aircraft flight manual (AFM), or its equivalent, will not be exceeded at any time during the flight.

(11) any navigational database required for PBN is suitable and current;

(12) not commencing a flight if he, or any other crew member or task specialist is incapacitated from performing duties by any cause such as injury, sickness, fatigue or the effects of any psychoactive substance;

(13) not continuing a flight beyond the nearest weather-permissible aerodrome or operating site when his/her or any other crew member or task specialist's capacity to perform duties is significantly reduced from causes such as fatigue, sickness or lack of oxygen;

(14) deciding on acceptance of the aircraft with unserviceabilities in accordance with the configuration deviation list (CDL) or MEL, if applicable;

(15) recording utilisation data and all known or suspected defects in the aircraft at the termination of the flight, or series of flights, in the aircraft technical log or journey log for the aircraft; and

(16) ensuring that:

(i) flight recorders are not disabled or switched off during flight;

(ii) in the event of an occurrence other than an accident or a serious incident that shall be reported, flight recorders' recordings are not intentionally erased; and

(iii) in the event of an accident or a serious incident, or if preservation of recordings of flight recorders is directed by the investigating authority:

(A) flight recorders recordings are not intentionally erased;

(B) flight recorders are deactivated immediately after the flight is completed; and

(C) precautionary measures to preserve the recordings of flight recorders are taken before leaving the flight crew compartment.

(d) The pilot-in-command shall have 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.

(e) The pilot-in-command shall, as soon as possible, report to the appropriate air traffic services (ATS) unit any hazardous weather or flight conditions encountered that are likely to affect the safety of other aircraft.

(f) Notwithstanding the provision of (a)(13), in a multi-crew operation the pilot-in-command may continue a flight beyond the nearest weather-permissible aerodrome when adequate mitigating procedures are in place.

(g) The pilot-in-command shall, in an emergency situation that requires immediate decision and action, take any action he considers necessary under the circumstances. In such cases he may deviate from rules, operational procedures and methods in the interest of safety.

(h) The pilot-in-command shall submit a report of an act of unlawful interference without delay to the Authority and shall inform the designated local authority.

(i) The pilot-in-command shall notify the nearest appropriate authority by the quickest available means of any accident involving the aircraft that results in serious injury or death of any person or substantial damage to the aircraft or property.

SPO.130 Taxiing of Aircraft

(See AC1 SPO.130 Taxiing of Aircraft)

(a) An aircraft shall not be taxied on the movement area of an aerodrome unless the person at the controls is an appropriately qualified pilot or;

(b) has been duly authorised by the owner or in the case where it is leased the lessee, or a designated agent and;

(1) is fully competent to taxi the aircraft;

(2) is qualified to use the radio if radio communications are required; and

(3) has received instruction from a competent person in respect of aerodrome layout, and where appropriate, information on routes, signs, marking, lights, ATC signals and instructions, phraseology and procedures, and

(4) is able to conform to the operational standards required for safe movement at the aerodrome.

(c) The operator shall establish procedures for taxiing of aircraft in order to ensure safe operation and in order to enhance runway safety. Procedures for taxiing should include at least the following:

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

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

(3) use of lights;

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

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

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

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

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

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

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

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

SPO.132 Rotor engagement

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

SPO.135 Portable Electronic Devices

The operator shall not permit any person to use a portable electronic device (PED) on board an aircraft that could adversely affect the performance of the aircraft's systems and equipment.

SPO.140 Use of Electronic Flight Bags (EFBs)

(a) Where portable EFBs are used on board an aircraft, the pilot-in-command and/or the operator/owner shall ensure that they do not affect the performance of the aeroplane systems, equipment or the ability to operate the aircraft.

(b) Where EFBs are used on board an aircraft the pilot-in-command and/or the owner shall:

(1) assess the safety risk(s) associated with each EFB function;

(2) establish the procedures for the use of, and training requirements for, the device and each EFB function; and

(3) ensure that, in the event of an EFB failure, sufficient information is readily available to the flight crew for the flight to be conducted safely.

(c) The Authority shall establish criteria for the operational use of EFB functions to be used for the safe operations of aircraft. In establishing criteria for the operational use of EFBs, the Authority shall ensure that:

(1) the EFB equipment and its associated installation hardware, including interaction with aircraft systems if applicable, meet the appropriate airworthiness certification requirements;

(2) the operator/owner has assessed the risks associated with the operations supported by the EFB function(s);

(3) the operator/owner has established requirements for redundancy of the information (if appropriate) contained and displayed by the EFB function(s);

(4) the operator/owner has established and documented procedures for the management of the EFB function(s) including any databases it may use; and

(5) the operator/owner has established and documented the procedures for the use of, and training requirements for, the EFB function(s).

SPO.145 Information on Emergency and Survival Equipment carried

The operator shall ensure that there are available for immediate communication to rescue coordination centres, lists containing information on the emergency and survival equipment carried on board all of his aircraft. The information shall 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 emergency portable radio equipment.

SPO.150 Documents to be carried

(a) The following documents shall be carried on each flight as originals or copies unless otherwise specified below:

(1) the certificate of registration;

(2) the certificate of airworthiness (CofA);

(3) the original or a copy of the Noise Certificate (if applicable), including an English translation, where one has been provided by the Authority responsible for issuing the noise certificate;

(4) the original or a copy of the specialised operation authorisation;

(5) the list of specific approvals, if applicable;

(6) the aircraft radio licence, if applicable;

(7) the third party liability insurance certificate(s);

(b) In case of loss or theft of documents specified in (a)(1) to (a)(7), the operation may continue until the flight reaches its destination or a place where replacement documents can be provided.

(c) The operator shall make available, within a reasonable time of being requested to do so by the Authority, the documentation required to be carried on board.

(d) Each flight crew member shall, on each flight, carry a valid flight crew licence with appropriate rating(s) for the purpose of the flight.

(e) The Authority may permit the information detailed in sub-paragraph (a) above, or parts thereof, to be presented in a form other than on printed paper. An acceptable standard of accessibility, usability and reliability must be assured.

Note 1: The Certificate of Registration and the Certificate of Airworthiness will now be presented in digital format. The certificates, when issued by the Authority, are rendered valid as the original documents in their digital form. They satisfy the on-board carriage requirements for aircraft engaged in international air navigation in accordance with Articles 29 and 31 of the Convention on International Civil Aviation as well as the requirements of Annex 7 and 8 to the same Convention.

SPO.151 Manuals to be carried

(See AMC1 SPO.151 Manuals to be carried)

(a) The following manuals shall be carried on each flight as originals or copies unless otherwise specified below:

(1) The current parts of the Operations Manual relevant to the duties of the crew are carried on each flight;

(2) Those parts of the Operations Manual which are required for the conduct of a flight are easily accessible to the crew on board the aeroplane; and

(3) the AFM, or equivalent document(s);

(b) Any amendment associated with the authorised standard operating procedures, prior approval shall be obtained before the amendment becomes effective.

(c) The operator shall incorporate all amendments and revisions required by the authority.

(d) The Authority may permit the information detailed in sub-paragraph (a) above, or parts thereof, to be presented in a form other than on printed paper. An acceptable standard of accessibility, usability and reliability must be assured.

SPO.152 Additional Information to be carried

(a) The operator shall ensure that, in addition to the documents and manuals prescribed in SPO.150 Documents to be carried and SPO.151 Manuals to be carried, the following information and forms, relevant to the type and area of operation, are carried on each flight:

(1) the journey log, or equivalent, for the aircraft;

(2) the aircraft technical log, if applicable;

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

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

(5) procedures and visual signals information for use by intercepting and intercepted aircraft;

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

(7) the current parts of the operations manual and/or SOP or AFM that are relevant to the duties of crew members and task specialists, which shall be easily accessible to them;

(8) the MEL or CDL, if applicable;

(9) appropriate notices to airmen (NOTAMs) and aeronautical information service (AIS) briefing documentation;

(10) appropriate meteorological information, if applicable;

(11) mass and balance documentation;

(12) cargo manifests, if applicable; and

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

(b) Any amendment associated with the authorised standard operating procedures, prior approval shall be obtained before the amendment becomes effective.

(c) The operator shall incorporate all amendments and revisions required by the Authority.

(d) The Authority may permit the information detailed in sub-paragraph (a) above, or parts thereof, to be presented in a form other than on printed paper. An acceptable standard of accessibility, usability and reliability must be assured.

SPO.153 Minimum equipment list

(a) The operator shall establish, for each aeroplane, a Minimum Equipment List (MEL) approved by the Authority. This shall be based upon, but no less restrictive than, the relevant Master Minimum Equipment List (MMEL) (if this exists) accepted by the Authority.

(b) The operator shall not operate an aeroplane other than in accordance with the MEL unless permitted by the Authority. Any such permission will in no circumstances permit operation outside the constraints of the MMEL.

(c) Where the Authority is not the State of Registry, the Authority shall ensure that the MEL does not affect the aeroplane's compliance with the airworthiness requirements applicable in the State of Registry.

SPO.154 Journey log

(See AMC1 SPO.154 Journey log)

A commander shall ensure that the Journey log is completed.

SPO.155 Preservation, Production and Use of Flight Recorder Recordings

(a) Preservation of recordings

(1) Flight recorders shall not be switched off during flight time.

(2) To preserve flight recorder records, flight recorders shall be deactivated upon completion of flight time following an accident or incident subject to mandatory reporting. The flight recorders shall not be reactivated before their disposition as determined in accordance with CAR ACC.

(3) Following an accident, the operator of an aircraft on which a flight recorder is carried shall, to the extent possible, preserve the original recorded data pertaining to that accident, as retained by the recorder for a period of 60 days. The flight recorders shall not be reactivated before their disposition as determined by the investigating authority.

(4) Unless prior permission has been granted by the Authority, following an incident that is subject to mandatory reporting, the operator of an aircraft on which a flight recorder is carried shall, to the extent possible, preserve the original recorded data pertaining to that incident, as retained by the recorder for a period of 60 days. The flight recorders shall not be reactivated before their disposition as determined by the investigating authority.

(5) Additionally, when the Authority so directs, the operator of an aircraft on which a flight recorder is carried shall preserve the original recorded data for a period of 60 days unless otherwise directed by the investigating authority.

(6) The operator shall conduct operational checks and evaluations of recordings to ensure the continued serviceability of the flight recorders which are required to be carried.

(7) The operator shall ensure that the recordings of flight parameters and data link communication messages required to be recorded on flight recorders are preserved. However, for the purpose of testing and maintaining those flight recorders, up to 1 hour of the oldest recorded data at the time of testing may be erased.

(8) When a flight data recorder is required to be carried aboard an aircraft, the operator of that aeroplane shall keep a document which presents the information necessary to retrieve and convert the stored data into engineering units. The documentation must be updated at regular intervals and shall contain;

(i) flight data recorder parameter allocations;

(ii) conversion equations;

(iii) periodic calibration records; and

(iv) other serviceability/maintenance information.

(b) Production of recordings. The operator of an aircraft on which a flight recorder is carried shall, within a reasonable time after being requested to do so by the Authority, produce any recording made by a flight recorder which is available or has been preserved.

(c) Use of recordings

(1) The cockpit voice recorder recordings may not be used for purposes other than for the investigation of an accident or incident subject to mandatory reporting except with the consent of all crew members concerned.

(2) The flight data recorder recordings may not be used for purposes other than for the investigation of an accident or incident subject to mandatory reporting except when such records are:

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

(ii) de-identified; or

(iii) disclosed under secure procedures.

SPO.160 Use of Flight Recorder Recordings by the Authority

(a) The Authority shall not allow the use of recordings or transcripts of CVR, CARS, Class A AIR and Class A AIRS for purposes other than the investigation of an accident or incident in accordance with CAR ACC except where the recordings or transcripts:

(1) are related to a safety-related event identified in the context of a safety management system; are restricted to the relevant portions of a de-identified transcript of the recording; and are subject to the protections accorded by Safety Management Systems;

(2) are sought for use in criminal proceedings not related to an event involving an accident or incident investigation and are subject to the protections accorded by Safety Management Systems; or

(3) are used for inspections of flight recorder systems.

Note: When an investigation under CAR ACC, or under ICAO Annex 13 by another State, is instituted, investigation records are subject to the protections accorded by CAR ACC.

(b) The Authority shall not allow the use of recordings or transcripts of FDR, ADRS as well as Class B and Class C AIR and AIRS for purposes other than the investigation of an accident or incident in accordance with CAR ACC, except where the recordings or transcripts are subject to the protections accorded by Safety Management Systems; and:

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

(2) are used by the operator in the operation of a flight data analysis programme required in sub-paragraph (d) above;

(3) are sought for use in proceedings not related to an event involving an accident or incident investigation;

(4) are de-identified; or

(5) are disclosed under secure procedures.

SPO.165 Transport of Dangerous Goods

(a) The transport of dangerous goods by air shall be conducted in accordance with CAR DG as last amended and amplified by the Technical Instructions for the Safe Transport of Dangerous Goods by Air (ICAO Doc 9284-AN/905), including its supplements and any other addenda or corrigenda.

(b) Dangerous goods shall only be transported by the operator approved by the Authority except when;

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

(2) they are carried by task specialists or crew members or are in baggage, in accordance with Part 8 of the Technical Instructions.

(3) required on board the aircraft for specialised purposes in accordance with the Technical Instructions;

(4) they are used to facilitate flight safety where carriage aboard the aircraft is reasonable to ensure their timely availability for operational purposes, whether or not such articles and substances are required to be carried or intended to be used in connection with a particular flight.

(c) The operator shall establish procedures to ensure that all reasonable measures are taken to prevent dangerous goods from being carried on board inadvertently.

(d) The operator shall provide personnel with the necessary information enabling them to carry out their responsibilities, as required by the Technical Instructions.

(e) The operator shall, in accordance with the Technical Instructions, report without delay to the Authority and the appropriate authority of the State of occurrence in the event of:

(1) any dangerous good accident or incidents;

(2) the finding of dangerous goods carried by task specialists or crew, or in their baggage, when not in accordance with Part 8 of the Technical Instructions.

(f) The operator shall ensure that task specialists are provided with information about dangerous goods.

(g) The operator shall ensure that notices giving information about the transport of dangerous goods are provided at acceptance points for cargo as required by the Technical Instructions.

SPO.170 Release of Dangerous Goods

The operator shall not operate an aircraft over congested areas of cities, towns or settlements or over an open-air assembly of persons when releasing dangerous goods.

SPO.175 Carriage and Use of Weapons

(a) The operator shall ensure that, when weapons are carried on a flight for the purpose of a specialised task, these are secured when not in use.

(b) The task specialist using the weapon shall take all necessary measures to prevent the aircraft and persons on board or on the ground from being endangered.

SPO.180 Admission to the Flight Crew Compartment

The pilot-in-command shall make the final decision regarding the admission to the flight crew compartment and shall ensure that:

(a) admission to the flight crew compartment does not cause distraction or interference with the operation of the flight; and

(b) all persons carried in the flight crew compartment are made familiar with the relevant safety procedures.

SUBPART C - OPERATOR PROCEDURES

SPO.200 Management System

(See AMC1 SPO.200(a)(1);(2);(3);(5) Management System & AMC1 SPO.200(a)(1) Management System & AMC1 SPO.200(a)(2) Management System & AMC1 SPO.200(a)(3) Management System & AMC1 SPO.200(a)(4) Management System & AMC1 SPO.200(a)(5) Management System & AMC2 SPO.200(a)(5) Management System & AMC2 SPO.200(a)(6) Management System & AMC1 SPO.200(b) Management System)

(a) The operator shall establish, implement and maintain a management system that includes:

(1) clearly defined lines of responsibility and accountability throughout the operator, including a direct safety accountability of the accountable manager;

(2) a description of the overall philosophies and principles of the operator with regard to safety, referred to as the safety policy;

(3) the identification of aviation safety hazards entailed by the activities of the operator, their evaluation and the management of associated risks, including taking actions to mitigate the risk and verify their effectiveness;

(4) maintaining personnel trained and competent to perform their tasks;

(5) documentation of all management system key processes, including a process for making personnel aware of their responsibilities and the procedure for amending this documentation;

(6) a function to monitor compliance of the operator with the relevant requirements. Compliance monitoring shall include a feedback system of findings to the accountable manager to ensure effective implementation of corrective actions as necessary; and

(7) any additional requirements that are prescribed in the relevant Subparts of this regulation.

(b) The management system shall correspond to the size of the operator and the nature and complexity of its activities, taking into account the hazards and associated risks inherent in these activities.

SPO.205 Contracted Activities

(See AMC1 SPO.205 Contracted activities & AMC2 SPO.205 Contracted activities)

(a) When contracting or purchasing any services or products as a part of its activities, the operator shall ensure all of the following:

(1) that the contracted or purchased services or products comply with the applicable requirements;

(2) that any aviation safety hazards associated with contracted or purchased services or products are considered by the operator's management system.

(b) When the certified operator or the SPO authorisation holder contracts any part of its activity to an organisation that is not itself certified or authorised in accordance with this Part to carry out such activity, the contracted organisation shall work under the approval of the operator. The contracting organisation shall ensure that the Authority is given access to the contracted organisation, to determine continued compliance with the applicable requirements.

SPO.210 Personnel requirements

(See AMC1 SPO.210 Personnel requirements)

(a) The operator shall appoint an accountable manager, who has the authority for ensuring that all activities can be financed and carried out in accordance with the applicable requirements. The

accountable manager shall be responsible for establishing and maintaining an effective management system.

(b) A person or group of persons shall be nominated by the operator, with the responsibility of ensuring that the operator remains in compliance with the applicable requirements. Such person(s) shall be ultimately responsible to the accountable manager.

(c) The operator shall have sufficient qualified personnel for the planned tasks and activities to be performed in accordance with the applicable requirements.

(d) The operator shall maintain appropriate experience, qualification and training records to show compliance with point (c).

(e) The operator shall ensure that all personnel are aware of the rules and procedures relevant to the exercise of their duties.

SPO.215 Facility requirements

The operator shall have facilities allowing the performance and management of all planned tasks and activities in accordance with the applicable requirements.

SPO.220 Record-keeping

(See AMC1 SPO.220(b) Record-keeping & Appendix 1 to SPO.220 Record-keeping)

(a) The operator shall establish a system of record-keeping that allows adequate storage and reliable traceability of all activities developed, covering in particular all the elements indicated in SPO.220 Record-keeping.

(b) The format of the records shall be specified in the operator's procedures.

(c) Records shall be stored in a manner that ensures protection from damage, alteration and theft.

SPO.225 Use of aircraft listed on an AOC for non-commercial operations and specialised operations

(See AMC1 SPO.225(b);(e) Use of aircraft listed on an AOC for non-commercial operations and specialised operations & AMC1 SPO.225(b);(d);(f) Use of aircraft listed on an AOC for non-commercial operations and specialised operations)

(a) Aircraft listed on an operator's AOC may remain on the AOC if it is operated in any of the following situations:

(1) by the AOC holder itself, for specialised operations in accordance with CAR-SPO;

(2) by other operators, for non-commercial operations with motor-powered aircraft or for specialised operations performed in accordance with CAR OPS 2A or CAR OPS 2H as applicable or CAR SPO, provided that the aircraft is used for a continuous period not exceeding 30 days.

(b) When the aircraft is used in accordance with point (a)(2), the AOC holder providing the aircraft and the operator using the aircraft shall establish a procedure:

(1) clearly identifying which operator is responsible for the operational control of each flight and to describe how the operational control is transferred between them;

(2) describing the handover procedure of the aircraft upon its return to the AOC holder.

That procedure shall be included in the operations manual of each operator or in a contract between the AOC holder and the operator using the aircraft in accordance with point (a)(2). The

AOC holder shall establish a template of such contract. Point SPO.220 Record-keeping shall apply to the record-keeping of those contracts.

The AOC holder and the operator using the aircraft in accordance with point (a)(2) shall ensure that the procedure is communicated to the relevant personnel.

(c) The AOC holder shall submit to the authority the procedure referred to in point (b) for prior approval. The AOC holder shall agree with the authority on the means and on the frequency of providing it with information about transfers of operational control.

(d) The continuing airworthiness of the aircraft used in accordance with point (a) shall be managed by the organisation responsible for the continuing airworthiness of the aircraft included in the AOC.

(e) The AOC holder providing the aircraft in accordance with point (a) shall:

(1) indicate in its operations manual the registration marks of the provided aircraft and the type of operations conducted with those aircraft;

(2) remain informed at all times and keep record of each operator that holds the operational control of the aircraft at any given moment until the aircraft is returned to the AOC holder;

(3) ensure that its hazard identification, risk assessment and mitigation measures address all the operations conducted with those aircraft.

(f) For operations under CAR OPS 2A and/or CAR OPS 2H and CAR SPO, the operator using the aircraft in accordance with point (a) shall ensure all of the following:

(1) that every flight conducted under its operational control is recorded in the aircraft technical log system;

(2) that no changes to the aircraft systems or configuration are made;

(3) that any defect or technical malfunction occurring while the aircraft is under its operational control is reported to the organisation referred to in point (d);

(4) that the AOC holder receives a copy of any occurrence report related to the flights performed with the aircraft.

Appendix 1 to SPO.220 Record-keeping

The operator shall ensure that the following information/documentation is stored in an acceptable form, accessible to the Authority, for the periods shown in the Tables below.

Table 1 – Information used for the preparation and execution of a flight

Information used for the preparation and execution of the flight	
Operational flight plan	3 months
Aeroplane Technical Log	36 months after the date of the last entry.
Route specific NOTAM/AIS briefing documentation if edited by the operator	3 months
Mass and balance documentation	3 months
Notification of special loads including written information to the commander about dangerous goods	3 months

Table 2 – Reports

Reports	
Journey log	6 months
Flight report(s) for recording details of any occurrence, or any event which the commander deems necessary to report/record	3 months
Reports on exceedances of duty and/or reducing rest periods	3 months
Fuel and oil records	3 months

Table 3 – Flight crew records

Flight Crew Records	
Flight duty periods, Duty periods and Rest periods	15 months
Licence	As long as the flight crew member is exercising the privileges of the licence for the operator
Conversion training and checking	3 years
Command course (including checking)	3 years
Recurrent training and checking	3 years
Training and checking to operate in either pilot's seat	3 years
Recent experience	15 months
Route and aerodrome competence	3 years
Training and qualification for specific operations when required by OPS (e.g. EDTO, CATII/III operations)	3 years
Dangerous Goods training as appropriate	3 years

Table 4 – Records for other operations personnel

Records for other operations personnel	
Training/qualification records of other personnel for whom an approved training programme is required	Last 2 training records

Table 5 – Other records

Other Records	
Records on cosmic and solar radiation dosage	Until 12 months after the crew member has left the employ of the operator
Quality System records	5 years
Dangerous Goods Transport Document	3 months after completion of the flight
Dangerous Goods Acceptance Checklist	3 months after completion of the flight

SUBPART D - OPERATIONAL PROCEDURES

SPO.300 Use of Aerodrome and Operating Sites

(a) The operator shall only use aerodromes and operating sites that are adequate for the type of aircraft and operation concerned.

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

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

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

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

(1) the overall dimensions of the operating site;

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

(3) approach and take-off flight paths;

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

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

(6) lighting, if applicable;

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

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

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

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

SPO.302 Specification of Isolated Aerodromes – Aeroplanes

For the selection of alternate aerodromes and the fuel policy, the operator shall consider an aerodrome as an isolated aerodrome if the flying time to the nearest adequate destination alternate aerodrome is more than:

(a) for aeroplanes with reciprocating engines, 60 minutes; or

(b) for aeroplanes with turbine engines, 90 minutes.

SPO.304 Aerodrome Operating Minima – Aeroplanes and Helicopters

General

(a) For instrument flight rules (IFR) flights, the operator or the pilot-in-command shall specify aerodrome operating minima for each departure, destination and alternate aerodrome to be used. Such minima shall:

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

(2) when undertaking low visibility operations, be approved by the Authority.

(b) When specifying the aerodrome operating minima, the operator or the pilot-in-command shall take the following into account:

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

(2) the competence and experience of the flight crew and, if applicable, its composition;

(3) the dimensions and characteristics of the runways and final approach and take-off areas (FATOs) that 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, during the take-off, the approach, the flare, the landing, the rollout 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;

(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.

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

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

Take-off

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

(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 weather-permissible 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/VIS along the take-off runway/area is equal to or better than the required minimum.

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

(f) Required RVR/visibility:

(1) Aeroplanes:

(i) For aeroplanes, the take-off minima specified by the operator should be expressed as RVR/VIS values not lower than those specified in Table 6 - Take-off - aeroplanes (without low visibility take-off (LVTO) approval) - RVR/VIS.

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

(2) Helicopters:

(i) For helicopters having a mass where it is possible to reject the take-off and land on the FATO in case of the critical engine failure being recognised at or before the take-off decision point (TDP), the operator should specify an RVR/VIS as take-off minima in accordance with Table 7 - Take-off - helicopters (without LVTO approval) - RVR/Visibility.

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

(iii) Table 10 - CAT I, APV, NPA - aeroplanes for converting reported meteorological visibility to RVR should not be used for calculating take-off minima.

Table 6 - Take-off - aeroplanes (without low visibility take-off (LVTO) approval) - RVR/VIS

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

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

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

Table 7 - Take-off - helicopters (without LVTO approval) - RVR/Visibility

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

Onshore aerodromes with instrument flight rules (IFR) departure procedures	RVR/VIS (m)
Offshore helideck *	
Two-pilot operations	400
Single-pilot operations	500

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

Approach and Landing

(a) The minima for a specific type of approach and landing procedure shall only be used 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 flight crew is qualified appropriately.

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

(c) Whenever practical approaches should be flown as stabilised approaches (SAps). Different procedures may be used for a particular approach to a particular runway.

(d) Whenever practical, 2D 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.

(e) For approaches not flown using the CDFA technique: when calculating the minima, the applicable minimum runway visual range (RVR) should be increased by 200 m for Category A and B aeroplanes and by 400 m for Category C and D aeroplanes, provided the resulting RVR/converted meteorological visibility (CMV) value does not exceed 5 000 m. SAp or CDFA should be used as soon as facilities are improved to allow these techniques.

Criteria for Establishing RVR/CMV

(a) In order to qualify for the lowest allowable values of RVR/CMV specified in Table 10 - CAT I, APV, NPA - aeroplanes, the instrument approach should meet at least the following facility requirements and associated conditions:

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

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

(ii) approach procedure with vertical guidance (APV); and

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

(2) Instrument approach operations flown using the CDFA technique with a nominal vertical profile, up to and including 4.5° for Category A and B aeroplanes, or 3.77° for Category C and D aeroplanes, where the facilities are non-directional beacon (NDB), NDB/distance measuring equipment (DME), VHF omnidirectional radio range (VOR), VOR/DME, localiser (LOC), LOC/DME, VHF direction finder (VDF), surveillance radar approach (SRA) or global

navigation satellite system (GNSS)/lateral navigation (LNAV), with a final approach segment of at least 3 NM, which also fulfil the following criteria:

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

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

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

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

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

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

(a) The minimum RVR/CMV/VIS should be the highest of the values specified in Table 9 - RVR/CMV vs DH/MDH and Table 10 - CAT I, APV, NPA - aeroplanes but not greater than the maximum values specified in Table 10 - CAT I, APV, NPA - aeroplanes, where applicable.

(b) The values in Table 8 - Approach lighting systems should be derived from the formula below:

(1) required RVR/VIS (m) = [(DH/MDH (ft) x 0.3048) / tanα] - length of approach lights (m);

(2) where α is the calculation angle, being a default value of 3.00° increasing in steps of 0.10° for each line in Table 8 - Approach lighting systems up to 3.77° and then remaining constant.

(c) If the approach is flown with a level flight segment at or above MDA/H, 200 m should be added for Category A and B aeroplanes and 400 m for Category C and D aeroplanes to the minimum RVR/CMV/VIS value resulting from the application of Table 9 - RVR/CMV vs DH/MDH and Table 10 - CAT I, APV, NPA - aeroplanes.

(d) An RVR of less than 750 m as indicated in Table 9 - RVR/CMV vs DH/MDH may be used:

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

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

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

(e) Lower values than those specified in Table 9 - RVR/CMV vs DH/MDH may be used for HUDLS and auto-land operations if approved by the authority.

(f) The visual aids should comprise standard runway day markings and approach and runway lights as specified in Table 8 - Approach lighting systems.

(g) For night operations or for any operation where credit for runway and approach lights is required, the lights should be on and serviceable, except as provided for in Table 14 - Failed or downgraded equipment - effect on landing minima.

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

(1) an RVR of less than 800 m as indicated in Table 9 - RVR/CMV vs DH/MDH may be used for CAT I approaches provided any of the following is used at least down to the applicable DH:

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

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

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

(3) an RVR of less than 800 m as indicated in Table 9 - RVR/CMV vs DH/MDH may be used for APV operations to runways with FALS, RTZL and RCLL when using an approved HUDLS, or equivalent approved system, or when conducting a coupled approach to a DH equal to or greater than 250 ft.

Table 8 - Approach lighting systems

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

Note: HIALS: high intensity approach lighting system;

MIALS: medium intensity approach lighting system;

ALS: approach lighting system.

Table 9 - RVR/CMV vs DH/MDH

DH or MDH			Class of lighting facility			
			FALS	IALS	BALS	NALS
			See (d), (e), (h) above for RVR < 750/800 m			
ft			RVR/CMV (m)			
200	-	210	550	750	1 000	1 200
211	-	220	550	800	1 000	1 200
221	-	230	550	800	1 000	1 200
231	-	240	550	800	1 000	1 200
241	-	250	550	800	1 000	1 300
251	-	260	600	800	1 100	1 300
261	-	280	600	900	1 100	1 300
281	-	300	650	900	1 200	1 400
301	-	320	700	1 000	1 200	1 400

DH or MDH			Class of lighting facility			
			FALS	IALS	BALS	NALS
			See (d), (e), (h) above for RVR < 750/800 m			
ft			RVR/CMV (m)			
321	-	340	800	1 100	1 300	1 500
341	-	360	900	1 200	1 400	1 600
361	-	380	1 000	1 300	1 500	1 700
381	-	400	1 100	1 400	1 600	1 800
401	-	420	1 200	1 500	1 700	1 900
421	-	440	1 300	1 600	1 800	2 000
441	-	460	1 400	1 700	1 900	2 100
461	-	480	1 500	1 800	2 000	2 200
481		500	1 500	1 800	2 100	2 300
501	-	520	1 600	1 900	2 100	2 400
521	-	540	1 700	2 000	2 200	2 400
541	-	560	1 800	2 100	2 300	2 500
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 10 - CAT I, APV, NPA - aeroplanes

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

Facility/conditions	RVR/CMV (m)	Aeroplane category			
		A	B	C	D
ILS, MLS, GLS, PAR, GNSS/SBAS, GNSS/VNAV	Min	According to Table 9 - RVR/CMV vs DH/MDH			
	Max	1 500	1 500	2 400,	2 400
NDB, NDB/DME, VOR, VOR/DME, LOC, LOC/DME, VDF, SRA, GNSS/LNAV with a procedure that fulfils the criteria in Criteria for Establishing RVR/CMV (a)(2).	Min	750	750	750	750
	Max	1 500	1 500	2 400	2 400
For NDB, NDB/DME, VOR, VOR/DME, LOC, LOC/DME, VDF, SRA, GNSS/LNAV: — not fulfilling the criteria in Criteria for Establishing RVR/CMV (a)(2) or — with a DH or MDH ≥ 1 200 ft	Min	1 000	1 000	1 200	1 200
	Max	According to Table 9 - RVR/CMV vs DH/MDH, if flown using the CDFA technique, otherwise an add-on of 200/400 m applies to the values in Table 8 - Approach lighting systems but not to result in a value exceeding 5 000 m.			

Determination of RVR/CMV/VIS Minima for NPA, CAT I - Helicopters

(a) For non-precision approach (NPA) operations, the minima specified in Table 11 - Onshore NPA minima should apply:

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

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

(3) for single-pilot operations, the minimum RVR is 800 m or the minima in Table 12 - Onshore CAT I minima, whichever is higher.

(b) For CAT I operations, the minima specified in Table 12 - Onshore CAT I minima should apply:

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

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

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

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

Table 11 - Onshore NPA minima

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

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

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

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

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

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

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

Table 12 - Onshore CAT I minima

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

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

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

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

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

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

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

Conversion of Reported Meteorological Visibility to RVR/CMV

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

(1) when reported RVR is available;

(2) for calculating take-off minima; and

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

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

(c) When converting meteorological visibility to RVR in circumstances other than those in (a), the conversion factors specified in Table 13 - Conversion of reported meteorological visibility to RVR/CMV should be used.

Table 13 - Conversion of reported meteorological visibility to RVR/CMV

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

Effect on Landing Minima of Temporarily Failed or Downgraded Ground Equipment.

(a) General

(1) These instructions are intended for both pre-flight and in-flight use. It is however not expected that the pilot-in-command would consult such instructions after passing 1 000 ft above the aerodrome. If failures of ground aids are announced at such a late stage, the approach could be continued at the pilot-in-command's discretion. If failures are announced before such a late stage in the approach, their effect on the approach should be considered as described in Table 14 - Failed or downgraded equipment - effect on landing minima and, if considered necessary, the approach should be abandoned.

(b) Conditions applicable to Table 14 - Failed or downgraded equipment - effect on landing minima:

(1) multiple failures of runway/FATO lights other than indicated in Table 14 - Failed or downgraded equipment - effect on landing minima should not be acceptable;

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

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

Table 14 - Failed or downgraded equipment - effect on landing minima

Failed or downgraded equipment	Effect on landing minima	
	CAT I	APV, NPA
ILS/MLS standby transmitter	No effect	
Outer marker		APV - not applicable

		NPA with FAF: no effect unless used as FAF
	No effect if replaced by height check at 1 000 ft	If the FAF cannot be identified (e.g. no method available for timing of descent), non-precision operations cannot be conducted
Middle marker	No effect	No effect unless used as MAPt
RVR Assessment Systems	No effect	
Approach lights	Minima as for NALS	
Approach lights except the last 210 m	Minima as for BALS	
Approach lights except the last 420 m	Minima as for IALS	
Standby power for approach lights	No effect	
Edge lights, threshold lights and runway end lights	Day - no effect Night - not allowed	
Centreline lights	No effect if flight director (F/D), HUDLS or auto-land; otherwise RVR 750 m	No effect
Centreline lights spacing increased to 30 m	No effect	
Touchdown zone lights	No effect if F/D, HUDLS or auto-land; otherwise RVR 750 m	No effect
Taxiway lighting system	No effect	

SPO.306 Aerodrome operating minima – NPA, APV, CAT I operations

(a) The decision height (DH) to be used for a non-precision approach (NPA) flown with the continuous descent final approach (CDFA) technique, approach procedure with vertical guidance (APV) or category I (CAT I) operation shall not be lower than the highest of:

(1) the minimum height to which the approach aid can be used without the required visual reference;

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

(3) the published approach procedure DH where applicable;

(4) the system minimum specified in Table 15 – System Minima; or

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

(b) The minimum descent height (MDH) for an NPA operation flown without the CDFA technique shall not be lower than the highest of:

(1) the OCH for the category of aircraft;

(2) the system minimum specified in Table 15 – System Minima; or

(3) the minimum MDH specified in the AFM, if stated.

Table 15 – System Minima

Facility	Lowest DH/MDH (ft)
Instrument landing system (ILS)	200
Global navigation satellite system (GNSS)/satellite-based augmentation system (SBAS) (lateral precision with vertical guidance approach (LPV))	200
GNSS (lateral navigation (LNAV))	250
GNSS/Baro-vertical navigation (VNAV) (LNAV/VNAV)	250
Localiser (LOC) with or without distance measuring equipment (DME)	250
Surveillance radar approach (SRA) (terminating at ½ NM)	250
SRA (terminating at 1 NM)	300
SRA (terminating at 2 NM or more)	350
VHF omnidirectional radio range (VOR)	300
VOR/DME	250
Non-directional beacon (NDB)	350
NDB/DME	300
VHF direction finder (VDF)	350

SPO.308 Aerodrome operating minima – circling operations with aeroplanes

(a) The MDH for a circling operation with aeroplanes shall not be lower than the highest of:

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

(2) the minimum circling height derived from Table 16 - MDH and minimum visibility for circling vs. aeroplane category; or

(3) the DH/MDH of the preceding instrument approach procedure.

(b) The minimum visibility for a circling operation with aeroplanes shall be the highest of:

(1) the circling visibility for the aeroplane category, if published;

(2) the minimum visibility derived from Table 16 - MDH and minimum visibility for circling vs. aeroplane category; or

(3) the runway visual range/converted meteorological visibility (RVR/CMV) of the preceding instrument approach procedure.

Table 16 - MDH and minimum visibility for circling vs. aeroplane category

	Aeroplane category			
	A	B	C	D
MDH (ft)	400	500	600	700
Minimum meteorological visibility (m)	1500	1600	2400	3600

SPO.310 Aerodrome operating minima – onshore circling operations with helicopters

(a) The MDH for an onshore circling operation with helicopters shall not be lower than 250 ft and the meteorological visibility not less than 800 m.

SPO.312 Departure and approach procedures – aeroplanes and helicopters

(a) The pilot-in-command shall use the departure and approach procedures established by the State of the aerodrome if such procedures have been published for the runway or FATO to be used.

(b) The pilot-in-command may deviate from a published departure route, arrival route or approach procedure:

(1) provided obstacle clearance criteria can be observed, full account is taken of the operating conditions and any ATC clearance is adhered to; or

(2) when being radar-vectored by an ATC unit.

(c) The final approach segment shall be flown visually or in accordance with the published approach procedures.

SPO.313 Navigation equipment– aeroplanes and helicopters

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

(1) the ATS flight plan, if applicable; and

(2) the requirements of air traffic services.

except when, if not so precluded by the appropriate authority, navigation for flights under VFR is accomplished by visual reference to landmarks.

(b) An aircraft shall have sufficient navigation equipment to ensure that, in the event of the failure of one item of equipment at any stage of the flight, the remaining equipment shall allow safe navigation in accordance with (a), or an appropriate contingency action, to be completed safely.

Note: For international general aviation, this requirement may be met by means other than the duplication of equipment.

(c) An aircraft operated on flights in which it is intended to land in instrument meteorological conditions, shall be equipped with navigation equipment capable of providing guidance to a point from which a visual landing can be performed. This equipment shall be capable of providing such guidance for each aerodrome or heliport at which is intended to land in instrument meteorological conditions and for any designated alternate aerodromes or heliports.

SPO.314 Performance-based navigation – aeroplanes and helicopters

(a) For operations where a navigation specification for performance-based navigation (PBN) has been prescribed, an aircraft shall, in addition to the requirements specified in SPO.213:

(1) be provided with navigation equipment which will enable it to operate in accordance with the prescribed navigation specification(s);

(2) have information relevant to the aircraft navigation specification capabilities listed in the flight manual or other aircraft documentation, approved by the State of Design or State of Registry; and

(3) where the aircraft is operated in accordance with a MEL, have information relevant to the aircraft navigation specification capabilities included in the MEL.

(b) The Authority, as the State of Registry, shall establish criteria for operations where a navigation specification for PBN has been prescribed.

(c) When establishing criteria for operations where a navigation specification for PBN has been prescribed, ensure that the operator/owner has established and documented:

(1) normal and abnormal procedures, including contingency procedures;

(2) flight crew qualification and proficiency requirements, in accordance with appropriate navigation specifications;

(3) a training programme for relevant personnel consistent with the intended operations; and

(4) appropriate maintenance procedures to ensure continued airworthiness, in accordance with appropriate navigation specifications.

(d) The Authority, as the State of Registry, shall issue a specific approval for operations based on PBN authorisation required (AR) navigation specifications.

SPO.316 Noise abatement procedures

(See AC1 SPO.316 Noise abatement procedures)

(a) The pilot-in-command shall take into account published noise abatement procedures to minimise the effect of aircraft noise while ensuring that safety has priority over noise abatement.

(b) For each aeroplane type two departure procedures should be defined, in accordance with ICAO Doc. 8168 (Procedures for Air Navigation Services, 'PANS-OPS'), Volume I:

(1) noise abatement departure procedure one (NADP 1), designed to meet the close-in noise abatement objective; and

(2) noise abatement departure procedure two (NADP 2), designed to meet the distant noise abatement objective.

(c) For each type of NADP (1 and 2), a single climb profile should be specified for use at all aerodromes, which is associated with a single sequence of actions. The NADP 1 and NADP 2 profiles may be identical.

SPO.318 Minimum obstacle clearance altitudes – IFR flights

(a) The operator shall specify a method to establish minimum flight altitudes that provide the required terrain clearance for all route segments to be flown in IFR.

(b) The pilot-in-command shall establish minimum flight altitudes for each flight based on this method. The minimum flight altitudes shall not be lower than those published by the State overflown.

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

SPO.320 Fuel and oil supply – aeroplanes

(a) A flight shall not be commenced unless, taking into account both the meteorological conditions and any delays that are expected in flight, the aeroplane carries sufficient fuel and oil to ensure that it can safely complete the flight.

(b) The pilot-in-command shall only commence a flight if the aeroplane carries sufficient fuel and oil for the following:

(1) for visual flight rules (VFR) flights:

(i) by day, to fly to the aerodrome of intended landing and thereafter to fly for at least 30 minutes at normal cruising altitude; or

(ii) by night, to fly to the aerodrome of intended landing and thereafter to fly for at least 45 minutes at normal cruising altitude;

(2) for IFR flights:

(i) when no destination alternate is required, to fly to the aerodrome of intended landing and thereafter to fly for at least 45 minutes at normal cruising altitude; or

(ii) when a destination alternate is required, to fly to the aerodrome of intended landing, to an alternate aerodrome and thereafter to fly for at least 45 minutes at normal cruising altitude.

(c) In computing the fuel required, including providing for contingency, the following shall be taken into consideration:

(1) forecast meteorological conditions;

(2) anticipated ATC routings and traffic delays;

(3) procedures for loss of pressurisation or failure of one engine while en-route, where applicable; and

(4) any other condition that may delay the landing of the aeroplane or increase fuel and/or oil consumption.

(d) Nothing shall preclude amendment of a flight plan in-flight, in order to re-plan the flight to another destination, provided that all requirements can be complied with from the point where the flight is re-planned.

SPO.322 Fuel and oil supply – helicopters

(See AMC1 SPO.322 (b)(1)(ii) Fuel and oil supply – helicopters)

(a) A flight shall not be commenced unless, taking into account both the meteorological conditions and any delays that are expected in flight, the helicopter carries sufficient fuel and oil to ensure that it can safely complete the flight. In addition, a reserve shall be carried to provide for contingencies.

(b) The pilot-in-command shall only commence a flight if the helicopter carries sufficient fuel and oil for the following:

(1) for VFR flights:

(i) to fly to the aerodrome/operating site of intended landing and thereafter to fly for at least 20 minutes at best-range-speed; or

(ii) for VFR flights by day, a reserve fuel of 10 minutes at best-range-speed provided that he remains within 25 NM of the aerodrome/operating site of departure; and

(2) for IFR flights:

(i) when no alternate is required or no weather-permissible alternate aerodrome is available, to fly to the aerodrome/operating site of intended landing, and thereafter to fly for 30 minutes at normal cruising speed at 450 m (1 500 ft) above the destination aerodrome/operating site under standard temperature conditions and approach and land; or

(ii) 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:

(A) to fly to the specified alternate; and

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

(c) In computing the fuel required, including providing for contingency, the following shall be taken into consideration:

(1) forecast meteorological conditions;

(2) anticipated ATC routings and traffic delays;

(3) failure of one engine while en-route, where applicable; and

(4) any other condition that may delay the landing of the aircraft or increase fuel and/or oil consumption.

(d) Nothing shall preclude amendment of a flight plan in-flight, in order to re-plan the flight to another destination, provided that all requirements can be complied with from the point where the flight is re-planned.

SPO.324 Safety briefing

(See AMC1 SPO.324 Safety briefing)

(a) The operator shall ensure that, prior to take-off task specialists are given a briefing on:

(1) emergency equipment and procedures;

(2) operational procedures associated with the specialised task before each flight or series of flights

(b) The briefing referred to in (a)(2) may be replaced by an initial and recurrent training programme. In such case the operator shall also define recency requirements.

SPO.326 Flight preparation

(a) Before commencing a flight, the pilot-in-command shall ascertain by every reasonable means available that the space-based facilities, ground and/or water facilities, including communication facilities and navigation aids available and directly required on such flight, for the safe operation of the aircraft, are adequate for the type of operation under which the flight is to be conducted.

(b) Before commencing a flight, the pilot-in-command shall be familiar with all available meteorological information appropriate to the intended flight. Preparation for a flight away from the vicinity of the place of departure, and for every flight under IFR, shall include:

(1) a study of available current weather reports and forecasts; and

(2) the planning of an alternative course of action to provide for the eventuality that the flight cannot be completed as planned, because of weather conditions.

SPO.328 Take-off alternate aerodromes

(a) For IFR flights, the pilot-in-command shall specify at least one weather-permissible take-off alternate aerodrome 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) for aeroplanes having two engines, not more than a distance equivalent to a flight time of 1 hour at the single-engine cruise speed in still air standard conditions; and

(2) for aeroplanes having three or more engines, not more than a distance equivalent to a flight time of 2 hours at the one-engine-inoperative (OEI) cruise speed according to the AFM in still air standard conditions.

(c) For an aerodrome to be selected as a take-off alternate aerodrome 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.

SPO.330 Destination alternate aerodromes – aeroplanes

For IFR flights, the pilot-in-command shall specify at least one weather-permissible destination alternate aerodrome in the flight plan, unless:

(a) the duration of the flight from the departure aerodrome, or from the point of in-flight re-planning, to the destination aerodrome is such that, taking into account all meteorological conditions and operational information relevant to the flight, at the estimated time of use, a reasonable certainty exists that;

(1) the approach and landing may be made under visual meteorological conditions (VMC); and

(2) separate runways are usable at the estimated time of use of the destination aerodrome with at least one runway having an operational instrument approach procedures; or

Note: Separate runways are two or more runways at the same aerodrome configured such that if one runway is closed, operations to the other runway(s) can be conducted.

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

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

(2) a point of no return has been determined; and

(3) a flight shall not be continued past the point of no return unless available current meteorological information indicates that the following meteorological conditions will exist at the estimated time of use:

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

(ii) visibility of at least 5,5 km (3 nm) or of 4 km (2 nm) more than the minimum associated with the procedure.

SPO.332 Destination alternate aerodromes – helicopters

For IFR flights, the pilot-in-command shall specify at least one weather-permissible destination alternate aerodrome in the flight plan, unless:

(a) the duration of the flight from the departure aerodrome, or from the point of in-flight re-planning, to the destination aerodrome is such that, taking into account all meteorological conditions and operational information relevant to the flight, at the estimated time of use, a reasonable certainty exists that;

(1) a cloud base of at least 120 m (400 ft) above the minimum associated with the instrument approach procedure; and

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

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

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

(2) a point of no return has been determined; and

(3) a flight shall not be continued past the point of no return unless available current meteorological information indicates that the following meteorological conditions will exist at the estimated time of use:

(i) the cloud base is at least 120 m (400 ft) above the minimum associated with the instrument approach procedure;

(ii) visibility is at least 1 500 m more than the minimum associated with the procedure.

SPO.334 Destination aerodromes – instrument approach operations

(See AMC1 SPO.334 Destination aerodromes – instrument approach operations)

The pilot-in-command shall ensure that sufficient means are available to navigate and land at the destination aerodrome or at any destination alternate aerodrome in the case of loss of capability for the intended approach and landing operation.

SPO.336 Refuelling with persons embarking, on board or disembarking

(See AMC1 SPO.336 Refuelling with persons embarking, on board or disembarking)

(a) The aircraft shall not be refuelled with aviation gasoline (AVGAS) or wide-cut type fuel or a mixture of these types of fuel, when persons are embarking, on board or disembarking.

(b) For all other types of fuel, necessary precautions shall be taken and the aircraft shall be properly manned by qualified personnel ready to initiate and direct an evacuation of the aircraft by the most practical and expeditious means available.

SPO.338 Use of headset

Each flight crew member required to be on duty in the flight crew compartment shall wear a headset with boom microphone or equivalent and use it as the primary device to communicate with ATS, other crew members and task specialists.

SPO.340 Smoking

(a) The pilot-in-command shall not allow smoking on board;

(1) during refuelling or defuelling of the aircraft;

(2) while the aeroplane is on the ground unless specifically permitted in accordance with procedures defined in the Operations Manual;

(3) outside designated smoking areas, in the aisle(s) and in the toilet(s);

(4) in cargo compartments and/or other areas where cargo is carried which is not stored in flame resistant containers or covered by flame resistant canvas;

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

(6) whenever deemed necessary in the interest of safety.

SPO.342 Meteorological conditions

(See AMC1 SPO.342 Meteorological conditions)

(a) The pilot-in-command shall only commence or continue a VFR flight if the latest available meteorological information indicates that the weather conditions along the route and at the intended destination at the estimated time of use will be at or above the applicable VFR operating minima.

(b) The pilot-in-command shall only commence or continue an IFR flight towards the planned destination aerodrome if 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.

(c) If a flight contains VFR and IFR segments, the meteorological information referred to in (a) and (b) shall be applicable as far as relevant.

SPO.344 Ice and other contaminants – ground procedures

(See AC1 SPO.344 Ice and other contaminants – ground procedures)

(a) The pilot-in-command shall only commence take-off if the aircraft is clear of any deposit that might adversely affect the performance or controllability of the aircraft, except as permitted in the AFM.

(b) The operator shall establish procedures to be followed when ground de-icing and anti-icing and related inspections of the aircraft are necessary to allow the safe operation of the aircraft.

SPO.346 Ice and other contaminants – flight procedures

(See AMC1 SPO.346 Ice and other contaminants – flight procedures)

(a) The pilot-in-command shall only commence a flight or intentionally fly into expected or actual icing conditions if the aircraft is certified and equipped to cope with such conditions.

(b) If icing exceeds the intensity of icing for which the aircraft is certified or if an aircraft not certified for flight in known icing conditions encounters icing, the pilot-in-command shall exit the icing conditions without delay, by a change of level and/or route, and if necessary by declaring an emergency to ATC.

(c) The operator shall establish procedures for flights in expected or actual icing conditions.

SPO.348 Take-off conditions – aeroplanes and helicopters

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

(a) according to the information available, the weather at the aerodrome or operating site and the condition of the runway or FATO intended to be used would not prevent a safe take-off and departure; and

(b) applicable aerodrome operating minima will be complied with.

SPO.350 Simulated situations in flight

Unless a task specialist is on-board the aircraft for training, the pilot-in-command shall, when carrying task specialists, not simulate:

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

(b) flight in instrument meteorological conditions (IMC).

SPO.352 In-flight fuel management

(a) The pilot-in-command shall monitor the amount of usable fuel remaining on board to ensure it is not less than the fuel required to proceed to an aerodrome where a safe landing can be made with the planned final reserve fuel remaining.

Note: The protection of final reserve fuel is intended to ensure safe landing at any aerodrome when unforeseen occurrences may not permit a safe completion of an operation as originally planned.

(b) The pilot-in-command shall advise ATC of a minimum fuel state by declaring MINIMUM FUEL when, having committed to land at a specific aerodrome, the pilot calculates that any change to the existing clearance to that aerodrome, or other air traffic delays, may result in landing with less than the planned final reserve fuel.

Note: The declaration of MINIMUM FUEL informs ATC that all planned aerodrome options have been reduced to a specific aerodrome that no aerodrome is available, and any change to the existing clearance, or air traffic delays, may result in landing with less than the planned final reserve fuel. This is not an emergency situation but an indication that an emergency situation is possible should any additional delay occur.

(c) The pilot-in-command shall declare a situation of fuel emergency by broadcasting MAYDAY MAYDAY MAYDAY FUEL, when the calculated usable fuel estimated to be available upon landing at the nearest landing site where a safe landing can be made is less than the required final reserve fuel.

Note 1: The planned final reserve fuel is the minimum amount of fuel required upon landing. The declaration of MAYDAY MAYDAY MAYDAY FUEL informs ATC that all available landing options have been reduced to a specific aerodrome and a portion of the final reserve fuel may be consumed prior to landing.

Note 2: The pilot estimates with reasonable certainty that the fuel remaining upon landing at the nearest aerodrome will be less than the final reserve fuel taking into consideration the latest information available to the pilot, the area to be overflown, meteorological conditions and other reasonable contingencies.

(d) The use of fuel after flight commencement for purposes other than originally intended during pre-flight planning shall require a re-analysis and, if applicable, adjustment of the planned operation.

SPO.354 Use of supplemental oxygen

(a) The operator shall ensure that task specialists and crew members use supplemental oxygen continuously whenever the cabin altitude exceeds 10 000 ft for a period of more than 30 minutes and whenever the cabin altitude exceeds 13 000 ft, unless otherwise approved by the Authority and in accordance with SOPs.

(b) Notwithstanding (a) and except for parachute operations, short excursions of a specified duration above 13 000 ft without using supplemental oxygen may be undertaken with a prior approval of the Authority based on the consideration of the following:

(1) the duration of the excursion above 13 000 ft is not more than 10 minutes or, if needed for a longer period, the time strictly necessary to the accomplishment of the specialised task;

(2) the flight is not conducted above 16 000 ft;

(3) the safety briefing in accordance with SPO.224 includes adequate information to crew members and tasks specialists on the effects of hypoxia;

(4) SOPs for the concerned operation reflecting (1), (2) and (3);

(5) the previous experience of the operator in conducting operations above 13 000 ft without using supplemental oxygen;

(6) the individual experience of crew members and task specialists and their physiological adaptation to high altitudes; and

(7) the altitude of the base where the operator is established or the operations are conducted from.

SPO.356 Ground proximity detection

(See AC1 SPO.356 Ground proximity detection)

(a) When undue proximity to the ground is detected by a flight crew member or by a ground proximity warning system, the pilot flying shall take corrective action immediately in order to establish safe flight conditions.

(b) The ground proximity warning system may be disabled during those specialised tasks, which by their nature require the aircraft to be operated within a distance from the ground below that which would trigger the ground proximity warning system.

SPO.358 Airborne collision avoidance system (ACAS)

(See AC1 SPO.358 Airborne collision avoidance system (ACAS))

(a) The operator shall establish operational procedures and training programmes when ACAS is installed and serviceable so that the flight crew is appropriately trained in the avoidance of collisions and competent in the use of ACAS II equipment.

(b) The ACAS II may be disabled during those specialised tasks, which by their nature require the aircraft to be operated within a distance from each other below that which would trigger the ACAS.

SPO.360 Approach and landing conditions – aeroplanes

(See AMC1 SPO.360 Approach and landing conditions – aeroplanes and helicopters)

Before commencing an approach to land, the pilot-in-command shall be satisfied that, according to the information available, the weather at the aerodrome or the operating site and the condition of the runway intended to be used would not prevent a safe approach, landing or missed approach.

SPO.362 Approach and landing conditions – helicopters

Before commencing an approach to land, the pilot-in-command shall be satisfied that, according to the information available, the weather at the aerodrome or the operating site and the condition of the final approach and take-off area (FATO) intended to be used would not prevent a safe approach, landing or missed approach.

SPO.364 Commencement and continuation of approach – aeroplanes and helicopters

(See AMC1 SPO.364 Commencement and continuation of approach – aeroplanes and helicopters)

(a) The pilot-in-command may commence an instrument approach regardless of the reported runway visual range/visibility (RVR/VIS).

(b) If the reported RVR/VIS is less than the applicable minimum, the approach shall not be continued:

(1) below 1 000 ft above the aerodrome; or

(2) into the final approach segment in the case where the decision altitude/height (DA/H) or minimum descent altitude/height (MDA/H) is more than 1 000 ft above the aerodrome,

(c) Where the RVR is not available, RVR values may be derived by converting the reported visibility.

(d) If, after passing 1 000 ft above the aerodrome, the reported RVR/VIS falls below the applicable minimum, the approach may be continued to DA/H or MDA/H.

(e) Where no outer marker or equivalent position exists, the commander or the pilot to whom conduct of the flight has been delegated shall make the decision to continue or abandon the approach before descending below 1 000 ft above the aerodrome on the final approach segment. If the MDA/H is at or above 1 000 ft above the aerodrome, the operator shall establish a height, for each approach procedure, below which the approach shall not be continued if the RVR/visibility is less than the applicable minima.

(f) The approach may be continued below DA/H or MDA/H and the landing may be completed provided that the visual reference adequate for the type of approach operation and for the intended runway is established at the DA/H or MDA/H and is maintained.

(g) In all cases above, an aeroplane shall not continue its approach to land at any aerodrome beyond a point at which the limits of the operating minima specified for that aerodrome would be infringed.

(h) The touchdown zone RVR shall always be controlling. If reported and relevant, the midpoint and stop end RVR are also controlling. The minimum RVR value for the mid-point is 125 m or the RVR required for the touch-down zone if less, and 75 m for the stop-end. For aeroplanes equipped with a roll-out guidance or control system, the minimum RVR value for the mid-point is 75 m.

Note. "Relevant", in this context, means that part of the runway used during the high speed phase of the landing down to a speed of approximately 60 knots.

(i) An approach to land shall not be continued below 300 m (1 000 ft) above aerodrome elevation unless the commander is satisfied that, with the runway surface condition information available, the aeroplane performance information indicates that a safe landing can be made.

SPO.366 Standard operating procedures

(See AMC1 SPO.366 Standard operating procedures & AMC2 SPO.366 Standard operating procedures)

(a) Before commencing a specialised operation, the operator shall conduct a risk assessment, assessing the complexity of the activity to determine the hazards and associated risks inherent in the operation and establish mitigating measures.

(b) Based on the risk assessment, the operator shall establish standard operating procedures (SOP) appropriate to the specialised activity and aircraft used taking account of the requirements of subpart E. The SOP shall be part of the operations manual or a separate document. SOP shall be regularly reviewed and updated, as appropriate.

(c) The operator shall ensure that specialised operations are performed in accordance with SOP.

SUBPART E – AIRCRAFT PERFORMANCE AND OPERATING LIMITATIONS

SPO.400 Operating limitations – all aircraft

(a) During any phase of operation, the loading, the mass and the centre of gravity (CG) position of the aircraft shall comply with any limitation specified in the appropriate manual.

(b) Placards, listings, instrument markings, or combinations thereof, containing those operating limitations prescribed by the AFM for visual presentation, shall be displayed in the aircraft.

SPO.405 Mass and balance

(See AC1 SPO.405 Mass and balance & AMC1 SPO.405(b) Mass and balance)

(a) The operator shall ensure that the mass and the CG of the aircraft have been established by actual weighing prior to the initial entry into service of the aircraft. The accumulated effects of modifications and repairs on the mass and balance shall be accounted for and properly documented. Such information shall be made available to the pilot-in-command. The aircraft shall be reweighed if the effect of modifications on the mass and balance is not accurately known.

(b) The weighing shall be accomplished by the manufacturer of the aircraft or by an approved maintenance organisation.

SPO.410 Mass and balance system

(See AMC1 SPO.410(a)(1) Mass and balance system & AMC1 SPO.410(a)(2) Mass and balance system & AC1 SPO.410(a)(2) Mass and balance system & AMC1 SPO.410(a)(3) Mass and balance system & AC1 SPO.410(a)(3) Mass and balance system & AMC1 SPO.410(a)(4) Mass and balance system & AC1 SPO.410(b) Mass and balance system)

(a) The operator shall establish a mass and balance system in order to determine for each flight or series of flights the following:

  (1) aircraft dry operating mass;

  (2) mass of the traffic load;

  (3) mass of the fuel load;

  (4) aircraft load and load distribution;

  (5) take-off mass, landing mass and zero fuel mass;

  (6) applicable aircraft CG positions.

(b) The flight crew shall be provided with a means of replicating and verifying any mass and balance computation based on electronic calculations.

(c) The operator shall establish procedures to enable the pilot-in-command to determine the mass of the fuel load by using the actual density or, if not known, the density calculated in accordance with a method specified in the operations manual.

(d) The pilot-in-command shall ensure that the loading of:

  (1) the aircraft is performed under the supervision of qualified personnel; and

  (2) traffic load is consistent with the data used for the calculation of the aircraft mass and balance.

(e) The operator shall specify, in the operations manual, the principles and methods involved in the loading and in the mass and balance system that meet the requirements contained in (a) to (d). This system shall cover all types of intended operations.

SPO.415 Mass and balance data and documentation

(See AC1 SPO.415 Mass and balance data and documentation & AMC1 SPO.415(b) Mass and balance data and documentation & AMC2 SPO.415(b) Mass and balance data and documentation & AC1 SPO.415(b) Mass and balance data and documentation & AC2 SPO.415(b) Mass and balance data and documentation)

(a) The operator shall establish mass and balance data and produce mass and balance documentation prior to each flight, or series of flights, specifying the load and its distribution in such a way that the mass and balance limits of the aircraft are not exceeded. The mass and balance documentation shall contain the following information:

(1) aircraft registration and type;

(2) flight identification, number and date, as applicable;

(3) name of the pilot-in-command;

(4) name of the person who prepared the document;

(5) dry operating mass and the corresponding CG of the aircraft;

(6) mass of the fuel at take-off and the mass of trip fuel;

(7) mass of consumables other than fuel, if applicable;

(8) load components;

(9) take-off mass, landing mass and zero fuel mass;

(10) applicable aircraft CG positions; and

(11) the limiting mass and CG values.

(b) Where mass and balance data and documentation is generated by a computerised mass and balance system, the operator shall verify the integrity of the output data.

SPO.416 Mass and balance data and documentation – alleviations

Notwithstanding SPO.415 Mass and balance data and documentation(a)(5), the CG position may not need not be on the mass and balance documentation, if 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.

SPO.420 Performance – general

The pilot-in-command shall only operate the aircraft 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 or operating sites used, taking into account the charting accuracy of any charts and maps used.

SPO.425 Take-off mass limitations

The operator shall ensure that:

(a) the mass of the aeroplane at the start of take-off shall not exceed the mass limitations:

(1) at take-off, as required in SPO.430 Take-off

(2) en-route with one engine inoperative (OEI), as required in SPO.435 En-route – one engine inoperative; and

(3) at landing, as required in SPO.440 Landing,

allowing for expected reductions in mass as the flight proceeds, and for fuel jettisoning;

(b) the mass at the start of take-off shall never exceed the maximum take-off mass specified in the AFM for the pressure altitude appropriate to the elevation of the aerodrome or operating site, and if used as a parameter to determine the maximum take-off mass, any other local atmospheric condition; and

(c) the estimated mass for the expected time of landing at the aerodrome or operating site of intended landing and at any destination alternate aerodrome shall never exceed the maximum landing mass specified in the AFM for the pressure altitude appropriate to the elevation of those aerodromes or operating sites and if used as a parameter to determine the maximum landing mass, any other local atmospheric condition.

SPO.430 Take-off

(See AMC1 SPO.430(a) Take-off & AMC1 SPO.430(a)(4) Take-off & AC1 SPO.430(a)(4) Take-off & AMC1 SPO.430(b)(2) Take-off & AC1 SPO.430(b)(2) Take-off)

(a) When determining the maximum take-off mass, the pilot-in-command shall take the following into account:

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

(3) a single value of V1 shall be used for the rejected and continued take-off, where a V1 is specified in the AFM; 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.

(b) Except for an aeroplane equipped with turboprop engines and a maximum take-off mass at or below 5 700 kg, in the event of an engine failure during take-off, the pilot-in-command shall ensure that the aeroplane is able:

(1) to discontinue the take-off and stop within the accelerate-stop distance available or the runway available; or

(2) to 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 SPO.435 En-route – one engine inoperative.

SPO.435 En-route – one engine inoperative

The pilot-in-command shall ensure that in the event of an engine becoming inoperative at any point along the route, a multi-engined aeroplane shall be able to continue the flight to an adequate aerodrome or operating site without flying below the minimum obstacle clearance altitude at any point.

SPO.440 Landing

(See AMC1 SPO.440 Landing & AMC2 SPO.440 Landing)

The pilot-in-command shall ensure that at any aerodrome or operating site, after clearing all obstacles in the approach path by a safe margin, the aeroplane shall be able to land and stop, or a seaplane to come to a satisfactory low speed, within the landing distance available. Allowance shall be made for expected variations in the approach and landing techniques if such allowance has not been made in the scheduling of performance data.

SPO.445 Performance and operating criteria – aeroplanes

(See AMC1 SPO.445(a) and (b) Performance and operating criteria – aeroplanes, and AMC1 SPO.446(b)(1) and (2) Performance and operating criteria – helicopters)

When operating an aeroplane at a height of less than 150 m (500 ft) above a non-congested area, for operations of aeroplanes that are not able to sustain level flight in the event of a critical engine failure, the operator shall:

(a) establish operational procedures to minimise the consequences of an engine failure;

(b) establish a training programme for crew members; and

(c) ensure that all crew members and task specialists on board are briefed on the procedures to be carried out in the event of a forced landing.

SPO.446 Performance and operating criteria – helicopters

(See AMC1 SPO.446(c) Performance and operating criteria – helicopters & AC1 SPO.446(c) Performance and operating criteria – helicopters)

(a) The pilot-in-command may operate an aircraft over congested areas provided that:

  (1) the helicopter is certified in category A or B; and

  (2) safety measures are established to prevent undue hazard to persons or property on the ground and the operation and its SOP is authorised.

(b) The operator shall:

  (1) establish operational procedures to minimise the consequences of an engine failure;

  (2) establish a training programme for crew members; and

  (3) ensure that all crew members and task specialists on board are briefed on the procedures to be carried out in the event of a forced landing.

(c) The operator shall ensure that the mass at take-off, landing or hover shall not exceed the maximum mass specified for:

  (1) a hover out of ground effect (HOGE) with all engines operating at the appropriate power rating; or

  (2) if conditions prevail that a HOGE is not likely to be established, the helicopter mass shall not exceed the maximum mass specified for a hover in ground effect (HIGE) with all engines operating at the appropriate power rating, provided prevailing conditions allow a hover in ground effect at the maximum specified mass.

SUBPART F – INSTRUMENTS, DATA AND EQUIPMENT

SECTION 1 – AEROPLANES

SPO.A.500 Instruments and equipment – general

(a) The operator shall ensure that a flight does not commence unless the instruments and equipment required under this Subpart are:

(1) approved, except as specified in sub-paragraph (d), and installed in accordance with the requirements applicable to them, including the minimum performance standard and the operational and airworthiness requirements; and

(2) in operable condition for the kind of operation being conducted except as provided in the MEL.

(b) Instruments and equipment minimum performance standards are those prescribed in the applicable Technical Standard Orders (TSO) unless different performance standards are prescribed in the operational or airworthiness codes. Instruments and equipment complying with design and performance specifications other than TSO may remain in service, or be installed, unless additional requirements are prescribed in this Subpart. Instruments and equipment that have already been approved do not need to comply with a revised TSO or a revised specification, other than TSO, unless a retroactive requirement is prescribed.

(c) Instruments and equipment required by this Subpart shall be approved in accordance with the applicable airworthiness requirements if they are:

(1) used by the flight crew to control the flight path;

(2) used to comply with SPO.A.615 Radio communication equipment;

(3) used to comply with SPO.A.620 Navigation equipment; or

(4) installed in the aeroplane.

(d) The following items, when required under this Subpart, do not need an equipment approval:

(1) spare fuses;

(2) independent portable lights;

(3) an accurate time piece;

(4) chart holder;

(5) first-aid kits;

(6) emergency medical kit;

(7) megaphones;

(8) survival and pyrotechnic signalling equipment;

(9) sea anchor and equipment for mooring;

(10) child restraint devices;

(11) a simple PCDS used by a task specialist as a restraint device.

(e) Instruments, equipment or accessories not required under this CAR SPO as well as any other equipment which is not required under this Regulation, but carried on a flight, shall comply with the following requirements:

(1) the information provided by those instruments, equipment or accessories shall not be used by the flight crew members to comply with equipment and SPO.A.620 Navigation equipment of this regulation;

(2) the instruments, equipment or accessories shall not affect the airworthiness of the aeroplane, even in the case of failures or malfunction.

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

(g) Those instruments that are used by a flight crew member shall be so arranged as to permit the flight crew member to see the indications readily from his/her station, with the minimum practicable deviation from the position and line of vision which he normally assumes when looking forward along the flight path.

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

SPO.A.505 Minimum equipment for flight

A flight shall not be commenced when any of the aeroplane's instruments, items of equipment or functions required for the intended flight are inoperative or missing, unless either of the following conditions is fulfilled:

(a) the aeroplane is operated in accordance with the minimum equipment list (MEL);

(b) the operator is approved by the Authority to operate the aeroplane within the constraints of the master minimum equipment list (MMEL); or

(c) the aeroplane is subject to a permit to fly issued in accordance with the applicable airworthiness requirements.

SPO.A.510 Spare electrical fuses

Where the aeroplane is fitted with fuses that are accessible in flight, spare electrical fuses of appropriate ratings for replacement of those fuses.

SPO.A.515 Operating lights

Aeroplanes operated at night shall be equipped with:

(a) an anti-collision light system;

(b) navigation/position lights;

(c) a landing light;

(d) 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;

(e) lighting supplied from the aeroplane's electrical system to provide illumination in all cabin compartments;

(f) an independent portable light for each crew member station; and

(g) lights to conform with the International Regulations for Preventing Collisions at Sea if the aeroplane is operated as a seaplane.

SPO.A.520 Operations under VFR – flight and navigational instruments and associated equipment

(See AMC1 SPO.A.520 & SPO.A.525 Operations under VFR & operations under IFR – flight and navigational instruments and associated equipment & AMC2 SPO.A.520/SPO.A.525 Flight and Navigational Instruments and Associated Equipment & AMC1 SPO.A.520(a)(9) & SPO.A.525(a)(9) & AMC1 SPO.A.520(h) & SPO.A.525(s) & AMC1 SPO.A.520(d) & SPO.A.525(k)(2))

(a) The operator shall not operate an aeroplane by day in accordance with Visual Flight Rules (VFR) unless it is equipped with the flight and navigational instruments and associated equipment and, where applicable, under the conditions stated in the following sub-paragraphs:

(1) A magnetic compass;

(2) An accurate timepiece showing the time in hours, minutes, and seconds;

(3) A sensitive pressure altimeter calibrated in feet with a sub-scale setting, calibrated in hectopascals/millibars, adjustable for any barometric pressure likely to be set during flight;

(4) An airspeed indicator calibrated in knots;

(5) A vertical speed indicator;

(6) A turn and slip indicator, or a turn co-ordinator incorporating a slip indicator;

(7) An attitude indicator;

(8) A stabilised direction indicator; and

(9) A means of indicating in the flight crew compartment the outside air temperature calibrated in degrees Celsius.

(b) For flights which do not exceed 60 minutes duration, which take-off and land at the same aerodrome, and which remain within 50 NM of that aerodrome, the instruments prescribed in sub-paragraphs (6), (7) and (8) above, and sub-paragraphs (c)(4), (c)(5) and (c)(6) below, may all be replaced by either a turn and slip indicator, or a turn co-ordinator incorporating a slip indicator, or both an attitude indicator and a slip indicator.

(c) Whenever two pilots are required the second pilot's station shall have separate instruments as follows:

(1) A sensitive pressure altimeter calibrated in feet with a sub-scale setting calibrated in hectopascals/millibars, adjustable for any barometric pressure likely to be set during flight;

(2) An airspeed indicator calibrated in knots;

(3) A vertical speed indicator;

(4) A turn and slip indicator, or a turn co-ordinator incorporating a slip indicator;

(5) An attitude indicator; and

(6) A stabilised direction indicator.

(d) Each airspeed indicating system must be equipped with a heated pitot tube or equivalent means for preventing malfunction due to either condensation or icing for:

(1) Aeroplanes with a maximum certificated take-off mass in excess of 5 700 kg or having a maximum approved passenger seating configuration of more than 9;

(2) Aeroplanes first issued with an individual certificate of airworthiness on or after 1 April 1999.

(e) Whenever duplicate instruments are required, the requirement embraces separate displays for each pilot and separate selectors or other associated equipment where appropriate.

(f) All aeroplanes must be equipped with means for indicating when power is not adequately supplied to the required flight instruments; and

(g) All aeroplanes with compressibility limitations not otherwise indicated by the required airspeed indicators shall be equipped with a Mach number indicator at each pilot's station.

(h) The operator shall not conduct day VFR operations unless the aeroplane is equipped with a headset with boom microphone or equivalent for each flight crew member on flight deck duty.

(i) VFR flights which are operated as controlled flights shall be equipped in accordance with SPO.A.525.

SPO.A.525 Operations under IFR – flight and navigational instruments and associated equipment

(See AMC1 SPO.A.520 & SPO.A.525 Operations under VFR & operations under IFR – flight and navigational instruments and associated equipment & AMC2 SPO.A.520/SPO.A.525 Flight and Navigational Instruments and Associated Equipment & AMC1 SPO.A.520(a)(9) & SPO.A.525(a)(9) & AMC1 SPO.A.520(h) & SPO.A.525(s) & AMC1 SPO.A.520(d) & SPO.A.525(k)(2))

(a) The operator shall not operate an aeroplane in accordance with Instrument Flight Rules (IFR) or by night in accordance with Visual Flight Rules (VFR) unless it is equipped with the flight and navigational instruments and associated equipment and, where applicable, under the conditions stated in the following sub-paragraphs:

(1) A magnetic compass;

(2) An accurate time-piece showing the time in hours, minutes and seconds;

(3) Two sensitive pressure altimeters calibrated in feet with sub-scale settings, calibrated in hectopascals/millibars, adjustable for any barometric pressure likely to be set during flight. These altimeters must have counter drum-pointer or equivalent presentation.

(4) An airspeed indicating system with heated pitot tube or equivalent means for preventing malfunctioning due to either condensation or icing including a warning indication of pitot heater failure. The pitot heater failure warning indication requirement does not apply to those aeroplanes with a maximum approved passenger seating configuration of 9 or less or a maximum certificated take-off mass of 5 700 kg or less and issued with an individual Certificate of Airworthiness prior to 1 April 1998;

(5) A vertical speed indicator;

(6) A turn and slip indicator;

(7) An attitude indicator;

(8) A stabilised direction indicator;

(9) A means of indicating in the flight crew compartment the outside air temperature calibrated in degrees Celsius; and

(10) Two independent static pressure systems, except that for propeller driven aeroplanes with maximum certificated take-off mass of 5 700 kg or less, one static pressure system and one alternate source of static pressure is allowed.

(b) Whenever two pilots are required the second pilot’s station shall have separate instruments as follows:

(1) A sensitive pressure altimeter calibrated in feet with a sub-scale setting, calibrated in hectopascals/millibars, adjustable for any barometric pressure likely to be set during flight and which may be one of the 2 altimeters required by sub-paragraph (c) above. These altimeters must have counter drum-pointer or equivalent presentation.

(2) An airspeed indicating system with heated pitot tube or equivalent means for preventing malfunctioning due to either condensation or icing including a warning indication of pitot heater failure. The pitot heater failure warning indication requirement does not apply to those aeroplanes with a maximum approved passenger seating configuration of 9 or less or a maximum certificated take-off mass of 5 700 kg or less and issued with an individual Certificate of Airworthiness prior to 1 April 1998;

(3) A vertical speed indicator;

(4) A turn and slip indicator;

(5) An attitude indicator; and

(6) A stabilised direction indicator.

(c) Those aeroplanes with a maximum certificated take-off mass in excess of 5 700 kg or having a maximum approved passenger seating configuration of more than 9 seats must be equipped with an additional, standby, attitude indicator (artificial horizon), capable of being used from either pilot's station, that:

(1) Is powered continuously during normal operation and, after a total failure of the normal electrical generating system is powered from a source independent of the normal electrical generating system;

(2) Provides 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;

(3) Operates independently of any other attitude indicating system;

(4) Is operative automatically after total failure of the normal electrical generating system; and

(5) Is appropriately illuminated during all phases of operation, except for aeroplanes with a maximum certificated take-off mass of 5 700 kg or less, equipped with a standby attitude indicator in the left-hand instrument panel.

(d) In complying with sub-paragraph (l) above, it must be clearly evident to the flight crew when the standby attitude indicator, required by that sub-paragraph, is being operated by emergency power. Where the standby attitude indicator has its own dedicated power supply there shall be an associated indication, either on the instrument or on the instrument panel, when this supply is in use.

(e) A chart holder in an easily readable position which can be illuminated for night operations.

(f) If the standby attitude instrument system is certificated according to EASA CS 25 or equivalent, the turn and slip indicators may be replaced by slip indicators.

(g) Whenever duplicate instruments are required, the requirement embraces separate displays for each pilot and separate selectors or other associated equipment where appropriate;

(h) All aeroplanes must be equipped with means for indicating when power is not adequately supplied to the required flight instruments; and

(i) All aeroplanes with compressibility limitations not otherwise indicated by the required airspeed indicators shall be equipped with a Mach number indicator at each pilot's station.

(j) The operator shall not conduct IFR or night operations unless the aeroplane is equipped with a headset with boom microphone or equivalent for each flight crew member on flight deck duty and a transmit button on the control wheel for each required pilot.

(k) Where aeroplanes are equipped with automatic landing systems, HUD or equivalent displays, EVS, SVS or CVS, or any combination of those systems into a hybrid system, the use of such systems for the safe operation of an aeroplane shall be approved by the Authority. In approving the operational use of automatic landing systems, a HUD or equivalent displays, EVS, SVS or CVS, the Authority shall ensure that:

(1) the equipment meets the appropriate airworthiness certification requirements;

(2) the operator has carried out a safety risk assessment of the operations supported by the automatic landing systems, HUD or equivalent displays, EVS, SVS or CVS;

(3) the operator has established and documented the procedures for the use of, and training requirements for, automatic landing systems, a HUD or equivalent displays, EVS, SVS or CVS.

SPO.A.526 Additional equipment for single-pilot operation under IFR

Aeroplanes operated under IFR with a single pilot shall be equipped with an autopilot with at least altitude hold and heading mode.

SPO.A.530 Terrain awareness warning system (TAWS)

(a) The operator shall not operate a turbine-engined aeroplane having a maximum certificated take-off mass in excess of 5 700 kg or a maximum approved passenger seating configuration of more than 9 unless it is equipped with a ground proximity warning system that includes a predictive terrain hazard warning function (Terrain Awareness and Warning System – TAWS).

(b) The operator shall not operate a piston-engined aeroplane of a maximum certificated take-off mass in excess of 5 700 kg or authorised to carry more than nine passengers shall be equipped with a ground proximity warning system which provides the warnings in sub-paragraph (c) below, warning of unsafe terrain clearance and a forward looking terrain avoidance function.

(c) A ground proximity warning system shall provide automatically provide, by means of aural signals, which may be supplemented by visual signals, timely and distinctive warning to the flight crew of sink rate, ground proximity, altitude loss after take-off or go-around, incorrect landing configuration and downward glideslope deviation.

(d) The terrain awareness and warning system must automatically provide the flight crew, by means of visual and aural signals and a terrain awareness display, with sufficient alerting time to prevent controlled flight into terrain events and provide a forward looking capability and terrain clearance floor.

SPO.A.531 Airborne collision avoidance system (ACAS II)

(See AMC1 SPO.A.531 Airborne collision avoidance system (ACAS II))

All turbine-engine aeroplanes of a maximum certificated take-off mass in excess of 5 700 kg or authorised to carry more than 19 passengers shall be equipped with an airborne collision avoidance system with a minimum performance level of at least ACAS II, that meets traffic alert and collision avoidance system (TCAS) Version 7.1 as specified in RTCA/DO-185B or EUROCAE/ED-143.

SPO.A.532 Airborne weather detecting equipment

(See AC1 SPO.A.532(a)(2))

(a) The operator shall not operate:

  (1) A pressurised aeroplane; or

  (2) An unpressurised aeroplane which has a maximum certificated take-off mass of more than 5 700 kg; or

  (3) An unpressurised aeroplane having a maximum approved passenger seating configuration of more than 9 seats;

  unless it is equipped with airborne weather radar equipment whenever such an aeroplane is being operated at night or in instrument meteorological conditions in areas where thunderstorms or other potentially hazardous weather conditions, regarded as detectable with airborne weather radar, may be expected to exist along the route.

(b) For propeller driven pressurised aeroplanes having a maximum certificated take-off mass not exceeding 5 700 kg with a maximum approved passenger seating configuration not exceeding 9 seats the airborne weather radar equipment may be replaced by other equipment capable of detecting

thunderstorms and other potentially hazardous weather conditions, regarded as detectable with airborne weather radar equipment, subject to approval by the Authority.

SPO.A.533 Equipment for operations in icing conditions

(a) The operator shall not operate an aeroplane in expected or actual icing conditions unless it is certificated and equipped to operate in icing conditions.

(b) The operator shall not operate an aeroplane in expected or actual icing conditions at night unless it is equipped with a means to illuminate or detect the formation of ice. Any illumination that is used must be of a type that will not cause glare or reflection that would handicap crew members in the performance of their duties.

SPO.A.534 Cosmic Radiation Detection Equipment

(a) The operator shall not operate an aeroplane above 15 000 m (49 000 ft) unless:

(1) it is equipped with an instrument to measure and indicate continuously the dose rate of total cosmic radiation being received (i.e. the total of ionizing and neutron radiation of galactic and solar origin) and the cumulative dose on each flight, or

(2) a system of on-board quarterly radiation sampling acceptable to the Authority is established.

SPO.A.535 Flight crew interphone system

Aeroplanes 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.

SPO.A.540 Cockpit voice recorder

(See Appendix 1 to SPO.A.540 & Appendix 1 to SPO.A.540/SPO.A.545/SPO.A.546 & Appendix 2 to SPO.A.540/SPO.A.545/SPO.A.546 & AC1 SPO.A.540)

(a) The following aeroplanes shall be equipped with a CVR:

(1) aeroplanes with an MCTOM of more than 27 000 kg for which the individual certificate of airworthiness is first issued on or after 01 January 1987;

(2) turbine-engined aeroplanes with an MCTOM of more than 5 700 kg, which are:

(i) certified to be operated with more than one pilots; and

(ii) for which a type certificate is first issued on or after 01 January 2016.

(b) All CVRs shall retain the information recorded during at least the last 2 hours of their operation.

(c) All aeroplanes of a maximum certificated take-off mass of over 27 000 kg for which the individual certificate of airworthiness is first issued on or after 01 January 2021 shall be equipped with a CVR capable of retaining the information recorded during at least the last 25 hours of its operation.

SPO.A.545 Flight data recorder – Aeroplanes Greater than 5700 kg

(See AC1 SPO.A.545/SPO.A.546 & Appendix 1 to SPO.A.540/SPO.A.545/SPO.A.546 & Appendix 2 to SPO.A.540/SPO.A.545/SPO.A.546 & Appendix 1 to SPO.A.545/SPO.A.546 Flight data recorder & Appendix 2 to SPO.A.545/SPO.A.546 Flight data recorder & Appendix 3 to SPO.A.545/SPO.A.546 Flight data recorder & Appendix 1 to SPO.A.545 Flight data recorder & Appendix 2 to SPO.A.545 Flight data recorder)

(a) [All multi-engine, turbine-powered aeroplanes of a MCTOM of over 5700 kg and having a passenger seating configuration, excluding any pilot seats of 10 or more, for which the individual certificate of airworthiness is first issued on or after 01 January 2005 shall be equipped with a FDR which shall record at least parameters 1-78 listed in Appendix 3 to SPO.A.545/SPO.A.546.

(b) All aeroplanes of a maximum certificated take-off mass of over 5 700 kg for which the application for type certification is submitted to a Contracting State on or after 01 January 2023 shall be equipped with an FDR capable of recording at least the 82 parameters listed in Appendix 3 to SPO.A.545/SPO.A.546.

(c) All aeroplanes of a maximum certificated take-off mass of over 27 000 kg for which the individual certificate of airworthiness is first issued on or after 01 January 1989 shall be equipped with a FDR which shall record at least parameters 1-32 listed in Appendix 3 to SPO.A.545/SPO.A.546.

(d) All aeroplanes of a MCTOM of over 5700 kg and first issued with an individual certificate of airworthiness on or after 01 January 2016 shall be equipped with a FDR that uses a digital method of recording and storing data and for which a method of readily retrieving that data from the storage medium is available.

(e) FDRs, ADRS, AIRs or AIRS shall not use engraving metal foil, frequency modulation (FM), photographic film or magnetic tape.

(f) All FDRs shall retain the information recorded during at least the last 25 hours of their operation.

(g) When FDRs are required to be installed, those FDRs that meet the current parameter certification requirements of the FAA, Transport Canada or EASA in respect to private air transport operations, shall be exempt from the parameter requirements of SPO.A.545.

Note 1: "The application for type certification is submitted to a Contracting State" refers to the date of application of the original "Type Certificate" for the aeroplane type, not the date of certification of particular aeroplane variants or derivative models.

Note 2: The documentation requirement concerning FDR and ADRS parameters provided by operators to accident investigation authorities should be in electronic format and take account of industry specifications.]

SPO.A.546 Flight Data Recorder – Aeroplanes of 5700kg or less

(See Appendix 1 to SPO.A.540/SPO.A.545/SPO.A.546 & Appendix 2 to SPO.A.540/SPO.A.545/ SPO.A.546 & Appendix 1 to SPO.A.545/SPO.A.546 Flight data recorder & Appendix 2 to SPO.A.545/SPO.A.546 Flight data recorder & Appendix 3 to SPO.A.545/SPO.A.546 Flight data recorderAC1 SPO.A.545/SPO.A.546)

(a) All turbine-engined aeroplanes of a maximum certificated take-off mass of 5 700 kg or less for which the application for type certification is submitted to a Contracting State on or after 01 January 2016 shall be equipped with:

(1) an FDR which shall record at least parameters 1-16 listed in Appendix 3 to SPO.A.545/SPO.A.546 Flight data recorder; or

(2) a Class C AIR or AIRS which shall record at least flight path and speed parameters displayed to the pilot(s), as defined in Appendix 2 to SPO.A.545/SPO.A.546 Flight data recorder), paragraph (b)(3); or

(3) an ADRS which shall record at least parameters 1-7 listed in Appendix 2 to SPO.A.545 Flight data recorder.

(b) FDRs or ADRS shall not use engraving metal foil, frequency modulation (FM), photographic film or magnetic tape.

Note: "The application for type certification is submitted to a Contracting State" refers to the date of application of the original "Type Certificate" for the aeroplane type, not the date of certification of particular aeroplane variants or derivative models.

SPO.A.550 Data link recording

(a) All aeroplanes for which the individual certificate of airworthiness is first issued after 01 January 2016, which utilise any of the data link communications applications listed in Appendix 2 to SPO.A.545/SPO.A.546 Flight data recorder and are required to carry a CVR, shall record on a crash protected flight recorder, the data link communications messages.

(b) From 01 January 2016, all aeroplanes which are modified to install and utilise any of the data link communications applications stated in Appendix 2 to SPO.A.545/SPO.A.546 Flight data recorder and are required to carry a CVR shall record on a crash protected flight recorder, all data link communications messages.

(c) The minimum recording duration shall be equal to the duration of the CVR.

(d) Data link recording shall be able to be correlated to the recorded cockpit audio.

SPO.A.555 Flight data and cockpit voice combination recorder

All aeroplanes of a maximum certificated take-off mass of over 15 000 kg for which the application for certification is submitted to a Contracting State on or after 01 January 2016 and which are required to be equipped with both a CVR and an FDR, shall be equipped with two combination recorders (FDR/CVR). One recorder shall be located as close to the cockpit as practicable and the other recorder located as far aft as practicable.

SPO.A.560 Seats, seat safety belts and restraint systems

(a) The operator shall not operate an aeroplane unless it is equipped with:

(1) a seat or berth for each person who is aged two years or more;

(2) a safety belt, with or without a diagonal shoulder strap, or a safety harness for use in each passenger seat for each passenger aged two years or more;

(3) a child restraint device, acceptable to the Authority, for each infant (See AC SPO.A.560 Seats, seat safety belts and restraint systems (a)(3);

(4) except as provided in sub-paragraph (c) below, a safety belt with shoulder harness for each flight crew seat and for any seat alongside a pilot's seat incorporating a device which will automatically restrain the occupant's torso in the event of rapid deceleration;

Note 1: The safety harness for each pilot seat should incorporate a device to prevent a suddenly incapacitated pilot from interfering with the flight controls.

Note 2: Safety harness includes shoulder straps and a seat belt which may be used independently.

(5) except as provided in sub-paragraph (c) below, a safety belt with shoulder harness for each cabin crew seat and observer's seats. However, this requirement does not preclude use of passenger seats by cabin crew members carried in excess of the required cabin crew complement; and

(6) seats for cabin crew members located near required floor level emergency exits except that, if the emergency evacuation of passengers would be enhanced by seating cabin crew members elsewhere, other locations are acceptable. The seats shall be forward or rearward facing within 15° of the longitudinal axis of the aeroplane.

(b) All safety belts with shoulder harness must have a single point release.

(c) A safety belt with a diagonal shoulder strap for aeroplanes with a maximum certificated take-off mass not exceeding 5700 kg or a safety belt for aeroplanes with a maximum certificated take-off mass not exceeding 2730 kg may be permitted in place of a safety belt with shoulder harness if it is not reasonably practicable to fit the latter.

SPO.A.565 First-aid kit

(See AMC1 SPO.A.565 First-aid kit)

(a) Aeroplanes shall be equipped with a first-aid kit.

(b) The first-aid kit shall be:

(1) readily accessible for use; and

(2) kept up-to-date.

SPO.A.570 Supplemental oxygen – pressurised aeroplanes

(See Appendix 1 to SPO.A.570 Supplemental oxygen – pressurised aeroplanes & AMC1 SPO.A.570 Supplemental oxygen – pressurised aeroplanes & AMC1 SPO.A.570(b)(2)(v) Supplemental oxygen – pressurised aeroplanes)

(a) General

(1) The operator shall not operate a pressurised aeroplane at pressure altitudes above 10 000 ft unless supplemental oxygen equipment, capable of storing and dispensing the oxygen supplies required by this paragraph, is provided.

(2) The amount of supplemental oxygen required shall be determined on the basis of cabin pressure altitude, flight duration and 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 aeroplane will descend in accordance with emergency procedures specified in the Aeroplane 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 shall be considered the same as the aeroplane pressure altitude, unless it is demonstrated to the 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.

(b) Oxygen equipment and supply requirements

(1) Flight crew members

(i) Each member of the flight crew on flight deck duty shall be supplied with supplemental oxygen in accordance with Appendix 1. If all occupants of flight deck seats are supplied from the flight crew source of oxygen supply then they shall be considered as flight crew members on flight deck duty for the purpose of oxygen supply. Flight deck seat occupants, not supplied by the flight crew source, are to be considered as passengers for the purpose of oxygen supply.

(ii) Flight crew members, not covered by sub-paragraph (b)(1)(i) above, are to be considered as passengers for the purpose of oxygen supply.

(iii) Oxygen masks shall be located so as to be within the immediate reach of flight crew members whilst at their assigned duty station.

(iv) Oxygen masks for use by flight crew members in pressurised aeroplanes operating at pressure altitudes above 25 000 ft, shall be a quick donning type of mask.

(2) Cabin crew members, additional crew members and passengers

(i) Cabin crew members and passengers shall be supplied with supplemental oxygen in accordance with Appendix 1, except when sub-paragraph (v) below applies. Cabin crew members carried in addition to the minimum number of cabin crew members required, and additional crew members, shall be considered as passengers for the purpose of oxygen supply.

(ii) Aeroplanes intended to be operated at pressure altitudes above 25 000 ft shall be provided sufficient spare outlets and masks and/or sufficient portable oxygen units with masks for use by all required cabin crew members. The spare outlets and/or portable oxygen units are to be distributed evenly throughout the cabin to ensure immediate availability of oxygen to each required cabin crew member regardless of his/her location at the time of cabin pressurisation failure.

(iii) Aeroplanes intended to be operated at pressure altitudes above 25 000 ft shall be provided an oxygen dispensing unit connected to oxygen supply terminals immediately available to each occupant, wherever seated. The total number of dispensing units and outlets shall exceed the number of seats by at least 10%. The extra units are to be evenly distributed throughout the cabin.

(iv) Aeroplanes intended to be operated at pressure altitudes above 25 000 ft or which, if operated at or below 25 000 ft, cannot descend safely within 4 minutes to 13 000 ft, shall be provided with automatically deployable oxygen equipment immediately available to each occupant, wherever seated. The total number of dispensing units and outlets shall exceed the number of seats by at least 10%. The extra units are to be evenly distributed throughout the cabin.

(v) The oxygen supply requirements, as specified in Appendix 1 to SPO.A.570 Supplemental oxygen – pressurised aeroplanes, 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. (See SPO.A.570 Supplemental oxygen – pressurised aeroplanes (b)(v)).

SPO.A.575 Supplemental oxygen – non-pressurised aeroplanes

(See Appendix 1 to SPO.A.575 Supplemental oxygen – non-pressurised aeroplanes)

(a) General

(1) The operator shall not operate a non-pressurised aeroplane at altitudes above 10 000 ft unless supplemental oxygen equipment, capable of storing and dispensing the oxygen supplies required, is provided.

(2) The amount of supplemental oxygen for sustenance required for a particular operation shall be determined on the basis of flight altitudes and flight duration, consistent with the operating procedures established for each operation in the Operations Manual and with the routes to be flown, and with the emergency procedures specified in the Operations Manual.

(3) An aeroplane intended to be operated at pressure altitudes above 10 000 ft shall be provided with equipment capable of storing and dispensing the oxygen supplies required.

(b) Oxygen supply requirements

(1) Flight crew members. Each member of the flight crew on flight deck duty shall be supplied with supplemental oxygen in accordance with Appendix 1. If all occupants of flight deck seats are supplied from the flight crew source of oxygen supply then they shall be considered as flight crew members on flight deck duty for the purpose of oxygen supply.

(2) Cabin crew members, additional crew members and passengers. Cabin crew members and passengers shall be supplied with oxygen in accordance with Appendix 1 to SPO.A..475. Cabin crew members carried in addition to the minimum number of cabin crew members required, and additional crew members, shall be considered as passengers for the purpose of oxygen supply.

SPO.A.580 Hand fire extinguishers

(See AMC1 SPO.A.580 Hand fire extinguishers)

The operator shall not operate an aeroplane unless hand fire extinguishers are provided for use in crew, passenger and, as applicable, cargo compartments and galleys in accordance with the following:

(a) The type and quantity of extinguishing agent must be suitable for the kinds of fires likely to occur in the compartment where the extinguisher is intended to be used and, for personnel compartments, must minimise the hazard of toxic gas concentration;

(b) At least one hand fire extinguisher, containing Halon 1211 (bromochlorodifluoromethane, CBrClF2), or equivalent as the extinguishing agent, must be conveniently located in the cockpit for use by the flight crew;

(c) At least one hand fire extinguisher must be located in, or readily accessible for use in, each galley not located on the main passenger deck;

(d) At least one readily accessible hand fire extinguisher must be available for use in each Class A or Class B cargo or baggage compartment and in each Class E cargo compartment that is accessible to crew members in flight; and

(e) There must be at least the following number of hand fire extinguishers conveniently located to provide adequate availability for use in each passenger compartment.

Maximum approved 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

When two or more extinguishers are required, they must be evenly distributed in the passenger compartment.

(f) At least one of the required fire extinguishers located in the passenger compartment of an aeroplane with a maximum approved passenger seating configuration of at least 31, and not more than 60, and at least two of the fire extinguishers located in the passenger compartment of an aeroplane with a maximum approved passenger seating configuration of 61 or more must contain Halon 1211 (bromochlorodifluoromethane, $CBrClF_2$), or equivalent as the extinguishing agent.

(g) Any agent used in a built-in fire extinguisher for each lavatory disposal receptacle for towels, paper or waste in an aeroplane for which the individual certificate of airworthiness is first issued on or after

31 December 2011 and any extinguishing agent used in a portable fire extinguisher in an aeroplane for which the individual certificate of airworthiness is first issued on or after 31 December 2018 shall:

(1) meet the applicable minimum performance requirements of the State of Registry; and

(2) not be of a type listed in Annex A, Group II of the *Montreal Protocol on Substances That Deplete the Ozone Layer*, current edition.

SPO.A.581 Crash axe and crowbar

(a) The operator shall not operate an aeroplane with a maximum certificated take-off mass exceeding 5 700 kg or having a maximum approved passenger seating configuration of more than 9 seats unless it is equipped with at least one crash axe or crowbar located on the flight deck. If the maximum approved passenger seating configuration is more than 200 an additional crash axe or crowbar must be carried and located in or near the most rearward galley area.

(b) Crash axes and crowbars located in the passenger compartment must not be visible to passengers.

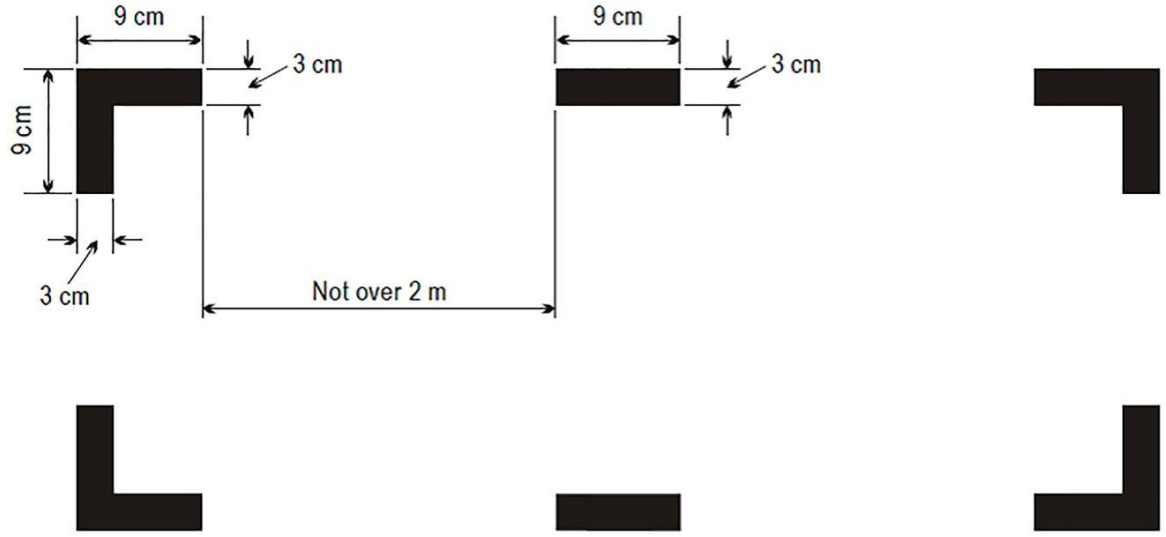
SPO.A.585 Marking of break-in points

(a) If areas of the aeroplane's fuselage suitable for break-in by rescue crews in an emergency are marked, such areas shall be marked as shown below.

(b) The colour of the markings should be red or yellow and, if necessary, should be outlined in white to contrast with the background.

(c) If the corner markings are more than 2 m apart, intermediate lines 9 cm x 3 cm should be inserted so that there is no more than 2 m between adjacent markings.

Marking of break-in points



SPO.A.590 Emergency locator transmitter (ELT)

(See AC1 SPO.A.590 Emergency locator transmitter (ELT) & AMC1 SPO.A.590 Emergency locator transmitter (ELT))

(a) All aeroplanes authorised to carry more than 19 passengers for which the individual certificate of airworthiness is first issued after 01 July 2008 shall be equipped with either;

(1) At least two ELTs, one of which shall be automatic; or

(2) at least one ELT and a capability that meets the requirements of SPO.A.592 Location of an Aircraft in Distress

Note: In the case where the requirements for SPO.A.592 Location of an Aircraft in Distress are met by another system no automatic ELT is required. (See AMC1 SPO.A.590 Emergency locator transmitter (ELT))

(b) The operator shall not operate an aeroplane authorised to carry 19 passengers or less unless it is equipped with at least:

(1) one ELT of any type; or

(2) one automatic ELT for aeroplanes first issued with an individual certificate of airworthiness after 1 July 2008.

(c) The operator shall ensure that all ELTs carried to satisfy the above requirements operate in accordance with the relevant provisions of ICAO Annex 10, Volume III.

SPO.A.592 Location of an Aircraft in Distress

(See AC SPO.A.592 Location of an Aircraft in Distress)

(a) All aeroplanes of a maximum certificated take-off mass of over 27 000 kg for which the individual certificate of airworthiness is first issued on or after 01 January 2021, shall autonomously transmit information from which a position can be determined by the operator at least once every minute, when in distress. (See AC SPO.A.592).

(b) All aeroplanes of a maximum certificated take-off mass of over 5 700 kg for which the individual certificate of airworthiness is first issued on or after 01 January 2021, should autonomously transmit information from which a position can be determined at least once every minute, when in distress . (See AC SPO.592).

(c) The operator shall make position information of a flight in distress available to the appropriate organisations, as established by the Authority.

SPO.A.595 Life Jackets

(See AMC1 SPO.A.595 Life Jackets)

(a) Land aeroplanes. the operator shall not operate a land aeroplane:

(1) with two or more engines when flying over water and at a distance of more than 50 nautical miles from the shore for those aeroplanes that meet the applicable en-route performance requirements of CAR OPS 1 Subparts G, H or I; or

(2) when flying en route over water beyond gliding distance from the shore, in the case of all other landplanes; and

(3) when taking off or landing at an aerodrome 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 a ditching,

unless it is equipped with life jackets equipped with a survivor locator light, for each person on board. Each life jacket must be stowed in a position easily accessible from the seat or berth of the person for whose use it is provided. Life jackets for infants may be substituted by other approved flotation devices equipped with a survivor locator light.

(b) Seaplanes and amphibians. the operator shall not operate a seaplane or an amphibian on water unless it is equipped with life jackets equipped with a survivor locator light, for each person on board. Each life jacket must be stowed in a position easily accessible from the seat or berth of the person for whose use it is provided. Life jackets for infants may be substituted by other approved flotation devices equipped with a survivor locator light.

SPO.A.600 Life-Rafts and Survival ELTs for extended overwater flights

(See AMC1 SPO.A.600(b)(2) Life-Rafts and Survival ELTs for extended overwater flights)

(a) On overwater flights, the operator shall not operate an aeroplane at a distance away from land, which is suitable for making an emergency landing, greater than that corresponding to:

(1) 120 minutes at cruising speed or 400 nautical miles, whichever is the lesser, 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 diversions; or

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

unless the equipment specified in sub-paragraphs (b), (c) and (d) below is carried.

(b) Sufficient life-rafts to carry all persons on board. Unless excess rafts of enough capacity are provided, the buoyancy and seating capacity beyond the rated capacity of the rafts must accommodate all occupants of the aeroplane in the event of a loss of one raft of the largest rated capacity. The life-rafts shall be equipped with:

(1) a survivor locator light; and

(2) life saving equipment including means of sustaining life as appropriate to the flight to be undertaken (see AMC1 SPO.A.600(b)(2) Life-Rafts and Survival ELTs for extended overwater flights(b)(2));

(c) At least two survival Emergency Locator Transmitters (ELT(S)) capable of transmitting on the distress frequencies prescribed in ICAO Annex 10, Volume V, Chapter 2 (See AC1 SPO.A.590 Emergency locator transmitter (ELT).); and

(d) At the earliest practicable date but not later than 01 January 2019, on all aeroplanes of a maximum certificated take-off mass of over 27 000 kg, a securely attached underwater locating device operating at a frequency of 8.8 kHz. This automatically activated underwater locating device shall operate for a minimum of 30 days and shall not be installed in wings or empennage.

SPO.A.605 Individual protective equipment

Each person on board shall wear individual protective equipment that is adequate for the type of operation being undertaken.

SPO.A.610 Headset

(a) Aeroplanes shall be equipped with a headset with a boom microphone or equivalent for each flight crew member at their assigned station in the flight crew compartment.

(b) Aeroplanes operated under IFR or at night shall be equipped with a transmit button on the manual pitch and roll control for each required flight crew member.

SPO.A.615 Radio communication equipment

(a) Aeroplanes operated under IFR or at night, or when required by the applicable airspace requirements, shall be equipped with radio communication equipment that, under normal radio propagating conditions, shall be capable of:

(1) conducting two-way communication for aerodrome control purposes;

(2) receiving meteorological information at any time during flight;

(3) conducting two-way communication at any time during flight with those aeronautical stations and on those frequencies prescribed by the appropriate authority; and

(4) providing for communication on the aeronautical emergency frequency 121,5 MHz.

(b) When more than one communication equipment unit is required, each shall be independent of the other or others to the extent that a failure in anyone will not result in failure of any other.

SPO.A.620 Navigation equipment

(a) Aeroplanes shall be equipped with navigation equipment that will enable them to proceed in accordance with:

(1) the ATS flight plan, if applicable; and

(2) the applicable airspace requirements.

(b) Aeroplanes shall have sufficient navigation equipment to ensure that, in the event of the failure of one item of equipment at any stage of the flight, the remaining equipment shall allow safe navigation in accordance with (a), or an appropriate contingency action to be completed safely.

(c) Aeroplanes operated on flights in which it is intended to land in IMC shall be equipped with suitable equipment capable of providing guidance to a point from which a visual landing can be performed. This equipment shall be capable of providing such guidance for each aerodrome at which it is intended to land in IMC and for any designated alternate aerodromes.

SPO.A.622 Performance Based Navigation

(a) For PBN operations the aircraft shall meet the airworthiness certification requirements for the appropriate navigation specification.

(b) Aeroplanes shall be equipped with surveillance equipment in accordance with the applicable airspace requirements.

SPO.A.625 Transponder

(a) All aeroplanes shall be equipped with a pressure-altitude reporting transponder which operates in accordance with the relevant provisions of ICAO Annex 10, Volume IV.

(b) Unless exempted by the appropriate authorities, aeroplanes operating as VFR flights shall be equipped with a pressure-altitude reporting transponder which operates in accordance with the relevant provision of Annex 10, Volume IV.

SPO.A.630 Management of aeronautical databases

(a) Aeronautical databases used on certified aircraft system applications shall meet data quality requirements that are adequate for the intended use of the data.

(b) The operator shall ensure the timely distribution and insertion of current and unaltered aeronautical databases to all aircraft that require them.

(c) Notwithstanding any other occurrence reporting requirements, the operator shall report to the database provider instances of erroneous, inconsistent or missing data that might be reasonably expected to constitute a hazard to flight.

In such cases, the operator shall inform flight crew and other personnel concerned and shall ensure that the affected data is not used.

Appendix 1 to SPO.A.540

Cockpit Voice Recorder (CVR) and Cockpit Audio Recording System (CARS)

(a) Start and stop logic

The CVR or CARS shall start to record prior to the aeroplane moving under its own power and record continuously until the termination of the flight when the aeroplane is no longer capable of moving under its own power. In addition, depending on the availability of electrical power, the CVR or CARS shall 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.

(b) Signals to be recorded

(1) The CVR shall record simultaneously on four separate channels, or more, at least the following:

(i) voice communication transmitted from or received in the aeroplane by radio;

(ii) aural environment on the flight deck;

(iii) voice communication of flight crew members on the flight deck using the aeroplane's interphone system, if installed;

(iv) voice or audio signals identifying navigation or approach aids introduced in the headset or speaker;

(v) digital communications with ATS, unless recorded by the FDR; and

(c) The preferred CVR audio allocation should be as follows:

(1) pilot-in-command audio panel;

(2) co-pilot audio panel;

(3) additional flight crew positions and time reference; and

(4) cockpit area microphone.

(d) The CARS shall record simultaneously on two separate channels, or more, at least the following:

(1) voice communication transmitted from or received in the aeroplane by radio;

(2) aural environment on the flight deck; and

(3) voice communication of flight crew members on the flight deck using the aeroplane's interphone system, if installed.

(e) The preferred CARS audio allocation should be as follows:

(1) voice communication; and

(2) aural environment on the flight deck.

Appendix 1 to SPO.A.540/SPO.A.545/SPO.A.546

Flight Recorders – General

Note 1: The following applies to all crash protected flight recorders which comprise one or more of the following systems:

(1) a flight data recorder (FDR),

(2) a cockpit voice recorder (CVR)

(3) an airborne image recorder (AIR),

(4) a data link recorder (DLR).

Note 2: The following applies to all lightweight flight recorders which comprise one or more of the following systems:

(1) an aircraft data recording system (ADRS),

(2) a cockpit audio recording system (CARS),

(3) an airborne image recording system (AIRS),

(4) a data link recording system (DLRS).

(a) Non-deployable flight recorder containers shall be painted a distinctive orange colour;

(b) Non-deployable crash protected flight recorder containers shall;

(1) carry reflective material to facilitate their location; and

(2) have a device to assist in locating that recorder in water and, not later than 01 January 2019, have securely attached an automatically activated underwater locating device operating at a frequency of 37.5 kHz that operates for a minimum of 90 days.

(c) Automatic deployable flight recorder containers shall:

(1) be painted a distinctive orange colour; however, the surface visible from outside the aeroplane may be of another colour;

(2) carry reflective material to facilitate their location; and

(3) have an integrated automatically activated ELT.

(d) The flight recorder systems shall be installed so that:

(1) the probability of damage to the recordings is minimised;

(2) there is an aural or visual means for pre-flight checking that the flight recorder systems are operating properly; and

(3) if the flight recorder systems have an erasure device, the installation shall be designed to prevent operation of the device during flight time or crash impact; and

(4) an aeroplane for which the individual certificate of airworthiness is first issued on or after 01 January 2023, a flight crew-operated erase function shall be provided on the flight deck which, when activated, modifies the recording of a CVR and AIR so that it cannot be retrieved using normal replay or copying techniques. The installation shall be designed to prevent activation during flight. In addition, the probability of an inadvertent activation of an erase function during an accident shall also be minimised.

Note: The erase function is intended to prevent access to CVR and AIR recordings by normal replay or copying means but would not prevent accident investigation authorities access to such recordings by specialised replay or copying techniques.

(e) The flight recorder systems shall be installed so that they receive electrical power from a bus that provides the maximum reliability for operation of the flight recorder systems without jeopardising service to essential or emergency loads.

(f) The flight recorder systems, when tested by methods approved by the appropriate certificating authority, shall be demonstrated to be suitable for the environmental extremes over which they are designed to operate.

(g) Means shall be provided for an accurate time correlation between the flight recorder systems recordings.

(h) The manufacturer shall provide the appropriate certificating authority with the following information in respect of the flight recorder systems:

(1) manufacturer’s operating instructions, equipment limitations and installation procedures;

(2) parameter origin or source and equations which relate counts to units of measurement; and

(3) manufacturer's test reports.

Appendix 2 to SPO.A.540/SPO.A.545/SPO.A.546

Inspection of Flight Recorder Systems

(a) Prior to the first flight of the day, the built-in test features for the flight recorders and flight data acquisition unit (FDAU), when installed, shall be monitored by manual and/or automatic checks.

(b) FDR systems or ADRS, CVR systems or CARS, and AIR systems or AIRS shall have recording inspection intervals of one year. This period may be extended by the Authority to two years provided these systems have demonstrated a high integrity of serviceability and self-monitoring.

(c) DLR systems or DLRS shall have recording inspection intervals of two years. This period may be extended by the Authority to four years provided these systems have demonstrated a high integrity of serviceability and self-monitoring.

(d) Recording inspections shall be carried out as follows:

(1) an analysis of the recorded data from the flight recorders shall ensure that the recorder operates correctly for the nominal duration of the recording;

(2) the analysis of the FDR or ADRS recording shall evaluate the quality of the recorded data to determine if the bit error rate (including those errors introduced by recorder, the acquisition unit, the source of the data on the aeroplane and by the tools used to extract the data from the recorder) is within acceptable limits and to determine the nature and distribution of the errors;

(3) the FDR or ADRS recording from a complete flight shall be examined in engineering units to evaluate the validity of all recorded parameters. Particular attention shall be given to parameters from sensors dedicated to the FDR or ADRS. Parameters taken from the aeroplane's electrical bus system need not be checked if their serviceability can be detected by other aeroplane systems;

(4) the readout facility shall have the necessary software to accurately convert the recorded values to engineering units and to determine the status of discrete signals;

(5) an annual examination of the recorded signal on the CVR or CARS shall be carried out by replay of the CVR or CARS recording. While installed in the aeroplane, the CVR or CARS shall record test signals from each aeroplane source and from relevant external sources to ensure that all required signals meet intelligibility standards;

(6) where practicable, during the examination, a sample of in-flight recordings of the CVR or CARS shall be examined for evidence that the intelligibility of the signal is acceptable; and

(7) an examination of the recorded images on the AIR or AIRS shall be carried out by replay of the AIR or AIRS recording. While installed in the aeroplane, the AIR or AIRS shall record test images from each aeroplane source and from relevant external sources to ensure that all required images meet recording quality standards.

(e) A flight recorder system shall be considered unserviceable if there is a significant period of poor quality data, unintelligible signals, or if one or more of the mandatory parameters is not recorded correctly.

(f) A report of the recording inspection shall be made available on request to regulatory authorities for monitoring purposes.

(g) Calibration of the FDR system:

(1) for those parameters which have sensors dedicated only to the FDR and are not checked by other means, recalibration shall be carried out at least every five years or in accordance with

the recommendations of the sensor manufacturer to determine any discrepancies in the engineering conversion routines for the mandatory parameters and to ensure that parameters are being recorded within the calibration tolerances; and

(2) when the parameters of altitude and airspeed are provided by sensors that are dedicated to the FDR system, there shall be a recalibration performed as recommended by the sensor manufacturer, or at least every two years.

Appendix 1 to SPO.A.545/SPO.A.546 Flight data recorder

Flight Data Recorder (FDR) and Aircraft Data Recording Systems (ADRS)

(a) Start and Stop Logic

The FDR or ADRS shall start to record prior to the aeroplane moving under its own power and record continuously until the termination of the flight when the aeroplane is no longer capable of moving under its own power.

(b) Parameters to be Recorded

(1) The parameters that satisfy the requirements for FDRs are listed in the paragraphs below in Appendix 3 to SPO.A.545/SPO.A.546. The number of parameters to be recorded shall depend on aeroplane complexity. The parameters without an asterisk (*) are mandatory parameters which shall be recorded regardless of aeroplane complexity. In addition, the parameters designated by an asterisk (*) shall be recorded if an information data source for the parameter is used by aeroplane systems or the flight crew to operate the aeroplane. However, other parameters may be substituted with due regard to the aeroplane type and the characteristics of the recording equipment.

(2) If further FDR recording capacity is available, recording of the following additional information shall be considered:

(i) operational information from electronic display systems, such as electronic flight instrument systems (EFIS), electronic centralized aircraft monitor (ECAM) and engine indication and crew alerting system (EICAS). Use the following order of priority:

(A) parameters selected by the flight crew relating to the desired flight path, e.g. barometric pressure setting, selected altitude, selected airspeed, decision height, and auto flight 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, ETC.;

(C) warnings and alerts; and

(D) the identity of displayed pages for emergency procedures and checklists; and

(ii) retardation information including brake application for use in the investigation of landing overruns and rejected take-offs.

(3) The parameters that satisfy the requirements for flight path and speed as displayed to the pilot(s) are listed below. The parameters without an (*) are mandatory parameters which shall be recorded. In addition, the parameters designated by an (*) shall be recorded if an information source for the parameter is displayed to the pilot and is practicable to record:

- Pressure altitude
- Indicated airspeed or calibrated airspeed
- Heading (primary flight crew reference)

- Pitch attitude
- Roll attitude
- Engine thrust/power
- Landing-gear status*
- Total or outside air temperature*
- Time*
- Navigation data*: drift angle, wind speed, wind direction, latitude/longitude
- Radio altitude*

(4) The parameters that satisfy the requirements for ADRS are listed in Appendix 2 to SPO.A.545

(c) Additional Information

(1) The measurement range, recording interval and accuracy of parameters on installed equipment shall be verified by methods approved by the appropriate certificating authority.

(2) Documentation concerning parameter allocation, conversion equations, periodic calibration and other serviceability/maintenance information shall be maintained by the operator. The documentation needs to be sufficient to ensure that accident investigation authorities have the necessary information to read out the data in engineering units.

Appendix 2 to SPO.A.545/SPO.A.546 Flight data recorder

Data Link Recorder (DLR) Applications to be Recorded

(a) Where the aircraft flight path is authorised or controlled through the use of data link messages, all data link messages, both uplinks (to the aircraft) and downlinks (from the aircraft), shall be recorded on the aircraft. As far as practicable, the time the messages were displayed to the flight crew and the time of the responses shall be recorded.

Note: Sufficient information to derive the content of the data link communications message and the time the messages were displayed to the flight crew is needed to determine an accurate sequence of events on board the aircraft.

(b) Messages applying to the applications listed below shall be recorded. Applications without the asterisk (*) are mandatory applications which shall be recorded regardless of the system complexity. Applications with an (*) shall be recorded only as far as is practicable given the architecture of the system.

Item No.	Application type	Application description	Recording content
1	Data link initiation	This includes any applications used to log on to or initiate data link service. In FANS-1/A and 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 CPDLC application. It also includes applications used for the exchange of oceanic (OCL) and departure clearances (DCL) as well as data link delivery of taxi clearances.	C
3	Addressed surveillance	This includes any surveillance application in which the ground sets up contracts for delivery of surveillance data. In FANS-1/A and ATN, this includes the automatic dependent surveillance — contract (ADS-C) application. Where parametric data are reported within the message they shall be recorded unless data from the same source are recorded on the FDR.	C
4	Flight information	This includes any service used for delivery of flight information to specific aircraft. This includes, for example, data link aviation weather report service (D-METAR), data link-automatic terminal service (D-ATIS), digital Notice to Airmen (D-NOTAM) and other textual data link services.	C
5	Aircraft broadcast surveillance	This includes elementary and enhanced surveillance systems, as well as automatic dependent surveillance — broadcast (ADS-B) output data. Where parametric data sent by the aeroplane are reported within the message they shall be recorded unless data from the same source are recorded on the FDR.	M*
6	Aeronautical operational control data	This includes any application transmitting or receiving data used for aeronautical operational control purposes (per the ICAO definition of operational control).	M*

Key:

C: Complete contents recorded.

M: Information that enables correlation to any associated records stored separately from the aeroplane.

*: Applications to be recorded only as far as is practicable given the architecture of the system.

Appendix 3 to SPO.A.545/SPO.A.546 Flight data recorder

Parameter Characteristics for Flight Data Recorders

Serial number	Parameter	Applicability	Measurement range	Maximum sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR readout)	Recording resolution
1	Time (UTC when available, otherwise relative time count or GNSS time sync)		24 hours	4	±0.125%/h	1 s
2	Pressure-altitude		–300 m (–1 000 ft) to maximum certificated altitude of aircraft +1 500 m (+5 000 ft)	1	±30 m to ±200 m (±100 ft to ±700 ft)	1.5 m (5 ft)
3	Indicated airspeed or calibrated airspeed		95 km/h (50 kt) to max V_{So} *(Note 1)* V_{So} to 1.2 V_D *(Note 2)*	1	±5% ±3%	1 kt (0.5 kt recommended)
4	Heading (primary flight crew reference)		360°	1	±2°	0.5°
5	Normal acceleration (*Note 8*)	Application for type certification is submitted to a Contracting State before 1 January 2016	–3 g to +6 g	0.125	±1% of maximum range excluding datum error of ±5%	0.004 g
		Application for type certification is submitted to a Contracting State on or after 1 January 2016	–3 g to +6 g	0.0625	±1% of maximum range excluding datum error of ±5%	0.004 g
6	Pitch attitude		±75° or usable range whichever is greater	0.25	±2°	0.5°
7	Roll attitude		±180°	0.25	±2°	0.5°
8	Radio transmission keying		On-off (one discrete)	1		

Serial number	Parameter	Applicability	Measurement range	Maximum sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR readout)	Recording resolution
9	Power on each engine *(Note 3)*		Full range	1 (per engine)	±2%	0.2% of full range or the resolution required to operate the aircraft
10*	Trailing edge flap and cockpit control selection		Full range or each discrete position	2	±5% or as pilot's indicator	0.5% of full range or the resolution required to operate the aircraft
11*	Leading edge flap and cockpit control selection		Full range or each discrete position	2	±5% or as pilot's indicator	0.5% of full range or the resolution required to operate the aircraft
12*	Thrust reverser position		Stowed, in transit, and reverse	1 (per engine)		
13*	Ground spoiler/speed brake selection (selection and position)		Full range or each discrete position	1	±2% unless higher accuracy uniquely required	0.2% of full range
14	Outside air temperature		Sensor range	2	±2°C	0.3°C
15*	Autopilot/auto throttle/AFCS mode and engagement status		A suitable combination of discretes	1		
16	Longitudinal acceleration *(Note 8)*	Application for type certification submitted to a Contracting State before 1 January 2016	±1 g	0.25	±0.015 g excluding a datum error of ±0.05 g	0.004 g
		Application for type certification submitted to a Contracting State on or after 1 January 2016	±1 g	0.0625	±0.015 g excluding a datum error of ±0.05 g	0.004 g
17	Lateral acceleration *(Note 8)*	Application for type certification submitted to a Contracting State before 1 January 2016	±1 g	0.25	±0.015 g excluding a datum error of ±0.05 g	0.004 g
		Application for type certification submitted to a Contracting State on or after 1 January 2016	±1 g	0.0625	±0.015 g excluding a datum error of ±0.05 g	0.004 g

Serial number	Parameter	Applicability	Measurement range	Maximum sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR readout)	Recording resolution
18	Pilot input and/or control surface position-primary controls (pitch, roll, yaw) *(Notes 4 and 8)*	Application for type certification submitted to a Contracting State before 1 January 2016	Full range	0.25	±2° unless higher accuracy uniquely required	0.2% of full range or as installed
		Application for type certification submitted to a Contracting State on or after 1 January 2016	Full range	0.125	±2° unless higher accuracy uniquely required	0.2% of full range or as installed
19	Pitch trim position		Full range	1	±3% unless higher accuracy uniquely required	0.3% of full range or as installed
20*	Radio altitude		–6 m to 750 m (–20 ft to 2 500 ft)	1	±0.6 m (±2 ft) or ±3% whichever is greater below 150 m (500 ft) and ±5% above 150 m (500 ft)	0.3 m (1 ft) below 150 m (500 ft) 0.3 m (1 ft) + 0.5% of full range above 150 m (500 ft)
21*	Vertical beam deviation (ILS/GNSS/GLS glide path, MLS elevation, IRNAV/IAN vertical deviation)		Signal range	1	±3%	0.3% of full range
22*	Horizontal beam deviation (ILS/GNSS/GLS localizer, MLS azimuth, IRNAV/IAN lateral deviation)		Signal range	1	±3%	0.3% of full range
23	Marker beacon passage		Discrete	1		
24	Master warning		Discrete	1		
25	Each NAV receiver frequency selection *(Note 5)*		Full range	4	As installed	

Serial number	Parameter	Applicability	Measurement range	Maximum sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR readout)	Recording resolution
26*	DME 1 and 2 distance (includes Distance to runway threshold (GLS) and Distance to missed approach point (IRNAV/IAN)) *(Notes 5 and 6)*		0 – 370 km (0 – 200 NM)	4	As installed	1 852 m (1 NM)
27	Air/ground status		Discrete	1		
28*	GPWS/TAWS/GCAS status (selection of terrain display mode including pop-up display status) and (terrain alerts, both cautions and warnings, and advisories) and (on/off switch position)		Discrete	1		
29*	Angle of attack		Full range	0.5	As installed	0.3 % of full range
30*	Hydraulics, each system (low pressure)		Discrete	2		0.5% of full range
31*	Navigation data (latitude/longitude, ground speed and drift angle) *(Note 7)*		As installed	1	As installed	
32*	Landing gear and gear selector position		Discrete	4	As installed	
33*	Groundspeed		As installed	1	Data should be obtained from the most accurate system	1 kt
34	Brakes (left and right brake pressure, left and right brake pedal position)		(Maximum metered brake range, discretes or full range)	1	±5%	2% of full range

Serial number	Parameter	Applicability	Measurement range	Maximum sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR readout)	Recording resolution
35*	Additional engine parameters (EPR, N_1, indicated vibration level, N_2, EGT, fuel flow, fuel cut-off lever position, N_3, engine fuel metering valve position)	Engine fuel metering valve position: Application for type certification is submitted to a Contracting State on or after 1 January 2023	As installed	Each engine each second	As installed	2% of full range
36*	TCAS/ACAS (traffic alert and collision avoidance system)		Discretes	1	As installed	
37*	Wind shear warning		Discrete	1	As installed	
38*	Selected barometric setting (pilot, co-pilot)		As installed	64	As installed	0.1 mb (0.01 in-Hg)
39*	Selected altitude (all pilot selectable modes of operation)		As installed	1	As installed	Sufficient to determine crew selection
40*	Selected speed (all pilot selectable modes of operation)		As installed	1	As installed	Sufficient to determine crew selection
41*	Selected Mach (all pilot selectable modes of operation)		As installed	1	As installed	Sufficient to determine crew selection
42*	Selected vertical speed (all pilot selectable modes of operation)		As installed	1	As installed	Sufficient to determine crew selection
43*	Selected heading (all pilot selectable modes of operation)		As installed	1	As installed	Sufficient to determine crew selection
44*	Selected flight path (all pilot selectable modes of operation) (course/DSTRK, path angle, final approach path (IRNAV/IAN))			1	As installed	
45*	Selected decision height		As installed	64	As installed	Sufficient to determine crew selection
46*	EFIS display format (pilot, co-pilot)		Discrete(s)	4	As installed	
47*	Multi-function/engine/alerts display format		Discrete(s)	4	As installed	
48*	AC electrical bus status		Discrete(s)	4	As installed	

Serial number	Parameter	Applicability	Measurement range	Maximum sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR readout)	Recording resolution
49*	DC electrical bus status		Discrete(s)	4	As installed	
50*	Engine bleed valve position		Discrete(s)	4	As installed	
51*	APU bleed valve position		Discrete(s)	4	As installed	
52*	Computer failure		Discrete(s)	4	As installed	
53*	Engine thrust command		As installed	2	As installed	
54*	Engine thrust target		As installed	4	As installed	2% of full range
55*	Computed centre of gravity		As installed	64	As installed	1% of full range
56*	Fuel quantity in CG trim tank		As installed	64	As installed	1% of full range
57*	Head up display in use		As installed	4	As installed	
58*	Para visual display on/off		As installed	1	As installed	
59*	Operational stall protection, stick shaker and pusher activation		As installed	1	As installed	
60*	Primary navigation system reference (GNSS, INS, VOR/DME, MLS, Loran C, localizer glideslope)		As installed	4	As installed	
61*	Ice detection		As installed	4	As installed	
62*	Engine warning each engine vibration		As installed	1	As installed	
63*	Engine warning each engine over temperature		As installed	1	As installed	
64*	Engine warning each engine oil pressure low		As installed	1	As installed	
65*	Engine warning each engine over speed		As installed	1	As installed	
66*	Yaw trim surface position		Full range	2	±3% unless higher accuracy uniquely required	0.3% of full range

Serial number	Parameter	Applicability	Measurement range	Maximum sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR readout)	Recording resolution
67*	Roll trim surface position		Full range	2	±3% unless higher accuracy uniquely required	0.3% of full range
68*	Yaw or sideslip angle		Full range	1	±5%	0.5°
69*	De-icing and/or anti-icing systems selection		Discrete(s)	4		
70*	Hydraulic pressure (each system)		Full range	2	±5%	100 psi
71*	Loss of cabin pressure		Discrete	1		
72*	Cockpit trim control input position, Pitch		Full range	1	±5%	0.2% of full range or as installed
73*	Cockpit trim control input position, Roll		Full range	1	±5%	0.2% of full range or as installed
74*	Cockpit trim control input position, Yaw		Full range	1	±5%	0.2% of full range or as installed
75*	All cockpit flight control input forces (control wheel, control column, rudder pedal)		Full range (±311 N (±70 lbf), ± 378 N (±85 lbf), ± 734 N (±165 lbf))	1	±5%	0.2% of full range or as installed
76*	Event marker		Discrete	1		
77*	Date		365 days	64		
78*	ANP or EPE or EPU		As installed	4	As installed	
79*	Cabin pressure altitude	Application for type certification submitted to a Contracting State on or after 1 January 2023	As installed (0 ft to 40 000 ft recommended)	1	As installed	100 ft
80*	Aeroplane computed weight	Application for type certification submitted to a Contracting State on or after 1 January 2023	As installed	64	As installed	1% of ful l range
81*	Flight director command	Application for type certification submitted to a Contracting State on or after 1 January 2023	Full range	1	± 2°	0.5°
82*	Vertical speed	Application for type certification submitted to a Contracting State on or after 1 January 2023	As installed	0.25	As installed (32 ft/min recommended)	16 ft/min

Notes.—

1. V_{S_0} stalling speed or minimum steady flight speed in the landing configuration is in Section "Abbreviations and Symbols".
2. V_D design diving speed.
3. Record sufficient inputs to determine power.
4. For aeroplanes with control systems in which movement of a control surface will back drive the pilot's control, ''or'' applies. For aeroplanes with control systems in which movement of a control surface will not back drive the pilot's control, ''and'' applies. In aeroplanes with split surfaces, a suitable combination of inputs is acceptable in lieu of recording each surface separately. In aeroplanes with independent pilot input on primary controls, each pilot input on primary controls needs to be recorded separately.
5. If signal available in digital form.
6. Recording of latitude and longitude from INS or other navigation system is a preferred alternative.
7. If signals readily available.
8. It is not intended that aeroplanes issued with an individual certificate of airworthiness before 1 January 2016 be modified to meet the measurement range, maximum sampling and recording interval, accuracy limits or recording resolution description detailed in this Appendix.

Appendix 1 to SPO.A.545 Flight data recorder

Flight Crew – Machine Interface Recordings

(a) Start and Stop Logic

The AIR or AIRS shall start to record prior to the aeroplane moving under its own power and record continuously until the termination of the flight when the aeroplane is no longer capable of moving under its own power. In addition, depending on the availability of electrical power, the AIR or AIRS shall 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.

(b) Classes

(1) A Class A AIR or AIRS captures the general cockpit area in order to provide data supplemental to conventional flight recorders.

Note 1: To respect crew privacy, the cockpit area view may be designed as far as practical to exclude the head and shoulders of crew members whilst seated in their normal operating position.

Note 2: There are no provisions for Class A AIR or AIRS in this document.

(2) A Class B AIR or AIRS captures data link message displays.

(3) A Class C AIR or AIRS captures instruments and control panels.

Note: A Class C AIR or AIRS may be considered as a means for recording flight data where it is not practical or is prohibitively expensive to record on an FDR or an ADRS, or where an FDR is not required.

(c) Applications to be recorded

(1) The operation of switches and selectors and the information displayed to the flight crew from electronic displays shall be captured by sensors or other electronic means.

(2) The recording of operation of switches and selectors by the flight crew shall include the following:

- any switch or selector that will affect the operation and the navigation of the aircraft; and
- selection of normal and alternate systems.

(3) The recording of the information displayed to the flight crew from electronic displays shall include the following:

- primary flight and navigation displays;
- aircraft system monitoring displays;
- engine indication displays;
- traffic, terrain, and weather displays;
- crew alerting systems displays;
- stand-by instruments; and
- installed EFB to the extent it is practical.

(4) If image sensors are used, the recording of such images shall not capture the head and shoulders of the flight crew members whilst seated in their normal operating position.

(d) Duration

The minimum flight crew-machine interface recording duration shall be at least for the last two hours.

(e) Correlation

Flight crew-machine interface recordings shall be able to be correlated to the recorded cockpit audio.

Appendix 2 to SPO.A.545 Flight data recorder

Parameter Characteristics for Aircraft Data Recording Systems (ADRS)

No.	Parameter name	Minimum recording range	Maximum recording interval in seconds	Minimum recording accuracy	Minimum recording resolution	Remarks
1	Heading					
	a) Heading (Magnetic or True)	±180°	1	±2°	0.5°	Heading is preferred, if not available, yaw rate shall be recorded
	b) Yaw rate	±300°/s	0.25	±1% + drift of 360°/h	2°/s	
2	Pitch					
	a) Pitch attitude	±90°	0.25	±2°	0.5°	Pitch attitude is preferred, if not available, pitch rate shall be recorded
	b) Pitch rate	±300°/s	0.25	±1% + drift of 360°/h	2°/s	
3	Roll					
	a) Roll attitude	±180°	0.25	±2°	0.5°	Roll attitude is preferred, if not available, roll rate shall be recorded
	b) Roll rate	±300°/s	0.25	±1% + drift of 360°/h	2°/s	
4	Positioning system:					
	a) Time	24 hours	1	±0.5 s	0.1 s	UTC time preferred where available.
	b) Latitude/longitude	Latitude:±90° Longitude:±180°	2 (1 if available)	As installed (0.00015° recommended)	0.00005°	
	c) Altitude	–300 m (–1 000 ft) to maximum certificated altitude of aeroplane +1 500 m (5 000 ft)	2 (1 if available)	As installed (±15 m (±50 ft) recommended)	1.5 m (5 ft)	
	d) Ground speed	0–1 000 kt	2 (1 if available)	As installed (±5 kt recommended)	1 kt	
	e) Track	0–360°	2 (1 if available)	As installed (± 2° recommended)	0.5°	
	f) Estimated error	Available range	2 (1 if available)	As installed	As installed	Shall be recorded if readily available
5	Normal acceleration	–3 g to + 6 g (*)	0.25 (0.125 if available)	As installed (± 0.09 g excluding a datum error of ±0.45 g recommended)	0.004 g	
6	Longitudinal acceleration	±1 g (*)	0.25 (0.125 if available)	As installed (±0.015 g excluding a datum error of ±0.05 g recommended)	0.004 g	

No.	Parameter name	Minimum recording range	Maximum recording interval in seconds	Minimum recording accuracy	Minimum recording resolution	Remarks
7	Lateral acceleration	±1 g (*)	0.25 (0.125 if available)	As installed (±0.015 g excluding a datum error of ±0.05 g recommended)	0.004 g	
8	External static pressure (or pressure altitude)	34.4 mb (3.44 in-Hg) to 310.2 mb (31.02 in-Hg) or available sensor range	1	As installed (±1 mb (0.1 in-Hg) or ±30 m (±100 ft) to ±210 m (±700 ft) recommended)	0.1 mb (0.01 in-Hg) or 1.5 m (5 ft)	
9	Outside air temperature (or total air temperature)	–50° to +90°C or available sensor range	2	As installed (±2°C recommended)	1°C	
10	Indicated air speed	As the installed pilot display measuring system or available sensor range	1	As installed (±3 % recommended)	1 kt (0.5 kt recommended)	
11	Engine RPM	Full range including overspeed condition	Each engine each second	As installed	0.2% of full range	
12	Engine oil pressure	Full range	Each engine each second	As installed (5% of full range recommended)	2% of full range	
13	Engine oil temperature	Full range	Each engine each second	As installed (5% of full range recommended)	2% of full range	
14	Fuel flow or pressure	Full range	Each engine each second	As installed	2% of full range	
15	Manifold pressure	Full range	Each engine each second	As installed	0.2% of full range	
16	Engine thrust/power/torque parameters required to determine propulsive thrust/power*	Full range	Each engine each second	As installed	0.1% of full range	* Sufficient parameters e.g. EPR/N1 or torque/Np as appropriate to the particular engine shall be recorded to determine power in both normal and reverse thrust. A margin for possible overspeed should be provided.
17	Engine gas generator speed (Ng)	0-150%	Each engine each second	As installed	0.2% of full range	
18	Free power turbine speed (Nf)	0-150%	Each engine each second	As installed	0.2% of full range	
19	Coolant temperature	Full range	1	As installed (±5°C recommended)	1° C	
20	Main voltage	Full range	Each engine each second	As installed	1 Volt	
21	Cylinder head temperature	Full range	Each cylinder each second	As installed	2% of full range	
22	Flaps position	Full range or each discrete position	2	As installed	0.5°	

No.	Parameter name	Minimum recording range	Maximum recording interval in seconds	Minimum recording accuracy	Minimum recording resolution	Remarks
23	Primary flight control surface position	Full range	0.25	As installed	0.2 % of full range	
24	Fuel quantity	Full range	4	As installed	1% of full range	
25	Exhaust gas temperature	Full range	Each engine each second	As installed	2% of full range	
26	Emergency voltage	Full range	Each engine each second	As installed	1 Volt	
27	Trim surface position	Full range or each discrete position	1	As installed	0.3% of full range	
28	Landing gear position	Each discrete position*	Each gear every two seconds	As installed		* Where available, record up-and- locked and down-and-locked position
29	Novel/unique aircraft features	As required	As required	As required	As required	

Appendix 1 to SPO.A.570 Supplemental oxygen – pressurised aeroplanes

Table 17 - Oxygen – Minimum Requirements for Supplemental Oxygen for Pressurised Aeroplanes

(a) SUPPLY FOR:	(b) DURATION AND CABIN PRESSURE ALTITUDE
1. All occupants of flight deck seats on flight deck duty	Entire flight time when the cabin pressure altitude exceeds 13 000 ft and entire flight time when the cabin pressure altitude exceeds 10 000 ft but does not exceed 13 000 ft after the first 30 minutes at those altitudes, but in no case less than: (i) 30 minutes for aeroplanes certificated to fly at altitudes not exceeding 25 000 ft *(Note 2)*. (ii) 2 hours for aeroplanes certificated to fly at altitudes more than 25 000 ft *(Note 3)*.
2. All required cabin crew members	Entire flight time when cabin pressure altitude exceeds 13 000 ft but not less than 30 minutes *(Note 2)*, and entire flight time when cabin pressure altitude is greater than 10 000 ft but does not exceed 13 000 ft after the first 30 minutes at these altitudes.
3. 100% of passengers *(Note 5)*	Entire flight time when the cabin pressure altitude exceeds 15 000 ft but in no case less than 10 minutes *(Note 4)*.
4. 30% of passengers *(Note 5)*	Entire flight time when the cabin pressure altitude exceeds 14 000 ft but does not exceed 15 000 ft.
5. 10% of passengers *(Note 5)*	Entire flight time when the cabin pressure altitude exceeds 10 000 ft but does not exceed 14 000 ft after the first 30 minutes at these altitudes.

Note 1: The supply provided must take account of the cabin pressure altitude and descent profile for the routes concerned.

Note 2: The required minimum supply is that 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.

Note 3: The required minimum supply is that 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 110 minutes at 10 000 ft. The oxygen required in OPS 1.780(a)(1) may be included in determining the supply required.

Note 4: The required minimum supply is that 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.

Note 5: For the purpose of this table 'passengers' means passengers actually carried and includes infants.

Appendix 1 to SPO.A.575 Supplemental oxygen – non-pressurised aeroplanes

Table 18 - Supplemental Oxygen for Non-pressurised Aeroplanes

(a) **SUPPLY FOR:**	(b) **DURATION AND PRESSURE ALTITUDE**
1. All occupants of flight deck seats on flight deck duty	Entire flight time at pressure altitudes above 10 000 ft
2. All required cabin crew members	Entire flight time at pressure altitudes above 13 000 ft and for any period exceeding 30 minutes at pressure altitudes above 10 000 ft but not exceeding 13 000 ft
3. 100% of passengers *(See Note)*	Entire flight time at pressure altitudes above 13 000 ft.
4. 10% of passengers *(See Note)*	Entire flight time after 30 minutes at pressure altitudes greater than 10 000 ft but not exceeding 13 000 ft.

SECTION 2 – HELICOPTERS

SPO.H.500 Instruments and equipment – general

(a) The operator shall ensure that a flight does not commence unless the instruments and equipment required under this Subpart are:

(1) approved, except as specified in sub-paragraph (c), and installed in accordance with the requirements applicable to them, including the minimum performance standard and the operational and airworthiness requirements; and

(2) in operable condition for the kind of operation being conducted except as provided in the MEL.

(a) Instruments and equipment minimum performance standards are those prescribed in the applicable Technical Standard Orders (TSO) unless different performance standards are prescribed in the operational or airworthiness codes. Instruments and equipment complying with design and performance specifications other than TSO may remain in service, or be installed, unless additional requirements are prescribed in this Subpart. Instruments and equipment that have already been approved do not need to comply with a revised TSO or a revised specification, other than TSO, unless a retroactive requirement is prescribed.

(b) Instruments and equipment required by this Subpart shall be approved in accordance with the applicable airworthiness requirements if they are:

(1) used by the flight crew to control the flight path;

(2) used to comply with SPO.H.615 Radio communication equipment;

(3) used to comply with SPO.H.620 Navigation equipment; or

(4) installed in the helicopter.

(c) The following items, when required under this Subpart, do not need an equipment approval:

(1) independent portable lights;

(2) an accurate time piece;

(3) first-aid kit;

(4) survival and signalling equipment;

(5) sea anchor and equipment for mooring;

(6) child restraint device;

(7) a simple PCDS used by a task specialist as a restraint device.

(d) Instruments, equipment or accessories not required under this CAR SPO as well as any other equipment which is not required under this Regulation, but carried on a flight, shall comply with the following requirements:

(1) the information provided by those instruments, equipment or accessories shall not be used by the flight crew members to comply with SPO.H.615 Radio communication equipment and SPO.H.620 Navigation equipment of this regulation;

(2) the instruments, equipment or accessories shall not affect the airworthiness of the helicopter, even in the case of failures or malfunction.

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

(f) Those instruments that are used by a flight crew member shall be so arranged as to permit the flight crew member to see the indications readily from his/her station, with the minimum practicable deviation from the position and line of vision which he normally assumes when looking forward along the flight path.

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

SPO.H.505 Minimum equipment for flight

A flight shall not be commenced when any of the helicopter's instruments, items of equipment or functions required for the intended flight is inoperative or missing, unless either of the following conditions is fulfilled:

(a) the helicopter is operated in accordance with the minimum equipment list (MEL);

(b) the operator is approved by the Authority to operate the helicopter within the constraints of the master minimum equipment list (MMEL); or

(c) the helicopter is subject to a permit to fly issued in accordance with the applicable airworthiness requirements.

SPO.H.515 Operating lights

Helicopters operated at night shall be equipped with:

(a) an anti-collision light system;

(b) navigation/position lights;

(c) a landing light;

(d) lighting supplied from the helicopter’s electrical system to provide adequate illumination for all instruments and equipment essential to the safe operation of the helicopter;

(e) lighting supplied from the helicopter’s electrical system to provide illumination in all cabin compartments;

(f) an independent portable light for each crew member station; and

(g) lights to conform with the International Regulations for Preventing Collisions at Sea if the helicopter is amphibious.

SPO.H.520 Day VFR Operations – Flight and Navigational Instruments and Associated Equipment

(See AMC SPO.H.520/525)

The operator shall not operate a helicopter by day in accordance with Visual Flight Rules (VFR) unless it is equipped with the flight and navigational instruments and associated equipment and, where applicable, under the conditions stated in the following sub-paragraphs:

(a) A magnetic direction indicator;

(b) A means of measuring and displaying the time in hours, minutes, and seconds;

Note: This instrument may be aircraft equipment or carried in the helicopter.

(c) A sensitive pressure altimeter calibrated in feet with a sub-scale setting, calibrated in hectopascals/millibars, adjustable for any barometric pressure likely to be set during flight;

(d) An airspeed indicator calibrated in knots;

(e) A vertical speed indicator;

(f) A slip indicator;

(g) A means of indicating on the flight deck the outside air temperature calibrated in degrees celcius (see AMC SPO.H.520(g) & AMC SPO.H.525(k)).

(h) Whenever two pilots are required the second pilot's station shall have separate instruments as follows:

(1) A sensitive pressure altimeter calibrated in feet with a sub-scale setting calibrated in hectopascals/millibars, adjustable for any barometric pressure likely to be set during flight;

(2) An airspeed indicator calibrated in knots;

(3) A vertical speed indicator; and

(4) A slip indicator.

(i) In addition to the flight and navigational equipment required by sub-paragraphs (a) to (h) above, helicopters with a maximum certificated take-off mass (MCTOM) over 3 175 kg or any helicopter operating over water when out of sight of land or when the visibility is less than 1 500m, must be equipped with the following flight instruments:

(1) An attitude indicator; and

(2) A gyroscopic direction indicator.

(j) Whenever duplicate instruments are required, the requirement embraces separate displays for each pilot and separate selectors or other associated equipment where appropriate;

(k) All helicopters must be equipped with means for indicating when power is not adequately supplied to the required flight instruments; and

(l) Each airspeed indicating system must be equipped with a heated pitot tube or equivalent means for preventing malfunction due to either condensation or icing for helicopters with a maximum certificated take-off mass (MCTOM) over 3 175 kg or having a maximum approved passenger seating configuration (MAPSC) of more than 9.

SPO.H.525 IFR or Night Operations – Flight and Navigational Instruments and Associated Equipment

(See AMC SPO.H.520/525)

The operator shall not operate a helicopter in accordance with Instrument Flight Rules (IFR) or by night in accordance with Visual Flight Rules (VFR) unless it is equipped with the flight and navigational instruments and associated equipment and, where applicable, under the conditions stated in the following sub-paragraphs:

(a) A magnetic direction indicator;

(b) A means of measuring and displaying the time in hours, minutes, and seconds;

Note: This instrument may be aircraft equipment or carried in the helicopter.

(c) Two sensitive pressure altimeters calibrated in feet, with sub-scale settings calibrated in hectopascals/millibars, adjustable for any barometric pressure likely to be set during flight. For single pilot night VFR operations one pressure altimeter may be substituted by a radio altimeter.

(d) An airspeed indicating system with heated pitot tube or equivalent means for preventing malfunctioning due to either condensation or icing including an annunciation of pitot heater failure. The pitot heater failure annunciation requirement does not apply to those helicopters with a maximum approved passenger seating configuration (MAPSC) of 9 or less or a maximum certificated take-off mass (MCTOM) of 3 175 kg or less and issued with an individual Certificate of Airworthiness prior to 1 August 1999 (see AMC SPO.H.520(d) & (m)(2));

(e) A vertical speed indicator;

(f) A slip indicator;

(g) An attitude indicator;

(h) A single standby attitude indicator (artificial horizon) capable of being used from either pilot's station that:

(1) Provides 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;

(2) Operates independently of any other attitude indicating system;

(3) Is operative automatically after total failure of the normal electrical generating system; and

(4) Is appropriately illuminated during all phases of operation;

(i) In complying with sub-paragraph (h) above, it must be clearly evident to the flight crew when the standby attitude indicator, required by that paragraph, is being operated by emergency power. Where the standby attitude indicator has its own dedicated power supply there shall be an associated indication clearly visible when this supply is in use.

(j) A gyroscopic direction indicator for VFR night and a magnetic gyroscopic direction indicator for IFR;

(k) A means of indicating in the flight crew compartment the outside air temperature calibrated in degrees Celsius (see AMC SPO.H.520(g) and 525(k)); and

(l) An alternate source of static pressure for the altimeter and the airspeed and vertical speed indicators; and

(m) Whenever two pilots are required the second pilot's station shall have separate instruments as follows:

(1) A sensitive pressure altimeter calibrated in feet with a sub-scale setting, calibrated in hectopascals/millibars, adjustable for any barometric pressure setting likely to be encountered during flight which may be one of the two altimeters required by sub-paragraph (c) above;

(2) An airspeed indicating system with heated pitot tube or equivalent means for preventing malfunctioning due to either condensation or icing including an annunciation of pitot heater failure. The pitot heater failure annunciation requirement does not apply to those helicopters with a maximum approved passenger seating configuration of 9 or less or a maximum certificated take-off mass (MCTOM) of 3 175 kg or less and issued with an individual Certificate of Airworthiness prior to 01 August 1999 (see AMC SPO.H.520(d) and (m)(2));

(3) A vertical speed indicator;

(4) A slip indicator;

(5) An attitude indicator; and

(6) A gyroscopic direction indicator for VFR night and a magnetic gyroscopic direction indicator for IFR.

(n) For IFR operations, a chart holder in an easily readable position which can be illuminated for night operations.

(o) Whenever duplicate instruments are required, the requirement embraces separate displays for each pilot and separate selectors or other associated equipment where appropriate; and

(p) All helicopters must be equipped with means for indicating when power is not adequately supplied to the required flight instruments.

(q) Where helicopters are equipped with automatic landing systems, HUD or equivalent displays, EVS, SVS or CVS, or any combination of those systems into a hybrid system, the use of such systems for the safe operation of a helicopter shall be approved by the Authority.

(r) In approving the operational use of automatic landing systems, a HUD or equivalent displays, EVS, SVS or CVS, the Authority shall ensure that:

(1) the equipment meets the appropriate airworthiness certification requirements;

(2) the operator has carried out a safety risk assessment of the operations supported by the automatic landing systems, HUD or equivalent displays, EVS, SVS or CVS;

(3) the operator has established and documented the procedures for the use of, and training requirements for, automatic landing systems, a HUD or equivalent displays, EVS, SVS or CVS.

SPO.H.526 Additional equipment for single-pilot operation under IFR

Helicopters operated under IFR with a single pilot shall be equipped with an autopilot with at least altitude hold and heading mode, except for helicopters with a maximum approved passenger seating configuration (MAPSC) of 6 or less first certificated for single pilot IMC operations on or before 01 January 1979.

SPO.H.532 Airborne weather detecting equipment

The operator shall not operate a helicopter with a maximum approved passenger seating configuration (MAPSC) of more than 9 under IFR or at night when current weather reports indicate that thunderstorms or other potentially hazardous weather conditions, regarded as detectable with airborne weather radar, may reasonably be expected along the route to be flown unless it is equipped with airborne weather radar equipment.

SPO.H.533 Equipment for operations in icing conditions

(a) The operator shall not operate a helicopter in expected or actual icing conditions unless it is certificated and equipped to operate in icing conditions.

(b) The operator shall not operate a helicopter in expected or actual icing conditions at night unless it is equipped with a means to illuminate or detect the formation of ice. Any illumination that is used must be of a type that will not cause glare or reflection that would handicap crew members in the performance of their duties.

SPO.H.535 Flight crew interphone system

Helicopters 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.

SPO.H.540 Cockpit voice recorder

(See Appendix 1 to SPO.H.540 & Appendix 1 to SPO.H.540/SPO.H.545/SPO.H.546 & Appendix 2 to SPO.H.540/SPO.H.545/SPO.H.546)

(a) All helicopters of a maximum certificated take-off mass of over 7 000 kg shall be equipped with a CVR.

(b) For helicopters not equipped with an FDR, at least main rotor speed shall be recorded on the CVR.

(c) CVRs and CARS shall not use magnetic tape or wire.

(d) All helicopters required to be equipped with a CVR, shall be equipped with a CVR which shall retain the information recorded during at least the last 2 hours of their operation.

SPO.H.545 Flight data recorder – Helicopters greater than 3175 kg

(See Appendix 1 to SPO.H.540/SPO.H.545/SPO.H.546 & Appendix 2 to SPO.H.540/SPO.H.545/SPO.H.546 & Appendix 1 to SPO.H.545/SPO.H.546 & Appendix 2 to SPO.H.545/SPO.H.546 & Appendix 3 to SPO.H.545/SPO.H.546 & Appendix 1 to SPO.H.545 & Appendix 2 to SPO.H.545)

(a) All helicopters of a maximum certificated take-off mass of over 3 175 kg for which the individual certificate of airworthiness is first issued on or after 01 January 2016 shall be equipped with a FDR capable of recording at least the first 48 parameters listed in Appendix 3 to SPO.H.545/SPO.H.546

(b) All helicopters of a maximum certificated take-off mass of over 3 175 kg for which the application for type certification is submitted to a Contracting State on or after 01 January 2023 shall be equipped with a FDR capable of recording at least the first 53 parameters listed in Appendix 3 to SPO.H.545/SPO.H.546.

(c) All helicopters of a maximum certificated take-off mass of over 7 000 kg, or having a passenger seating configuration of more than 19, for which the individual certificate of airworthiness is first issued on or after 01 January 1989 shall be equipped with a FDR capable of recording at least the first 30 parameters listed in Appendix 3 to SPO.H.545/SPO.H.546.

(d) FDRs shall not use engraving metal foil, frequency modulation (FM), photographic film or magnetic tape.

(e) All FDRs shall retain the information recorded during at least the last 10 hours of their operation, and in addition sufficient information from the preceding take-off for calibration purposes.

(f) FDRs that meet the current parameter certification requirements of the FAA, Transport Canada or EASA in respect to commercial air transport operations, shall be exempt from meeting the parameter requirements of SPO.H.546 Flight Data Recorders – Helicopters of between 2250 kg and 3175 kg.

Note: "The application for type certification is submitted to a Contracting State" refers to the date of application of the original "Type Certificate" for the helicopter type, not the date of certification of particular helicopter variants or derivative models.

SPO.H.546 Flight Data Recorders – Helicopters of between 2250 kg and 3175 kg

(See Appendix 1 to SPO.H.540/SPO.H.545/SPO.H.546 & Appendix 2 to SPO.H.540/SPO.H.545/SPO.H.546 & Appendix 1 to SPO.H.545/SPO.H.546 & Appendix 2 to SPO.H.545/SPO.H.546 & Appendix 3 to SPO.H.545/SPO.H.546)

(a) All turbine-engined helicopters of a maximum certificated take-off mass of over 2 250 kg, up to and including 3 175 kg for which the application for type certification was submitted to a Contracting State on or after 01 January 2018 shall be equipped with:

(1) an FDR which shall record at least parameters 1-48 listed in Appendix 3 to SPO.H.545/SPO.H.546; or

(2) a Class C AIR or AIRS which shall record at least the flight path and speed parameters displayed to the pilot(s), as defined in Appendix 2 to SPO.H.545/SPO.H.546, paragraph (b)(3); or

(3) an ADRS which shall record at least parameters 1-7 listed in Appendix 2 to SPO.H.545.

(b) FDRs or ADRS shall not use engraving metal foil, frequency modulation (FM), photographic film or magnetic tape.

Note: "The application for type certification is submitted to a Contracting State" refers to the date of application of the original "Type Certificate" for the helicopter type, not the date of certification of particular helicopter variants or derivative models.

SPO.H.550 Data link recording

(See Appendix 2 to SPO.H.545/SPO.H.546)

(a) All helicopters for which the individual certificate of airworthiness is first issued after 01 January 2016, which utilise any of the data link communications applications listed in Appendix 2 to SPO.H.545/SPO.H.546 and are required to carry a CVR, shall record on a crash protected flight recorder, the data link communications messages.

(b) From 01 January 2016, all helicopters which are modified to install and utilise any of the data link communications applications stated in Appendix 2 to SPO.H.545/SPO.H.546 and are required to carry a CVR shall record on a crash protected flight recorder, all data link communications messages.

(c) The minimum recording duration shall be equal to the duration of the CVR.

(d) Data link recording shall be able to be correlated to the recorded cockpit audio.

SPO.H.555 Flight data and cockpit voice combination recorder

All helicopters of a maximum certificated take-off mass over 2 700 kg, required to be equipped with an FDR and/or a CVR, may alternatively be equipped with one combination recorder (FDR/CVR).

SPO.H.560 Seats, seat safety belts and restraint systems

(a) Helicopters shall be equipped with:

(1) a seat or station for each crew member or task specialist on board;

(2) a seat belt on each seat, and restraint devices for each station;

(3) for helicopters first issued with an individual Certificate of Airworthiness, up to and including 31 July 1999 a safety belt, with or without a diagonal shoulder strap, or a safety harness for use in each passenger seat for each passenger aged two years or more;

(4) for helicopters first issued with an individual Certificate of Airworthiness, on or after 01 August 1999, a safety belt, with a diagonal shoulder strap, or a safety harness for use in each passenger seat for each passenger aged 2 years or more;

(5) a seat belt with upper torso restraint system incorporating a device that will automatically restrain the occupant’s torso in the event of rapid deceleration on each flight crew seat.

(b) A seat belt with upper torso restraint system shall have a single point release.

SPO.H.565 First-aid kit

(See AMC1 SPO.H.565 First-Aid Kits)

(a) The operator shall not operate a helicopter unless it is equipped with a first-aid kit, readily accessible for use.

(b) The operator shall ensure that first-aid kits are:

(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.

SPO.H.575 Supplemental oxygen – non-pressurised helicopters

(a) Non-pressurised helicopters operated at flight altitudes when the oxygen supply is required in accordance with (b) shall be equipped with oxygen storage and dispensing apparatus capable of storing and dispensing the required oxygen supplies.

(b) Non-pressurised helicopters operated above flight altitudes at which the pressure altitude in the cabin compartments is above 10 000 ft shall carry enough breathing oxygen to supply:

(1) all crew members for any period in excess of 30 minutes when the pressure altitude in the cabin compartment will be between 10 000 ft and 13 000 ft; and

(2) all crew members and task specialists for any period that the pressure altitude in the cabin compartment will be above 13 000 ft.

(c) Notwithstanding (b), excursions of a specified duration between 13 000 ft and 16 000 ft may be undertaken without oxygen supplies, -in accordance with SPO.H.575 Supplemental oxygen – non-pressurised helicopters(b).

SPO.H.580 Hand fire extinguishers

(See AMC1 SPO.H.580 Hand fire extinguishers)

The operator shall not operate a helicopter unless hand fire extinguishers are provided for use in crew, passenger and, as applicable, cargo compartments and galleys in accordance with the following:

(a) The type and quantity of extinguishing agent must be suitable for the kinds of fires likely to occur in the compartment where the extinguisher is intended to be used and, for personnel compartments, must minimise the hazard of toxic gas concentration;

(b) At least one hand fire extinguisher, containing Halon 1211 (bromochlorodifluoromethane, CBrClF2), or equivalent as the extinguishing agent, must be conveniently located in the cockpit for use by the flight crew;

Note: Any extinguishing agent used in a portable fire extinguisher in helicopter for which the individual certificate of airworthiness is first issued on or after 31 December 2018 shall not be of a type listed in Annex A, Group II of the Montreal Protocol on Substances That Deplete the Ozone Layer, 8th Edition, 2009.

(c) At least one hand fire extinguisher must be located in, or readily accessible for use in, each galley not located on the main passenger deck;

(d) At least one readily accessible hand fire extinguisher must be available for use in each cargo compartment which is accessible to crew members during flight for the purpose of firefighting; and

(e) There must be at least the following number of hand fire extinguishers conveniently located to provide adequate availability for use in each passenger compartment.

Passenger compartment seating capacity	Minimum number of hand fire extinguishers
7 to 30	1
31 to 60	2
61 to 200	3

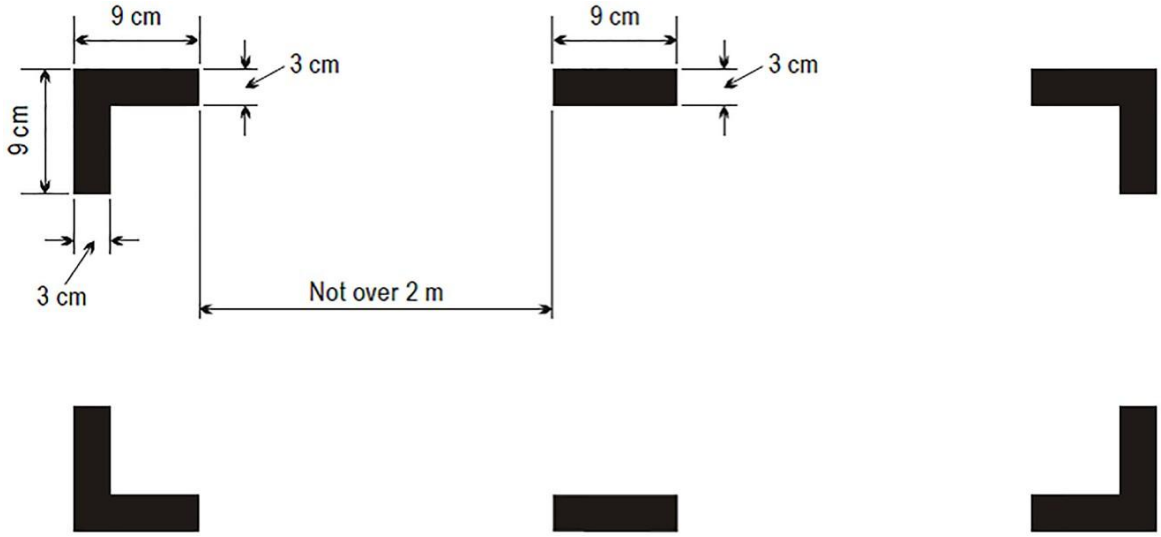
SPO.H.585 Marking of break-in points

(a) The operator shall ensure that, if areas of the fuselage suitable for break-in by rescue crews in emergency are available on a helicopter, such areas shall be marked as shown below.

(b) The colour of the markings shall be red or yellow, and if necessary they shall be outlined in white to contrast with the background.

(c) If the corner markings are more than 2 metres apart, intermediate lines 9 cm x 3 cm shall be inserted so that there is no more than 2 metres between adjacent marks.

Marking of break-in points



SPO.H.590 Emergency locator transmitter (ELT)

(a) All helicopters operating in performance Class 1 and 2 shall be equipped with at least one automatic ELT and, when operating on flights over water as described in SPO.H.595 Flight over water paragraph (a)(1), with at least one automatic ELT and one ELT(S) in a raft or life jacket.

(b) All helicopters operating in performance Class 3 shall be equipped with at least one automatic ELT and, when operating on flights over water as described in SPO.H.595 Flight over water paragraph (a)(2), with at least one automatic ELT and one ELT(S) in a raft or life jacket.

(c) ELT equipment carried to satisfy the requirements shall operate in accordance with the relevant provisions of ICAO Annex 10, Volume III.

Note1: The judicious choice of numbers of ELTs, their type and placement on the helicopter and associated floatable life support systems will ensure the greatest chance of ELT activation in the event of an accident for helicopters operating over water or land, including areas especially difficult for search and rescue.

Note 2: Placement of transmitter units is a vital factor in ensuring optimal crash and fire protection. The placement of the control and switching devices (activation monitors) of automatic fixed ELTs and their associated operational procedures will also take into consideration the need for rapid detection of inadvertent activation and convenient manual switching by crew members.

SPO.H.595 Flight over water

(a) Helicopters shall be equipped with a life-jacket for each person on board, that shall be worn or stowed in a position that is readily accessible from the seat or station of the person for whose use it is provided, when:

(1) flying over water beyond autorotational distance from the land where in case of the critical engine failure, the helicopter is not able to sustain level flight; or

(2) flying over water at a distance of land corresponding to more than 10 minutes flying at normal cruising speed, where in case of the critical engine failure, the helicopter is able to sustain level flight; or

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

(b) Each life-jacket shall be equipped with a means of electric illumination for the purpose of facilitating the location of persons.

(c) The pilot-in-command of a helicopter operated on a flight over water at a distance from land corresponding to more than 30 minutes flying time at normal cruising speed or 50 NM, whichever is less, shall determine the risks to survival of the occupants of the helicopter in the event of a ditching, based on which he shall determine the carriage of:

(1) equipment for making the distress signals;

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

(3) life-saving equipment to provide the means of sustaining life, as appropriate to the flight to be undertaken.

(d) The pilot-in-command shall determine the risks to survival of the occupants of the helicopter in the event of a ditching, when deciding if the life-jackets required in (a) shall be worn by all occupants.

SPO.H.597 Life-jackets

(a) Helicopters shall be equipped with a life-jacket for each person on board, that shall be worn or stowed in a position that is readily accessible from the seat or station of the person for whose use it is provided, when:

(1) operated on a flight over water at a distance from land corresponding to more than 10 minutes flying time at normal cruising speed, where in the case of the critical engine failure, the helicopter is able to sustain level flight;

(2) operated on a flight over water beyond auto-rotational distance from the land, where in the case of the critical engine failure, the helicopter is not able to sustain level flight; or

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

(b) Each life-jacket shall be equipped with a means of electric illumination for the purpose of facilitating the location of persons.

SPO.H.598 Survival suits

(See AMC1 SPO.H.598 Survival suits)

Each person on board shall wear a survival suit when so determined by the pilot-in-command based on a risk assessment taking into account the following conditions:

(a) flights over water beyond autorotational distance or safe forced-landing distance from land, where, in the case of a critical engine failure, the helicopter is not able to sustain level flight; and

(b) 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.

SPO.H.599 Life-rafts, survival ELTs and survival equipment on extended overwater flights

(See Appendix 1 to SPO.H.599 Emergency Locator Transmitter (ELT(S)) & AMC1 SPO.H.599 Life-rafts, survival ELTs and survival equipment on extended overwater flights)

The operator shall not operate a helicopter on a flight over water at a distance from land corresponding to more than 10 minutes flying time at normal cruising speed when operating in Performance Class 1 or 2, or 3 minutes flying time at normal cruising speed when operating in Performance Class 3 unless it carries:

(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;

(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) shall be sufficient to accommodate all persons on the helicopter (See AMC1 SPO.H.599 Life-rafts, survival ELTs and survival equipment on extended overwater flights paragraph (a)(2));

(c) 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 transmitting on the distress frequencies prescribed in Appendix 1 to SPO.H.599 Emergency Locator Transmitter (ELT(S)). (See also AMC1 SPO.H.599 Life-rafts, survival ELTs and survival equipment on extended overwater flights paragraph (a)(3));

(d) Emergency exit illumination; and

(e) Lifesaving equipment including means of sustaining life as appropriate to the flight to be undertaken.

SPO.H.600 Survival equipment

(See AMC1 SPO.H.600 Survival equipment & AMC1 SPO.H.600(b) Survival equipment)

The operator shall not operate a helicopter in areas where search and rescue would be especially difficult unless it is equipped with the following:

(a) Signalling equipment to make the pyrotechnical distress signals described in ICAO Annex 2;

(b) At least one survival Emergency Locator Transmitter (ELT(S)) capable of transmitting on the distress frequencies prescribed in Appendix 1 to SPO.H.599 Emergency Locator Transmitter (ELT(S)) (see also AMC1 SPO.H.599 Life-rafts, survival ELTs and survival equipment on extended overwater flights paragraph (a)(3)); and

(c) Additional survival equipment for the route to be flown taking account of the number of persons on board (see AMC1 SPO.H.600 Survival equipment(c)).

SPO.H.602 Helicopters certified for operating on water – miscellaneous equipment

Helicopters certified for operating on water shall be equipped with:

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

(b) equipment for making the sound signals prescribed in the International Regulations for Preventing Collisions at Sea, where applicable.

SPO.H.603 All helicopters on flights over water – ditching

(a) The operator shall not operate a helicopter in Performance Class 1 or 2 on a flight over water in a hostile environment at a distance from land corresponding to more than 10 minutes flying time at normal cruise speed unless that helicopter is so designed for landing on water or is certificated in

accordance with ditching provisions. Sea state shall be an integral part of ditching information and certification.

(b) The operator shall not operate a helicopter in Performance Class 1 or 2 on a flight over water in a non-hostile environment at a distance from land corresponding to more than 10 minutes flying time at normal cruise speed unless that helicopter is; so designed for landing on water; or is certificated in accordance with ditching provisions; or is fitted with emergency flotation equipment.

(c) The operator shall not operate a helicopter in Performance Class 2, when taking-off or landing over water, unless that helicopter is; so designed for landing on water; or is certificated in accordance with ditching provisions; or is fitted with emergency floatation equipment. Except 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, unless otherwise required by the Authority.

(d) The operator shall not operate a helicopter in Performance Class 3 on a flight over water beyond safe forced landing distance from land unless that helicopter is; so designed for landing on water; or is certificated in accordance with ditching provisions; or is fitted with emergency flotation equipment.

SPO.H.605 Individual protective equipment

Each person on board shall wear individual protective equipment that is adequate for the type of operation being undertaken.

SPO.H.610 Headset

Whenever a radio communication and/or radio navigation system is required, helicopters shall be equipped with a headset with boom microphone or equivalent and a transmit button on the flight controls for each required pilot, crew member and/or task specialist at his/her assigned station.

SPO.H.615 Radio communication equipment

(a) Helicopters operated under IFR or at night, or when required by the applicable airspace requirements, shall be equipped with radio communication equipment that, under normal radio propagating conditions, shall be capable of:

(1) conducting two-way communication for aerodrome control purposes;

(2) receiving meteorological information;

(3) conducting two-way communication at any time during flight with those aeronautical stations and on those frequencies prescribed by the appropriate authority; and

(4) providing for communication on the aeronautical emergency frequency 121,5 MHz.

(b) When more than one communications equipment unit is required, each shall be independent of the other or others to the extent that a failure in anyone will not result in failure of any other.

(c) When a radio communication system is required, and in addition to the flight crew interphone system required in SPO.H.535 Flight crew interphone system, helicopters shall be equipped with a transmit button on the flight controls for each required pilot and crew member at his/her assigned station.

SPO.H.620 Navigation equipment

(a) Helicopters shall be equipped with navigation equipment that will enable them to proceed in accordance with:

(1) the ATS flight plan, if applicable; and

(2) the applicable airspace requirements.

(b) Helicopters shall have sufficient navigation equipment to ensure that, in the event of the failure of one item of equipment at any stage of the flight, the remaining equipment shall allow safe navigation in accordance with (a), or an appropriate contingency action to be completed safely.

(c) Helicopters operated on flights in which it is intended to land in IMC shall be equipped with navigation equipment capable of providing guidance to a point from which a visual landing can be performed. This equipment shall be capable of providing such guidance for each aerodrome at which it is intended to land in IMC and for any designated alternate aerodromes.

(d) For PBN operations the aircraft shall meet the airworthiness certification requirements for the appropriate navigation specification.

(e) Helicopters shall be equipped with surveillance equipment in accordance with the applicable airspace requirements.

SPO.H.625 Transponder

Where required by the airspace being flown, helicopters shall be equipped with a secondary surveillance radar (SSR) transponder with all the required capabilities.

SPO.H.630 Management of aeronautical databases

(a) Aeronautical databases used on certified aircraft system applications shall meet data quality requirements that are adequate for the intended use of the data.

(b) The operator shall ensure the timely distribution and insertion of current and unaltered aeronautical databases to all aircraft that require them.

(c) Notwithstanding any other occurrence reporting requirements, the operator shall report to the database provider instances of erroneous, inconsistent or missing data that might be reasonably expected to constitute a hazard to flight.

In such cases, the operator shall inform flight crew and other personnel concerned, and shall ensure that the affected data is not used.

Appendix 1 to SPO.H.540

Cockpit Voice Recorder (CVR) and Cockpit Audio Recording System (CARS)

(a) Start and stop logic

The CVR or CARS shall start to record prior to the helicopter moving under its own power and record continuously until the termination of the flight when the helicopter is no longer capable of moving under its own power. In addition, depending on the availability of electrical power, the CVR or CARS shall 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.

(b) Signals to be recorded

(1) The CVR shall record simultaneously on four separate channels, or more, at least the following:

(i) voice communication transmitted from or received in the helicopter by radio;

(ii) aural environment on the flight deck;

(iii) voice communication of flight crew members on the flight deck using the helicopter's interphone system, if installed;

(iv) voice or audio signals identifying navigation or approach aids introduced in the headset or speaker; and

(v) voice communication of flight crew members using the passenger address system, if installed.

(c) The preferred CVR audio allocation should be as follows:

(1) pilot-in-command audio panel;

(2) co-pilot audio panel;

(3) additional flight crew positions and time reference; and

(4) cockpit area microphone.

(d) The CARS shall record simultaneously on two separate channels, or more, at least the following:

(1) voice communication transmitted from or received in the helicopter by radio;

(2) aural environment on the flight deck; and

(3) voice communication of flight crew members on the flight deck using the helicopter's interphone system, if installed.

(e) The preferred CARS audio allocation should be as follows:

(1) voice communication; and

(2) aural environment on the flight deck.

Appendix 1 to SPO.H.540/SPO.H.545/SPO.H.546

Flight Recorders - General

Note 1: The following applies to all crash protected flight recorders which comprise one or more of the following systems:

(1) a flight data recorder (FDR),

(2) a cockpit voice recorder (CVR)

(3) an airborne image recorder (AIR),

(4) a data link recorder (DLR).

Note 2: The following applies to all lightweight flight recorders which comprise one or more of the following systems:

(1) an aircraft data recording system (ADRS),

(2) a cockpit audio recording system (CARS),

(3) an airborne image recording system (AIRS)

(4) a data link recording system (DLRS).

(a) Non-deployable flight recorder containers shall be painted a distinctive orange colour;

(b) Non-deployable crash protected flight recorder containers shall;

(1) carry reflective material to facilitate their location; and

(2) have a device to assist in locating that recorder in water and, not later than 01 January 2019, have securely attached an automatically activated underwater locating device operating at a frequency of 37.5 kHz that operates for a minimum of 90 days.

(c) Automatic deployable flight recorder containers shall:

(1) be painted a distinctive orange colour, however the surface visible from outside the aircraft may be of another colour;

(2) carry reflective material to facilitate their location; and

(3) have an integrated automatically activated ELT.

(d) The flight recorder systems shall be installed so that:

(1) the probability of damage to the recordings is minimised;

(2) there is an aural or visual means for pre-flight checking that the flight recorder systems are operating properly; and

(3) if the flight recorder systems have an erasure device, the installation shall be designed to prevent operation of the device during flight time or crash impact; and

(4) for helicopters for which the individual certificate of airworthiness is first issued on or after 01 January 2023, a flight crew-operated erase function shall be provided on the flight deck which, when activated, modifies the recording of a CVR and AIR so that it cannot be retrieved using normal replay or copying techniques. The installation shall be designed to prevent activation during flight. In addition, the probability of an inadvertent activation of an erase function during an accident shall also be minimised.

Note: The erase function is intended to prevent access to CVR and AIR recordings by normal replay or copying means but would not prevent accident investigation authorities' access to such recordings by specialised replay or copying techniques.

(e) The flight recorder systems shall be installed so that they receive electrical power from a bus that provides the maximum reliability for operation of the flight recorder systems without jeopardizing service to essential or emergency loads.

(f) The flight recorder systems, when tested by methods approved by the appropriate certificating authority, shall be demonstrated to be suitable for the environmental extremes over which they are designed to operate.

(g) Means shall be provided for an accurate time correlation between the flight recorder systems recordings.

(h) The manufacturer shall provide the appropriate certificating authority with the following information in respect of the flight recorder systems:

(1) manufacturer's operating instructions, equipment limitations and installation procedures;

(2) parameter origin or source and equations which relate counts to units of measurement; and

(3) manufacturer's test reports.

(i) Flight recorders shall be constructed, located and installed so as to provide maximum practical protection for the recordings in order that the recorded information may be preserved, recovered and transcribed. Flight recorders shall meet the prescribed crashworthiness and fire protection specifications.

Appendix 2 to SPO.H.540/SPO.H.545/SPO.H.546

Inspection of Flight Recorder Systems

(a) Prior to the first flight of the day, the built-in test features for the flight recorders and flight data acquisition unit (FDAU), when installed, shall be monitored by manual and/or automatic checks.

(b) FDR systems or ADRS, CVR systems or CARS, and AIR systems or AIRS shall have recording inspection intervals of one year. This period may be extended by the Authority to two years provided these systems have demonstrated a high integrity of serviceability and self-monitoring.

(c) DLR systems or DLRS shall have recording inspection intervals of two years. This period may be extended by the Authority to four years provided these systems have demonstrated a high integrity of serviceability and self-monitoring.

(d) Recording inspections shall be carried out as follows:

(1) an analysis of the recorded data from the flight recorders shall ensure that the recorder operates correctly for the nominal duration of the recording;

(2) the analysis of the FDR or ADRS recording shall evaluate the quality of the recorded data to determine if the bit error rate (including those errors introduced by recorder, the acquisition unit, the source of the data on the helicopter and by the tools used to extract the data from the recorder) is within acceptable limits and to determine the nature and distribution of the errors;

(3) the FDR or ADRS recording from a complete flight shall be examined in engineering units to evaluate the validity of all recorded parameters. Particular attention shall be given to parameters from sensors dedicated to the FDR or ADRS. Parameters taken from the aircraft's electrical bus system need not be checked if their serviceability can be detected by other aircraft systems;

(4) the readout facility shall have the necessary software to accurately convert the recorded values to engineering units and to determine the status of discrete signals;

(5) an annual examination of the recorded signal on the CVR or CARS shall be carried out by replay of the CVR or CARS recording. While installed in the aircraft, the CVR or CARS shall record test signals from each aircraft source and from relevant external sources to ensure that all required signals meet intelligibility standards;

(6) where practicable, during the examination, a sample of in-flight recordings of the CVR or CARS shall be examined for evidence that the intelligibility of the signal is acceptable; and

(7) an examination of the recorded images on the AIR or AIRS shall be carried out by replay of the AIR or AIRS recording. While installed in the aircraft, the AIR or AIRS shall record test images from each aircraft source and from relevant external sources to ensure that all required images meet recording quality standards.

(e) A flight recorder system shall be considered unserviceable if there is a significant period of poor quality data, unintelligible signals, or if one or more of the mandatory parameters is not recorded correctly.

(f) A report of the recording inspection shall be made available on request to regulatory authorities for monitoring purposes.

(g) Calibration of the FDR system:

(1) for those parameters which have sensors dedicated only to the FDR and are not checked by other means, recalibration shall be carried out at least every five years or in accordance with the recommendations of the sensor manufacturer to determine any discrepancies in the engineering conversion routines for the mandatory parameters and to ensure that parameters are being recorded within the calibration tolerances; and

(2) when the parameters of altitude and airspeed are provided by sensors that are dedicated to the FDR system, there shall be a recalibration performed as recommended by the sensor manufacturer, or at least every two years.

Appendix 1 to SPO.H.545/SPO.H.546

(a) Start and Stop Logic

The FDR or ADRS shall start to record prior to the helicopter moving under its own power and record continuously until the termination of the flight when the helicopter is no longer capable of moving under its own power.

(b) Parameters to be Recorded

(1) The parameters that satisfy the requirements for FDRs are listed in the paragraph (3) below. The number of parameters to be recorded shall depend on helicopter complexity. The parameters without an asterisk (*) are mandatory parameters which shall be recorded regardless of helicopter complexity. In addition, the parameters designated by an asterisk (*) shall be recorded if an information data source for the parameter is used by helicopter systems or the flight crew to operate the helicopter. However, other parameters may be substituted with due regard to the helicopter type and the characteristics of the recording equipment.

(2) If further FDR recording capacity is available, recording of the following additional information shall be considered:

(i) operational information from electronic display systems, such as electronic flight instrument systems (EFIS), electronic centralized aircraft monitor (ECAM) and engine indication and crew alerting system (EICAS); and

(ii) Additional engine parameters (EPR, N1, fuel flow etc.)

(3) The following parameters shall satisfy the requirements for flight path and speed:

- Pressure altitude
- Indicated airspeed or calibrated airspeed
- Heading (primary flight crew reference)
- Pitch attitude
- Roll attitude
- Engine thrust/power
- Landing-gear status*
- Total or outside air temperature*
- Time*
- Navigation data*: drift angle, wind speed, wind direction, latitude/longitude

- Radio altitude*

Note: The parameters that satisfy the requirements for ADRS are listed in Appendix 2 to SPO.H.545.

(c) Additional Information

(1) The measurement range, recording interval and accuracy of parameters on installed equipment shall be verified by methods approved by the appropriate certificating authority.

(2) Documentation concerning parameter allocation, conversion equations, periodic calibration and other serviceability/maintenance information shall be maintained by the operator. The documentation needs to be sufficient to ensure that accident investigation authorities have the necessary information to read out the data in engineering units.

Appendix 2 to SPO.H.545/SPO.H.546

Data Link Recorder (DLR) Applications to be Recorded

(a) Where the helicopter flight path is authorised or controlled through the use of data link messages, all data link messages, both uplinks (to the helicopter) and downlinks (from the helicopter), shall be recorded on the aircraft. As far as practicable, the time the messages were displayed to the flight crew and the time of the responses shall be recorded.

Note: Sufficient information to derive the content of the data link communications message and the time the messages were displayed to the flight crew is needed to determine an accurate sequence of events on board the aircraft.

(b) Messages applying to the applications listed below shall be recorded. Applications without the asterisk (*) are mandatory applications which shall be recorded regardless of the system complexity. Applications with an (*) shall be recorded only as far as is practicable given the architecture of the system.

Item No.	Application type	Application description	Recording content
1	Data link initiation	This includes any applications used to log on to or initiate data link service. In FANS-1/A and 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 CPDLC application. It also includes applications used for the exchange of oceanic (OCL) and departure clearances (DCL) as well as data link delivery of taxi clearances.	C
3	Addressed surveillance	This includes any surveillance application in which the ground sets up contracts for delivery of surveillance data. In FANS-1/A and ATN, this includes the automatic dependent surveillance — contract (ADS-C) application. Where parametric data are reported within the message they shall be recorded unless data from the same source are recorded on the FDR.	C
4	Flight information	This includes any service used for delivery of flight information to specific aircraft. This includes, for example, data link aviation weather report service (D-METAR), data link-automatic terminal service (D-ATIS), digital Notice to Airmen (D-NOTAM) and other textual data link services.	C
5	Aircraft broadcast surveillance	This includes elementary and enhanced surveillance systems, as well as automatic dependent surveillance — broadcast (ADS-B) output data. Where parametric data sent by the aeroplane are reported within the message they shall be recorded unless data from the same source are recorded on the FDR.	M*
6	Aeronautical operational control data	This includes any application transmitting or receiving data used for aeronautical operational control purposes (per the ICAO definition of operational control).	M*

Key:

C: Complete contents recorded.

M: Information that enables correlation to any associated records stored separately from the aeroplane.

*: Applications to be recorded only as far as is practicable given the architecture of the system.

Appendix 3 to SPO.H.545/SPO.H.546

Parameter Characteristics for Flight Data Recorders

Serial number	Parameter	Applicability	Measurement range	Maximum sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR readout)	Recording resolution
1	Time (UTC when available, otherwise relative time count or GNSS time sync)		24 hours	4	±0.125% /h	1 s
2	Pressure altitude		−300 m (−1 000 ft) to maximum certificated altitude of aircraft +1 500 m (+5 000 ft)	1	±30 m to ±200 m (±100 ft to ±700 ft)	1.5 m (5 ft)
3	Indicated airspeed		As the installed pilot display measuring system	1	±3%	1 kt
4	Heading		360°	1	±2°	0.5°
5	Normal acceleration		−3 g to +6 g	0.125	±0.09 g excluding a datum error of ±0.045 g	0.004 g
6	Pitch attitude		±75° or 100% of useable range whichever is greater	0.5	±2°	0.5°
7	Roll attitude		±180°	0.5	±2°	0.5°
8	Radio transmission keying		On-off (one discrete)	1	—	—
9	Power on each engine		Full range	1 (per engine)	±2%	0.1% of full range
10	Main rotor:					
	Main rotor speed		50–130%	0.51	±2%	0.3% of full range
	Rotor brake		Discrete		—	—
11	Pilot input and/or control surface position — primary controls (collective pitch, longitudinal cyclic pitch, lateral cyclic pitch, tail rotor pedal)		Full range	0.5 (0.25 recommended)	±2% unless higher accuracy uniquely required	0.5% of operating range
12	Hydraulics, each system (low pressure and selection)		Discrete	1	—	—
13	Outside air temperature		Sensor range	2	±2°C	0.3°C

Serial number	Parameter	Applicability	Measurement range	Maximum sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR readout)	Recording resolution
14*	Autopilot/ autothrottle/AFCS mode and engagement status		A suitable combination of discretes	1	—	—
15*	Stability augmentation system engagement		Discrete	1	—	—
16*	Main gearbox oil pressure		As installed	1	As installed	6.895 kN/m² (1 psi)
17*	Main gearbox oil temperature		As installed	2	As installed	1°C
18	Yaw rate		±400°/second	0.25	±1.5% maximum range excluding datum error of ±5%	±2°/s
19*	Sling load force		0 to 200% of certified load	0.5	±3% of maximum range	0.5% for maximum certified load
20	Longitudinal acceleration		±1 g	0.25	±0.015 g excluding a datum error of ±0.05 g	0.004 g
21	Lateral acceleration		±1 g	0.25	±0.015 g excluding a datum error of ±0.05 g	0.004 g
22*	Radio altitude		–6 m to 750 m (–20 ft to 2 500 ft)	1	±0.6 m (±2 ft) or ±3% whichever is greater below 150 m (500 ft) and ±5% above 150 m (500 ft)	0.3 m (1 ft) below 150 m (500 ft), 0.3 m (1 ft) + 0.5% of full range above 150 m (500 ft)
23*	Vertical beam deviation		Signal range	1	±3%	0.3% of full range
24*	Horizontal beam deviation		Signal range	1	±3%	0.3% of full range
25	Marker beacon passage		Discrete	1	—	—
26	Warnings		Discrete(s)	1	—	—
27	Each navigation receiver frequency selection		Sufficient to determine selected frequency	4	As installed	—
28*	DME 1 and 2 distances		0–370 km (0–200 NM)	4	As installed	1 852 m (1 NM)

Serial number	Parameter	Applicability	Measurement range	Maximum sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR readout)	Recording resolution
29*	Navigation data (latitude/longitude, ground speed, drift angle, wind speed, wind direction)		As installed	2	As installed	As installed
30*	Landing gear and gear selector position		Discrete	4	—	—
31*	Engine exhaust gas temperature (T_4)		As installed	1	As installed	
32*	Turbine inlet temperature (ITT/ITT)		As installed	1	As installed	
33*	Fuel contents		As installed	4	As installed	
34*	Altitude rate		As installed	1	As installed	
35*	Ice detection		As installed	4	As installed	
36*	Helicopter health and usage monitor system		As installed	—	As installed	—
37	Engine control modes		Discrete	1	—	—
38*	Selected barometric setting (pilot and co-pilot)		As installed	64 (4 recommended)	As installed	0.1 mb (0.01 in Hg)
39*	Selected altitude (all pilot selectable modes of operation)		As installed	1	As installed	Sufficient to determine crew selection
40*	Selected speed (all pilot selectable modes of operation)		As installed	1	As installed	Sufficient to determine crew selection
41*	Selected Mach (all pilot selectable modes of operation)		As installed	1	As installed	Sufficient to determine crew selection
42*	Selected vertical speed (all pilot selectable modes of operation)		As installed	1	As installed	Sufficient to determine crew selection
43*	Selected heading (all pilot selectable modes of operation)		As installed	1	As installed	Sufficient to determine crew selection

Serial number	Parameter	Applicability	Measurement range	Maximum sampling and recording interval (seconds)	Accuracy limits (sensor input compared to FDR readout)	Recording resolution
44*	Selected flight path (all pilot selectable modes of operation)		As installed	1	As installed	Sufficient to determine crew selection
45*	Selected decision height		As installed	4	As installed	Sufficient to determine crew selection
46*	EFIS display format (pilot and co-pilot)		Discrete(s)	4	—	—
47*	Multi-function/ engine/alerts display format		Discrete(s)	4	—	—
48*	Event marker		Discrete	1	—	—
49*	GPWS/TAWS/GCAS status (selection of terrain display mode including pop-up display status) and (terrain alerts, both cautions and warnings, and advisories) and (on/off switch position) and (operational status)	Application for type certification is submitted to a Contracting State on or after 1 January 2023	Discrete(s)	1	As installed	
50*	TCAS/ACAS (traffic alert and collision avoidance system) and (operational status)	Application for type certification is submitted to a Contracting State on or after 1 January 2023	Discrete(s)	1	As installed	
51*	Primary flight controls – pilot input forces	Application for type certification is submitted to a Contracting State on or after 1 January 2023	Full range	0.125 (0.0625 recommended)	± 3% unless higher accuracy is uniquely required	0.5% of operating range
52*	Computed centre of gravity	Application for type certification is submitted to a Contracting State on or after 1 January 2023	As installed	64	As installed	1% of full range
53*	Helicopter computed weight	Application for type certification is submitted to a Contracting State on or after 1 January 2023	As installed	64	As installed	1% of full range

Appendix 1 to SPO.H.545

Airborne Image Recorder (AIR) and Airborne Image Recording System (AIRS)

(a) Start and Stop Logic

The AIR or AIRS shall start to record prior to the helicopter moving under its own power and record continuously until the termination of the flight when the helicopter is no longer capable of moving under its own power. In addition, depending on the availability of electrical power, the AIR or AIRS shall 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.

(b) Classes

(1) A Class A AIR or AIRS captures the general cockpit area in order to provide data supplemental to conventional flight recorders.

Note 1: To respect crew privacy, the cockpit area view may be designed as far as practical to exclude the head and shoulders of crew members whilst seated in their normal operating position.

Note 2: There are no provisions for Class A AIR or AIRS in this document.

(2) A Class B AIR or AIRS captures data link message displays.

(3) A Class C AIR or AIRS captures instruments and control panels.

Note: A Class C AIR or AIRS may be considered as a means for recording flight data where it is not practical or is prohibitively expensive to record on an FDR or an ADRS, or where an FDR is not required.

Appendix 2 to SPO.H.545

Parameter Characteristics for Aircraft Data Recording Systems (ADRS)

N°	Parameter name	Minimum recording range	Maximum recording interval in seconds	Minimum recording accuracy	Minimum recording resolution	Remarks
1	Heading:					
	a) Heading (Magnetic or True)	±180°	1	±2°	0.5°	*Heading is preferred, if not available, yaw rate shall be recorded
	b) Yaw rate	±300°/s	0.25	±1% + drift of 360°/h	2°/s	
2	Pitch:					
	a) Pitch attitude	±90°	0.25	±2°	0.5°	*Pitch attitude is preferred, if not available, pitch rate shall be recorded
	b) Pitch rate	±300°/s	0.25	±1% + drift of 360°/h	2°/s	
3	Roll:					
	a) Roll attitude	±180°	0.25	±2°	0.5°	*-Roll attitude is preferred, if not available, roll rate shall be recorded
	b) Roll rate	±300°/s	0.25	±1% + drift of 360°/h	2°/s	
4	Positioning system:					
	a) Time	24 hours	1	±0.5°	0.1°	UTC time preferred where available
	b) Latitude/longitude	Latitude:±90° Longitude:±180°	2 (1 if available)	As installed (0.00015° recommended)	0.00005°	
	c) Altitude	–300 m (–1 000 ft) to maximum certificated altitude of aircraft +1 500 m (5 000 ft)	2 (1 if available)	As installed (±15 m (±50 ft) recommended)	1.5 m (5 ft)	
	d) Ground speed	0–1 000 kt	2 (1 if available)	As installed (±5 kt recommended)	1 kt	
	e) Track	0–360°	2 (1 if available)	As installed (± 2° recommended)	0.5°	
	f) Estimated error	Available range	2 (1 if available)	As installed	As installed	Shall be recorded if readily available

N°	Parameter name	Minimum recording range	Maximum recording interval in seconds	Minimum recording accuracy	Minimum recording resolution	Remarks
5	Normal acceleration	−3 g to + 6 g	0.25 (0.125 if available)	As installed (±0.09 g excluding a datum error of ±0.05 g recommended)	0.004 g	
6	Longitudinal acceleration	±1 g	0.25 (0.125 if available)	As installed (±0.015 g excluding a datum error of ±0.05 g recommended)	0.004 g	
7	Lateral acceleration	±1 g	0.25 (0.125 if available)	As installed (±0.015 g excluding a datum error of ±0.05 g recommended)	0.004 g	
8	External static pressure (or pressure altitude)	34.4 hPa (1.02 in-Hg) to 310.2 hPa (9.16 in-Hg) or available sensor range	1	As installed (±1 hPa (0.3 in-Hg) or ±30 m (±100 ft) to ±210 m (±700 ft) recommended)	0.1 hPa (0.03 in-Hg) or 1.5 m (5 ft)	
9	Outside air temperature (or total air temperature)	−50° to +90°C or available sensor range	2	As installed (±2°C recommended)	1°C	
10	Indicated air speed	As the installed pilot display measuring system or available sensor range	1	As installed (±3% recommended)	1 kt (0.5 kt recommended)	
11	Main rotor speed (Nr)	50% to 130% or available sensor range	0.5	As installed	0.3% of full range	
12	Engine RPM (*)	Full range including overspeed condition	Each engine each second	As installed	0.2% of full range	*For piston-engined helicopters
13	Engine oil pressure	Full range	Each engine each second	As installed (5% of full range recommended)	2% of full range	
14	Engine oil temperature	Full range	Each engine each second	As installed (5% of full range recommended)	2% of full range	
15	Fuel flow or pressure	Full range	Each engine each second	As installed	2% of full range	
16	Manifold pressure (*)	Full range	Each engine each second	As installed	0.2% of full range	*For piston-engined helicopters

N°	Parameter name	Minimum recording range	Maximum recording interval in seconds	Minimum recording accuracy	Minimum recording resolution	Remarks
17	Engine thrust/power/ torque parameters required to determine propulsive thrust/power*	Full range	Each engine each second	As installed	0.1% of full range	*Sufficient parameters e.g. EPR/N1 or torque/Np as appropriate to the particular engine shall be recorded to determine power. A margin for possible overspeed should be provided. Only for turbine-engined helicopters.
18	Engine gas generator speed (Ng) (*)	0–150%	Each engine each second	As installed	0.2% of full range	*Only for turbine-engined helicopters
19	Free power turbine speed (Nf) (*)	0–150%	Each engine each second	As installed	0.2% of full range	*Only for turbine-engined helicopters
20	Collective pitch	Full range	0.5	As installed	0.1% of full range	
21	Coolant temperature (*)	Full range	1	As installed (±5°C recommended)	1° C	*Only for piston-engined helicopters
22	Main voltage	Full range	Each engine each second	As installed	1 Volt	
23	Cylinder head temperature (*)	Full range	Each cylinder each second	As installed	2% of full range	*Only for piston-engined helicopters
24	Fuel quantity	Full range	4	As installed	1% of full range	
25	Exhaust gas temperature	Full range	Each engine each second	As installed	2% of full range	
26	Emergency voltage	Full range	Each engine each second	As installed	1 Volt	
27	Trim surface position	Full range or each discrete position	1	As installed	0.3% of full range	
28	Landing gear position	Each discrete position*	Each gear every two seconds	As installed		*Where available, record up-and-locked and down-and-locked position
29	Novel/unique aircraft features	As required	As required	As required	As required	

Appendix 1 to SPO.H.599 Emergency Locator Transmitter (ELT(S))

All ELT(S) shall be capable of transmitting simultaneously on 121.5 MHz and 406 MHz, be coded in accordance with ICAO Annex 10 and be registered with the national agency responsible for initiating Search and Rescue, or another nominated agency.

SUBPART G – FLIGHT CREW

SPO.700 Composition of flight crew

(a) The composition of the flight crew and the number of flight crew members at designated crew stations shall be not less than the minimum specified in the aircraft flight manual or operating limitations prescribed for the aircraft.

(b) The flight crew shall include additional flight crew members when required by the type of operation and shall not be reduced below the number specified in the operations manual.

(c) All flight crew members shall hold a licence and ratings issued or acceptable to the Authority and appropriate to the duties assigned to them.

(d) The flight crew member may be relieved in flight of his/her duties at the controls by another suitably qualified flight crew member.

(e) When engaging the services of flight crew members who are working on a freelance or part- time basis, the operator shall verify that all applicable requirements of this Subpart and the relevant elements of CAR LIC as applicable, including the requirements on recent experience, are complied with, taking into account all services rendered by the flight crew member to other operator(s) to determine in particular:

(1) the total number of aircraft types or variants operated; and

(2) the applicable flight and duty time limitations and rest requirements.

SPO.705 Designation as pilot-in-command

(See AMC1 SPO.705(b)(2);(c) Designation as pilot-in-command & AMC1 SPO.705(c) Designation as pilot-in-command & AMC2 SPO.705(c) Designation as pilot-in-command)

(a) One pilot amongst the flight crew, qualified as pilot-in-command acceptable to the Authority, shall be designated by the operator as pilot-in-command.

(b) The operator shall only designate a flight crew member to act as pilot-in-command if he/she has:

(1) the minimum level of experience specified in the operations manual;

(2) adequate knowledge of the route or area to be flown and of the aerodromes, including alternate aerodromes, facilities and procedures to be used;

(3) in the case of multi-crew operations, completed an operator’s command course if upgrading from co-pilot to pilot-in-command.

(c) In the case of commercial operations of aeroplanes and helicopters, the pilot-in- command or the pilot, to whom the conduct of the flight may be delegated, shall have had initial familiarisation training of the route or area to be flown and of the aerodromes, facilities and procedures to be used. This route/area and aerodrome knowledge shall be maintained by operating at least once on the route or area or to the aerodrome within a 12- month period.

SPO.710 Flight engineer

(a) When a separate flight engineer station is incorporated in the design of an aeroplane, the flight crew shall include one crew member who is suitably qualified in accordance with applicable regulation.

SPO.715 Crew resource management (CRM) training

(See AMC1 SPO.715 Crew resource management (CRM) training & AMC2 SPO.715 Crew resource management (CRM) training & AMC3 SPO.715 Crew resource management (CRM) training)

(a) Before operating, the flight crew member shall have received CRM training, appropriate to his/her role, as specified in the operations manual.

(b) Elements of CRM training shall be included in the aircraft type or class training and recurrent training as well as in the command course.

SPO.720 Operator conversion training

(a) In the case of aeroplane or helicopter operations, the flight crew member shall complete the operator conversion training course before commencing unsupervised line flying:

(1) when changing to an aircraft for which a new type or class rating is required;

(2) when joining an operator.

(b) The operator conversion training course shall include training on the equipment installed on the aircraft as relevant to flight crew members' roles.

SPO.725 Differences training and familiarisation training

(a) The operator shall ensure that a flight crew member completes;

(1) Differences training which requires additional knowledge and training on the aircraft or an appropriate training device. It should be carried out:

(i) when introducing a significant change of equipment and/or procedures on types or variants currently operated; and

(ii) in the case of aeroplanes, when operating another variant of an aeroplane of the same type or another type of the same class currently operated; or

(iii) in the case of helicopters, when operating a variant of a helicopter currently operated.

(2) Familiarisation training requires only the acquisition of additional knowledge. It should be carried out when:

(i) operating another helicopter or aeroplane of the same type; or

(ii) when introducing a significant change of equipment and/or procedures on types or variants currently operated.

(b) The operator shall specify in the Operations Manual when such differences training or familiarisation training is required.

SPO.730 Recurrent training and checking - General

(a) Each flight crew member shall complete annual recurrent flight and ground training relevant to the type or variant of aircraft on which he/she operates, including training on the location and use of all emergency and safety equipment carried.

(b) Each flight crew member shall be periodically checked to demonstrate competence in carrying out normal, abnormal and emergency procedures.

SPO.735 Recurrent training and checking – commercial specialised operations - operator

proficiency check

(a) Each flight crew member shall complete operator proficiency checks to demonstrate his/her competence in carrying out normal, abnormal and emergency procedures, covering the relevant aspects associated with the specialised tasks described in the operations manual.

(b) Appropriate consideration shall be given when operations are undertaken under IFR or at night.

(c) The validity period of the operator proficiency check shall be 12 calendar months. The validity period shall be counted from the end of the month when the check was taken. When the operator proficiency check is undertaken within the last three months of the validity period, the new validity period shall be counted from the original expiry date.

SPO.740 Pilot qualification to operate in either pilot's seat

Flight crew members who may be assigned to operate in either pilot's seat shall complete appropriate training and checking as specified in the operations manual.

SPO.745 Operation on more than one type or variant

(a) The operator shall ensure that a flight crew member does not operate on more than one type or variant, unless: the flight crew member is competent to do so.

(b) When considering operations of more than one type or variant, the operator shall ensure that the differences and/or similarities of the aeroplanes concerned justify such operations, taking account of the following:

(1) The level of technology;

(2) Operational procedures;

(3) Handling characteristics.

(c) The operator shall ensure that a flight crew member operating more than one type or variant complies with all of the requirements prescribed in Subpart G for each type or variant unless the Authority has approved the use of credit(s) related to the training, checking and recent experience requirements.

(d) The operator shall specify appropriate procedures and/or operational restrictions, approved by the Authority, in the Operations Manual, for any operation on more than one type or variant covering:

(1) The flight crew members' minimum experience level;

(2) The minimum experience level on one type or variant before beginning training for and operation of another type or variant;

(3) The process whereby flight crew qualified on one type or variant will be trained and qualified on another type or variant; and

(4) All applicable recent experience requirements for each type or variant.

SPO.750 Provision of training

(a) All the training required in this Subpart shall be conducted:

(1) in accordance with the training programmes and syllabi established by the operator in the operations manual;

(2) by appropriately qualified personnel. In the case of flight and flight simulation training and checking, the personnel providing the training and conducting the checks shall be acceptable to the authority.

(b) The FSTD shall replicate the aircraft used by the operator, as far as practicable. Differences between the FSTD and the aircraft shall be described and addressed through a briefing or training, as appropriate.

(c) The operator shall establish a system to adequately monitor changes to the FSTD and to ensure that those changes do not affect the adequacy of the training programmes.

SUBPART H – FLIGHT AND DUTY TIME LIMITATIONS AND REST REQUIREMENTS

SPO.900 Scope

This Subpart establishes the requirements to be met by an operator and its crew members with regard to flight and duty time limitations and rest requirements for crew members.

SPO.905 Definitions

For the purpose of this Subpart, the following definitions shall apply:

(a) 'acclimatised' means a state in which a crew member's circadian biological clock is synchronised to the time zone where the crew member is. A crew member is considered to be acclimatised to a 2-hour wide time zone surrounding the local time at the point of departure. When the local time at the place where a duty commences differs by more than 2 hours from the local time at the place where the next duty starts, the crew member, for the calculation of the maximum daily flight duty period, is considered to be acclimatised in accordance with the values in the Table 19 – Acclimatised Assessment.

Table 19 – Acclimatised Assessment

Time difference (h) between reference time and local time where the crew member starts the next duty	Time elapsed since reporting at reference time				
	<48	48–71:59	72–95:59	96–119:59	≥120
< 4	B	D	D	D	D
≤6	B	X	D	D	D
≤9	B	X	X	D	D
≤12	B	X	X	X	D

'B' means acclimatised to the local time of the departure time zone,

'D' means acclimatised to the local time where the crew member starts his/her next duty, and 'X' means that a crew member is in an unknown state of acclimatisation.

(b) 'reference time' means the local time at the reporting point situated in a 2-hour wide time zone band around the local time where a crew member is acclimatised;

(c) 'accommodation' means, for the purpose of standby and split duty, a quiet and comfortable place not open to the public with the ability to control light and temperature, equipped with adequate furniture that provides a crew member with the possibility to sleep, with enough capacity to accommodate all crew members present at the same time and with access to food and drink;

(d) 'suitable accommodation' means, for the purpose of standby, split duty and rest, a separate room for each crew member located in a quiet environment and equipped with a bed, which is sufficiently ventilated, has a device for regulating temperature and light intensity, and access to food and drink;

(e) 'augmented flight crew' means a flight crew which comprises more than the minimum number required to operate the aircraft, allowing each flight crew member to leave the assigned post, for the purpose of in-flight rest, and to be replaced by another appropriately qualified flight crew member;

(f) ‘break’ means a period of time within a flight duty period, shorter than a rest period, counting as duty and during which a crew member is free of all tasks;

(g) ‘delayed reporting’ means the postponement of a scheduled FDP by the operator before a crew member has left the place of rest;

(h) ‘disruptive schedule’ means a crew member’s roster which disrupts the sleep opportunity during the optimal sleep time window by comprising an FDP or a combination of FDPs which encroach, start or finish during any portion of the day or of the night where a crew member is acclimatised. A schedule may be disruptive due to early starts, late finishes or night duties.

(1) ‘early type’ of disruptive schedule means:

(i) for ‘early start’ a duty period starting in the period between 05:00 and 05:59 in the time zone to which a crew member is acclimatised, and

(ii) for ‘late finish’ a duty period finishing in the period between 23:00 and 01:59 in the time zone to which a crew member is acclimatised;

(2) ‘late type’ of disruptive schedule means:

(i) for ‘early start’ a duty period starting in the period between 05:00 and 06:59 in the time zone to which a crew member is acclimatised; and

(ii) for ‘late finish’ a duty period finishing in the period between 00:00 and 01:59 in the time zone to which a crew member is acclimatised;

(i) ‘night duty’ means a duty period encroaching any portion of the period between 02:00 and 04:59 in the time zone to which the crew is acclimatised;

(j) ‘duty’ means any task that a crew member performs for the operator, including flight duty, administrative work, giving or receiving training and checking, positioning, and some elements of standby;

(k) ‘duty period’ means a period which starts when a crew member is required by an operator to report for or to commence a duty and ends when that person is free of all duties, including post- flight duty;

(l) ‘flight duty period ('FDP')’ means a period that commences when a crew member is required to report for duty, which includes a sector or a series of sectors, and finishes when the aircraft finally comes to rest and the engines are shut down, at the end of the last sector on which the crew member acts as an operating crew member;

(m) ‘flight time’ means, for aeroplanes, the time between an aircraft first moving from its parking place for the purpose of taking off until it comes to rest on the designated parking position and all engines or propellers are shut down.

(n) ‘home base’ means the location, assigned by the operator to the crew member, from where the crew member normally starts and ends a duty period or a series of duty periods and where, under normal circumstances, the operator is not responsible for the accommodation of the crew member concerned;

(o) ‘local day’ means a 24-hour period commencing at 00:00 local time;

(p) ‘local night’ means a period of 8 hours falling between 22:00 and 08:00 local time;

(q) ‘operating crew member’ means a crew member carrying out duties in an aircraft during a sector;

(r) ‘positioning’ means the transferring of a non-operating crew member from one place to another, at the behest of the operator, excluding:

- the time of travel from a private place of rest to the designated reporting place at home base and vice versa, and
- the time for local transfer from a place of rest to the commencement of duty and vice versa;

(s) ‘rest facility’ means a bunk or seat with leg and foot support suitable for crew members' sleeping on board an aircraft.

(t) ‘reserve’ means a period of time during which a crew member is required by the operator to be available to receive an assignment for an FDP, positioning or other duty notified at least 10 hours in advance.

(u) ‘rest period’ means a continuous, uninterrupted and defined period of time, following duty or prior to duty, during which a crew member is free of all duties, standby and reserve.

(v) ‘rotation’ is a duty or a series of duties, including at least one flight duty, and rest periods out of home base, starting at home base and ending when returning to home base for a rest period where the operator is no longer responsible for the accommodation of the crew member.

(w) ‘single day free of duty’ means, a time free of all duties and standby consisting of one day and two local nights, which is notified in advance. A rest period may be included as part of the single day free of duty.

(x) ‘sector’ means the segment of an FDP between an aircraft first moving for the purpose of taking off until it comes to rest after landing on the designated parking position.

(y) ‘standby’ means a pre-notified and defined period of time during which a crew member is required by the operator to be available to receive an assignment for a flight, positioning or other duty without an intervening rest period.

(z) ‘airport standby’ means a standby performed at the airport;

(aa) ‘other standby’ means a standby either at home or in a suitable accommodation;

(bb) ‘window of circadian low ('WOCL') means the period between 02:00 and 05:59 hours in the time zone to which a crew member is acclimatised.

SPO.910 Responsibilities of the Authority

(a) The Authority has established the following prescriptive regulations for flight time, flight duty period, duty period limitations and rest period requirements for the purpose of managing fatigue. These regulations are based upon scientific principles, knowledge and operational experience with the aim of ensuring that flight crew members are performing at an adequate level of alertness.

(b) The Authority may grant variations to the requirements in this Subpart in accordance with applicable laws and procedures and in consultation with interested parties.

(c) Each operator will have to demonstrate to the Authority, using operational experience and taking into account other relevant factors such as current scientific knowledge, that its request for a variation produces an equivalent level of safety. Such variations will be accompanied with suitable mitigation measures where appropriate.

SPO.915 Operator responsibilities

An operator shall:

(a) publish duty rosters sufficiently in advance to provide the opportunity for crew members to plan adequate rest;

(b) ensure that flight duty periods are planned in a way that enables crew members to remain sufficiently free from fatigue so that they can operate to a satisfactory level of safety under all circumstances;

(c) specify reporting times that allow sufficient time for ground duties;

(d) take into account the relationship between the frequency and pattern of flight duty periods and rest periods and give consideration to the cumulative effects of undertaking long duty hours combined with minimum rest periods;

(e) allocate duty patterns which avoid practices that cause a serious disruption of an established sleep/work pattern, such as alternating day/night duties;

(f) comply with the provisions concerning disruptive schedules;

(g) provide rest periods of sufficient time to enable crew members to overcome the effects of the previous duties and to be rested by the start of the following flight duty period;

(h) plan recurrent extended recovery rest periods and notify crew members sufficiently in advance;

(i) plan flight duties in order to be completed within the allowable flight duty period taking into account the time necessary for pre-flight duties, the sector and turnaround times;

(j) change a schedule and/or crew arrangements if the actual operation exceeds the maximum flight duty period on more than 33% of the flight duties in that schedule during a scheduled seasonal period.

SPO.920 Crew member responsibilities

Crew members shall:

(a) A crew member shall not operate an aeroplane if he/she knows that he/she is suffering from or is likely to suffer from fatigue or feels unfit, to the extent that the flight may be endangered.; and

(b) make optimum use of the opportunities and facilities for rest provided and plan and use their rest periods properly.

SPO.925 Flight and Duty Limitations

(a) Cumulative duty hours

The operator shall ensure that the total duty periods to which a crew member is assigned do not exceed:

(1) 190 duty hours in any 28 consecutive days, spread as evenly as practicable throughout this period; and

(2) 60 duty hours in any seven consecutive days.

(b) Limit on total block times

The operator shall ensure that the total block times of the flights on which an individual crew member is assigned as an operating crew member does not exceed;

(1) 900 block hours in a calendar year;

(2) 100 block hours in any 28 consecutive days.

SPO.930 Maximum Daily Flight Duty Period (FDP)

(a) Except for single-pilot operations and to emergency medical service operations;

(1) The operator shall specify reporting times that realistically reflect the time for safety-related ground duties as approved by the Authority.

(2) The maximum basic daily FDP is 13 hours.

(3) These 13 hours will be reduced by 30 minutes for each sector from the third sector onwards with a maximum total reduction of two hours.

(4) When the FDP starts in the WOCL, the maximum stated in point (2) and point (3) will be reduced by 100 % of its encroachment up to a maximum of two hours. When the FDP ends in or fully encompasses the WOCL, the maximum FDP stated in point (2) and point (3) will be reduced by 50 % of its encroachment.

(b) Extensions

(1) The maximum daily FDP can be extended by up to one hour.

(2) Extensions are not allowed for a basic FDP of six sectors or more.

(3) Where an FDP encroaches on the WOCL by up to two hours extensions are limited to up to four sectors.

(4) Where an FDP encroaches on the WOCL by more than two hours extensions are limited to up to two sectors.

(5) The maximum number of extensions is two in any seven consecutive days.

(6) Where an FDP is planned to use an extension pre and post flight minimum rest is increased by two hours or post flight rest only is increased by four hours. Where the extensions are used for consecutive FDPs the pre and post rest between the two operations shall run consecutively.

(7) When an FDP with extension starts in the period 22.00 to 04.59 the operator will limit the FDP to 11.45.

(c) Operational Robustness

Planned schedules must allow for flights to be completed within the maximum permitted flight duty period. To assist in achieving this operators will take action to change a schedule or crewing arrangements at the latest where the actual operation exceeds the maximum FDP on more than 33 % of the flights in that schedule during a scheduled seasonal period.

(d) Positioning

(1) All the time spent on positioning is counted as duty.

(2) Positioning after reporting but prior to operating shall be included as part of the FDP but shall not count as a sector.

(3) A positioning sector immediately following operating sector will be taken into account for the calculation of minimum rest as defined in SPO.935 points (a)(1) and (a)(2) below.

(e) Extended FDP (split duty)

(1) The Authority may grant approval to an operation based on an extended FDP which includes a break.

(2) Each operator will have to demonstrate to the Authority, using operational experience and taking into account other relevant factors, such as current scientific knowledge, that its request for an extended FDP produces an equivalent level of safety.

SPO.935 Rest

(a) Minimum rest

(1) The minimum rest which must be provided before undertaking a flight duty period starting at home base shall be at least as long as the preceding duty period or 12 hours whichever is the greater;

(2) The minimum rest which must be provided before undertaking a flight duty period starting away from home base shall be at least as long as the preceding duty period or 10 hours whichever is the greater; when on minimum rest away from home base, the operator must allow

for an eight hour sleep opportunity taking due account of travelling and other physiological needs;

(3) The operator will ensure that effects on crew members of time zone differences will be compensated by additional rest, as regulated by the Authority.

(4) Notwithstanding (1) and (2), the Authority may grant reduced rest arrangements. Each operator will have to demonstrate to the Authority, using operational experience and taking into account other relevant factors, such as current scientific knowledge, that its request for reduced rest arrangements produces an equivalent level of safety.

(b) Rest periods

The operator shall ensure that the minimum rest provided as outlined above is increased periodically to a weekly rest period, being a 36-hour period including two local nights, such that there shall never be more than 168 hours between the end of one weekly rest period and the start of the next. As an exception, the Authority may decide that the second of those local nights may start from 20:00 hours if the weekly rest period has a duration of at least 40 hours.

SPO.940 Extension of Flight Duty Period due to In-flight Rest

(a) Extension of flight duty period due to in-flight rest may be granted by the Authority providing each operator demonstrates to the Authority, using operational experience and taking into account other relevant factors such as current scientific knowledge, that its request produces an equivalent level of safety:

(b) The Authority shall set the requirements in connection with the augmentation of a basic flight crew for the purpose of extending the flight duty period beyond the limits in SPO.930 above.

SPO.945 Unforeseen Circumstances in Actual Flight Operations - Commander's Discretion

(a) Taking into account the need for careful control of these instances implied underneath, during the actual flight operation, which starts at the reporting time, the limits on flight duty, duty and rest periods prescribed in this Subpart may be modified in the event of unforeseen circumstances. Any such modifications must be acceptable to the commander after consultation with all other crew members and must, in all circumstances, comply with the following:

(1) The maximum FDP referred to in SPO.930(a) above may not be increased by more than two hours unless the flight crew has been augmented, in which case the maximum flight duty period may be increased by not more than three hours;

(2) If on the final sector within an FDP unforeseen circumstances occur after take-off that will result in the permitted increase being exceeded, the flight may continue to the planned destination or alternate;

(3) In the event of such circumstances, the rest period following the FDP may be reduced but never below the minimum rest defined in SPO.935(a)(2);

(b) The commander shall, in case of special circumstances, which could lead to severe fatigue, and after consultation with the crew members affected, reduce the actual flight duty time and/or increase the rest time in order to eliminate any detrimental effect on flight safety;

(c) The operator shall ensure that:

(1) The commander submits a report to the operator whenever an FDP is increased by his/her discretion or when a rest period is reduced in actual operation and

(2) Where the increase of a FDP or reduction of a rest period exceeds one hour, a copy of the report, to which the operator must add his comments, is sent to the Authority no later than 28 days after the event.

SPO.950 Standby

(a) Airport standby

(1) A crew member is on airport standby from reporting at the normal report point until the end of the notified standby period.

(2) Airport standby will count in full for the purposes of cumulative duty hours.

(3) Where airport standby is immediately followed by a flight duty, the relationship between such airport standby and the assigned flight duty shall be defined by the Authority. In such a case, airport standby shall be added to the duty period referred to in SPO.935 under points (a)(1) and (2) for the purposes of calculating minimum rest.

(4) Where the airport standby does not lead to assignment on a flight duty, it shall be followed at least by a rest period as regulated by the Authority.

(5) While on airport standby the operator will provide to the crew member a quiet and comfortable place not open to the public.

(b) Other forms of standby (including standby at hotel) shall be regulated by the Authority, taking into account the following:

(1) All activity shall be rostered and/or notified in advance.

(2) The start and end time of the standby shall be defined and notified in advance.

(3) The maximum length of any standby at a place other than a specified reporting point shall be determined.

(4) Taking into account facilities available for the crew member to rest and other relevant factors, the relationship between the standby and any assigned flight duty resulting from the standby shall be defined.

(5) The counting of standby times for the purposes of cumulative duty hours shall be defined.

SPO.955 Nutrition

A meal and drink opportunity must occur in order to avoid any detriment to a crew member's performance, especially when the FDP exceeds six hours.

SPO.960 Flight Duty, Duty and Rest Period Records

(a) The operator shall ensure that crew member's records include:

(1) block times;

(2) start, duration and end of each duty or flight duty periods;

(3) rest periods and days free of all duties;

and are maintained to ensure compliance with the requirements of this Subpart; copies of these records will be made available to the crew member upon request.

(b) If the records held by the operator under paragraph (a) do not cover all of his/her flight duty, duty and rest periods, the crew member concerned shall maintain an individual record of his/her:

(1) block times;

(2) start, duration and end of each duty or flight duty periods; and

(3) rest periods and days free of all duties.

(c) A crew member shall present his/her records on request to any operator who employs his/her services before he/she commences a flight duty period.

(d) Records shall be preserved for at least 15 calendar months from the date of the last relevant entry.

(e) Additionally, operators shall separately retain all commander's discretion reports of extended flight duty periods, extended flight hours and reduced rest periods for at least six months after the event.

SPO.965 Fatigue Management

(See AC SPO.965 Fatigue Management)

(a) The Authority has established FRMS regulations to authorise the operator to use a Fatigue Risk Management System (FRMS) to manage fatigue with the aim of ensuring that flight crew members are performing at an adequate level of alertness.

(b) Where the operator adopts prescriptive fatigue management regulations for part or all of its operations, the Authority may approve, in exceptional circumstances, variations to these regulations on the basis of a risk assessment provided by the operator. Approved variations shall provide a level of safety equivalent to, or better than that achieved through the prescriptive fatigue management regulations.

(c) The Authority shall approve the operator's FRMS before it may take the place of any or all of the prescriptive fatigue management regulations. An approved FRMS shall provide a level of safety equivalent to, or better than, the prescriptive fatigue management regulations.

(d) The Authority shall establish a process to ensure that an FRMS provides a level of safety equivalent to, or better than, the prescriptive fatigue management regulations. As part of this process, the Authority shall:

(1) require that the operator establish maximum values for flight times and/or flight duty periods(s) and duty period(s), and minimum values for rest periods. These values shall be based upon scientific principles and knowledge, subject to safety assurance processes, and acceptable to the Authority;

(2) mandate a decrease in maximum values and an increase in minimum values in the event that the operator's data indicates these values are too high or too low, respectively; and

(3) approve any increase in maximum values or decrease in minimum values only after evaluating the operator's justification for such changes, based on accumulated FRMS experience and fatigue-related data.

(e) Where the operator implements an FRMS to manage fatigue-related safety risks, the operator shall, as a minimum:

(1) incorporate scientific principles and knowledge within the FRMS;

(2) identify fatigue-related safety hazards and the resulting risks on an on-going basis;

(3) ensure that remedial actions, necessary to effectively mitigate the risks associated with the hazards, are implemented promptly;

(4) provide for continuous monitoring and regular assessment of the mitigation of fatigue risks achieved by such actions;

(5) integrate the FRMS with the operator's SMS; and

(6) provide for continuous improvement to the overall performance of the FRMS.

SUBPART I - SPECIFIC REQUIREMENTS

SECTION 1 – HELICOPTER EXTERNAL SLING LOAD OPERATIONS (HESLO)

SPO.HESLO.100 Standard operating procedures

(See AMC1 SPO.HESLO.100 Standard operating procedures & AC1 SPO.HESLO.100 Standard operating procedures)

The standard operating procedures for HESLO shall specify:

(a) the equipment to be carried, including its operating limitations and appropriate entries in the MEL, as applicable;

(b) crew composition and experience requirements of crew members and task specialists;

(c) the relevant theoretical and practical training for crew members to perform their tasks, the relevant training for task specialists to perform their tasks, and the qualification and nomination of persons providing such training to crew members and task specialists;

(d) responsibilities and duties of crew members and task specialists;

(e) helicopter performance criteria necessary to be met to conduct HESLO operations;

(f) normal, abnormal and emergency procedures.

SPO.HESLO.105 Specific HESLO equipment

The helicopter shall be equipped with at least:

(a) one cargo safety mirror or alternative means to see the hook(s)/load; and

(b) one load meter, unless there is another method of determining the weight of the load.

SPO.HESLO.110 Transportation of dangerous goods

The operator transporting dangerous goods to or from unmanned sites or remote locations shall apply to the Authority for an exemption from the provisions of the Technical Instructions if they intend not to comply with the requirements of those Instructions.

SECTION 2 – HUMAN EXTERNAL CARGO OPERATIONS (HEC)

SPO.HEC.100 Standard operating procedures

(See AMC1 SPO.HEC.100 Standard operating procedures)

The standard operating procedures for HEC shall specify:

(a) the equipment to be carried, including its operating limitations and appropriate entries in the MEL, as applicable;

(b) crew composition and experience requirements of crew members and task specialists;

(c) the relevant theoretical and practical training for crew members to perform their tasks, the relevant training for task specialists to perform their tasks, and the qualification and nomination of persons providing such training to crew members and task specialists;

(d) responsibilities and duties of crew members and task specialists;

(e) helicopter performance criteria necessary to be met to conduct HEC operations;

(f) normal, abnormal and emergency procedures.

SPO.HEC.105 Specific HEC equipment

(See AMC1 SPO.HEC.105(b) Specific HEC equipment)

(a) The helicopter shall be equipped with:

(1) hoist operations equipment or cargo hook;

(2) one cargo safety mirror or alternative means to see the hook; and

(3) one load meter, unless there is another method of determining the weight of the load.

(b) The installation of all hoist and cargo hook equipment other than a simple PCDS, and any subsequent modifications shall have an airworthiness approval appropriate to the intended function.

SECTION 3 – PARACHUTE OPERATIONS (PAR)

SPO.PAR.100 Standard operating procedures

The standard operating procedures for PAR shall specify:

(a) the equipment to be carried, including its operating limitations and appropriate entries in the MEL, as applicable;

(b) crew composition and experience requirements of crew members and task specialists;

(c) the relevant training for crew members and task specialists to perform their task and the qualification and nomination of persons providing such training to the crew members and task specialists;

(d) responsibilities and duties of crew members and task specialists;

(e) performance criteria necessary to be met to conduct parachute operations;

(f) normal, abnormal and emergency procedures.

SPO.PAR.105 Carriage of crew members and task specialists

The requirement for task specialist's responsibilities as laid down in SPO.120 shall not be applicable for task specialists performing parachute jumping.

SPO.PAR.110 Seats

Notwithstanding SPO.A.460(a) and SPO.H.460 (a)(1), the floor of the aircraft may be used as a seat, provided means are available for the task specialist to hold or strap on.

SPO.PAR.115 Supplemental oxygen

Notwithstanding SPO.254(a), the requirement to use supplemental oxygen shall not be applicable for crew members other than the pilot-in-command and for task specialists carrying out duties essential to the specialised task, whenever the cabin altitude:

(a) exceeds 13 000 ft, for a period of not more than 6 minutes.

(b) exceeds 15 000 ft, for a period of not more 3 minutes.

SPO.PAR.125 Releasing of dangerous goods

Notwithstanding SPO.170, parachutists may exit the aircraft for the purpose of parachute display over congested areas of cities, towns or settlements or over an open-air assembly of persons whilst carrying smoke trail devices, provided those are manufactured for that purpose.

SECTION 4 – AEROBATIC FLIGHTS (ABF)

SPO.ABF.100 Standard operating procedures

The standard operating procedures for ABF shall specify:

(a) the equipment to be carried, including its operating limitations and appropriate entries in the MEL, as applicable;

(b) crew composition and experience requirements of crew members and task specialists;

(c) the relevant training for crew members and task specialists to perform their task and the qualification and nomination of persons providing such training to the crew members and task specialists;

(d) responsibilities and duties of crew members and task specialists;

(e) performance criteria necessary to be met to conduct aerobatic flights;

(f) normal, abnormal and emergency procedures.

SPO.ABF.105 Documents, manuals and information to be carried

The following documents listed in SPO.150(a) need not be carried during aerobatic flights:

(a) details of the filed ATS flight plan, if applicable;

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

(c) procedures and visual signals information for use by intercepting and intercepted aircraft; and

(d) information concerning search and rescue services for the area of the intended flight.

SPO.ABF.115 Equipment

The following equipment requirements need not be applicable to aerobatic flights:

(a) first-aids kit as laid down in SPO.A.465 and SPO.H.465;

(b) hand-fire extinguishers as laid down in SPO.A.480 and SPO.H.480; and

(c) emergency locator transmitters or personal locator beacons as laid down in SPO.A.490 and SPO.H.490.

SECTION 5 – INSPECTION AND VALIDATION FLIGHTS (IVFs))

SPO.IVF.100 Standard operating procedures

(See AMC1 SPO.IVF.100 Standard operating procedures)

The standard operating procedures for IVF shall specify:

(d) the equipment to be carried, including its operating limitations and appropriate entries in the MEL, as applicable;

(e) crew composition and experience requirements of crew members and task specialists;

(f) the relevant training for crew members and task specialists to perform their task and the qualification and nomination of persons providing such training to the crew members and task specialists;

(g) responsibilities and duties of crew members and task specialists;

(h) performance criteria necessary to be met to conduct IVF flights;

(i) normal, abnormal and emergency procedures.

PART II - ADVISORY CIRCULARS (AC) / ACCEPTABLE MEANS OF COMPLIANCE (AMC)

AC/AMC A - APPLICABILITY

AMC1 SPO.001 Applicability

(See SPO.001 Applicability)

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

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

(b) abnormal manoeuvres are performed;

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

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

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

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

AC1 SPO.001 List of Specialised Operations

(See SPO.001 Applicability)

(a) Specialised operations include the following activities:

(1) helicopter external loads operations;

(2) helicopter survey operations;

(3) human external cargo operations;

(4) parachute operations and skydiving;

(5) agricultural flights;

(6) aerial photography flights;

(7) glider towing;

(8) aerial advertising flights;

(9) calibration flights;

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

(11) oil spill work;

(12) avalanche mining operations;

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

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

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

(16) aerobatic flights;

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

(18) maritime funeral operations;

(19) scientific research flights;

(20) cloud seeding; and

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

(b) For other operations, the operator can apply the criteria specified in AMC1 SPO.001 to determine whether an activity falls within the scope of specialised operations.

AC2 SPO.001 Applicability

(See SPO.001 Applicability)

Type of Aircraft	Commercial or non-Commercial	Non High Risk	High Risk[15]
Complex Motor-Powered Aircraft[16]	Commercial[17]	CAR SPO plus declaration	CAR SPO plus application for Authorisation
	Non-Commercial[18]	CAR SPO plus declaration	
Non-Complex Motor-Powered Aircraft[19]	Commercial	CAR SPO plus declaration	
	Non-Commercial	CAR OPS 2A/H as applicable	

For all commercial operations and non-commercial with complex motor powered aircraft, all subparts are applicable.

For non-commercial with non-complex motor powered aircraft CAR SPO does not apply. CAR OPS 2A / 2H as applicable shall be complied with.

For all operations, any specific approvals are required to be applied for separately and in the normal manner.

AC1 SPO.004 Declaration

(See SPO.004 Declaration)

General

The intent of the declaration is to:

(a) have the operator acknowledge its responsibilities under the applicable safety regulations and that it holds all necessary approvals;

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[15] Definition of High Risk as per CAR DEF "any commercial specialised aircraft operation carried out over an area where the safety of third parties on the ground is likely to be endangered in the event of an emergency, or, as determined by the authority of the place where the operation is conducted, any commercial specialised aircraft operation that, due to its specific nature and the local environment in which it is conducted, poses a high risk, in particular to third parties on the ground".

[16] Definition of a Complete Motor-Powered Aircraft as per CAR DEF

[17] Commercial operation definition as per CAR DEF "Commercial operation shall mean any operation of an aircraft, in return for renumeration or other valuable consideration, which is available to the public or, when not made available to the public, which is performed under a contract between an operator and a customer, where the latter has no control over the operator".

[18] Non-commercial operation that falls outside the definition of commercial operation.

[19] Any aircraft not a complex Motor-Powered aircraft.

(b) inform the authority of the existence of an operator; and

(c) enable the authority to fulfil its oversight responsibilities.

Managed Operations

When the non-commercial operation of a complex motor-powered aircraft is managed by a third party on behalf of the owner, that party may be the operator, and therefore has to declare its capability and means to discharge the responsibilities associated with the operation of the aircraft to the authority.

In such a case, it should also be assessed whether the third party operator undertakes a commercial operation.

AMC1 SPO.005 Authorisation of high risk commercial specialised operations

(See SPO.005 Authorisation of high risk commercial specialised operations)

Verification of Compliance

(a) For the purpose of verifying the operator's standard operating procedures (SOPs), the Authority may conduct an audit at the operator's facilities or require the conduct of one or more demonstration flights operated as if they were specialised operations.

(b) An individual should be nominated by the Authority to become the focal point for all aspects of the authorisation process and to coordinate all necessary activity. This nominated person should confirm to the responsible person of the Authority issuing the authorisation that all appropriate audits and inspections have been carried out.

(c) When the verification process is complete, the person, nominated in accordance with (b), should present the application to the person responsible for the issuance of an authorisation together with a written recommendation and evidence of the result of the review of the operator's risk assessment documentation and SOPs, which is required before the authorisation is issued. The Authority should inform the applicant of its decision concerning the application. In cases where an application for an authorisation is refused, the applicant should be informed of the right of appeal as exists under San Marino law.

AC/AMC B - GENERAL

AMC1 SPO.125 Pilot-in-Command Responsibilities and Authority

(See SPO.125 Pilot-in-Command Responsibilities and Authority)

Flight Preparation for PBN Operations

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

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

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

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

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

Database Suitability

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

Database Currency

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

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

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

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

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

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

(4) any MEL limitations are observed; and

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

AC1 SPO.130 Taxiing of Aircraft

(See SPO.130 Taxiing of Aircraft)

Safety Critical Activity

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

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

Skills and Knowledge

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

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

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

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

(d) interpretation of marshalling signals, where applicable;

(e) identification of suitable parking area;

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

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

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

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

(j) interpretation of operational instructions;

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

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

AMC1 SPO.151 Manuals to be carried

(See SPO.151 Manuals to be carried)

Contents – Non-commercial specialised operations with complex motor powered aircraft and commercial specialised operations

(a) The OM should contain at least the following information, where applicable, as relevant to the area and type of operation:

A General/Basic

0 Administration and Control of Operations Manual

0.1 Introduction:

(a) A statement that the manual complies with all applicable regulations.

(b) A statement that the manual contains operational instructions that are to be complied with by the relevant personnel.

(c) A list and brief description of the various parts, their contents, applicability and use.

(d) Explanations and definitions of terms and words needed for the use of the manual.

0.2 System of amendment and revision:

(a) Details of the person(s) responsible for the issuance and insertion of amendments and revisions.

(b) A record of amendments and revisions with insertion dates and effective dates.

(c) A statement that handwritten amendments and revisions are not permitted, except in situations requiring immediate amendment or revision in the interest of safety.

(d) A description of the system for the annotation of pages or paragraphs and their effective dates.

(e) A list of effective pages or paragraphs.

(f) Annotation of changes (in the text and, as far as practicable, on charts and diagrams).

(g) Temporary revisions.

(h) A description of the distribution system for the manuals, amendments and revisions.

1 Organisation and Responsibilities

1.1 Organisational structure. A description of the organisational structure, including the general organogram and operations departments' organograms. The organogram should depict the relationship between the operations departments and the other departments of the operator. In particular, the subordination and reporting lines of all divisions, departments, etc., which pertain to the safety of flight operations, should be shown.

1.2 Nominated persons. The name of each nominated person responsible for flight operations, crew training and ground operations. A description of their function and responsibilities should be included.

1.3 Responsibilities and duties of operations management personnel. A description of the duties, responsibilities and authority of operations management personnel pertaining to the safety of flight operations and the compliance with the applicable regulations.

1.4 Authority, duties and responsibilities of the pilot-in-command/commander. A statement defining the authority, duties and responsibilities of the pilot- in-command/commander.

1.5 Duties and responsibilities of crew members other than the pilot-in-command/commander.

2 Operational Control and Supervision

2.1 Supervision of the operation by the operator. A description of the system for supervision of the operation by the operator. This should show how the safety of flight operations and the qualifications of personnel are supervised. In particular, the procedures related to the following items should be described:

(a) licence and qualification validity,

(b) competence of operations personnel,

(c) control, analysis and storage of the required records.

2.2 System and responsibility for promulgation of additional operational instructions and information. A description of any system for promulgating information which may be of an operational nature, but which is supplementary to that in the OM. The applicability of this information and the responsibilities for its promulgation should be included.

2.3 Operational control. A description of the procedures and responsibilities necessary to exercise operational control with respect to flight safety.

2.4 Powers of the authority. A description of the powers of the authority and guidance to staff on how to facilitate inspections by authority personnel.

3 Management System

A description of the management system, including at least the following:

(a) safety policy;

(b) the process for identifying safety hazards and for evaluating and managing the associated risks;

(c) compliance monitoring system;

(d) allocation of duties and responsibilities;

(e) documentation of all key management system processes.

4 Crew Composition

4.1 Crew composition. An explanation of the method for determining crew compositions, taking account of the following:

(a) the type of aircraft being used;

(b) the area and type of operation being undertaken;

(c) the phase of the flight;

(d) the minimum crew requirement and flight duty period planned;

(e) experience (total and on type), recency and qualification of the crew members;

(f) the designation of the pilot-in-command/commander and, if necessitated by the duration of the flight, the procedures for the relief of the pilot-in-command/commander or other members of the flight crew;

4.2 Designation of the pilot-in-command/commander. The rules applicable to the designation of the pilot-in-command/commander.

4.3 Flight crew incapacitation. Instructions on the succession of command in the event of flight crew incapacitation.

4.4 Operation on more than one type. A statement indicating which aircraft are considered as one type for the purpose of flight crew scheduling.

5 Qualification Requirements

5.1 A description of the required licence, rating(s), qualification/competency (e.g. for routes and aerodromes), experience, training, checking and recency for operations personnel to conduct their duties. Consideration should be given to the aircraft type, kind of operation and composition of the crew.

5.2 Flight crew:

(a) pilot-in-command/commander,

(b) pilot relieving the pilot-in-command/commander,

(c) co-pilot,

(e) pilot under supervision,

(f) system panel operator,

(g) operation on more than one type or variant.

5.3 Training, checking and supervision personnel for flight crew.

5.4 Other operations personnel (including technical crew and crew members other than flight and technical crew).

6 Crew Health Precautions

6.1 Crew health precautions. The relevant regulations and guidance to crew members concerning health, including the following:

(a) alcohol and other intoxicating liquids,

(b) narcotics,

(c) drugs,

(d) sleeping tablets,

(e) anti-depressants,

(f) pharmaceutical preparations,

(g) immunisation,

(h) deep-sea diving,

(i) blood/bone marrow donation,

(j) meal precautions prior to and during flight,

(k) sleep and rest,

(l) surgical operations.

6.2 The relevant regulations and guidance to crew members concerning dangerous goods used for specialised tasks (pesticides and chemicals, etc.).

7 Flight Time Limitations

7.1 Flight and duty time limitations and rest requirements.

7.2 Exceedance of flight and duty time limitations and/or reductions of rest periods. Conditions under which flight and duty time may be exceeded or rest periods may be reduced, and the procedures used to report these modifications.

7.3 A description of the fatigue risk management, including at least the following:

(a) the philosophy and principles;

(b) documentation of processes;

(c) scientific principles and knowledge;

(d) hazard identification and risk assessment processes;

(e) risk mitigation process;

(f) FRM safety assurance processes; and

(g) FRM promotion processes.

8 Operating Procedures

8.1 Flight preparation instructions. As applicable to the operation:

8.1.1 General procedures;

8.1.2 Minimum flight altitudes. A description of the method of determination and application of minimum altitudes, including a procedure to establish the minimum altitudes/flight levels;

8.1.3 Criteria and responsibilities for determining the adequacy of aerodromes/operating sites to be used;

8.1.4 Interpretation of meteorological information. Explanatory material on the decoding of MET forecasts and MET reports relevant to the area of operations, including the interpretation of conditional expressions;

8.1.5 Determination of the quantities of fuel, oil and water methanol carried. The methods by which the quantities of fuel, oil and water methanol to be carried are determined and monitored in-flight. The system for maintaining fuel and oil records should also be described;

8.1.6 Procedure for the determination of the mass of loads, the calculation of performance margins and the centre of gravity;

8.1.7 Emergency procedures, e.g. load, fuel or chemical jettison (to include the actions of all personnel);

8.1.8 System for supply of NOTAMS, meteorological and other safety- critical information both at base and in field locations;

8.1.9 Mandatory equipment for specific tasks (mirror, cargo sling, load cell, special radio equipment, radar altimeters, etc.);

8.1.10 Guidance on the CDL and MEL;

8.1.11 Policy on completion and carriage of documents including operator's aircraft technical log and journey log, or equivalent;

8.1.12 Any task-specific standard operating procedures not covered above.

8.2 Ground handling instructions. As applicable to the operation:

8.2.1 Briefing requirements for in-flight and ground task specialists;

8.2.2 Decontamination procedures;

8.2.3 Fuelling procedures, including safety precautions during refuelling and defuelling including quality checks required in the field location, precautions against spillage and environmental damage;

8.2.4. De-icing and anti-icing on the ground. A description of the de-icing and anti-icing policy and procedures for aircraft on the ground.

8.3 Flight procedures. As applicable to the operation:

8.3.1 Procedures relevant to the aircraft type, specific task and area;

8.3.2 Altimeter setting procedures;

8.3.3 Actions following alerts from audio warning devices;

8.3.4 GPWS/TAWS for aeroplanes. Procedures and instructions required for the avoidance of controlled flight into terrain, including limitations on high rate

of descent near the surface (the related training requirements are covered in OM-D 2.1);

8.3.5 Policy and procedures for the use of TCAS/ACAS for aeroplanes and, when applicable, for helicopters;

8.3.6 Policy and procedures for in-flight fuel management;

8.3.7 Procedures for operating in adverse and potentially hazardous atmospheric conditions;

8.3.8 Wake turbulence and rotor downwash for helicopters;

8.3.9 Use of restraint devices;

8.3.10 Policy on use of vacant seats;

8.3.11 Cabin safety requirements including smoking.

8.4 Task-specific weather limitations.

8.5 Use of the minimum equipment and configuration deviation list(s).

8.6 Oxygen requirements. An explanation of the conditions under which oxygen should be provided and used (altitude, exposure times, night etc.).

9 Dangerous Goods and Weapons

9.1 Information, instruction and general guidance on the transport of dangerous goods as internal or external loads, including:

9.1.1 The operator's policy on the transport of dangerous goods;

9.1.2 Guidance on the requirements for acceptance, labelling, handling, stowage, and segregation of dangerous goods;

9.1.3 Procedures for responding to emergency situations involving dangerous goods;

9.1.4 Duties of all personnel involved; and

9.1.5 Instructions on carriage of the operator’s personnel on cargo aircraft when dangerous goods are being carried.

9.2 The conditions under which weapons, munitions of war and sporting weapons may be carried.

10 Security

10.1 Security instructions, guidance procedures, and training which must include the authority and responsibilities of operations personnel. Policies and procedures for handling and reporting crime on board such as unlawful interference, sabotage, bomb threats, and hijacking must also be included.

10.2 A description of preventative security measures and training.

Note: Parts of the security instructions and guidance may be kept confidential.

11 Handling, Notifying and Reporting Accidents, Incidents and Occurrences, and Using the CVR Recordings

Procedures for handling, notifying and reporting accidents, incidents and occurrences. This section should include:

11.1 Definitions of accidents and occurrences and responsibilities of all persons involved;

11.2 Reporting procedures (including any mandatory forms);

11.3 Special notification when dangerous goods are carried; and

11.4 Procedures for the preservation of recordings of the flight recorders in order to prevent inadvertent reactivation, repair or reinstallation of the flight recorders following an accident or a serious incident or when this preservation is directed by the investigating authority.

12 Rules of the Air

(a) Visual and instrument flight rules,

(b) Territorial application of the rules of the air,

(c) Communication procedures, including communication-failure procedures,

(d) Information and instructions relating to the interception of civil aircraft,

(e) The circumstances in which a radio listening watch is to be maintained,

(f) Signals,

(g) Time system used in operation,

(h) ATC clearances, adherence to flight plan and position reports,

(i) Visual signals used to warn an unauthorised aircraft flying in or about to enter a restricted, prohibited or danger area,

(j) Procedures for flight crew observing an accident or receiving a distress transmission,

(k) The ground/air visual codes for use by survivors, and description and use of signal aids,

(l) Distress and urgency signals.,

(m) Territorial procedures for obtaining permissions and exemptions, e.g. for underslung loads and low flying clearances.

13 Leasing

A description of the operational arrangements for leasing and code-share, associated procedures and management responsibilities.

B Aircraft Operating Matters - Type Related

0 General Information and Units of Measurement

0.1 General information (e.g. aircraft dimensions), including a description of the units of measurement used for the operation of the aircraft type concerned and conversion tables.

1 Limitations

1.1 A description of the certified limitations and the applicable operational limitations should include the following:

(a) certification status (e.g. FAR/EASA CS–23, CS–25, ICAO Annex 16 (CS–36 and CS–34 etc.);

(b) passenger seating configuration for each aircraft type, including a pictorial presentation;

(c) types of operation that are approved (e.g. VFR/IFR, CAT II/III, RNP, flights in known icing conditions, etc.);

(d) crew composition;

(e) mass and centre of gravity;

(f) speed limitations;

(g) flight envelope(s);

(h) wind limits, including operations on contaminated runways;

(i) performance limitations for applicable configurations;

(j) runway slope;

(k) for aeroplanes, limitations on wet or contaminated runways;

(l) airframe contamination;

(m) system limitations.

2 Normal Procedures

The normal procedures and duties assigned to the crew, the appropriate checklists and the system for their use, including any task or specific role equipment procedures not contained in the AFM.

3 Abnormal and/or Emergency Procedures

The abnormal and/or emergency procedures and duties assigned to the crew, the appropriate checklists and the system for their use, including any task or specific role equipment emergency procedures not contained in the AFM.

4 Performance

4.1 Performance data should be provided in a form in which it can be used without difficulty.

4.2 Performance data. Performance material which provides the necessary data for compliance with the performance requirements.

5 Flight Planning

5.1 Data and instructions necessary for pre-flight and in-flight planning.

5.2 Procedures for specialised tasks.

6 Mass and Balance

Instructions and data for the calculation of the mass and balance, including:

6.1 Calculation system (e.g. index system);

6.2 Information and instructions for completion of mass and balance documentation; and

6.3 Limitations.

7 Loading

Procedures and provisions for loading and unloading and securing the load in the aircraft.

8 Configuration Deviation List (CDL)

The CDL(s), if provided by the manufacturer, taking account of the aircraft types and variants operated, including procedures to be followed when an aircraft is being dispatched under the terms of its CDL.

9 Minimum Equipment List (MEL)

The MEL for each aircraft type or variant operated and the type(s)/area(s) of operation. It should also contain procedures to be followed when an aircraft is being dispatched with one or more inoperative items, in accordance with the MEL.

10 Survival and Emergency Equipment including Oxygen

10.1 A list of the survival equipment to be carried, taking into account the nature of the area of operation, such as a hostile or a non-hostile environment.

10.2 A checklist for assessing the serviceability of the equipment and instructions for its use prior to take-off.

10.3 The procedure for determining the amount of oxygen required and the quantity that is available.

11 Emergency Evacuation Procedures

11.1 Emergency evacuation procedures, crew coordination and occupant handling in the event of a forced landing, ditching or other emergency.

12 Aircraft Systems

A description of the aircraft systems and all equipment specific to the tasks. Additional equipment, systems or fitting, related special procedures including any supplements to the AFM.

C Tasks and Operating Areas Instructions and Information

1 Specific instructions related to the specialised tasks and operating areas in accordance with instructions and information relating to communications, navigation and aerodromes/operating sites, including minimum flight levels and altitudes for each route to be flown and operating minima for each aerodrome/operating site planned to be used, including the following:

(a) minimum flight level/altitude;

(b) operating minima for departure, destination and alternate aerodromes;

(c) communication facilities and navigation aids;

(d) runway/final approach and take-off area (FATO) data and aerodrome/operating site facilities;

(e) approach, missed approach and departure procedures including noise abatement procedures;

(f) communication-failure procedures;

(g) search and rescue facilities in the area over which the aircraft is to be flown;

(h) a description of the aeronautical charts that should be carried on board in relation to the type of flight and the route to be flown, including the method to check their validity;

(i) availability of aeronautical information and MET services;

(j) en-route communication/navigation procedures;

(k) aerodrome/operating site categorisation for flight crew competence qualification;

(l) special aerodrome/operating site limitations (performance limitations and operating procedures, etc.).

2 Information related to landing sites available for approved operations, including:

(a) a description of the landing site (position, surface, slope, elevation, etc.);

(b) the preferred landing direction; and

(c) obstacles in the area.

D Training

1 Training syllabi and checking programmes for all operations personnel assigned to operational duties in connection with the preparation and/or conduct of a flight.

2 Training syllabi and checking programmes should include:

2.1 For flight crew, all relevant items required by this CAR and required for any special approvals;

2.2 For other crew members, all relevant items this CAR, as applicable;

2.3 For in-flight and ground task specialists concerned, including crew members:

a. All relevant items applicable to dangerous goods awareness or carriage; and

b. All relevant items applicable to security procedures; and

2.4 For operations personnel other than crew members, all other relevant items pertaining to their duties.

3 Procedures:

3.1 Procedures for training and checking.

3.2 Procedures to be applied in the event that personnel do not achieve or maintain the required standards.

3.3 A system for tracking expiry dates for qualifications, checks, tests, recency and licences.

4 Description of documentation to be stored and storage periods.

(b) If there are sections that, because of the nature of the operation, do not apply, it is recommended that operators maintain the numbering system described and insert 'Not applicable' or 'Intentionally blank' where appropriate.

AMC1 SPO.154 Journey log

(See SPO.154 Journey log)

(a) The aircraft journey log, or equivalent, should include the following items, where applicable:

(1) aircraft nationality and registration,

(2) date,

(3) name(s) of crew member(s),

(4) duty assignments of crew member(s),

(5) place of departure,

(6) place of arrival,

(7) time of departure,

(8) time of arrival,

(9) hours of flight,

(10) nature of flight (scheduled or non-scheduled),

(11) incidents, observations, if any,

(12) signature of person in charge.

(b) The information, or parts thereof, may be recorded in a form other than on printed paper. Accessibility, usability and reliability should be assured.

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

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

(1) within a 24-hour period;

(2) at the same aerodrome or operating site or remain within a local area specified in the operations manual; and

(3) with the same pilot-in-command/commander of the aircraft.

AC/AMC C - OPERATOR PROCEDURES

AMC1 SPO.200(a)(1);(2);(3);(5) Management System

(See SPO.200 Management System)

Non-Complex Operators - General

(a) Safety risk management may be performed using hazard checklists or similar risk management tools or processes, which are integrated into the activities of the operator.

(b) The operator should manage safety risks related to a change. The management of change should be a documented process to identify external and internal change that may have an adverse effect on safety. It should make use of the operator's existing hazard identification, risk assessment and mitigation processes.

(c) The operator should identify a person who fulfils the role of safety manager and who is responsible for coordinating the safety-management-related processes and tasks. This person may be the accountable manager or a person with an operational role within the operator.

(d) Within the operator, responsibilities should be identified for hazard identification, risk assessment and mitigation.

(e) The safety policy should include a commitment to improve towards the highest safety standards, comply with all applicable legal requirements, meet all applicable standards, consider best practices and provide appropriate resources.

(f) The operator should, in cooperation with other stakeholders, develop, coordinate and maintain an emergency response plan (ERP) that ensures orderly and safe transition from normal to emergency operations and return to normal operations. The ERP should provide the actions to be taken by the operator or specified individuals in an emergency and reflect the size, nature and complexity of the activities performed by the operator.

AMC1 SPO.200(a)(1) Management System

(See SPO.200 Management System)

Complex Operators - Organisation and Accountabilities

The management system of an operator should encompass safety by including a safety manager and a safety review board in the organisational structure.

(a) Safety manager

(1) The safety manager should act as the focal point and be responsible for the development, administration and maintenance of an effective safety management system.

(2) The functions of the safety manager should be to:

(i) facilitate hazard identification, risk analysis and management;

(ii) monitor the implementation of actions taken to mitigate risks, as listed in the safety action plan;

(iii) provide periodic reports on safety performance;

(iv) ensure maintenance of safety management documentation;

(v) ensure that there is safety management training available and that it meets acceptable standards;

(vi) provide advice on safety matters; and

(vii) ensure initiation and follow-up of internal occurrence/accident investigations.

(3) If more than one person is designated for the safety management function, the accountable manager should identify the person who acts as the unique focal point (i.e. the 'safety manager').

(b) Safety review board

(1) The safety review board should be a high level committee that considers matters of strategic safety in support of the accountable manager's safety accountability.

(2) The board should be chaired by the accountable manager and be composed of heads of functional areas.

(3) The safety review board should monitor:

(i) safety performance against the safety policy and objectives;

(ii) that any safety action is taken in a timely manner; and

(iii) the effectiveness of the operator's safety management processes.

(c) The safety review board should ensure that appropriate resources are allocated to achieve the established safety performance.

(d) The safety manager or any other relevant person may attend, as appropriate, safety review board meetings. He/she may communicate to the accountable manager all information, as necessary, to allow decision making based on safety data.

AMC1 SPO.200(a)(2) Management System

(See SPO.200 Management System)

Complex Operators - Safety Policy

(a) The safety policy should:

(1) be endorsed by the accountable manager;

(2) reflect organisational commitments regarding safety and its proactive and systematic management;

(3) be communicated, with visible endorsement, throughout the operator; and

(4) include safety reporting principles.

(b) The safety policy should include a commitment:

(1) to improve towards the highest safety standards;

(2) to comply with all applicable legislation, meet all applicable standards and consider best practices;

(3) to provide appropriate resources;

(4) to enforce safety as one primary responsibility of all managers; and

(5) not to blame someone for reporting something which would not have been otherwise detected.

(c) Senior management should:

(1) continually promote the safety policy to all personnel and demonstrate their commitment to it;

(2) provide necessary human and financial resources for its implementation; and

(3) establish safety objectives and performance standards.

AMC1 SPO.200(a)(3) Management System

(See SPO.200 Management System)

Complex Operators – Safety Risk Management

(a) Hazard identification processes

(1) Reactive and proactive schemes for hazard identification should be the formal means of collecting, recording, analysing, acting on and generating feedback about hazards and the associated risks that affect the safety of the operational activities of the operator.

(2) All reporting systems, including confidential reporting schemes, should include an effective feedback process.

(b) Risk assessment and mitigation processes

(1) A formal risk management process should be developed and maintained that ensures analysis (in terms of likelihood and severity of occurrence), assessment (in terms of tolerability) and control (in terms of mitigation) of risks to an acceptable level.

(2) The levels of management who have the authority to make decisions regarding the tolerability of safety risks, in accordance with (b)(1), should be specified.

(c) Internal safety investigation

(1) The scope of internal safety investigations should extend beyond the scope of occurrences required to be reported to the competent authority.

(d) Safety performance monitoring and measurement

(1) Safety performance monitoring and measurement should be the process by which the safety performance of the operator is verified in comparison to the safety policy and objectives.

(2) This process should include:

(i) safety reporting, also addressing the status of compliance with the applicable requirements;

(ii) safety studies, that is, rather large analyses encompassing broad safety concerns;

(iii) safety reviews including trends reviews, which would be conducted during introduction and deployment of new technologies, change or implementation of procedures, or in situations of structural change in operations;

(iv) safety audits focussing on the integrity of the operator's management system, and periodically assessing the status of safety risk controls; and

(v) safety surveys, examining particular elements or procedures of a specific operation, such as problem areas or bottlenecks in daily operations, perceptions and opinions of operational personnel and areas of dissent or confusion.

(e) The management of change

The operator should manage safety risks related to a change. The management of change should be a documented process to identify external and internal change that may have an adverse effect on safety. It should make use of the operator's existing hazard identification, risk assessment and mitigation processes.

(f) Continuous improvement

The operator should continuously seek to improve its safety performance. Continuous improvement should be achieved through:

(1) proactive and reactive evaluations of facilities, equipment, documentation and procedures through safety audits and surveys;

(2) proactive evaluation of individuals' performance to verify the fulfilment of their safety responsibilities; and

(3) reactive evaluations to verify the effectiveness of the system for control and mitigation of risk.

(g) The emergency response plan (ERP)

(1) An ERP should be established that provides the actions to be taken by the operator or specified individuals in an emergency. The ERP should reflect the size, nature and complexity of the activities performed by the operator.

(2) The ERP should ensure:

(i) an orderly and safe transition from normal to emergency operations;

(ii) safe continuation of operations or return to normal operations as soon as practicable; and

(iii) coordination with the emergency response plans of other organisations, where appropriate.

AMC1 SPO.200(a)(4) Management System

(See SPO.200 Management System)

Training and Communication on Safety

(a) Training

(1) All personnel should receive safety training as appropriate for their safety responsibilities.

(2) Adequate records of all safety training provided should be kept.

(b) Communication

(1) The operator should establish communication about safety matters that:

(i) ensures that all personnel are aware of the safety management activities as appropriate for their safety responsibilities;

(ii) conveys safety critical information, especially relating to assessed risks and analysed hazards;

(iii) explains why particular actions are taken; and

(iv) explains why safety procedures are introduced or changed.

(2) Regular meetings with personnel where information, actions and procedures are discussed may be used to communicate safety matters.

AMC1 SPO.200(a)(5) Management System

(See SPO.200 Management System)

Management System Documentation – General

(a) The operator's management system documentation should at least include the following information:

(1) a statement signed by the accountable manager to confirm that the operator will continuously work in accordance with the applicable requirements and the operator's documentation, as required by this regulation;

(2) the operator's scope of activities;

(3) the titles and names of persons referred to in SPO.210(a) and (b);

(4) an operator chart showing the lines of responsibility between the persons referred to in SPO.210;

(5) a general description and location of the facilities referred to in SPO.215;

(6) procedures specifying how the operator ensures compliance with the applicable requirements;

(7) the amendment procedure for the operator's management system documentation.

(b) The operator's management system documentation may be included in a separate manual or in (one of) the manual(s), as required by the applicable subpart(s). A cross-reference should be included.

AMC2 SPO.200(a)(5) Management System

(See SPO.200 Management System)

Complex Operators – Safety Management Manual

(a) The safety management manual (SMM) should be the key instrument for communicating the approach to safety for the whole of the operator. The SMM should document all aspects of safety management, including the safety policy, objectives, procedures and individual safety responsibilities.

(b) The contents of the safety management manual should include all the following:

(1) scope of the safety management system;

(2) safety policy and objectives;

(3) safety accountability of the accountable manager;

(4) safety responsibilities of key safety personnel;

(5) documentation control procedures;

(6) hazard identification and risk management schemes;

(7) safety action planning;

(8) safety performance monitoring;

(9) incident investigation and reporting;

(10) emergency response planning;

(11) management of change (including organisational changes regarding safety responsibilities);

(12) safety promotion.

(c) The SMM may be contained in (one of) the manual(s) of the operator.

AMC2 SPO.200(a)(6) Management System

(See SPO.200 Management System)

Compliance Monitoring – General

(a) Compliance monitoring

The implementation and use of a compliance monitoring function should enable the operator to monitor compliance with the relevant requirements of this regulation.

(1) The operator should specify the basic structure of the compliance monitoring function applicable to the activities conducted.

(2) The compliance monitoring function should be structured according to the size of the operator and the complexity of the activities to be monitored.

(b) Organisations should monitor compliance with the procedures they have designed to ensure safe activities. In doing so, they should as a minimum, and where appropriate, monitor compliance with the following:

(1) privileges of the operator;

(2) manuals, logs, and records;

(3) training standards;

(4) management system procedures and manuals;

(5) activities of the organisation carried out under the supervision of the nominated persons in accordance with SPO.210(b); and

(6) any outsourced activities in accordance with SPO.205, for compliance with the contract.

(c) Organisational set up

(1) To ensure that the operator continues to meet the requirements of this Part and other applicable Parts, the accountable manager should designate a quality manager. The role of the quality manager is to ensure that the activities of the operator are monitored for compliance with the applicable regulatory requirements, and any additional requirements as established by the operator, and that these activities are carried out properly under the supervision of the relevant head of functional area.

(2) The quality manager should be responsible for ensuring that the compliance monitoring programme is properly implemented, maintained and continually reviewed and improved.

(3) The quality manager should:

(i) have direct access to the accountable manager;

(ii) not be one of the other persons referred to in SPO.210(b);

(iii) be able to demonstrate relevant knowledge, background and appropriate experience related to the activities of the operator, including knowledge and experience in compliance monitoring; and

(iv) have access to all parts of the operator, and as necessary, any contracted operator.

(4) In the case of a non-complex operator, this task may be exercised by the accountable manager provided he/she has demonstrated having the related competence as defined in (c)(3)(iii).

(5) In the case the same person acts as quality manager and as safety manager, the accountable manager, with regards to his/her direct accountability for safety, should ensure that sufficient resources are allocated to both functions, taking into account the size of the operator and the nature and complexity of its activities.

(6) The independence of the compliance monitoring function should be established by ensuring that audits and inspections are carried out by personnel not responsible for the function, procedure or products being audited.

(7) If more than one person is designated for the compliance monitoring function, the accountable manager should identify the person who acts as the unique focal point (i.e. the 'quality manager').

(d) Compliance monitoring documentation

(1) Relevant documentation should include the relevant part(s) of the operator’s management system documentation.

(2) In addition, relevant documentation should also include the following:

(i) terminology;

(ii) specified activity standards;

(iii) a description of the operator;

(iv) the allocation of duties and responsibilities;

(v) procedures to ensure regulatory compliance;

(vi) the compliance monitoring programme, reflecting:

(A) schedule of the monitoring programme;

(B) audit procedures including an audit plan that is implemented, maintained, and continually reviewed and improved;

(C) reporting procedures;

(D) follow-up and corrective action procedures; and

(E) recording system.

(vii) the training syllabus referred to in (e)(2);

(viii) document control.

(e) Training

(1) Correct and thorough training is essential to optimise compliance in every operator. To achieve significant outcome of such training, the operator should ensure that all personnel understand the objectives as laid down in the operator's management system documentation.

(2) Those responsible for managing the compliance monitoring function should receive training on this task. Such training should cover the requirements of compliance monitoring, manuals and procedures related to the task, audit techniques, reporting and recording.

(3) Time should be provided to train all personnel involved in compliance management and for briefing the remainder of the personnel.

(4) The allocation of time and resources should be governed by the volume and complexity of the activities concerned.

AMC1 SPO.200(b) Management System

(See SPO.200 Management System)

Size, Nature and Complexity of the Activity

(a) An operator should be considered as complex when it has a workforce of more than 20 full time equivalents (FTEs) involved in the activity.

(b) Operators with up to 20 FTEs involved in the activity may also be considered complex based on an assessment of the following factors:

(1) in terms of complexity, the extent and scope of contracted activities subject to the approval;

(2) in terms of risk criteria, the extent of the following:

(i) operations requiring a specific approval;

(ii) high-risk commercial specialised operations;

(iii) operations with different types of aircraft used; and

(iv) operations in challenging environment (offshore, mountainous area, etc.).

AMC1 SPO.205 Contracted activities

(See SPO.205 Contracted Activities)

Responsibility when Contracting Activities

(a) The operator may decide to contract certain activities to external organisations.

(b) A written agreement should exist between the operator and the contracted organisation clearly defining the contracted activities and the applicable requirements.

(c) The contracted safety-related activities relevant to the agreement should be included in the operator's safety management and compliance monitoring programmes.

(d) The operator should ensure that the contracted organisation has the necessary authorisation or approval when required and commands the resources and competence to undertake the task.

AMC2 SPO.205 Contracted activities

(See SPO.205 Contracted Activities)

Third Party Providers

(a) The initial audit and/or the continuous monitoring of contracted organisations may be performed by a third-party provider on behalf of the operator when it is demonstrated that:

(1) a documented arrangement has been established with the third-party provider;

(2) the audit standards applied by the third-party provider address the scope of this Regulation in sufficient detail;

(3) the third-party provider uses an evaluation system, designed to assess the operational, management and control systems of the contracted organisation;

(4) the independence of the third-party provider, its evaluation system as well as the impartiality of the auditors is ensured;

(5) the auditors are appropriately qualified and have sufficient knowledge, experience and training, including on-the-job training, to perform their allocated tasks;

(6) audits are performed on-site;

(7) access to the relevant data and facilities is granted to the level of detail necessary to verify compliance with the applicable requirements;

(8) access to the full audit report is granted;

(9) procedures have been established for monitoring continuous compliance of the contracted organisation with the applicable requirements; and

(10) procedures have been established to notify the contracted organisation of any non-compliance with the applicable requirements, the corrective actions to be taken, the follow-up of these corrective actions, and closure of findings.

(b) The use of a third-party provider for the initial audit or the monitoring of continuous compliance of the contracted organisation does not exempt the operator from its responsibility under the applicable requirements.

(c) The operator should maintain a list of the contracted organisations monitored by the third-party provider. This list and the full audit report prepared by the third-party provider should be made available to the authority upon request.

AMC1 SPO.210 Personnel requirements

(See SPO.210 Personnel requirements)

Nominated Persons

(a) The person may hold more than one of the nominated posts if such an arrangement is considered suitable and properly matched to the scale and scope of the commercial specialised operation.

(b) A description of the functions and the responsibilities of the nominated persons, including their names, should be contained in the operations manual.

(c) A commercial specialised operator should make arrangements to ensure continuity of supervision in the absence of nominated persons.

(d) The person nominated by a commercial specialised operator should normally not be nominated by another commercial specialised operator.

(e) Persons nominated should be contracted to work sufficient hours to fulfil the management functions associated with the scale and scope of the commercial specialised operation.

Combination of Nominated Persons Responsibilities

(a) The acceptability of a single person holding several posts, possibly in combination with being the accountable manager, should depend upon the nature and scale of the commercial specialised operation. The two main areas of concern should be competence and an individual's capacity to meet his/her responsibilities.

(b) As regards competence in different areas of responsibility, there should not be any difference from the requirements applicable to persons holding only one post.

(c) The capacity of an individual to meet his/her responsibilities should primarily be dependent upon the scale of the commercial specialised operation. However, the complexity of the organisation or of the operation may prevent, or limit, combinations of posts which may be acceptable in other circumstances.

(d) In most circumstances, the responsibilities of a nominated person should rest with a single individual. However, in the area of ground operations, it may be acceptable for responsibilities to be split, provided that the responsibilities of each individual concerned are clearly defined.

(e) The smallest organisation that can be considered is the one-man organisation where all the nominated posts are filled by the accountable manager, and audits are conducted by an independent person.

Competence of Nominated Persons

(a) Nominated persons should normally be expected to possess the experience and meet the licensing provisions that are listed in (b) to (f). There may be exceptional cases where not all the provisions can be met. In that circumstance, the nominee should have comparable experience and the ability to perform effectively the functions associated with the post and with the scale of the specialised operation.

(b) Nominated persons should have:

(1) practical experience and expertise in the application of aviation safety standards and safe operating practices;

(2) comprehensive knowledge of:

(i) the applicable safety regulations and any associated requirements and procedures;

(ii) the operator's high-risk specialised operation authorisation, if applicable; and

(iii) the need for, and content of, the relevant parts of the commercial specialised operator's operations manual;

(3) familiarity with management systems preferably in the area of aviation;

(4) appropriate management experience, preferably in a comparable organisation; and

(5) 5 years of relevant work experience of which at least 2 years should be from the aeronautical industry in an appropriate position.

(c) Flight operations. The nominated person should hold or have held a valid flight crew licence and the associated ratings appropriate to the type of commercial specialised operations conducted by the operator. In case the nominated person's licence and ratings are not current, his/her deputy should hold a valid flight crew licence and the associated ratings.

(d) Crew training. The nominated person or his/her deputy should be a current type rating instructor on a type/class operated by the commercial specialised operator. The nominated person should have a thorough knowledge of the operator's crew training concept for flight crew and when relevant other crew.

(e) Ground operations. The nominated person should have a thorough knowledge of the commercial specialised operator's ground operations concept.

(f) Continuing airworthiness. The nominated person should have the relevant knowledge and appropriate experience requirements related to aircraft continuing airworthiness.

AMC1 SPO.220(b) Record-keeping

(See SPO.220 Record-keeping)

General

(a) The record-keeping system should ensure that all records are accessible whenever needed within a reasonable time. These records should be organised in a way that ensures traceability and retrievability throughout the required retention period.

(b) Records should be kept in paper form or in electronic format or a combination of both. Records stored on microfilm or optical disc format are also acceptable. The records should remain legible throughout the required retention period. The retention period starts when the record has been created or last amended.

(c) Paper systems should use robust material which can withstand normal handling and filing. Computer systems should have at least one backup system which should be updated within 24 hours of any new entry. Computer systems should include safeguards against the ability of unauthorised personnel to alter the data.

(d) All computer hardware used to ensure data backup should be stored in a different location from that containing the working data and in an environment that ensures they remain in good condition. When hardware or software changes take place, special care should be taken that all necessary data continues to be accessible at least through the full period specified in the relevant subpart. In the absence of such indication, all records should be kept for a minimum period of 5 years.

AMC1 SPO.225(b);(e) Use of aircraft listed on an AOC for non-commercial operations and specialised operations

(See SPO.225 Use of aircraft listed on an AOC for non-commercial operations and specialised operations)

Responsibilities of the AOC Holder

(a) The AOC holder providing the aircraft should include the following information in the respective parts of its operations manual:

(1) how the relevant personnel are informed about which of the operators is responsible for the operational control of each flight;

(2) when possible, which of the aircraft are used by the AOC holder itself, when conducting operations as a different operator (SPO operator, ATO or DTO), or by other operators;

(3) when possible, the name of the other operators using the aircraft for operations performed in accordance with SPO.310;

(4) when possible, the frequency with which the aircraft is used by the other operators;

(5) the means of instructing the relevant personnel on the continuing airworthiness procedure covering the use of the aircraft by other operators; and

(6) a customised list of occurrences that the other operators must report to the AOC holder when using the aircraft in accordance with SPO.310. This list may be adjusted to fit the aircraft used by the other operators, as well as the type of operation for which it is used. The AOC holder should communicate this list to the other operators.

(b) The AOC holder should ensure that the operations specifications form of the respective aircraft is not carried on board when that aircraft is used by other operators for their non-commercial complex or non-commercial non-complex or SPO operations.

AMC1 SPO.225(b);(d);(f) Use of aircraft listed on an AOC for non-commercial operations and specialised operations

(See SPO.225 Use of aircraft listed on an AOC for non-commercial operations and specialised operations)

Responsibilities of the Other Operator

The other operator using the aircraft listed on an AOC for operations under SPO.310 should include the following elements in its procedure:

(a) a description of the way in which the shifting of operational control is communicated, including how, when and to whom the information is communicated;

(b) a description of the specific responsibilities resulting from having the operational control of the flight performed with the aircraft listed on the AOC;

(c) a description of the means to ensure that the relevant personnel are instructed to:

(1) contact the organisation responsible for the management of continuing airworthiness of the aircraft of the AOC holder for any defect or technical malfunction which occurs before or during the operation.

The information about any defect or malfunction should be transmitted to the organisation responsible for the management of continuing airworthiness of the AOC holder before the aircraft is used for the next flight. The same information should be confirmed by the entries in the aircraft technical log system; and

(2) report any occurrence in accordance with the applicable rules and the internal procedures; and

(d) a customised list of occurrences, as developed by the AOC holder, which the other operator should use when informing the AOC holder of any safety-relevant issue or event that occurred while the aircraft was under its operational control.

AC/AMC D - OPERATING PROCEDURES

AC1 SPO.316 Noise abatement procedures

(See SPO.316 Noise abatement procedures)

Terminology

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

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

General

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

Example

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

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

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

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

(f) These two altitudes may be runway specific when the aeroplane flight management system (FMS) has the relevant function that permits the crew to change thrust reduction and/or acceleration altitude/height. If the aeroplane is not FMS equipped or the FMS is not fitted with the relevant function, two fixed heights should be defined and used for each of the two NADPs.

AMC1 SPO.322 (b)(1)(ii) Fuel and oil supply – helicopters

(See SPO.322 Fuel and oil supply – helicopters)

Reduced Reserve Fuel

(a) The operator should specify in the SOP:

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

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

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

AMC1 SPO.324 Safety briefing

(See SPO.324 Safety briefing)

Task Specialists - General

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

(b) Such briefing should include, as appropriate:

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

(2) procedures for boarding and disembarking;

(3) procedures for loading and unloading the aircraft;

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

(5) use of communication equipment and hand signals;

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

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

(i) location of emergency exits;

(i) restrictions regarding smoking;

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

(iii) stowage of tools and hand baggage.

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

AMC1 SPO.334 Destination aerodromes – instrument approach operations

(See SPO.334 Destination aerodromes – instrument approach operations)

PBN Operations

(a) The pilot-in-command should only select an aerodrome as a destination alternate aerodrome if an instrument approach procedure that does not rely on GNSS is available either at that aerodrome or at the destination aerodrome.

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

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

AMC1 SPO.336 Refuelling with persons embarking, on board or disembarking

(See SPO.336 Refuelling with persons embarking, on board or disembarking)

Operational Procedures – Aeroplanes

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

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

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

(3) Flight crew members and task specialists should be warned that refuelling will take place.

(4) 'Fasten seat belts' signs should be off.

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

(6) Task specialists should be instructed to unfasten their seat belts and refrain from smoking.

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

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

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

Operational Procedures – Helicopters

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

(1) Door(s) on the refuelling side of the helicopter remain closed.

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

(3) Firefighting facilities of the appropriate scale be positioned to be immediately available in the event of a fire.

(4) Sufficient qualified personnel are on board and be prepared for an immediate emergency evacuation.

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

(6) The ground area beneath the exits intended for emergency evacuation be kept clear.

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

Aircraft Refuelling Provisions on Safe Refuelling Practices

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

(1) whenever deemed necessary in the interest of safety;

AMC1 SPO.342 Meteorological conditions

(See SPO.342 Meteorological conditions)

Validation of Meteorological Conditions

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

Application of Aerodrome Forecasts (TAF & TREND)

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

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

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

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

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

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

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

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

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

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

(3) improvements should in all cases be disregarded.

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

(1) deteriorations may be disregarded; and

(2) improvements should be disregarded.

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

FM:	from
BECMG:	becoming
AT:	at
TL:	till
TEMPO:	temporarily
PROB:	probability

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.

AC1 SPO.344 Ice and other contaminants – ground procedures

(See SPO.344 Ice and other contaminants – ground procedures)

Terminology

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

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

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

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

(3) Type II fluid;

(4) mixture of water and Type II fluid;

(5) Type III fluid;

(6) mixture of water and Type III fluid;

(7) Type IV fluid;

(8) mixture of water and Type IV fluid.

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

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

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

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

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

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

(1) heated water;

(2) Type I fluid;

(3) mixture of water and Type I fluid;

(4) Type II fluid;

(5) mixture of water and Type II fluid;

(6) Type III fluid;

(7) mixture of water and Type III fluid;

(8) Type IV fluid;

(9) mixture of water and Type IV fluid.

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

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

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

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

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

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

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

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

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

Anti-Icing Codes

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

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

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

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

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

(b) 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.

De-Icing/Anti-Icing - Procedures

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

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

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

(3) post-treatment checks;

(4) pre-take-off checks;

(5) pre-take-off contamination checks;

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

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

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

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

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

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

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

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

are carried out at the same time, using a mixture of de- icing/anti-icing fluid and water. Two-step de-icing/anti-icing means that de-icing and anti- icing are carried out in two separate steps. The aircraft is first de-iced using heated water only or a heated mixture of de-icing/anti-icing fluid and water. After completion of the de-icing operation a layer of a mixture of de-icing/anti-icing fluid and water, or of de- icing/anti-icing fluid only, is sprayed over the aircraft surfaces. The second step will be applied before the first-step fluid freezes, typically within three minutes and, if necessary, area by area.

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

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

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

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

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

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

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

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

(c) Special operational considerations

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

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

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

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

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

(d) Communications

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

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

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

(e) Hold-over protection

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

(f) Training

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

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

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

(3) a new type of aircraft.

(g) Contracting

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

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

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

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

(4) checking and communications procedures.

(h) Special maintenance considerations

(1) General

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

(2) Special considerations regarding residues of dried fluids

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

(i) Dried fluid residues

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

(ii) Re-hydrated fluid residues

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

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

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

De-Icing/Anti-Icing - Background Information

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

(a) General

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

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

(3) Under certain meteorological conditions, de-icing and/or anti-icing procedures may be ineffective in providing sufficient protection for continued operations. Examples of these conditions are freezing rain, ice pellets and hail, heavy snow, high wind velocity, fast dropping

OAT or any time when freezing precipitation with high water content is present. No HoT guidelines exist for these conditions.

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

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

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

(iii) International Organization for Standardization (ISO) 11075 Aircraft - De- icing/anti-icing fluids - ISO type I;

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

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

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

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

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

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

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

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

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

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

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

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

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

(b) Fluids

(1) Type I fluid: Due to its properties, Type I fluid forms a thin, liquid-wetting film on surfaces to which it is applied which, under certain weather conditions, gives a very limited HoT. With this type of fluid, increasing the concentration of fluid in the fluid/water mix does not provide any extension in HoT.

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

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

(4) Fluids used for de-icing and/or anti-icing should be acceptable to the operator and the aircraft manufacturer. These fluids normally conform to specifications such as SAE AMS1424, SAE AMS1428 or equivalent. Use of non-conforming fluids is not recommended due to their characteristics being unknown. The anti-icing and aerodynamic properties of thickened fluids

may be seriously degraded by, for example, inappropriate storage, treatment, application, application equipment and age.

(c) Hold-over protection

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

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

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

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

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

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

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

AMC1 SPO.346 Ice and other contaminants – flight procedures

(See SPO.346 Ice and other contaminants – flight procedures)

Flight in Expected or Actual Icing Conditions

(a) The procedures to be established by the operator should take account of the design, the equipment, the configuration of the aircraft and the necessary training. For these reasons, different aircraft types operated by the same company may require the development of different procedures. In every case, the relevant limitations are those that are defined in the AFM and other documents produced by the manufacturer.

(b) The operator should ensure that the procedures take account of the following:

(1) the equipment and instruments that should be serviceable for flight in icing conditions;

(2) the limitations on flight in icing conditions for each phase of flight. These limitations may be imposed by the aircraft's de-icing or anti-icing equipment or the necessary performance corrections that must be made;

(3) the criteria the flight crew should use to assess the effect of icing on the performance and/or controllability of the aircraft;

(4) the means by which the flight crew detects, by visual cues or the use of the aircraft's ice detection system, that the flight is entering icing conditions; and

(5) the action to be taken by the flight crew in a deteriorating situation (which may develop rapidly) resulting in an adverse effect on the performance and/or controllability of the aircraft, due to:

(i) the failure of the aircraft's anti-icing or de-icing equipment to control a build-up of ice; and/or

(ii) ice build-up on unprotected areas.

(c) Training for dispatch and flight in expected or actual icing conditions. The content of the operations manual should reflect the training, both conversion and recurrent, that flight crew and all other relevant operational personnel require in order to comply with the procedures for dispatch and flight in icing conditions:

(1) instruction on how to recognise, from weather reports or forecasts that are available before flight commences or during flight, the risks of encountering icing conditions along the planned route and on how to modify, as necessary, the departure and in-flight routes or profiles;

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

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

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

AC1 SPO.356 Ground proximity detection

(See SPO.356 Ground proximity detection)

Guidance Material for Terrain Awareness Warning System (TAWS) Flight Crew Training Programmes

(a) Introduction

(1) This contains performance-based training objectives for TAWS flight crew training.

(2) The training objectives cover five areas: theory of operation; pre-flight operations; general in-flight operations; response to TAWS cautions; response to TAWS warnings.

(3) The term ‘TAWS’ means a ground proximity warning system (GPWS) enhanced by a forward-looking terrain avoidance function. Alerts include both cautions and warnings.

(4) The content is intended to assist operators who are producing training programmes. The information it contains has not been tailored to any specific aircraft or TAWS equipment, but highlights features that are typically available where such systems are installed. It is the responsibility of the individual operator to determine the applicability of the content 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 advisory circular and that published in the other documents described above, then the information contained in the AFM or A/FCOM will take precedence.

(b) Scope

(1) The scope is designed to identify training objectives in the areas of: academic training; manoeuvre training; initial evaluation; recurrent qualification. Under each of these four areas, the training material has been separated into those items that are considered essential training items and those that are considered to be desirable. In each area, objectives and acceptable performance criteria are defined.

(2) No attempt is made to define how the training programme should be implemented. Instead, objectives are established to define the knowledge that a pilot operating a TAWS is expected to possess and the performance expected from a pilot who has completed TAWS training. However, the guidelines do indicate those areas in which the pilot receiving the training should demonstrate his/her understanding, or performance, using a real-time, interactive training device, i.e. a flight simulator. Where appropriate, notes are included within the performance criteria that amplify or clarify the material addressed by the training objective.

(c) Performance-based training objectives

(1) TAWS academic training

(i) This training is typically conducted in a classroom environment. The knowledge demonstrations specified in this section may be completed through the successful completion of written tests or by providing correct responses to non-real-time computer-based training (CBT) questions.

(ii) Theory of operation. The pilot should demonstrate an understanding of TAWS operation and the criteria used for issuing cautions and warnings. This training should address system operation. Objective: to demonstrate knowledge of how a TAWS functions. Criteria: the pilot should demonstrate an understanding of the following functions:

(A) Surveillance

a. The GPWS computer processes data supplied from an air data computer, a radio altimeter, an instrument landing system (ILS)/microwave landing system (MLS)/multi-mode (MM) receiver, a roll attitude sensor, and actual position of the surfaces and of the landing gear.

b. The forward-looking terrain avoidance function utilises an accurate source of known aircraft position, such as that which may be provided by a flight management system (FMS) or global positioning system (GPS), or an electronic terrain database. The source and scope of the terrain, obstacle and airport data, and features such as the terrain clearance floor, the runway picker, and geometric altitude (where provided), should all be described.

c. Displays required to deliver TAWS outputs include a loudspeaker for voice announcements, visual alerts (typically amber and red lights) and a terrain awareness display (that may be combined with other displays). In addition, means should be provided for indicating the status of the TAWS and any partial or total failures that may occur.

(B) Terrain avoidance. Outputs from the TAWS computer provide visual and audio synthetic voice cautions and warnings to alert the flight crew about potential conflicts with terrain and obstacles.

(C) Alert thresholds. Objective: to demonstrate knowledge of the criteria for issuing cautions and warnings. Criteria: the pilot should be able to demonstrate an understanding of the methodology used by a TAWS to issue cautions and alerts and the general criteria for the issuance of these alerts, including:

a. basic GPWS alerting modes specified in the ICAO standard:

Mode 1: excessive sink rate;

Mode 2: excessive terrain closure rate;

Mode 3: descent after take-off or missed approach;

Mode 4: unsafe proximity to terrain; and

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

b. an additional, optional alert mode:

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

c. TAWS cautions and warnings that alert the flight crew to obstacles and terrain ahead of the aircraft in line with or adjacent to its projected flight path (forward-looking terrain avoidance (FLTA) and premature descent alert (PDA) functions).

(D) TAWS limitations. Objective: to verify that the pilot is aware of the limitations of

TAWS. Criteria: the pilot should demonstrate knowledge and an understanding of TAWS limitations identified by the manufacturer for the equipment model installed, such as:

a. navigation should not be predicated on the use of the terrain display;

b. unless geometric altitude data is provided, use of predictive TAWS functions is prohibited when altimeter subscale settings display 'QFE' (atmospheric pressure at aerodrome elevation/runway threshold);

c. nuisance alerts can be issued if the aerodrome of intended landing is not included in the TAWS airport database;

d. in cold weather operations, corrective procedures should be implemented by the pilot unless the TAWS has in-built compensation, such as geometric altitude data;

e. loss of input data to the TAWS computer could result in partial or total loss of functionality. Where means exist to inform the flight crew that functionality has been degraded, this should be known and the consequences understood;

f. radio signals not associated with the intended flight profile (e.g. ILS glide path transmissions from an adjacent runway) may cause false alerts;

g. inaccurate or low accuracy aircraft position data could lead to false or non-annunciation of terrain or obstacles ahead of the aircraft; and

h. minimum equipment list (MEL) restrictions should be applied in the event of the TAWS becoming partially or completely unserviceable. (It should be noted that basic GPWS has no forward-looking capability.)

(E) TAWS inhibits. Objective: to verify that the pilot is aware of the conditions under which certain functions of a TAWS are inhibited. Criteria: the pilot should demonstrate knowledge and an understanding of the various TAWS inhibits, including the following means of:

a. silencing voice alerts;

b. inhibiting ILS glide path signals (as may be required when executing an ILS back beam approach);

c. inhibiting flap position sensors (as may be required when executing an approach with the flaps not in a normal position for landing);

d. inhibiting the FLTA and PDA functions; and

e. selecting or deselecting the display of terrain information, together with appropriate annunciation of the status of each selection.

(2) Operating procedures. The pilot should demonstrate the knowledge required to operate TAWS avionics and to interpret the information presented by a TAWS. This training should address the following topics:

(i) Use of controls. Objective: to verify that the pilot can properly operate all TAWS controls and inhibits. Criteria: the pilot should demonstrate the proper use of controls, including the following means by which:

(A) before flight, any equipment self-test functions can be initiated;

(B) TAWS information can be selected for display; and

(C) all TAWS inhibits can be operated and what the consequent annunciations mean

with regard to loss of functionality.

(ii) Display interpretation. Objective: to verify that the pilot understands the meaning of all information that can be annunciated or displayed by a TAWS. Criteria: the pilot should demonstrate the ability to properly interpret information annunciated or displayed by a TAWS, including the following:

(A) knowledge of all visual and aural indications that may be seen or heard;

(B) response required on receipt of a caution;

(C) response required on receipt of a warning; and

(D) response required on receipt of a notification that partial or total failure of the TAWS has occurred (including annunciation that the present aircraft position is of low accuracy).

(iii) Use of basic GPWS or use of the FLTA function only. Objective: to verify that the pilot understands what functionality will remain following loss of the GPWS or of the FLTA function. Criteria: the pilot should demonstrate knowledge of how to recognise the following:

(A) un-commanded loss of the GPWS function, or how to isolate this function and how to recognise the level of the remaining controlled flight into terrain (CFIT) protection (essentially, this is the FLTA function); and

(B) un-commanded loss of the FLTA function, or how to isolate this function and how to recognise the level of the remaining CFIT protection (essentially, this is the basic GPWS).

(iv) Crew coordination. Objective: to verify that the pilot adequately briefs other flight crew members on how TAWS alerts will be handled. Criteria: the pilot should demonstrate that the pre-flight briefing addresses procedures that will be used in preparation for responding to TAWS cautions and warnings, including the following:

(A) the action to be taken, and by whom, in the event that a TAWS caution and/or warning is issued; and

(B) how multi-function displays will be used to depict TAWS information at take- off, in the cruise and for the descent, approach, landing (and any missed approach). This will be in accordance with procedures specified by the operator, who will recognise that it may be more desirable that other data is displayed at certain phases of flight and that the terrain display has an automatic 'pop-up' mode in the event that an alert is issued.

(v) Reporting rules. Objective: to verify that the pilot is aware of the rules for reporting alerts to the controller and other authorities. Criteria: the pilot should demonstrate knowledge of the following:

(A) when, following recovery from a TAWS alert or caution, a transmission of information should be made to the appropriate ATC unit; and

(B) the type of written report that is required, how it is to be compiled and whether any cross-reference should be made in the aircraft technical log and/or voyage report (in accordance with procedures specified by the operator), following a flight in which the aircraft flight path has been modified in response to a TAWS alert, or if any part of the equipment appears not to have functioned correctly.

(vi) Alert thresholds. Objective: to demonstrate knowledge of the criteria for issuing cautions and warnings. Criteria: the pilot should be able to demonstrate an understanding of the

methodology used by a TAWS to issue cautions and warnings and the general criteria for the issuance of these alerts, including awareness of the following:

(A) modes associated with basic GPWS, including the input data associated with each; and

(B) visual and aural annunciations that can be issued by TAWS and how to identify which are cautions and which are warnings.

(3) TAWS manoeuvre training. The pilot should demonstrate the knowledge required to respond correctly to TAWS cautions and warnings. This training should address the following topics:

(i) Response to cautions:

(A) Objective: to verify that the pilot properly interprets and responds to cautions. Criteria: the pilot should demonstrate an understanding of the need, without delay:

a. to initiate action required to correct the condition that has caused the TAWS to issue the caution and to be prepared to respond to a warning, if this should follow; and

b. if a warning does not follow the caution, to notify the controller of the new position, heading and/or altitude/flight level of the aircraft, and what the pilot-in-command intends to do next.

(B) The correct response to a caution might require the pilot to:

a. reduce a rate of descent and/or to initiate a climb;

b. regain an ILS glide path from below, or to inhibit a glide path signal if an ILS is not being flown;

c. select more flap, or to inhibit a flap sensor if the landing is being conducted with the intent that the normal flap setting will not be used;

d. select gear down; and/or

e. initiate a turn away from the terrain or obstacle ahead and towards an area free of such obstructions if a forward-looking terrain display indicates that this would be a good solution and the entire manoeuvre can be carried out in clear visual conditions.

(ii) Response to warnings. Objective: to verify that the pilot properly interprets and responds to warnings. Criteria: the pilot should demonstrate an understanding of the following:

(A) The need, without delay, to initiate a climb in the manner specified by the operator.

(B) The need, without delay, to maintain the climb until visual verification can be made that the aircraft will clear the terrain or obstacle ahead or until above the appropriate sector safe altitude (if certain about the location of the aircraft with respect to terrain) even if the TAWS warning stops. If, subsequently, the aircraft climbs up through the sector safe altitude, but the visibility does not allow the flight crew to confirm that the terrain hazard has ended, checks should be made to verify the location of the aircraft and to confirm that the altimeter subscale settings are correct.

(C) When workload permits that, the flight crew should notify the air traffic controller of the new position and altitude/flight level and what the pilot-in- command intends to do next.

(D) That the manner in which the climb is made should reflect the type of aircraft and the method specified by the aircraft manufacturer (which should be reflected in the operations manual) for performing the escape manoeuvre. Essential aspects will include the need for an increase in pitch attitude, selection of maximum thrust,

confirmation that external sources of drag (e.g. spoilers/speed brakes) are retracted and respect of the stick shaker or other indication of eroded stall margin.

(E) That TAWS warnings should never be ignored. However, the pilot's response may be limited to that which is appropriate for a caution, only if:

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

b. it is immediately clear to the pilot that the aircraft is in no danger in respect of its configuration, proximity to terrain or current flight path.

(4) TAWS initial evaluation:

(i) The flight crew member's understanding of the academic training items should be assessed by means of a written test.

(ii) The flight crew member's understanding of the manoeuvre training items should be assessed in a flight simulation training device (FSTD) equipped with TAWS visual and aural displays and inhibit selectors similar in appearance and operation to those in the aircraft that the pilot will fly. The results should be assessed by a flight simulation training instructor, synthetic flight examiner, type rating instructor or type rating examiner.

(iii) The range of scenarios should be designed to give confidence that proper and timely responses to TAWS cautions and warnings will result in the aircraft avoiding a CFIT accident. To achieve this objective, the pilot should demonstrate taking the correct action to prevent a caution developing into a warning and, separately, the escape manoeuvre needed in response to a warning. These demonstrations should take place when the external visibility is zero, though there is much to be learnt if, initially, the training is given in 'mountainous' or 'hilly' terrain with clear visibility. This training should comprise a sequence of scenarios, rather than be included in line orientated flight training (LOFT).

(iv) A record should be made, after the pilot has demonstrated competence, of the scenarios that were practised.

(5) TAWS recurrent training:

(i) TAWS recurrent training ensures that pilots maintain the appropriate TAWS knowledge and skills. In particular, it reminds pilots of the need to act promptly in response to cautions and warnings and of the unusual attitude associated with flying the escape manoeuvre.

(ii) An essential item of recurrent training is the discussion of any significant issues and operational concerns that have been identified by the operator. Recurrent training should also address changes to TAWS logic, parameters or procedures and to any unique TAWS characteristics of which pilots should be aware.

(6) Reporting procedures:

(i) Verbal reports. Verbal reports should be made promptly to the appropriate ATC unit:

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

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

(C) when an air traffic control unit issues instructions that, if followed, would cause the pilot to manoeuvre the aircraft towards terrain or obstacle or it would appear from the display that a potential CFIT occurrence is likely to result.

(ii) Written reports. Written reports should be submitted in accordance with the operator's occurrence reporting scheme and they should also be recorded in the aircraft technical log:

(A) whenever the aircraft flight path has been modified in response to a TAWS alert (false, nuisance or genuine);

(B) whenever a TAWS alert has been issued and is believed to have been false; and/or

(C) if it is believed that a TAWS alert should have been issued but was not.

(iii) Within this GM, and with regard to reports:

(A) the term 'false' means that the TAWS issued an alert that could not possibly be justified by the position of the aircraft in respect to terrain and it is probable that a fault or failure in the system (equipment and/or input data) was the cause;

(B) the term 'nuisance' means that the TAWS issued an alert that was appropriate, but was not needed because the flight crew could determine by independent means that the flight path was, at that time, safe;

(C) the term 'genuine' means that the TAWS issued an alert that was both appropriate and necessary;

(D) the report terms described above are only meant to be assessed after the occurrence is over, to facilitate subsequent analysis, the adequacy of the equipment and the programmes it contains. The intention is not for the flight crew to attempt to classify an alert into any of these three categories when visual and/or aural cautions or warnings are annunciated.

AC1 SPO.358 Airborne collision avoidance system (ACAS)

(See SPO.358 Airborne collision avoidance system (ACAS))

General

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

(1) ICAO Annex 10, Volume IV;

(2) ICAO Doc 8168 (PANS-OPS), Volume III; and

(3) ICAO PANS-ATM.

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

ACAS Flight Crew Training

(c) During the implementation of ACAS, several operational issues were identified that had been attributed to deficiencies in flight crew training programmes. As a result, the issue of flight crew training has been discussed within the ICAO, which has developed guidelines for operators to use when designing training programmes.

(d) This contains performance-based training objectives for ACAS II flight crew training. Information contained here related to traffic advisories (TAs) is also applicable to ACAS I and ACAS II users. The training objectives cover five areas: theory of operation; pre-flight operations; general in-flight operations; response to TAs; and response to resolution advisories (RAs).

(e) The information provided is valid for version 7 and 7.1 (ACAS II). Where differences arise, these are identified.

(f) The performance-based training objectives are further divided into the areas of: academic training; manoeuvre training; initial evaluation and recurrent qualification. Under each of these four areas, the training material has been separated into those items which are considered essential training items and those which are considered desirable. In each area, objectives and acceptable performance criteria are defined.

(g) ACAS academic training

(1) This training is typically conducted in a classroom environment. The knowledge demonstrations specified in this section may be completed through the successful completion of written tests or through providing correct responses to non-real-time computer-based training (CBT) questions.

(2) Essential items

(i) Theory of operation. The flight crew member should demonstrate an understanding of ACAS II operation and the criteria used for issuing TAs and RAs. This training should address the following topics:

(A) System operation

Objective: to demonstrate knowledge of how ACAS functions.

Criteria: the flight crew member should demonstrate an understanding of the following functions:

a. Surveillance

1. ACAS interrogates other transponder-equipped aircraft within a nominal range of 14 NM.

2. ACAS surveillance range can be reduced in geographic areas with a large number of ground interrogators and/or ACAS II- equipped aircraft.

3. If the operator's ACAS implementation provides for the use of the Mode S extended squitter, the normal surveillance range may be increased beyond the nominal 14 NM. However, this information is not used for collision avoidance purposes.

b. Collision avoidance

1. TAs can be issued against any transponder-equipped aircraft that responds to the ICAO Mode C interrogations, even if the aircraft does not have altitude reporting capability.

2. RAs can be issued only against aircraft that are reporting altitude and in the vertical plane only.

3. RAs issued against an ACAS-equipped intruder are co-ordinated to ensure complementary RAs are issued.

4. Failure to respond to an RA deprives own aircraft of the collision protection provided by own ACAS.

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

(B) Advisory thresholds

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

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

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

b. Thresholds for issuing a TA or an RA vary with altitude. The thresholds are larger at higher altitudes.

c. A TA occurs from 15 to 48 seconds and an RA from 15 to 35 seconds before the projected CPA.

d. RAs are chosen to provide the desired vertical miss distance at CPA. As a result, RAs can instruct a climb or descent through the intruder aircraft's altitude.

(C) ACAS limitations

Objective: to verify that the flight crew member is aware of the limitations of ACAS.

Criteria: the flight crew member should demonstrate knowledge and understanding of ACAS limitations, including the following:

a. ACAS will neither track nor display non-transponder-equipped aircraft, nor aircraft not responding to ACAS Mode C interrogations.

b. ACAS will automatically fail if the input from the aircraft’s barometric altimeter, radio altimeter or transponder is lost.

1. In some installations, the loss of information from other on- board systems such as an inertial reference system (IRS) or attitude heading reference system (AHRS) may result in an ACAS failure. Individual operators should ensure that their flight crews are aware of the types of failure which will result in an ACAS failure.

2. ACAS may react in an improper manner when false altitude information is provided to own ACAS or transmitted by another aircraft. Individual operators should ensure that their flight crew are aware of the types of unsafe conditions which can arise. Flight crew members should ensure that when they are advised, if their own aircraft is transmitting false altitude reports, an alternative altitude reporting source is selected, or altitude reporting is switched off.

c. Some aeroplanes within 380 ft above ground level (AGL) (nominal value) are deemed to be ‘on ground’ and will not be displayed. If ACAS is able to determine an aircraft below this altitude is airborne, it will be displayed.

d. ACAS may not display all proximate transponder-equipped aircraft in areas of high density traffic.

e. The bearing displayed by ACAS is not sufficiently accurate to support the initiation of horizontal manoeuvres based solely on the traffic display.

f. ACAS will neither track nor display intruders with a vertical speed in excess of 10 000 ft/min. In addition, the design implementation may result in some short-term errors in the tracked vertical speed of an intruder during periods of

high vertical acceleration by the intruder.

g. Ground proximity warning systems/ground collision avoidance systems (GPWSs/GCASs) warnings and wind shear warnings take precedence over ACAS advisories. When either a GPWS/GCAS or wind shear warning is active, ACAS aural annunciations will be inhibited and ACAS will automatically switch to the 'TA only' mode of operation.

(D) ACAS inhibits

Objective: to verify that the flight crew member is aware of the conditions under which certain functions of ACAS are inhibited.

Criteria: the flight crew member should demonstrate knowledge and understanding of the various ACAS inhibits, including the following:

a. 'Increase Descent' RAs are inhibited below 1 450 ft AGL.

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

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

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

e. Altitude and configuration under which 'Climb' and 'Increase Climb' RAs are inhibited. ACAS can still issue 'Climb' and 'Increase Climb' RAs when operating at the aeroplane's certified ceiling. (In some aircraft types, 'Climb' or 'Increase Climb' RAs are never inhibited.)

(ii) Operating procedures

The flight crew member should demonstrate the knowledge required to operate the ACAS avionics and interpret the information presented by ACAS. This training should address the following:

(A) Use of controls

Objective: to verify that the pilot can properly operate all ACAS and display controls.

Criteria: demonstrate the proper use of controls, including the following:

a. Aircraft configuration required to initiate a self-test.

b. Steps required to initiate a self-test.

c. Recognising when the self-test was successful and when it was unsuccessful. When the self-test is unsuccessful, recognising the reason for the failure and, if possible, correcting the problem.

d. Recommended usage of range selection. Low ranges are used in the terminal area and the higher display ranges are used in the en-route environment and in the transition between the terminal and en-route environment.

e. Recognising that the configuration of the display does not affect the ACAS surveillance volume.

f. Selection of lower ranges when an advisory is issued, to increase display resolution.

g. Proper configuration to display the appropriate ACAS information without eliminating the display of other needed information.

h. If available, recommended usage of the above/below mode selector. The above mode should be used during climb and the below mode should be used

during descent.

i. If available, proper selection of the display of absolute or relative altitude and the limitations of using this display if a barometric correction is not provided to ACAS.

(B) Display interpretation

Objective: to verify that the flight crew member understands the meaning of all information that can be displayed by ACAS. The wide variety of display implementations require the tailoring of some criteria. When the training programme is developed, these criteria should be expanded to cover details for the operator's specific display implementation.

Criteria: the flight crew member should demonstrate the ability to properly interpret information displayed by ACAS, including the following:

a. Other traffic, i.e. traffic within the selected display range that is not proximate traffic or causing a TA or RA to be issued.

b. Proximate traffic, i.e. traffic that is within 6 NM and ± 1 200 ft.

c. Non-altitude reporting traffic.

d. No bearing TAs and RAs.

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

f. TAs: the minimum available display range that allows the traffic to be displayed should be selected, to provide the maximum display resolution.

g. RAs (traffic display): the minimum available display range of the traffic display that allows the traffic to be displayed should be selected, to provide the maximum display resolution.

h. RAs (RA display): flight crew members should demonstrate knowledge of the meaning of the red and green areas or the meaning of pitch or flight path angle cues displayed on the RA display. Flight crew members should also demonstrate an understanding of the RA display limitations, i.e. if a vertical speed tape is used and the range of the tape is less than 2 500 ft/min, an increase rate RA cannot be properly displayed.

i. If appropriate, awareness that navigation displays oriented on ‘Track-Up’ may require a flight crew member to make a mental adjustment for drift angle when assessing the bearing of proximate traffic.

(C) Use of the TA only mode

Objective: to verify that a flight crew member understands the appropriate times to select the TA only mode of operation and the limitations associated with using this mode.

Criteria: the flight crew member should demonstrate the following:

a. Knowledge of the operator's guidance for the use of TA only.

b. Reasons for using this mode. If TA only is not selected when an airport is conducting simultaneous operations from parallel runways separated by less than 1 200 ft, and to some intersecting runways, RAs can be expected. If, for any reason, TA only is not selected and an RA is received in these situations, the response should comply with the operator's approved procedures.

c. All TA aural annunciations are inhibited below 500 ft AGL. As a result, TAs issued below 500 ft AGL may not be noticed unless the TA display is included in the routine instrument scan.

(D) Crew coordination

Objective: to verify that the flight crew member understands how ACAS advisories will be handled.

Criteria: the flight crew member should demonstrate knowledge of the crew procedures that should be used when responding to TAs and RAs, including the following:

a. task sharing between the pilot flying and the pilot monitoring;

b. expected call-outs; and

c. communications with ATC.

(E) Phraseology rules

Objective: to verify that the flight crew member is aware of the rules for reporting RAs to the controller.

Criteria: the flight crew member should demonstrate the following:

a. the use of the phraseology contained in ICAO PANS-OPS;

b. an understanding of the procedures contained in ICAO PANS-ATM and ICAO Annex 2; and

c. the understanding that verbal reports should be made promptly to the appropriate ATC unit:

1. whenever any manoeuvre has caused the aeroplane to deviate from an air traffic clearance;

2. when, subsequent to a manoeuvre that has caused the aeroplane to deviate from an air traffic clearance, the aeroplane has returned to a flight path that complies with the clearance; and/or

3. when air traffic issue instructions that, if followed, would cause the crew to manoeuvre the aircraft contrary to an RA with which they are complying.

(F) Reporting rules

Objective: to verify that the flight crew member is aware of the rules for reporting RAs to the operator.

Criteria: the flight crew member should demonstrate knowledge of where information can be obtained regarding the need for making written reports to various States when an RA is issued. Various States have different reporting rules and the material available to the flight crew member should be tailored to the operator's operating environment. This responsibility is satisfied by the flight crew member reporting to the operator according to the applicable reporting rules.

(3) Non-essential items: advisory thresholds

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

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

(i) The minimum and maximum altitudes below/above which TAs will not be issued.

(ii) When the vertical separation at CPA is projected to be less than the ACAS-desired separation, a corrective RA that requires a change to the existing vertical speed will be issued. This separation varies from 300 ft at low altitude to a maximum of 700 ft at high altitude.

(iii) When the vertical separation at CPA is projected to be just outside the ACAS- desired separation, a preventive RA that does not require a change to the existing vertical speed will be issued. This separation varies from 600 to 800 ft.

(iv) RA fixed range thresholds vary between 0.2 and 1.1 NM.

(h) ACAS manoeuvre training

(1) Demonstration of the flight crew member's ability to use ACAS displayed information to properly respond to TAs and RAs should be carried out in a full flight simulator equipped with an ACAS display and controls similar in appearance and operation to those in the aircraft. If a full flight simulator is utilised, crew resource management (CRM) should be practised during this training.

(2) Alternatively, the required demonstrations can be carried out by means of an interactive CBT with an ACAS display and controls similar in appearance and operation to those in the aircraft. This interactive CBT should depict scenarios in which real-time responses should be made. The flight crew member should be informed whether or not the responses made were correct. If the response was incorrect or inappropriate, the CBT should show what the correct response should be.

(3) The scenarios included in the manoeuvre training should include: corrective RAs; initial preventive RAs; maintain rate RAs; altitude crossing RAs; increase rate RAs; RA reversals; weakening RAs; and multi-aircraft encounters. The consequences of failure to respond correctly should be demonstrated by reference to actual incidents such as those publicised in EUROCONTROL ACAS II Bulletins (available on the EUROCONTROL website).

(i) TA responses

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

Criteria: the pilot should demonstrate the following:

(A) Proper division of responsibilities between the pilot flying and the pilot monitoring. The pilot flying should fly the aircraft using any type-specific procedures and be prepared to respond to any RA that might follow. For aircraft without an RA pitch display, the pilot flying should consider the likely magnitude of an appropriate pitch change. The pilot monitoring should provide updates on the traffic location shown on the ACAS display, using this information to help visually acquire the intruder.

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

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

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

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

(ii) RA responses

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

Criteria: the pilot should demonstrate the following:

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

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

(C) Proper interpretation of the displayed information. The pilot should recognise the intruder causing the RA to be issued (red square on display). The pilot should respond appropriately.

(D) For corrective RAs, the response should be initiated in the proper direction within 5 seconds of the RA being displayed. The change in vertical speed should be accomplished with an acceleration of approximately ¼ g (gravitational acceleration of 9.81 m/sec²).

(E) Recognition of the initially displayed RA being modified. Response to the modified RA should be properly accomplished, as follows:

a. For increase rate RAs, the vertical speed change should be started within 2½ seconds of the RA being displayed. The change in vertical speed should be accomplished with an acceleration of approximately ⅓ g.

b. For RA reversals, the vertical speed reversal should be started within 2½ seconds of the RA being displayed. The change in vertical speed should be accomplished with an acceleration of approximately ⅓ g.

c. For RA weakenings, the vertical speed should be modified to initiate a return towards the original clearance.

d. An acceleration of approximately ¼ g will be achieved if the change in pitch attitude corresponding to a change in vertical speed of 1 500 ft/min is accomplished in approximately 5 seconds, and of ⅓ g if the change is accomplished in approximately 3 seconds. The change in pitch attitude required to establish a rate of climb or descent of 1 500 ft/min from level flight will be approximately 6° when the true airspeed (TAS) is 150 kt, 4° at 250 kt, and 2° at 500 kt. (These angles are derived from the formula: 1 000 divided by TAS.)

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

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

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

(I) When the RA weakens, or when the green 'fly to' indicator changes position, the

pilot should initiate a return towards the original clearance, and when 'clear of conflict' is annunciated, the pilot should complete the return to the original clearance.

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

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

(L) Knowledge of the ACAS multi-aircraft logic and its limitations, and that ACAS can optimise separations from two aircraft by climbing or descending towards one of them. For example, ACAS only considers intruders that it considers to be a threat when selecting an RA. As such, it is possible for ACAS to issue an RA against one intruder that results in a manoeuvre towards another intruder that is not classified as a threat. If the second intruder becomes a threat, the RA will be modified to provide separation from that intruder.

(i) ACAS initial evaluation

(1) The flight crew member's understanding of the academic training items should be assessed by means of a written test or interactive CBT that records correct and incorrect responses to phrased questions.

(2) The flight crew member's understanding of the manoeuvre training items should be assessed in a full flight simulator equipped with an ACAS display and controls similar in appearance and operation to those in the aircraft the flight crew member will fly, and the results assessed by a qualified instructor, inspector, or check airman. The range of scenarios should include: corrective RAs; initial preventive RAs; maintain rate RAs; altitude crossing RAs; increase rate RAs; RA reversals; weakening RAs; and multi-threat encounters. The scenarios should also include demonstrations of the consequences of not responding to RAs, slow or late responses, and manoeuvring opposite to the direction called for by the displayed RA.

(3) Alternatively, exposure to these scenarios can be conducted by means of an interactive CBT with an ACAS display and controls similar in appearance and operation to those in the aircraft the pilot will fly. This interactive CBT should depict scenarios in which real- time responses should be made and a record made of whether or not each response was correct.

(j) ACAS recurrent training

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

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

AMC1 SPO.360 Approach and landing conditions – aeroplanes and helicopters

(See SPO.360 Approach and landing conditions – aeroplanes)

Landing Distance/FATO Suitability

The in-flight determination of the landing distance/FATO suitability should be based on the latest available meteorological report, or the locally observed conditions where appropriate.

AMC1 SPO.364 Commencement and continuation of approach – aeroplanes and helicopters

(See SPO.364 Commencement and continuation of approach – aeroplanes and helicopters)

Visual References for Instrument Approach Operations

(a) NPA, APV and CAT I operations

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

(1) elements of the approach lighting system;

(2) the threshold;

(3) the threshold markings;

(4) the threshold lights;

(5) the threshold identification lights;

(6) the visual glide slope indicator;

(7) the touchdown zone or touchdown zone markings;

(8) the touchdown zone lights;

(9) FATO/runway edge lights; or

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

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

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

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

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

(c) CAT II or other-than standard category II (OTS CAT II) operations

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

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

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

(d) CAT III operations

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

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

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

(e) Approach operations utilising EVS - CAT I operations

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

(i) elements of the approach light; or

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

(A) the beginning of the runway landing surface,

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

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

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

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

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

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

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

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

AMC1 SPO.366 Standard operating procedures

(See SPO.366 Standard operating procedures)

Development of Standard Operating Procedures

(a) SOPs should be developed to a standard format in accordance with AMC2 SPO.266 (SOP template) and taking into account the results of the risk assessment process.

(b) SOPs should be based on a systematic risk assessment to ensure that the risks associated with the task are acceptable. The risk assessment should describe the activity in detail, identify the relevant hazards, analyse the causes and consequences of accidental events and establish methods to treat the associated risk.

AMC2 SPO.366 Standard operating procedures

(See SPO.366 Standard operating procedures)

SOP Template

(a) Nature and complexity of the activity:

(1) The nature of the activity and exposure. The nature of the flight and the risk exposure (e.g. low height) should be described.

(2) The complexity of the activity. Detail should be provided on how demanding the activity is with regard to the required piloting skills, the crew composition, the necessary level of experience, the ground support, safety and individual protective equipment that should be provided for persons involved.

(3) The operational environment and geographical area. The operational environment and geographical area over which the operation takes place should be described:

(i) congested hostile environment: aircraft performance standard, compliance with rules of the air, mitigation of third party risk;

(ii) mountain areas: altitude, performance, the use/non-use of oxygen with mitigating procedures;

(iii) sea areas: sea state and temperature, risk of ditching, availability of search and rescue, survivability, carriage of safety equipment;

(iv) desert areas: carriage of safety equipment, reporting procedures, search and rescue information; and

(v) other areas.

(4) The application of risk assessment and evaluation. The method of application of (a)(1) to (a)(3) to the particular operation so as to minimise risk should be described. The description should reference the risk assessment and the evaluation on which the procedure is based. The SOPs should:

(i) contain elements relevant to the operational risk management performed during flight;

(ii) contain limitations, where required, such as weather, altitudes, speeds, power margins, masses, landing site size; and

(iii) list functions required to monitor the operation. Special monitoring requirements in addition to the normal functions should be described in the SOPs.

(b) Aircraft and equipment:

(1) The aircraft. The category of aircraft to be used for the activity should be indicated (e.g. helicopter/aeroplane, single/multi-engined, classic tail rotor/Fenestron/no tail rotor (NOTAR) equipped). In particular, for helicopters, the necessary level of performance certification (Category A/B) should be specified.

(2) Equipment. All equipment required for the activity should be listed. This includes installed equipment certified in accordance with Part-21 as well as equipment approved in accordance with other officially recognised standards. A large number of activities require, in addition to the standard radio communication equipment, additional air-to- ground communication equipment. This should be listed and the operational procedure should be defined.

(c) Crew members:

(1) The crew composition, including the following, should be specified:

(i) minimum flight crew (according to the appropriate manual); and

(ii) additional flight crew.

(2) In addition, for flight crew members, the following should be specified:

(i) selection criteria (initial qualification, flight experience, experience of the activity);

(ii) initial training (volume and content of the training); and

(iii) recent experience requirement and/or recurrent training (volume and content of the training).

The criteria listed in (c)(2)(i) to (c)(2)(iii) should take into account the operational environment and the complexity of the activity and should be detailed in the training programmes.

(d) Task specialists:

(1) Whenever a task specialist is required, his/her function on board should be clearly defined. In addition, the following should be specified:

(i) selection criteria (initial background, experience of the activity);

(ii) initial training (volume and content of the training); and

(iii) recent experience requirement and/or recurrent training (volume and content of the training).

The criteria listed in (d)(1) should take into account the specialisation of the task specialist and should be detailed in the training programmes.

(2) There are a large number of activities for which task specialists are required. This chapter should detail the following for such personnel:

(i) specialisation;

(ii) previous experience; and

(iii) training or briefing.

Briefing or specific training for task specialists referred to in (d)(2) should be detailed in the training programmes.

(e) Performance:

This chapter should detail the specific performance requirements to be applied, in order to ensure an adequate power margin.

(f) Normal procedures:

(1) Operating procedures. The operating procedures to be applied by the flight crew, including the coordination with task specialists.

(2) Ground procedures. The procedures to be applied by the task specialists should be described, e.g. loading/unloading, cargo hook operation.

(g) Emergency procedures:

(1) Operating procedures. The emergency procedures to be applied by the flight crew, the coordination with the task specialist and coordination between the flight crew and task specialists should be described.

(2) Ground procedures. The emergency procedures to be applied by the task specialists (e.g. in the case of a forced landing) should be specified.

(h) Ground equipment:

This chapter should detail the nature, number and location of ground equipment required for the activity, such as:

(1) refuelling facilities, dispenser and storage;

(2) firefighting equipment;

(3) size of the operating site (landing surface, loading/unloading area); and

(4) ground markings.

(i) Records:

It should be determined which records specific to the flight(s) are to be kept, such as task details, aircraft registration, pilot-in-command, flight times, weather and any remarks, including a record of occurrences affecting flight safety or the safety of persons or property on the ground.

AC/AMC E - AIRCRAFT PERFORMACE AND OPERATING LIMITATIONS

AC1 SPO.405 Mass and balance

(See SPO.405 Mass and balance)

Weighing of an aircraft

(a) New aircraft that have been weighed at the factory may be placed into operation without reweighing if the mass records and balance records have been adjusted for alterations or modifications to the aircraft. Aircraft transferred from one operator to another operator do not have to be weighed prior to use by the receiving operator unless the mass and balance cannot be accurately established by calculation.

(b) The mass and the centre of gravity (CG) position of an aircraft should be revised whenever the cumulative changes to the dry operating mass exceed ± 0.5 % of the maximum landing mass or for aeroplanes the cumulative change in CG position exceeds 0.5 % of the mean aerodynamic chord. This may be done by weighing the aircraft or by calculation. If the AFM requires to record changes to mass and CG position below these thresholds, or to record changes in any case, and make them known to the pilot-in-command, mass and CG position should be revised accordingly and made known to the pilot-in-command.

AMC1 SPO.405(b) Mass and balance

(See SPO.405 Mass and balance)

Weighing of an aircraft

(a) When weighing an aircraft, normal precautions should be taken, which are consistent with good practices such as:

(1) checking for completeness of the aircraft and equipment;

(2) determining that fluids are properly accounted for;

(3) ensuring that the aircraft is clean; and

(4) ensuring that weighing is accomplished in an enclosed building.

(b) Any equipment used for weighing should be properly calibrated, zeroed and used in accordance with the manufacturer's instructions. Each scale should be calibrated either by the manufacturer, by a civil department of weights and measures or by an appropriately authorised organisation within 2 years or within a time period defined by the manufacturer of the weighing equipment, whichever is less. The equipment should enable the mass of the aircraft to be established accurately. One single accuracy criterion for weighing equipment cannot be given. However, the weighing accuracy is considered satisfactory if the accuracy criteria in Table 20 - Accuracy criteria for weighing equipment are met by the individual scales/cells of the weighing equipment used:

Table 20 - Accuracy criteria for weighing equipment

For a scale/cell load	An accuracy of
below 2 000 kg	± 1 %
from 2 000 kg to 20 000 kg	± 20 kg
above 20 000 kg	± 0.1 %

CG Limits - Operational CG Envelope and In-Flight CG

In the Certificate Limitations section of the AFM, forward and aft CG limits are specified. These limits ensure that the certification stability and control criteria are met throughout the whole flight and allow the proper trim setting for take-off. The operator should ensure that these limits are respected by:

(c) defining and applying operational margins to the certified CG envelope in order to compensate for the following deviations and errors:

(1) deviations of actual CG at empty or operating mass from published values due, for example, to weighing errors, unaccounted modifications and/or equipment variations.

(2) Deviations in fuel distribution in tanks from the applicable schedule.

(3) Deviations in the distribution of cargo in the various compartments as compared with the assumed load distribution as well as inaccuracies in the actual mass of cargo.

(4) Deviations of the actual CG of cargo load within individual cargo compartments or cabin sections from the normally assumed mid position.

(5) Deviations of the CG caused by gear and flap positions and by application of the prescribed fuel usage procedure, unless already covered by the certified limits.

(6) Deviations caused by in-flight movement of crew members and task specialist.

(d) Defining and applying operational procedures in order to:

(1) take into account any significant CG travel during flight caused by persons movement; and

(2) take into account any significant CG travel during flight caused by fuel consumption/ transfer.

AMC1 SPO.410(a)(1) Mass and balance system

(See SPO.410 Mass and balance system)

Dry Operating Mass

The dry operating mass should include:

(a) crew and equipment, and

(b) removable task specialist equipment, if applicable.

AMC1 SPO.410(a)(2) Mass and balance system

(See SPO.410 Mass and balance system)

Special Standard Masses for Traffic Load

The operator should use standard mass values for other load items. These standard masses should be calculated on the basis of a detailed evaluation of the mass of the items.

AC1 SPO.410(a)(2) Mass and balance system

(See SPO.410 Mass and balance system)

Traffic Load

Traffic load includes task specialists.

AMC1 SPO.410(a)(3) Mass and balance system

(See SPO.410 Mass and balance system)

Fuel Load

The mass of the fuel load should be determined by using its actual relative density or a standard relative density.

AC1 SPO.410(a)(3) Mass and balance system

(See SPO.410 Mass and balance system)

Fuel Density

(a) If the actual fuel density is not known, the operator may use standard fuel density values for determining the mass of the fuel load. Such standard values should be based on current fuel density measurements for the airports or areas concerned.

(b) Typical fuel density values are:

(1) Gasoline (piston engine fuel) – 0.71;

(2) JET A1 (Jet fuel JP 1) – 0.79;

(3) JET B (Jet fuel JP 4) – 0.76;

(4) Oil – 0.88.

AMC1 SPO.410(a)(4) Mass and balance system

(See SPO.410 Mass and balance system)

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.

AC1 SPO.410(b) Mass and balance system

(See SPO.410 Mass and balance system)

General

The mass and balance computation may be available in flight planning documents or separate systems and may include standard load profiles.

AMC1 SPO.415 Mass and balance data and documentation

(See SPO.415 Mass and balance data and documentation)

General

(a) The mass and balance documentation should:

(1) enable the pilot-in-command to determine that the load and its distribution are within the mass and balance limits of the aircraft; and

(2) include advise to the pilot-in-command whenever a non-standard method has been used for determining the mass of the load.

(b) The information above may be available in flight planning documents or mass and balance systems.

(c) Any last minute change should be brought to the attention of the pilot-in-command and entered in the flight planning documents containing the mass and balance information and mass and balance systems.

(d) Where mass and balance documentation is generated by a computerised mass and balance system, the operator should verify the integrity of the output data at intervals not exceeding six months.

(e) A copy of the final mass and balance documentation may be sent to aircraft via data link or may be made available to the pilot-in–command by other means for its acceptance.

(f) The person supervising the loading of the aircraft should confirm by hand signature or equivalent that the load and its distribution are in accordance with the mass and balance documentation given to the pilot in command. The pilot-in-command should indicate his acceptance by hand signature or equivalent.

AC1 SPO.415 Mass and balance data and documentation

(See SPO.415 Mass and balance data and documentation)

Signature or Equivalent

Where a signature by hand is impracticable or it is desirable to arrange the equivalent verification by electronic means, as referred to in AMC1 SPO.415(f), the following conditions should be applied in order to make an electronic signature the equivalent of a conventional hand-written signature:

(a) electronic 'signing' by entering a personal identification number (PIN) code with appropriate security, etc.;

(b) entering the PIN code generates a print-out of the individual's name and professional capacity on the relevant document(s) in such a way that it is evident, to anyone having a need for that information, who has signed the document;

(c) the computer system logs information to indicate when and where each PIN code has been entered;

(d) the use of the PIN code is, from a legal and responsibility point of view, considered to be fully equivalent to signature by hand;

(e) the requirements for record keeping remain unchanged; and

(f) all personnel concerned are made aware of the conditions associated with electronic signature and this is documented.

AMC1 SPO.415(b) Mass and balance data and documentation

(See SPO.415 Mass and balance data and documentation)

Integrity

The operator should verify the integrity of mass and balance data and documentation generated by a computerised mass and balance system, at intervals not exceeding six months. The operator should establish a system to check that amendments of its input data are incorporated properly in the system and that the system is operating correctly on a continuous basis.

AMC2 SPO.415(b) Mass and balance data and documentation

(See SPO.415 Mass and balance data and documentation)

Mass and Balance Documentation Sent via Data Link

Whenever the mass and balance documentation is sent to the aircraft via data link, a copy of the final mass and balance documentation as accepted by the pilot-in-command should be available on the ground.

AC1 SPO.415(b) Mass and balance data and documentation

(See SPO.415 Mass and balance data and documentation)

On Board Integrated Mass and Balance Computer System

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

AC2 SPO.415(b) Mass and balance data and documentation

(See SPO.415 Mass and balance data and documentation)

Stand-Alone Computerised Mass and Balance System

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

AMC1 SPO.430(a) Take-off

(See SPO.430 Take-off)

Take-Off Mass

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

(a) the pressure altitude at the aerodrome;

(b) the ambient temperature at the aerodrome;

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

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

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

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

AMC1 SPO.430(a)(4) Take-off

(See SPO.430 Take-off)

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.

AC1 SPO.430(a)(4) Take-off

(See SPO.430 Take-off)

Runway Surface Condition

Operation on runways contaminated with water, slush, snow or ice implies uncertainties with regard to runway friction and contaminant drag and therefore to the achievable performance and control of the aeroplane during take-off 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 considers justified under the prevailing conditions. The excess runway length available including the criticality of the overrun area should also be considered.

AMC1 SPO.430(b)(2) Take-off

(See SPO.430 Take-off)

Adequate Margin

The adequate margin should be defined in the operations manual.

AC1 SPO.430(b)(2) Take-off

(See SPO.430 Take-off)

Adequate Margin

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

AMC1 SPO.440 Landing

(See SPO.440 Landing)

GENERAL

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

(a) the pressure altitude at the aerodrome;

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

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

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

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

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

AMC2 SPO.440 Landing

(See SPO.440 Landing)

Allowances

Allowances should be stated in the operations manual.

AMC1 SPO.445(a) and (b) Performance and operating criteria – aeroplanes, and AMC1 SPO.446(b)(1) and (2) Performance and operating criteria – helicopters

(See SPO.445 Performance and operating criteria – aeroplanes & SPO.446 Performance and operating criteria – helicopters)

Operational Procedures and Training Programme

(a) The operational procedures should be based on the manufacturer's recommended procedures where they exist.

(b) The crew member training programme should include briefing, demonstration or practice, as appropriate, of the operational procedures necessary to minimise the consequences of an engine failure.

AMC1 SPO.446(c) Performance and operating criteria – helicopters

(See SPO.446 Performance and operating criteria – helicopters)

Maximum Specified Masses

(a) The operator should establish a procedure to determine maximum specified masses for HIGE and HOGE before each flight or series of flights.

(b) This procedure should take into account ambient temperature at the aerodrome or operating site, pressure altitude and wind conditions data available.

AC1 SPO.446(c) Performance and operating criteria – helicopters

(See SPO.446 Performance and operating criteria – helicopters)

GENERAL

(a) Even when the surface allows a hover in ground effect (HIGE), the likelihood of, for example, dust or blowing snow may necessitate hover out of ground effect (HOGE) performance.

(b) Wind conditions on some sites (particularly in mountainous areas and including downdraft) may require a reduction in the helicopter mass in order to ensure that an out of ground effect hover can be achieved at the operational site in the conditions prevailing.

AC/AMC F - INSTRUMENTS, DATA AND EQUIPMENT

SECTION 1 - AEROPLANES

AMC1 SPO.A.520 & SPO.A.525 Operations under VFR & operations under IFR – flight and navigational instruments and associated equipment

(See SPO.A.520 Operations under VFR – flight and navigational instruments and associated equipment & SPO.A.525 Operations under IFR – flight and navigational instruments and associated equipment)

(a) Individual requirements of these paragraphs 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 that provided by the instruments and associated equipment as specified in this Subpart.

(b) The equipment requirements of these paragraphs may be met by alternative means of compliance when equivalent safety of the installation has been shown during type certification approval of the helicopter for the intended kind of operation.

AMC2 SPO.A.520/SPO.A.525 Flight and Navigational Instruments and Associated Equipment

(See SPO.A.520 Operations under VFR – flight and navigational instruments and associated equipment & SPO.A.525 Operations under IFR – flight and navigational instruments and associated equipment)

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 Pax	SINGLE-PILOT	TWO PILOTS REQUIRED	MAX T/O MASS AUTH>5 700 kg OR MAX PASS>9 Pax
(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 Note (5)	2 Note (5)	2 Note (5)
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 Note (1)	2 Notes (1) & (2)	2 Notes (1) & (2)	1 Note (4)	2 Note (4)	2 Note (4)
10	Attitude Indicator	1 Note (1)	2 Notes (1) & (2)	2 Notes (1) & (2)	1	2	2
11	Gyroscopic Direction Indicator	1 Note (1)	2 Notes (1) & (2)	2 Notes (1) & (2)	1	2	2
12	Standby Attitude Indicator						1
13	*Mach Number Indicator*	*See Note (3) for all aeroplanes*					

Notes:

(1) 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.

(2) The substitute instruments permitted by Note (1) shall be provided at each pilot's station.

(3) Serial 13 - A Mach number indicator is required for each pilot whenever compressibility limitations are not otherwise indicated by airspeed indicators.

(4) 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 or equivalent, is required.

(5) Neither Three pointers, nor drum pointer altimeters satisfy the requirement.

AMC1 SPO.A.520(a)(9) & SPO.A.525(a)(9) Flight and Navigational Instruments and Associated Equipment

(See SPO.A.520 Operations under VFR – flight and navigational instruments and associated equipment)

A means to indicate outside air temperature indicator may be an air temperature indicator which provides indications that are convertible to outside air temperature. C

AMC1 SPO.A.520(h) & SPO.A.525(s) Headset, Boom Microphone and Associated Equipment

(See SPO.A.520 Operations under VFR – flight and navigational instruments and associated equipment & SPO.A.525 Operations under IFR – flight and navigational instruments and associated equipment)

A headset, as required by SPO.A.520(h) & SPO.A.525(h), consists of a communication device which includes an earphone(s) to receive and a microphone to transmit audio signals to the aeroplane's communication system. To comply with the minimum performance requirements, the earphone(s) and microphone should match with the communication system's characteristics and the flight deck environment. The headset should be adequately adjustable to fit the pilot's head. Headset boom microphones should be of the noise cancelling type.

AMC1 SPO.A.520(d) & SPO.A.525(k)(2) Flight and Navigational Instruments and Associated Equipment

(See SPO.A.520 Operations under VFR – flight and navigational instruments and associated equipment & SPO.A.525 Operations under IFR – flight and navigational instruments and associated equipment)

A combined pitot heater warning indicator is acceptable provided that a means exists to identify the failed heater in systems with two or more sensors.

AMC1 SPO.A.531 Airborne collision avoidance system (ACAS II)

(See SPO.A.531 Airborne collision avoidance system (ACAS II))

The minimum performance level for ACAS II is contained in ICAO Annex 10, Volume IV, Chapter 4.

AC1 SPO.A.532(a)(2) Quarterly Radiation Sampling

(See SPO.A.532 Airborne weather detecting equipment)

(a) Compliance with SPO.A.532(a)(2) may be shown by conducting quarterly radiation sampling during aeroplane operation using the following criteria:

(1) The sampling should be carried out in conjunction with a Radiological Agency or similar organisation acceptable to the Authority;

(2) Sixteen route sectors which include flight above 49 000 ft should be sampled every quarter (three months). Where less than sixteen route sectors which include flight above 49 000 ft are achieved each quarter, then all sectors above 49 000 ft should be sampled.;

(3) The cosmic radiation recorded should include both the neutron and non-neutron components of the radiation field.

(b) The results of the sampling, including a cumulative summary quarter on quarter, should be reported to the Authority under arrangements acceptable to the Authority.

AC1 SPO.A.540 Cockpit Voice Recorders

(See SPO.A.540 Cockpit voice recorder)

CVR/CARS Installation Standards Summary

<table>
<tr><td rowspan="3">Date</td><td colspan="6">MCTOW</td></tr>
<tr><td colspan="2">Over 27000 kg</td><td colspan="2">Over 5700 kg</td><td colspan="2">Over 2250 kg</td></tr>
<tr><td>All aeroplanes</td><td>All turbine aeroplanes first certificate of airworthiness</td><td>All aeroplanes first certificate of airworthiness</td><td>All turbine aeroplanes first certificate of airworthiness</td><td>All turbine aeroplanes more than 1 pilot new type certificate</td><td>All turbine aeroplanes more than 1 pilot first certificate of airworthiness</td></tr>
<tr><td></td><td rowspan="3"></td><td rowspan="4">SPO.A.540(c)</td><td></td><td>N/A</td><td rowspan="3"></td><td rowspan="3"></td></tr>
<tr><td>1987 ➡</td><td rowspan="3">SPO.A.540(b)</td><td rowspan="2"></td></tr>
<tr><td>2003 ➡</td></tr>
<tr><td>2016 ➡</td><td>SPO.A.540(a)</td><td></td><td rowspan="2">SPO.A.500(a)</td><td rowspan="2">N/A</td></tr>
<tr><td>2021 ➡</td><td>N/A</td><td></td></tr>
</table>

AC1 SPO.A.545/SPO.A.546 Flight Data Recorders

(See SPO.A.545 Flight data recorder – Aeroplanes Greater than 5700 kg & SPO.A.546 Flight Data Recorder – Aeroplanes of 5700kg or less)

FDR/AIR/ADRS/AIRS Installation Standards Summary

<table>
<tr><td rowspan="3">Date</td><td colspan="9">MCTOW</td></tr>
<tr><td colspan="3">Over 27000 kg</td><td colspan="3">Over 5700 kg</td><td colspan="3">5700 kg and below</td></tr>
<tr><td>All aeroplanes new type certificate</td><td>All aeroplanes first certificate of airworthiness</td><td>All turbine aeroplanes first certificate of airworthiness</td><td>All aeroplanes new type certificate</td><td>All aeroplanes first certificate of airworthiness</td><td>All turbine aeroplanes first certificate of airworthiness</td><td>All turbine aeroplanes new type certificate</td><td>All turbine aeroplanes first certificate of airworthiness</td><td>Multi-turbine aeroplanes first certificate of airworthiness</td></tr>
<tr><td></td><td rowspan="5"></td><td rowspan="2"></td><td>SPO.A.545(a)</td><td rowspan="5"></td><td rowspan="2"></td><td>SPO.A.545(a)</td><td rowspan="4"></td><td rowspan="4"></td><td rowspan="3"></td></tr>
<tr><td>1967 ➡</td><td>SPO.A.545(e)</td><td>N/A</td></tr>
<tr><td>1989 ➡</td><td rowspan="3">SPO.A.545(f)</td><td rowspan="4"></td><td rowspan="3">SPO.A.545(b)</td><td rowspan="4"></td></tr>
<tr><td>1990 ➡</td><td rowspan="3">N/A</td></tr>
<tr><td>2005 ➡</td><td rowspan="3">SPO.A.545(c)</td><td rowspan="3">SPO.A.545(c)</td></tr>
<tr><td>2016 ➡</td><td>(Some parameters are sampled at an increased frequency)</td><td>(Some parameters are sampled at an increased frequency)</td><td>SPO.A.545(a)</td><td>N/A</td><td></td></tr>
<tr><td>2023 ➡</td><td>SPO.A.540(d)</td><td>N/A</td><td></td><td>SPO.A.545(d)</td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

AC SPO.A.560 Seats, seat safety belts and restraint systems

(See SPO.A.560 Seats, seat safety belts and restraint systems)

(a) General

A child restraint device (CRD) is considered to be acceptable if:

(1) It is a 'supplementary loop belt' manufactured with the same techniques and the same materials of the approved safety belts; or

(2) It complies with paragraph (b).

(b) Acceptable CRDs

Provided the CRD can be installed properly on the respective aircraft seat, the following CRDs are considered "acceptable":

(1) Types of CRDs

(i) CRDs approved for use in aircraft only by EASA, the FAA or Transport Canada (on the basis of a national technical standard) and marked accordingly.

(ii) CRDs approved for use in motor vehicles according to the UN standard ECE R 44, -03 or later series of Amendments; or

(iii) CRDs approved for use in motor vehicles and aircraft according to Canadian CMVSS 213/213.1; or

(iv) 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 lettering:

(A) "THIS CHILD RESTRAINT SYSTEM CONFORMS TO ALL APPLICABLE FEDERAL MOTOR VEHICLE SAFETY STANDARDS"; and

(B) "THIS RESTRAINT IS CERTIFIED FOR USE IN MOTOR VEHICLES AND AIRCRAFT".

(v) 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).

(2) Devices approved for use in cars manufactured and tested to standards equivalent to those listed in (1) (i) to (v) inclusive, which are acceptable to the Authority. 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.

(3) The qualifying organisation shall be a competent and independent organisation that is acceptable to the authority.

(c) Location

(1) Forward-facing CRDs may be installed on both forward- and rearward-facing passenger seats but only when fitted in the same direction as the passenger seat on which 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.

(2) A child in a restraint device should be located as near to a floor level exit as feasible.

(3) A child in a restraint device should be seated so as to not hinder evacuation for any passenger.

(4) A child in a restraint device should neither be located in the row 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.

(5) 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.

(6) A Row Segment is the fraction of a row separated by two aisles or by one aisle and the aircraft fuselage.

(d) Installation

(1) CRDs shall 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) shall 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, shall only be used on aircraft seats that are equipped with such connecting devices and shall not be attached by the aircraft seat lap belt. The method of connecting must be clearly shown in the manufacturer's instructions to be provided with each CRD.

(2) All safety and installation instructions must be followed carefully by the responsible person accompanying the infant. Crew members should prohibit the use of any inadequately installed CRD or not qualified seat.

(3) If a forward-facing CRD with a rigid backrest is to be fastened by a lap belt, the restraint device should be fastened when the backrest of the passenger seat on which it rests is in a reclined position. Thereafter, the backrest is to be positioned upright. This procedure ensures better tightening of the CRD on the aircraft seat if the aircraft seat is reclinable.

(4) The buckle of the adult safety belt must be easily accessible for both opening and closing and must be in line with the seat belt halves (not canted) after tightening.

(5) Forward-facing restraint devices with an integral harness must not be installed such that the adult safety belt is secured over the child.

(e) Operation

(1) Each CRD shall remain secured to a passenger seat during all phases of flight, unless it is properly stowed when not in use.

(2) Where a CRD is adjustable in recline it must be in an upright position for all occasions when passenger restraint devices are required to be used.

AMC1 SPO.A.565 First-aid kit

(See SPO.A.565 First-aid kit)

(a) First-aid kits (FAKs) should be equipped with appropriate and sufficient medications and instrumentation. However, these kits should be amended by the operator according to the characteristics of the operation (scope of operation, flight duration, number and demographics of passengers, etc.).

(b) The following should be included in the FAKs:

(1) Equipment:

(i) bandages (assorted sizes),

(ii) burns dressings (large and small),

(iii) wound dressings (large and small),

(iv) adhesive dressings (assorted sizes),

(v) adhesive tape;

(vi) adhesive wound closures;

(vii) safety pins;

(viii) safety scissors;

(ix) antiseptic wound cleaner;

(x) disposable resuscitation aid;

(xi) disposable gloves;

(xii) tweezers: splinter; and

(xiii) thermometers (non-mercury).

(2) Medications:

(i) simple analgesic (may include liquid form);

(ii) antiemetic;

(iii) nasal decongestant;

(iv) gastrointestinal antacid, in the case of aeroplanes carrying more than nine persons;

(v) anti-diarrhoeal medication, in the case of aeroplanes carrying more than nine persons; and

(vi) antihistamine.

(3) Other:

(i) a list of contents in at least two languages (English and one other). This should include information on the effects and side effects of medications carried;

(ii) first-aid handbook, current edition;

(iii) medical incident report form; and

(iv) biohazard disposal bags.

(4) An eye irrigator, although not required to be carried in the FAK, should, where possible, be available for use on the ground.

Maintenance of First Aid Kit

To be kept up to date, the first-aid kit should be:

(a) inspected periodically to confirm, to the extent possible, that contents are maintained in the condition necessary for their intended use;

(b) replenished at regular intervals, in accordance with instructions contained on their labels, or as circumstances warrant; and

(c) replenished after use in-flight at the first opportunity where replacement items are available.

AMC1 SPO.A.570 Supplemental oxygen – pressurised aeroplanes

(See SPO.A.570 Supplemental oxygen – pressurised aeroplanes)

Supplemental Oxygen – Pressurised Aeroplanes

(a) A quick donning mask is the 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 5 seconds and will thereafter remain in position, both hands being free;

(2) Can be put on without disturbing eyeglasses and without delaying the flight crew member from proceeding with assigned emergency duties;

(3) After being put on, does not prevent immediate communication between the flight crew members and other crew members over the aeroplane intercommunication system;

(4) Does not inhibit radio communications.

(b) In determining the supplemental oxygen for the routes to be flown, it is assumed that the aeroplane will descend in accordance with the emergency procedures specified in the Operations Manual, without exceeding its operating limitations, to a flight altitude that will allow the flight to be completed safely (i.e. flight altitudes ensuring adequate terrain clearance, navigational accuracy, hazardous weather avoidance etc.)

AMC1 SPO.A.570(b)(2)(v) Supplemental oxygen – pressurised aeroplanes

(See SPO.A.570 Supplemental oxygen – pressurised aeroplanes)

Supplemental Oxygen - Pressurised Aeroplanes (Not Certificated to Fly Above 25 000 ft)

(a) With respect to SPO.A.570(b)(2)(v) the maximum altitude up to which an aeroplane can operate, without a passenger oxygen system 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;

(2) maximum operational speed (VMO) or the airspeed approved in the Aeroplane Flight Manual for emergency descent, whichever is the lesser;

(3) all engines operative;

(4) the estimated mass of the aeroplane at the top of climb.

(b) Emergency descent data (charts) established by the aeroplane manufacturer and published in the Aeroplane Operating Manual and/or Aeroplane Flight Manual should be used to ensure uniform application of the rule.

(c) On routes where the oxygen is necessary to be carried for 10% of the passengers for the flight time between 10 000ft and 13 000ft the oxygen may be provided either:

(1) by 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 own discretion when seated on his assigned seat; or:

(2) by portable bottles when a fully trained crew member is carried on board of each such flight.

AMC1 SPO.A.580 Hand fire extinguishers

(See SPO.A.580 Hand fire extinguishers)

Hand Fire Extinguishers

(a) The number and location of hand fire extinguishers should be such as to provide adequate availability for use, account being taken of the number and size of the passenger compartments, the need to minimise the hazard of toxic gas concentrations and the location of toilets, galleys etc. These considerations may result in the number being greater than the minimum prescribed.

(b) There should be at least one fire extinguisher suitable for both flammable fluid and electrical equipment fires installed on the flight deck. 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 on the flight deck, or in any compartment not separated by a partition from the flight deck, because of the adverse effect on vision during discharge and, if non-conductive, interference with electrical contacts by the chemical residues.

(c) Where only one hand fire extinguisher is required in the passenger compartments it should be located near the crew member's station, where provided.

(d) Where two or more hand fire extinguishers are required in the passenger compartments and their location is not otherwise dictated by consideration of paragraph (a) above, an extinguisher should be located near each end of the cabin with the remainder distributed throughout the cabin as evenly as is practicable.

(e) Unless an extinguisher is clearly visible, its location should be indicated by a placard or sign. Appropriate symbols may be used to supplement such a placard or sign.

AC1 SPO.A.590 Emergency locator transmitter (ELT)

(See SPO.A.590 Emergency locator transmitter (ELT))

Emergency Locator Transmitter (ELT)

(a) 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 be manually activated. An ELT is one of the following:

(1) Automatic Fixed (ELT(AF)). An automatically activated ELT which is permanently attached to an aircraft;

(2) Automatic Portable (ELT(AP)). An automatically activated ELT which is rigidly attached to an aircraft but readily removable from the aircraft;

(3) Automatic Deployable (ELT(AD)). An ELT, which is rigidly attached to the aircraft and which is automatically deployed and activated by impact, and, in some cases, also by hydrostatic sensors. Manual deployment is also provided;

(4) 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 survivors.

(b) An automatic portable ELT, (ELT(AP)), as installed in accordance with SPO.A.590, may be used to replace one ELT(S) provided that it meets the ELT(S) requirements. A water-activated ELT(S) is not an ELT(AP).

The judicious choice of numbers of ELTs, their type and placement on aircraft and associated floatable life support systems will ensure the greatest chance of ELT activation in the event of an accident for aircraft operating over water or land, including areas especially difficult for search and rescue. Placement of transmitter units is a vital factor in ensuring optimal crash and fire protection. The placement of the control and switching devices (activation monitors) of automatic fixed ELTs and their associated operational procedures will also take into consideration the need for rapid detection of inadvertent activation and convenient manual switching by crew members.

Note: ADFR may replace an automatic ELB. (see AMC1 SPO.A.590 Emergency locator transmitter (ELT) *below)*

AMC1 SPO.A.590 Emergency locator transmitter (ELT)

(See SPO.A.590 Emergency locator transmitter (ELT))

Automatic deployable flight recorder (ADFR)

(a) The following requirements shall apply to an ADFR:

(1) deployment shall take place when the aeroplane structure has been significantly deformed;

(2) deployment shall take place when an aeroplane sinks in water;

(3) ADFR shall not be capable of manual deployment;

(4) the ADFR shall be able to float on water;

(5) the ADFR deployment shall not compromise the safe continuation of the flight;

(6) the ADFR deployment shall not significantly reduce the chance of survival of the recorder and of successful transmission by its ELT;

(7) the ADFR deployment shall not release more than one piece;

(8) an alert shall be made to the flight crew when the ADFR is no longer captive to the aircraft;

(9) the flight crew shall have no means to disable ADFR deployment when the aircraft is airborne;

(10) the ADFR shall contain an integrated ELT, which shall activate automatically during the deployment sequence.

(b) Such ELT may be of a type that is activated in-flight and provides information from which a position can be determined; and the integrated ELT of an ADFR shall satisfy the same requirements as an ELT required to be installed on an aeroplane. The integrated ELT shall at least have the same performance as the fixed ELT to maximize detection of the transmitted signal.

Note 1: Refer to the Manual on Location of Aircraft in Distress and Flight Recorder Data Recovery (Doc 10054) for more information on ADFR.

Note 2: If an integrated ELT of a type that is activated in flight is used within an ADFR it could be a means to comply with the requirements of SPO.A.590 Emergency locator transmitter (ELT).

AC SPO.A.592 Location of an Aircraft in Distress

(See SPO.A.592 Location of an Aircraft in Distress)

(a) Purpose and scope

Location of an aeroplane in distress aims at establishing, to a reasonable extent, the location of an accident site within a 6 NM radius.

(b) Operation

(1) An aeroplane in distress shall automatically activate the transmission of information from which its position can be determined by the operator and the position information shall contain a time stamp. It shall also be possible for this transmission to be activated manually. The system used for the autonomous transmission of position information shall be capable of transmitting that information in the event of aircraft electrical power loss, at least for the expected duration of the entire flight.

Note: Guidance on the location of an aeroplane in distress is provided in Attachment K of ICAO Annex 6, Part I.

(2) An aircraft is in a distress condition when it is in a state that, if the aircraft behaviour event is left uncorrected, can result in an accident. Autonomous transmission of position information shall be active when an aircraft is in a distress condition. This will provide a high probability of locating an accident site to within a 6 NM radius. the operator shall be alerted when an aircraft is in a distress condition with a 14 acceptable low rate of false alerts. In case of a

triggered transmission system, initial transmission of position information shall commence immediately or no later than five seconds after the detection of the activation event.

Note. 1: Aircraft behaviour events can include but are not limited to unusual attitudes, unusual speed conditions, collision with terrain and total loss of thrust/propulsion on all engines and ground proximity warnings.

Note. 2: A distress alert can be triggered using criteria that may vary as a function of aircraft position and phase of flight. Further guidance regarding in-flight event detection and triggering criteria may be found in the EUROCAE ED-237, Minimum Aviation System Performance Specification (MASPS) for Criteria to Detect In-Flight Aircraft Distress Events to Trigger Transmission of Flight Information.

(3) When an aircraft operator or an air traffic service unit (ATSU) has reason to believe that an aircraft is in distress, coordination shall be established between the ATSU and the aircraft operator.

(4) The Authority shall identify the organisations that will require the position information of an aircraft in an emergency phase. These shall include, as a minimum:

(i) air traffic service unit(s) (ATSU); and

(ii) SAR rescue coordination centre (s) (RCC) and sub-centres.

(5) When autonomous transmission of position information has been activated, it shall only be able to be de-activated using the same mechanism that activated it.

(6) The accuracy of position information shall, as a minimum, meet the position accuracy requirements established for ELTs.

AMC1 SPO.A.595 Life Jackets

(See SPO.A.595 Life Jackets)

For the purpose of SPO.A.595 Life Jackets, seat cushions are not considered to be flotation devices.

AMC1 SPO.A.600(b)(2) Life-Rafts and Survival ELTs for extended overwater flights

(See SPO.A.600 Life-Rafts and Survival ELTs for extended overwater flights)

Life-rafts and ELT for Extended Overwater Flights

(a) The following should be readily available with each life-raft:

(1) Means for maintaining buoyancy;

(2) A sea anchor:

(3) Life-lines, and means of attaching one life-raft to another;

(4) Paddles for life-rafts with a capacity of 6 or less;

(5) Means of protecting the occupants from the elements;

(6) A water resistant torch;

(7) Signalling equipment to make the pyrotechnical distress signals described in ICAO Annex 2;

(8) 100g of glucose tablet for each 4, or fraction of 4, persons which the life-raft is designed to carry:

(9) At least 2 litres of drinkable water provided in durable containers or means of making sea water drinkable or a combination of both; and

(10) First-aid equipment.

(b) As far as practicable, items listed above should be contained in a pack.

SECTION 2 - HELICOPTERS

AMC1 SPO.H.565 First-Aid Kits

(See SPO.H.565 First-aid kit)

The following provides guidance on typical contents of a first-aid kit for carriage aboard a helicopter:

- List of contents
- Antiseptic swabs (10/pack)
- Bandage: adhesive strips
- Bandage: gauze 7.5 cm × 4.5 m
- Bandage: triangular; safety pins
- Dressing: burn 10 cm × 10 cm
- Dressing: compress, sterile 7.5 cm × 12 cm
- Dressing: gauze, sterile 10.4 cm × 10.4 cm
- Tape: adhesive 2.5 cm (roll)
- Steri-strips (or equivalent adhesive strip)
- Hand cleanser or cleansing towelettes
- Pad with shield, or tape, for eye
- Scissors: 10 cm (if allowed by national regulations)
- Tape: Adhesive, surgical 1.2 cm × 4.6 m
- Tweezers: splinter
- Disposable gloves (multiple pairs)
- Thermometers (non-mercury)
- Mouth-to-mouth resuscitation mask with one-way valve
- First-aid manual, current edition
- Incident record form

The following suggested medications can be included in the first-aid kits where permitted by national regulations:

- Mild to moderate analgesic
- Antiemetic
- Nasal decongestant
- Antacid
- Antihistamine

A universal precaution kit should be carried on a helicopter that is required to operate with at least one cabin crew member. Such a kit may be used to clean up any potentially infectious body contents such as blood, urine, vomit and faeces and to protect the cabin crew who are assisting potentially infectious cases of suspected communicable disease. Typical contents are;

- Dry powder that can convert small liquid spill into a sterile granulated gel
- Germicidal disinfectant for surface cleaning
- Skin wipes
- Face/eye mask (separate or combined)
- Gloves (disposable)
- Protective apron
- Large absorbent towel
- Pick-up scoop with scraper
- Bio-hazard disposal waste bag
- Instructions

AMC1 SPO.H.580 Hand fire extinguishers

(See SPO.H.580 Hand fire extinguishers)

(a) The number and location of hand fire extinguishers should be such as to provide adequate availability for use, account being taken of the number and size of the passenger compartments, the need to minimise the hazard of toxic gas concentrations and the location of toilets, galleys etc. These considerations may result in the number being greater than the minimum prescribed.

(b) There should be at least one fire extinguisher suitable for both flammable fluid and electrical equipment fires installed on the flight deck. 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 on the flight deck, or in any compartment not separated by a partition from the flight deck, because of the adverse effect on vision during discharge and, if non-conductive, interference with electrical contacts by the chemical residues.

(c) Where only one hand fire extinguisher is required in the passenger compartments it should be located near the crew member's station, where provided.

(d) Where two or more hand fire extinguishers are required in the passenger compartments and their location is not otherwise dictated by consideration of paragraph 1 above, an extinguisher should be located near each end of the cabin with the remainder distributed throughout the cabin as evenly as is practicable.

(e) Unless an extinguisher is clearly visible, its location should be indicated by a placard or sign. Appropriate symbols may be used to supplement such a placard or sign.

Note: Information concerning extinguishing agents is contained in the UNEP Halons Technical Options Committee Technical Note No. 1 – New Technology Halon Alternatives and FAA Report No. DOT/FAA/AR-99-63, Options to the Use of Halons for Aircraft Fire Suppression Systems.

AMC1 SPO.H.598 Survival suits

(See SPO.H.598 Survival suits)

Estimated Survival Time

(a) Introduction

(1) A person accidentally immersed in cold seas (typically offshore Northern Europe) will have a better chance of survival if he is wearing an effective survival suit in addition to a life-jacket. By wearing the survival suit, he can slow down the rate which his/her body temperature falls

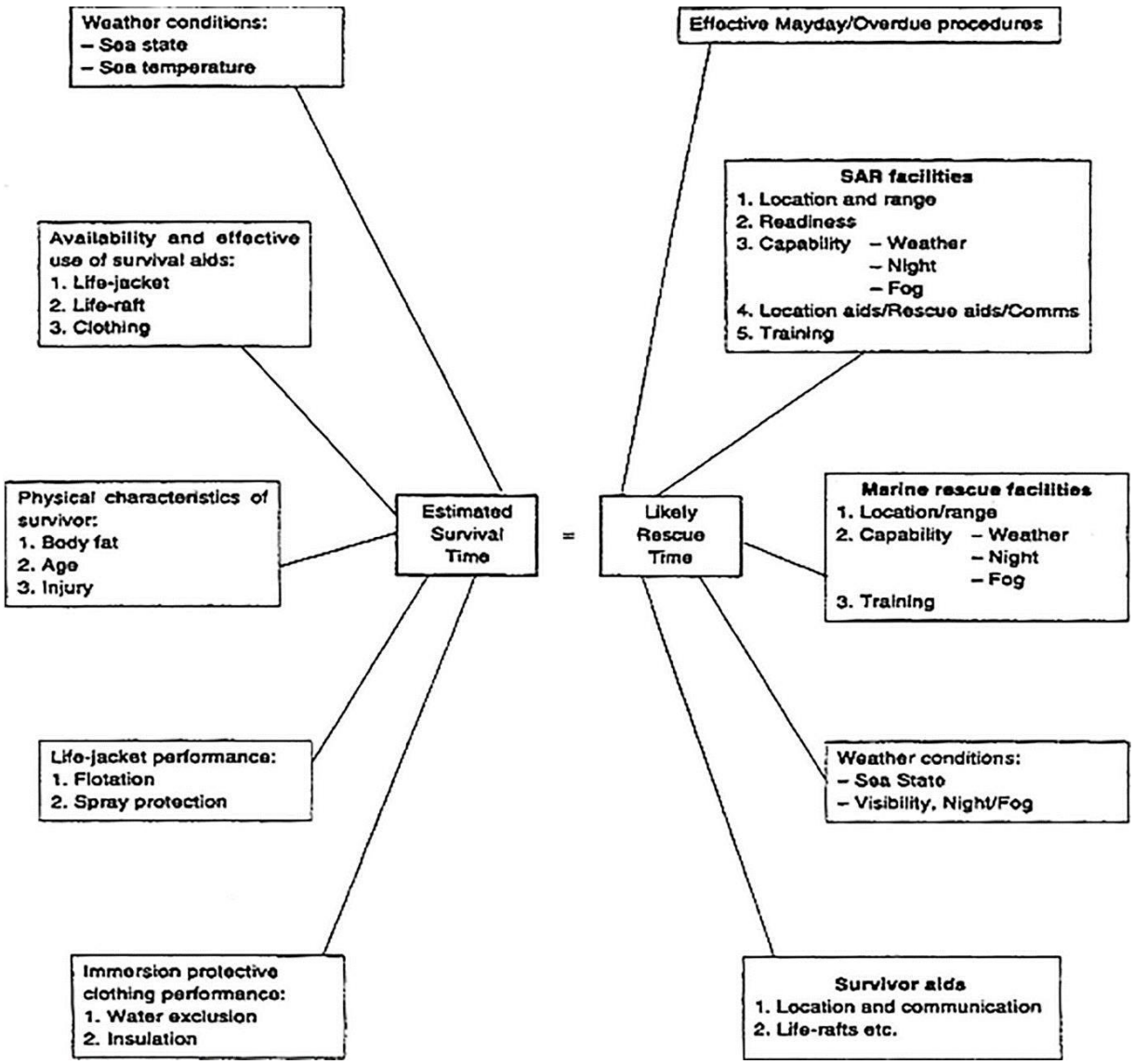
and, consequently, protect himself/herself from the greater risk of drowning brought about by incapacitation due to hypothermia.

(2) The complete survival suit system – suit, life-jacket and clothes worn under the suit – should be able to keep the wearer alive long enough for the rescue services to find and recover him/her. In practice the limit is about 3 hours. If a group of persons in the water cannot be rescued within this time they are likely to have become so scattered and separated that location will be extremely difficult, especially in the rough water typical of Northern European sea areas. If it is expected that in water protection could be required for periods greater than 3 hours, improvements should, rather, be sought in the search and rescue procedures than in the immersion suit protection.

(b) Survival times

(1) The aim should be to ensure that a person in the water can survive long enough to be rescued, i.e. the survival time should be greater than the likely rescue time. The factors affecting both times are shown below. The figure emphasises that survival time is influenced by many factors, physical and human. Some of the factors are relevant to survival in cold water and some are relevant in water at any temperature.

The survival equation



(2) Broad estimates of likely survival times for the thin individual offshore are given in Table 21 - Timescale within which the most vulnerable individuals are likely to succumb to the prevailing

conditions.. 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 21 - 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

(3) Consideration should also be given to escaping from the helicopter itself should it submerge or invert in the water. In this case escape time is limited to the length of time the occupants can hold their breath. The breath holding time can be greatly reduced by the effect of cold shock. Cold shock is caused by the sudden drop in skin temperature on immersion and is characterised by a gasp reflex and uncontrolled breathing. The urge to breath rapidly becomes overwhelming and, if still submerged, the individual will inhale water resulting in drowning. Delaying the onset of cold shock by wearing an immersion suit will extend the available escape time from a submerged helicopter.

(4) The effects of water leakage and hydrostatic compression on the insulation quality of clothing are well recognised. In a nominally dry system, the insulation is provided by still air trapped within the clothing fibres and between the layers of suit and clothes. It has been observed that many systems lose some of their insulating capacity either because the clothes under the 'waterproof' survival suit get wet to some extent or because of hydrostatic compression of the whole assembly. As a result of water leakage and compression, survival times will be shortened. The wearing of warm clothing under the suit is recommended.

(5) Whatever type of survival suit and other clothing is provided, it should not be forgotten that significant heat loss can occur from the head.

AMC1 SPO.H.599 Life-rafts, survival ELTs and survival equipment on extended overwater flights

(See SPO.H.599 Life-rafts, survival ELTs and survival equipment on extended overwater flights)

Life–Rafts and Equipment for Making Distress Signals

(a) Each required life-raft should conform to the following specifications:

(1) be of an approved design and stowed so as to facilitate their ready use in an emergency;

(2) be radar conspicuous to standard airborne radar equipment;

(3) when carrying more than one life-raft on board, at least 50 % of the rafts should be able to be deployed by the crew while seated at their normal station, where necessary by remote control; and

(4) life-rafts that are not deployable by remote control or by the crew should be of such weight as to permit handling by one person. 40 kg should be considered a maximum weight.

(b) Each required life-raft should contain at least the following:

(1) one approved survivor locator light;

(2) one approved visual signalling device;

(3) one canopy (for use as a sail, sunshade or rain catcher) or other mean to protect occupants from the elements;

(4) one radar reflector;

(5) one 20 m retaining line designed to hold the life-raft near the helicopter but to release it if the helicopter becomes totally submerged;

(6) one sea anchor; and

(7) one survival kit, appropriately equipped for the route to be flown, which should contain at least the following:

(i) one life-raft repair kit;

(ii) one bailing bucket;

(iii) one signalling mirror;

(iv) one police whistle;

(v) one buoyant raft knife;

(vi) one supplementary means of inflation;

(vii) sea sickness tablets;

(viii) one first-aid kit;

(ix) one portable means of illumination;

(x) 500 ml of pure water and one sea water desalting kit; and

(xi) one comprehensive illustrated survival booklet in an appropriate language.

AMC1 SPO.H.600 Survival equipment

(See SPO.H.600 Survival equipment)

Additional Survival Equipment

(a) The following additional survival equipment should be carried when required:

(1) 500 ml of water for each four, or fraction of four, persons on board;

(2) one knife;

(3) first-aid equipment; and

(4) one set of air/ground codes.

(b) In addition, when polar conditions are expected, the following should be carried:

(1) a means of melting snow;

(2) one snow shovel and one ice saw;

(3) sleeping bags for use by 1/3 of all persons on board and space blankets for the remainder or space blankets for all persons on board; and

(4) one arctic/polar suit for each crew member.

(c) If any item of equipment contained in the above list is already carried on board the aircraft in accordance with another requirement, there is no need for this to be duplicated.

AMC1 SPO.H.600(b) Survival equipment

(See SPO.H.600 Survival equipment)

Survival ELT

An ELT(AP) may be used to replace one required ELT(S) provided that it meets the ELT(S) requirements. A water-activated ELT(S) is not an ELT(AP).

AC/AMC G - FLIGHT CREW

AMC1 SPO.705(b)(2);(c) Designation as pilot-in-command

(See SPO.705 Designation as pilot-in-command)

Route/Area and Aerodrome Knowledge for Commercial Operations

For commercial operations, the experience of the route or area to be flown and of the aerodrome facilities and procedures to be used should include the following:

(a) Area and route knowledge

(1) Area and route training should include knowledge of:

(i) terrain and minimum safe altitudes;

(ii) seasonal meteorological conditions;

(iii) meteorological, communication and air traffic facilities, services and procedures;

(iv) search and rescue procedures where available; and

(v) navigational facilities associated with the area or route along which the flight is to take place.

(2) Depending on the complexity of the area or route, as assessed by the operator, the following methods of familiarisation should be used:

(i) for the less complex areas or routes, familiarisation by self-briefing with route documentation, or by means of programmed instruction; and

(ii) in addition, for the more complex areas or routes, in-flight familiarisation as a pilot- in-command/commander or co-pilot under supervision, observer, or familiarisation in a flight simulation training device (FSTD) using a database appropriate to the route concerned.

(b) Aerodrome knowledge

(1) Aerodrome training should include knowledge of obstructions, physical layout, lighting, approach aids and arrival, departure, holding and instrument approach procedures, applicable operating minima and ground movement considerations.

(2) The operations manual should describe the method of categorisation of aerodromes and, in the case of CAT operations, provide a list of those aerodrome categorised as B or C.

(3) All aerodromes to which an operator operates should be categorised in one of these three categories:

(i) category A - an aerodrome that meets all of the following requirements:

(A) an approved instrument approach procedure;

(B) at least one runway with no performance limited procedure for take-off and/or landing;

(C) published circling minima not higher than 1 000 ft above aerodrome level; and

(D) night operations capability.

(ii) category B - an aerodrome that does not meet the category A requirements or which requires extra considerations such as:

(A) non-standard approach aids and/or approach patterns;

(B) unusual local weather conditions;

(C) unusual characteristics or performance limitations; or

(D) any other relevant considerations, including obstructions, physical layout, lighting, etc.

(iii) category C - an aerodrome that requires additional considerations to a category B aerodrome;

(iv) offshore installations may be categorised as category B or C aerodromes, taking into account the limitations determined in accordance with special approvals related to the use of offshore locations.

(c) Prior to operating to a:

(1) category B aerodrome, the pilot-in-command/commander should be briefed, or self- briefed by means of programmed instruction, on the category B aerodrome(s) concerned. The completion of the briefing should be recorded. This recording may be accomplished after completion or confirmed by the pilot-in-command/commander before departure on a flight involving category B aerodrome(s) as destination or alternate aerodromes.

(2) category C aerodrome, the pilot-in-command/commander should be briefed and visit the aerodrome as an observer and/or undertake instruction in a suitable FSTD. The completion of the briefing, visit and/or instruction should be recorded.

AMC1 SPO.705(c) Designation as pilot-in-command

(See SPO.705 Designation as pilot-in-command)

Route/Area and Aerodrome Recency

(a) The 12-month period should be counted from the last day of the month:

(1) when the familiarisation training was undertaken; or

(2) of the latest operation on the route or area to be flown and of the aerodromes, facilities and procedures to be used.

(b) When the operation is undertaken within the last 3 calendar months of that period, the new 12-month period should be counted from the original expiry date.

AMC2 SPO.705(c) Designation as pilot-in-command

(See SPO.705 Designation as pilot-in-command)

Route/Area and Aerodrome Recency – Commercial Operations other than CAT

In the case of commercial operations other than CAT, the knowledge should be maintained as follows:

(a) except for operations to the most demanding aerodromes, by completion of at least 10 flight sectors within the area of operation during the preceding 12 months in addition to any required self-briefing;

(b) operations to the most demanding aerodromes may be performed only if:

(1) the pilot-in-command has been qualified at the aerodrome within the preceding 36 months by a visit as an operating flight crew member or as an observer;

(2) the approach is performed in visual meteorological conditions (VMC) from the applicable minimum sector altitude; and

(3) an adequate self-briefing has been made prior to the flight.

AMC1 SPO.715 Crew resource management (CRM) training

(See SPO.715 Crew resource management (CRM) training)

CRM Training – Multi-Pilot Operations

(a) General

(1) Training environment

CRM training should be conducted in the non-operational environment (classroom and computer-based) and in the operational environment (flight simulation training device (FSTD) and aircraft). Tools such as group discussions, team task analysis, team task simulation and feedback should be used.

(2) Classroom training

Whenever possible, classroom training should be conducted in a group session away from the pressures of the usual working environment, so that the opportunity is provided for flight crew members to interact and communicate in an environment conducive to learning.

(3) Computer-based training

Computer-based training should not be conducted as a stand-alone training method but may be conducted as a complementary training method.

(4) Flight simulation training devices (FSTDs)

Whenever practicable, parts of the CRM training should be conducted in FSTDs that reproduce a realistic operational environment and permit interaction. This includes but is not limited to line-oriented flight training (LOFT) scenarios.

(5) Integration into flight crew training

CRM principles should be integrated into relevant parts of flight crew training and operations including checklists, briefings, abnormal and emergency procedures.

(6) Combined CRM training for flight crew and technical crew

(i) Operators should provide combined training for flight crew and technical crew during recurrent CRM training.

(ii) The combined training should address at least:

(A) effective communication, coordination of tasks and functions of flight crew and technical crew; and

(B) mixed multinational and cross-cultural flight crew and technical crew, and their interaction, if applicable.

(iii) The combined training should be expanded to include medical passengers, if applicable to the operation.

(iv) Combined CRM training should be conducted by flight crew CRM trainer.

(v) There should be an effective liaison between flight crew and technical crew training departments. Provision should be made for transfer of relevant knowledge and skills between flight crew and technical crew CRM trainers.

(7) Management system

CRM training should address hazards and risks identified by the operator’s management system.

(8) Competency-based CRM training

(i) Whenever practicable, the compliance-based approach concerning CRM training may be substituted by a competency-based approach such as evidence-based training. In this context, CRM training should be characterised by a performance orientation, with emphasis on standards of performance and their measurement, and the development of training to the specified performance standards.

(ii) CRM training should be an essential element of the alternative training and qualification programme (ATQP), when the operator applies ATQP.

(9) Contracted CRM training

If the operator chooses not to establish its own CRM training, another operator, a third party or a training organisation may be contracted to provide the training. In case of contracted CRM training, the operator should ensure that the content of the course covers the specific culture, the type of operations and the associated procedures of the operator. When crew members from different operators attend the same course, the CRM training should be specific to the relevant flight operations and to the trainees concerned.

(b) Initial operator's CRM training

(1) The flight crew member should complete the initial operator's CRM training once. When the type of operation of a new operator is not different, the new operator should not be required to provide the initial operator's CRM training to this flight crew member a second time.

(2) The initial training should cover all elements specified in Table 22 - Flight crew CRM training.

(c) Operator conversion course - CRM training

When the flight crew member undertakes a conversion course with a change of aircraft type or change of operator, elements of CRM training should be integrated into all appropriate phases of the operator's conversion course, as specified in Table 22 - Flight crew CRM training.

(d) Annual recurrent CRM training

(1) Annual recurrent CRM training should be provided in such a way that all CRM training elements specified for the annual recurrent training in Table 22 - Flight crew CRM training are covered over a period not exceeding 3 years.

(2) Operators should update their CRM recurrent training programme over a period not exceeding 3 years. The revision of the programme should take into account information from the operator's management system including the results of the CRM assessment.

(e) Command course - CRM training

The operator should ensure that elements of CRM training are integrated into the command course, as specified in Table 22 - Flight crew CRM training.

(f) Training elements

The CRM training elements to be covered are specified in Table 22 - Flight crew CRM training. The operator should ensure that the following aspects are addressed:

(1) Automation and philosophy on the use of automation

(i) The CRM training should include training in the use and knowledge of automation, and in the recognition of systems and human limitations associated with the use of automation. The operator should, therefore, ensure that the flight crew member receives training on:

(A) the application of the operations policy concerning the use of automation as stated in the operations manual; and

(B) system and human limitations associated with the use of automation, giving special

attention to issues of mode awareness, automation surprises and over-reliance including false sense of security and complacency.

(ii) The objective of this training should be to provide appropriate knowledge, skills and attitudes for managing and operating automated systems. Special attention should be given to how automation increases the need for crews to have a common understanding of the way in which the system performs, and any features of automation that make this understanding difficult.

(iii) If conducted in an FSTD, the training should include automation surprises of different origin (system- and pilot-induced).

(2) Monitoring and intervention

Flight crew should be trained in CRM-related aspects of operation monitoring before, during and after flight, together with any associated priorities. This CRM training should include guidance to the pilot monitoring on when it would be appropriate to intervene, if felt necessary, and how this should be done in a timely manner. Reference should be made to the operator procedures for structured intervention as specified in the operations manual.

(3) Resilience development

CRM training should address the main aspects of resilience development. The training should cover:

(i) Mental flexibility

Flight crew should be trained to:

(A) understand that mental flexibility is necessary to recognise critical changes;

(B) reflect on their judgement and adjust it to the unique situation;

(C) avoid fixed prejudices and over-reliance on standard solutions; and

(D) remain open to changing assumptions and perceptions.

(ii) Performance adaptation

Flight crew should be trained to:

(A) mitigate frozen behaviours, overreactions and inappropriate hesitation; and

(B) adjust actions to current conditions.

(4) Surprise and startle effect

CRM training should address unexpected, unusual and stressful situations. The training should cover:

(i) surprises and startle effects; and

(ii) management of abnormal and emergency situations, including:

(A) the development and maintenance of the capacity to manage crew resources;

(B) the acquisition and maintenance of adequate automatic behavioural responses; and

(C) recognising the loss and re-building situation awareness and control.

(5) Cultural differences

CRM training should cover cultural differences of multinational and cross-cultural crews. This includes recognising that:

(i) different cultures may have different communication specifics, ways of understanding and approaches to the same situation or problem;

(ii) difficulties may arise when crew members with different mother tongue communicate in a common language which is not their mother tongue; and

(iii) cultural differences may lead to different methods for identifying a situation and solving a problem.

(6) Operator's safety culture and company culture

CRM training should cover the operator's safety culture, its company culture, the type of operations and the associated procedures of the operator. This should include areas of operations that may lead to particular difficulties or involve unusual hazards.

(7) Case studies

(i) CRM training should cover aircraft type-specific case studies, based on the information available within the operator's management system, including:

(A) accident and serious incident reviews to analyse and identify any associated non-technical causal and contributory factors, and instances or examples of lack of CRM; and

(B) analysis of occurrences that were professionally managed.

(ii) If relevant aircraft type-specific or operator-specific case studies are not available, the operator should consider other case studies relevant to the scale and scope of its operations.

(g) CRM training syllabus

Table 22 - Flight crew CRM training below specifies which CRM training elements should be covered in each type of training. The levels of training in Table 22 - Flight crew CRM training can be described as follows:

(1) 'Required' means training that should be instructional or interactive in style to meet the objectives specified in the CRM training programme or to refresh and strengthen knowledge gained in a previous training.

(2) 'In-depth' means training that should be instructional or interactive in style taking full advantage of group discussions, team task analysis, team task simulation, etc., for the acquisition or consolidation of knowledge, skills and attitudes. The CRM training elements should be tailored to the specific needs of the training phase being undertaken.

Table 22 - Flight crew CRM training

CRM training elements	Initial operator's CRM training	Operator conversion course when changing aircraft type	Operator conversion course when changing operator	Annual recurrent training	Command course
General principles					
Human factors in aviation; General instructions on CRM principles and objectives; Human performance and limitations; Threat and error management.	In-depth	Required	Required	Required	Required
Relevant to the individual flight crew member					
Personality awareness, human error and reliability, attitudes and behaviours, self-assessment and self-	In-depth	Not required	Not required	Required	In-depth

critique; Stress and stress management; Fatigue and vigilance; Assertiveness, situation awareness, information acquisition and processing.					
Relevant to the flight crew					
Automation and philosophy on the use of automation	Required	In-depth	In-depth	In-depth	In-depth
Specific type-related differences	Required	In-depth	Not required	Required	Required
Monitoring and intervention	Required	In-depth	In-depth	Required	Required
Relevant to the entire aircraft crew					
Shared situation awareness, shared information acquisition and processing; Workload management; Effective communication and coordination inside and outside the flight crew compartment; Leadership, cooperation, synergy, delegation, decision-making, actions; Resilience development; Surprise and startle effect; Cultural differences.	In-depth	Required	Required	Required	In-depth
Relevant to the operator and the organisation					
Operator's safety culture and company culture, standard operating procedures (SOPs), organisational factors, factors linked to the type of operations; Effective communication and coordination with other operational personnel and ground services.	In-depth	Required	In-depth	Required	In-depth
Case studies	In-depth	In-depth	In-depth	In-depth	In-depth

(h) Assessment of CRM skills

(1) Assessment of CRM skills is the process of observing, recording, interpreting and debriefing crews and crew member's performance using an accepted methodology in the context of the overall performance.

(2) The flight crew member's CRM skills should be assessed in the operational environment, but not during CRM training in the non-operational environment. Nevertheless, during training in the non-operational environment, feedback from the flight crew CRM trainer or from trainees on individual and crew performance may be given to the crew members concerned.

(3) The assessment of CRM skills should:

(i) include debriefing the crew and the individual crew member;

(ii) serve to identify additional training, where needed, for the crew or the individual crew member; and

(iii) be used to improve the CRM training system by evaluating de-identified summaries of all CRM assessments.

(4) Prior to the introduction of CRM skills assessment, a detailed description of the CRM methodology, including the required CRM standards and the terminology used for the assessment, should be published in the operations manual.

(5) Methodology of CRM skills assessment

The assessment should be based on the following principles:

(i) only observable behaviours are assessed;

(ii) the assessment should positively reflect any CRM skills that result in enhanced safety; and

(iii) assessments should include behaviour that results in an unacceptable reduction in safety margin.

(6) Operators should establish procedures, including additional training, to be applied in the event that flight crew members do not achieve or maintain the required CRM standards.

AMC2 SPO.715 Crew resource management (CRM) training

(See SPO.715 Crew resource management (CRM) training)

(a) For single-pilot helicopter operations with technical crew, *AMC1 SPO.715 Crew resource management (CRM) training* should be applied.

(b) For single-pilot operations other than those specified in (a), *AMC1 SPO.715 Crew resource management (CRM) training* should be applied with the following differences:

(1) Relevant training

Training should cover the relevant CRM training, i.e. initial operator's training, the operator conversion course and recurrent training.

(2) Relevant training elements

CRM training should focus on the elements specified in Table 22 - Flight crew CRM training of *AMC1 SPO.715 Crew resource management (CRM) training* which are relevant to single-pilot operations. Therefore, single-pilot CRM training should include, among others:

(i) situation awareness;

(ii) workload management;

(iii) decision-making;

(iv) resilience development;

(v) surprise and startle effect; and

(vi) effective communication and coordination with other operational personnel and ground services.

(3) Computer-based training

Notwithstanding (a)(3) of *AMC1 SPO.715 Crew resource management (CRM) training*, computer-based training may be conducted as a stand-alone training method.

(4) Operation with ELA2 aircraft

Notwithstanding (1) and (2), for operations with ELA2 aircraft the relevant CRM training and its duration should be determined by the operator, based on the aircraft type and the complexity of the operation.

AMC3 SPO.715 Crew resource management (CRM) training

(See SPO.715 Crew resource management (CRM) training)

Flight Crew CRM Trainer

(a) Applicability

The provisions described herein:

(1) should be fulfilled by flight crew CRM trainers responsible for classroom CRM training; and

(2) are not applicable to:

(i) instructors, holding a certificate acceptable to the authority, who conduct CRM training in the operational environment; and

(ii) trainers or instructors conducting training other than CRM training, but integrating CRM elements into this training.

(b) Qualification of flight crew CRM trainer

(1) A training and standardisation programme for flight crew CRM trainers should be established.

(2) A flight crew CRM trainer, in order to be suitably qualified, should:

(i) have adequate knowledge of the relevant flight operations;

(ii) have adequate knowledge of human performance and limitations (HPL), whilst:

(A) having obtained a commercial pilot licence acceptable to the authority; or

(B) having followed a theoretical HPL course covering the whole syllabus of the HPL examination;

(iii) have completed flight crew initial operator's CRM training;

(iv) have received training in group facilitation skills;

(v) have received additional training in the fields of group management, group dynamics and personal awareness; and

(vi) have demonstrated the knowledge, skills and credibility required to train the CRM training elements in the non-operational environment, as specified in Table 22 - Flight crew CRM training of *AMC1 SPO.715 Crew resource management (CRM) training*.

(3) The following qualifications and experiences are also acceptable for a flight crew CRM trainer in order to be suitably qualified:

(i) A flight crew member holding a recent qualification as a flight crew CRM trainer may continue to be a flight crew CRM trainer after the cessation of active flying duties if he/she maintains adequate knowledge of the relevant flight operations.

(ii) A former flight crew member may become a flight crew CRM trainer if he/she maintains adequate knowledge of the relevant flight operations and fulfils the provisions of (2)(ii) to (2)(vi).

(iii) An experienced CRM trainer may become a flight crew CRM trainer if he/she demonstrates adequate knowledge of the relevant flight operations and fulfils the provisions of (2)(ii) to (2)(vi).

(c) Training of flight crew CRM trainer

(1) Training of flight crew CRM trainers should be both theoretical and practical. Practical elements should include the development of specific trainer skills, particularly the integration of CRM into line operations.

(2) The basic training of flight crew CRM trainers should include the training elements for flight crew, as specified in Table 22 - Flight crew CRM training of *AMC1 SPO.715 Crew resource management (CRM) training*. In addition, the basic training should include the following:

(i) introduction to CRM training;

(ii) operator's management system;

(iii) characteristics, as applicable:

(A) of the different types of CRM trainings (initial, recurrent, etc.);

(B) of combined training; and

(C) related to the type of aircraft or operation; and

(iv) assessment.

(3) The refresher training of flight crew CRM trainers should include new methodologies, procedures and lessons learned.

(4) Instructors, holding a certificate acceptable to the authority, who are also CRM trainers, may combine the CRM trainer refresher training with instructor refresher training.

(5) Instructors for non-complex motor-powered aircraft should be qualified as flight crew CRM trainers for this aircraft category with no additional training, as specified in (2) and (3) when:

(i) holding a certificate acceptable to the authority; and

(ii) fulfilling the provisions of (b)(2) or (b)(3).

(6) The training of flight crew CRM trainers should be conducted by flight crew CRM trainers with a minimum of 3 years' experience. Assistance may be provided by experts in order to address specific areas.

(d) Assessment of flight crew CRM trainer

(1) A flight crew CRM trainer should be assessed by the operator when conducting the first CRM training course. This first assessment should be valid for a period of 3 years.

(2) The operator should ensure that the process for the assessment is included in the operations manual describing methods for observing, recording, interpreting and debriefing the flight crew CRM trainer. All personnel involved in the assessment must be credible and competent in their role.

(e) Recency and renewal of qualification as flight crew CRM trainer

(1) For recency of the 3-year validity period, the flight crew CRM trainer should:

(i) conduct at least 2 CRM training events in any 12-month period;

(ii) be assessed within the last 12 months of the 3-year validity period by the operator; and

(iii) complete CRM trainer refresher training within the 3-year validity period.

(2) The next 3-year validity period should start at the end of the previous period.

(3) For renewal, i.e. when a flight crew CRM trainer does not fulfil the provisions of (1), he/she should, before resuming as flight crew CRM trainer:

(i) comply with the qualification provisions of (b) and (d); and

(ii) complete CRM trainer refresher training.

AC/AMC H - FLIGHT AND DUTY TIME LIMITATIONS AND REST REQUIREMENTS

AC SPO.965 Fatigue Management

(See SPO.965 Fatigue Management)

(a) Fatigue Risk Management System

(1) FRMS policy

(i) The operator shall define his FRMS policy, with all elements of the FRMS clearly identified.

(ii) The policy shall require that the scope of FRMS operations be clearly defined in the Operations Manual.

(iii) The policy shall:

(A) reflect the shared responsibility of management, flight crews, and other involved personnel;

(B) clearly state the safety objectives of the FRMS;

(C) be signed by the Accountable Manager of the organisation;

(D) be communicated, with visible endorsement, to all the relevant areas and levels of the organisation;

(E) declare management commitment to effective safety reporting;

(F) declare management commitment to the provision of adequate resources for the FRMS;

(G) declare management commitment to continuous improvement of the FRMS;

(H) require that clear lines of accountability for management, flight crews, and all other involved personnel are identified; and

(I) require periodic reviews to ensure it remains relevant and appropriate.

(2) FRMS documentation

The operator shall develop and keep current FRMS documentation that describes and records:

(i) RMS policy and objectives;

(ii) FRMS processes and procedures;

(iii) accountabilities, responsibilities and authorities for these processes and procedures;

(iv) mechanisms for on-going involvement of management, flight crew members, and all other involved personnel;

(v) FRMS training programmes, training requirements and attendance records;

(vi) scheduled and actual flight times, duty periods and rest periods with significant deviations and reasons for deviations noted; and

(vii) FRMS outputs including findings from collected data, recommendations, and actions taken.

(b) Fatigue risk management processes

(1) Identification of hazards

The operator shall develop and maintain three fundamental and documented processes for fatigue hazard identification:

(i) Predictive

The predictive process shall identify fatigue hazards by examining crew scheduling and taking into account factors known to affect sleep and fatigue and their effects on performance. Methods of examination may include but are not limited to:

(A) operator or industry operational experience and data collected on similar types of operations;

(B) evidence-based scheduling practices; and

(C) bio-mathematical models.

(ii) Proactive

The proactive process shall identify fatigue hazards within current flight operations. Methods of examination may include but are not limited to:

(A) self-reporting of fatigue risks;

(B) crew fatigue surveys;

(C) relevant flight crew performance data;

(D) available safety databases and scientific studies; and

(E) analysis of planned versus actual time worked.

(iii) Reactive

The reactive process shall identify the contribution of fatigue hazards to reports and events associated with potential negative safety consequences in order to determine how the impact of fatigue could have been minimized. At a minimum, the process may be triggered by any of the following:

(A) fatigue reports;

(B) confidential reports;

(C) audit reports;

(D) incidents; and

(E) flight data analysis events.

(2) Risk assessment

The operator shall develop and implement risk assessment procedures that determine the probability and potential severity of fatigue-related events and identify when the associated risks require mitigation.

(i) The risk assessment procedures shall review identified hazards and link them to:

(A) operational processes;

(B) their probability;

(C) possible consequences; and

(D) the effectiveness of existing safety barriers and controls.

(3) Risk mitigation

(i) The operator shall develop and implement risk mitigation procedures that:

(A) select the appropriate mitigation strategies;

(B) implement the mitigation strategies; and

(C) monitor the strategies' implementation and effectiveness.

(c) FRMS safety assurance processes

(1) The operator shall develop and maintain FRMS safety assurance processes to:

(i) provide for continuous FRMS performance monitoring, analysis of trends, and measurement to validate the effectiveness of the fatigue safety risk controls. The sources of data may include, but are not limited to:

(A) hazard reporting and investigations;

(B) audits and surveys; and

(C) reviews and fatigue studies;

(ii) provide a formal process for the management of change which shall include but is not limited to:

(A) identification of changes in the operational environment that may affect FRMS;

(B) identification of changes within the organisation that may affect FRMS; and

(C) consideration of available tools which could be used to maintain or improve FRMS performance prior to implementing changes; and

(iii) provide for the continuous improvement of the FRMS. This shall include but is not limited to:

(A) the elimination and/or modification of risk controls have had unintended consequences or that are no longer needed due to changes in the operational or organisational environment;

(B) routine evaluations of facilities, equipment, documentation and procedures; and

(C) the determination of the need to introduce new processes and procedures to mitigate emerging fatigue-related risks.

(d) FRMS promotion processes

(1) FRMS promotion processes support the on-going development of the FRMS, the continuous improvement of its overall performance, and attainment of optimum safety levels. The following shall be established and implemented by the operator as part of its FRMS:

(i) training programmes to ensure competency commensurate with the roles and responsibilities of management, flight crew, and all other involved personnel under the planned FRMS; and

(ii) an effective FRMS communication plan that:

(A) explains FRMS policies, procedures and responsibilities to all relevant stakeholders; and

(B) describes communication channels used to gather and disseminate FRMS-related information.

AC/AMC I - SPECIFIC REQUIREMENTS

SECTION 1 – HELICOPTER EXTERNAL SLING LOAD OPERATIONS (HESLO)

AMC1 SPO.HESLO.100 Standard operating procedures

(See SPO.HESLO.100 Standard operating procedures)

Standard Operating Procedures

(a) Before conducting any HESLO, the operator should develop its SOPs taking into account the elements below.

(b) Nature and complexity of the activity

(1) Nature of the activity and exposure:

Helicopter flights for the purpose of transporting external loads by different means, e.g. under slung, external pods or racks. These operations are usually performed at a low height.

(2) Complexity of the activity:

The complexity of the activity varies with the size and the shape of the load, the length of the rope and characteristics of the pick-up and drop-off zones, the time per load cycle, etc.

HESLO types

HESLO 1:	short line, 20 metres (m) or less
HESLO 2:	long line, more than 20 m
HESLO 3:	specialised sling load, such as: Logging, insulators and pullers, traverse mounting, spinning of fibre cable, ice and snow removal from power lines, sawing, geophysical surveys, cable laying onto the ground or into ditches, avalanche control, landslide control
HESLO 4:	Advanced sling load such as: Tower erecting, wire stringing, disassembly of masts and towers

(3) Operational environment and geographical area:

HESLO may be performed over any geographical area. Special attention should be given to:

(i) hostile and congested;

(ii) mountains;

(iii) sea;

(iv) jungle;

(v) desert; and

(vi) polar;

(vii) lakes and river canyons; and

(viii) environmentally sensitive areas (e.g. national parks, noise sensitive areas).

(c) Equipment

(1) The helicopter may be equipped with:

(i) additional mirror(s) and/or video camera(s);

(ii) a bubble window;

(iii) supplementary hook(s) or multi-hook device(s); and

(iv) load data recorder (lifts, weights, torques, power, forces, shocks and electrical activities)

(2) When conducting single-pilot vertical reference operations with no assistance of a task specialist or other crew member, additional engine monitoring in the pilot line of vision or an audio warning system is recommended.

(3) All additional equipment used, e.g. ropes, cables, mechanical hooks, swivel hooks, nets, buckets, chainsaws, baskets, containers, should be manufactured according to applicable rules or recognised standards. The operator should be responsible for maintaining the serviceability of this equipment.

(4) Adequate radio communication equipment (e.g. VHF, UHF, FM) should be installed and serviceable in the helicopter for co-ordination with the task specialists involved in the operation.

(5) Task specialists involved in the operation should be equipped with hand-held communication equipment, protective helmets with integrated earphones and microphones, and the relevant personal protective equipment.

(d) Crew members

(1) Crew composition:

(i) The minimum flight crew as stated in the approved AFM. For operational or training purposes, an additional crew member may assist the pilot-in-command (PIC) in a single-pilot operation. In such a case:

(A) procedures are in place for a crew member to monitor the flight, especially during the departure, approach and HESLO cycle, to ensure that a safe flight path is maintained; and

(B) when a task specialist is tasked with assisting the pilot, the procedures according to which this assistance is taking place should be clearly defined.

(ii) For safety and/or operational purposes, task specialists should be instructed by the operator to fulfil specified tasks.

(2) Pilot training for HESLO

Before acting as unsupervised PIC, the pilot should demonstrate to the operator that he has the required skills and knowledge.

(i) Theoretical knowledge for HESLO 1:

(A) content of the operations manual (OM) including the relevant SOPs;

(B) AFM (limitations, performance, mass and balance, abnormal and emergency procedures, etc.);

(C) procedures (e.g. short line, long line, construction, wire stringing or cable laying flying techniques), as required for the operation;

(D) load and site preparation including load rigging techniques and external load procedures;

(E) special equipment used in the operation;

(F) training in human factor principles; and

(G) hazards and dangers.

(ii) Theoretical knowledge for other HESLO levels should include the elements listed in point (i) above where additional knowledge to that of HESLO 1 is needed for the adequate HESLO level.

(iii) Practical training defined in the operator's training programme:

(A) Flight instruction provided by a HESLO instructor; and

(B) Flight under the supervision of a HESLO instructor. The supervision should take place during HESLO missions, from inside the helicopter and on-site.

For the purpose of this AMC, a HESLO mission is defined as a flight or series of flights from point A to point B on a particular day and for specialised operations, for a particular client.

(3) Pilot experience

(i) Prior to commencing training:

(A) 10 hours flight experience on the helicopter type;

(B) For HESLO 2: At least 100 HESLO cycles;

(C) For HESLO 3: At least 500 HESLO cycles; and

(D) For HESLO 4: At least 1 000 flight hours on helicopters and 2 000 HESLO cycles, including experience as unsupervised PIC in HESLO 2 or HESLO 3.

(ii) Before acting as PIC under the supervision of a HESLO instructor:

(A) For HESLO 1: At least 5 hours and 50 HESLO cycles flight instruction;

(B) For HESLO 2: In addition to HESLO 1 training, at least 2 hours and 20 HESLO cycles flight instruction with a long line of more than 20 metres.

(C) For HESLO 3 and 4: A number of HESLO cycles flight instruction, as relevant to the activity to be performed and the required skills.

(iii) Before acting as unsupervised PIC:

(A) For HELSO 1, 300 hours helicopter flight experience as PIC; and

(B) For HESLO 1: At least 8 hours, 80 HESLO cycles and 5 HESLO missions;

(C) For HESLO 2: At least 5 hours, 50 HESLO cycles and 5 HESLO missions with long line of more than 20 metres;

(D) For HESLO 3 and 4: A number of HESLO missions under the supervision of a HESLO instructor, as relevant to the activity to be performed and the required skills;

(E) For HESLO 3 and 4, 15 hours on the helicopter type, performing HESLO 1 and 2 operations;

(F) At least 20 hours gained in an operational environment similar to the environment of intended operation (desert, sea, jungle, mountains, etc.).

(4) Pilot proficiency: Before acting as unsupervised PIC, pilot proficiency has been assessed as sufficient for the intended operations and environment under the relevant HESLO type, by a HESLO instructor nominated by the operator.

(5) Pilot recurrent training and checking at least every two years:

(i) review of the load rigging techniques;

(ii) external load procedures;

(iii) review of the applicable flying techniques; and

(iv) review of human factor principles.

(v) A pilot who has performed 20 hours of relevant HESLO within the past 12 months may not need any further flight training other than in accordance with this regulation.

(e) Task specialists

Before acting as task specialist, he should demonstrate to the operator that he has been trained appropriately and has the required skill and knowledge.

(1) Initial training

(i) The initial training of task specialists should include at least:

(A) behaviour in a rotor turning environment and training in ground safety and emergency procedures;

(B) procedures including load rigging, usage and conservation (replacement) of LLD;

(C) helicopter marshalling signals;

(D) radio communication;

(E) selection and preparation of pick-up and drop-off sites, dangers on working places (downwash, loose goods, third people);

(F) handling and safety of the third party;

(G)

(H) relevant training for the helicopter type;

(I) duties and responsibilities as described in the appropriate manual;

(J) perception and classification of flight obstacles (none, critical, danger), measures for safety;

(K) human factor principles; and

(L) for task specialists seated in the cockpit and whose tasks are to assist the pilot, the relevant CRM training elements.

(ii) The individual safety equipment appropriate to the operational environment and complexity of the activity should be described in the appropriate manual.

(2) Recurrent training

(i) The annual recurrent training should include the items listed in the initial training as described in (e)(1) above.

(ii) The operator should establish a formal qualification list for each task specialist.

(iii) The operator should establish a system of record keeping that allows adequate storage and reliable traceability of:

(A) the initial and recurrent training;

(B) Qualifications (qualification list).

(3) Briefing of task specialists

Briefings on the organisation and coordination between the flight crew and task specialists involved in the operation should take place prior to each operation. These briefings should include at least the following:

(i) location and size of pick-up and drop-off site, operating altitude;

(ii) location of refuelling site and procedures to be applied;

(iii) load sequence, danger areas, performance and limitations, emergency procedures; and

(iv) for a task specialist who has not received the relevant elements of CRM training, the operator's crew coordination concept including relevant elements of CRM.

(4) Responsibility of task specialists operating on the ground:

(i) Task specialists operating on the ground are responsible for the safe organisation of the ground operation, including:

(A) adequate selection and preparation of the pick-up and drop-off points and load rigging;

(B) appropriate communication and assistance to the flight crew and other task specialists; and

(C) access restriction on the pick-up and drop-off site.

(ii) If more than one task specialist is required for a task, one should be nominated as leading the activities. He should act as the main link between the flight crew and other task specialist(s) involved in the operation and is responsible for:

(A) task specialist coordination and activities on the ground; and

(B) the safety of the working area (loading and fuelling).

(f) HESLO instructor

The HESLO instructor should be assigned by the operator on the basis of the following:

(1) the HESLO instructor for pilots should:

(i) be suitably qualified as determined by the operator and have a minimum experience of 500 hours HESLO;

(ii) have at least 10 hours HESLO experience as unsupervised PIC in the appropriate HESLO level on which instruction, supervision and proficiency assessments are to be provided; and

(iii) have attended the 'teaching and learning' part of the flight instructor or type rating instructor training or have prior experience as an aerial work instructor subject to national rules.

(2) the HESLO instructor for task specialists should be suitably qualified as determined by the operator and have at least 2 years of experience in HESLO operations.

(g) Performance

(1) Power margins for HESLO operations:

(i) HESLO 1 and 2

The mass of the helicopter should not exceed the maximum mass specified in accordance with SPO.346 (c)(1) at the pick-up or drop-off site, whichever is higher, as stated in the appropriate manual.

(ii) HESLO 3 and 4

The mass of the helicopter should not exceed the maximum mass specified in accordance with SPO.346 (c)(1) at the pick-up or drop-off site, whichever is higher, as stated in the appropriate manual, and in the case of construction (montage) operations, reduced by 10% of the mass of the sling load capacity.

(h) Normal procedures

(1) Operating procedures:

HESLO should be performed in accordance with the appropriate manual and appropriate operating procedures. These procedures should include, for each type of operation:

(i) crew individual safety equipment (e.g. helmet, fire-retardant suits);

(ii) crew responsibilities;

(iii) crew coordination and communication;

(iv) selection and size of pick-up and drop-off sites;

(v) selection of flight routes;

(vi) fuel management in the air and on the ground;

(vii) task management; and

(viii) third party risk management.

(2) Ground procedures:

The operator should specify appropriate procedures, including:

(i) use of ground equipment;

(ii) load rigging;

(iii) size and weight assessment of loads;

(iv) attachment of suitably prepared loads to the helicopter;

(v) two-way radio communication procedures;

(vi) selection of suitable pick-up and drop-off sites;

(vii) safety instructions for task specialists operating on the ground;

(viii) helicopter performances information;

(ix) fuel management on the ground;

(x) responsibility, organisation and task management of other personnel on the ground involved in the operation;

(xi) third party risk management; and

(xii) environmental protection.

(i) Emergency procedures

(1) Operating procedures for the flight crew:

In addition to the emergency procedures published in the AFM or OM, the operator should ensure that the flight crew:

(i) is familiar with the appropriate emergency procedures;

(ii) has appropriate knowledge of the emergency procedures for personnel on the ground involved in the operation; and

(iii) reports emergencies as specified in the AFM or OM.

(2) Ground procedures:

The operator should ensure that the task specialist on the ground involved in the operation:

(i) is familiar with the appropriate emergency procedures;

(ii) has appropriate knowledge of the flight crew emergency procedures;

(iii) reports emergencies as specified in the AFM or OM; and

(iv) prevents, as far as possible, environmental pollution.

(j) Ground equipment

The operator should specify the use of ground equipment, such as fuel trucks, cables, strops, etc. in the AFM or OM, including at least:

(1) minimum size of the operating site;

(2) surface condition;

(3) positioning of ground equipment on the operating site;

(4) fuel handling;

(5) environment protection plan; and

(6) location and use of fire suppression equipment.

AC1 SPO.HESLO.100 Standard operating procedures

(See SPO.HESLO.100 Standard operating procedures)

Pilot Initial Training

The table below summarises minimum training standards.

Table 23 - Training minimum standards

HESLO 1	CPL(H) or ATPL(H) PPL(H) only for non-commercial operations Minimum 10 hours PIC on type Type rating completed HESLO ground instruction completed Task specialist syllabus reviewed HESLO 1 flight instruction completed: Minimum 5 hours/50 HESLO cycles HESLO 1 flights under supervision completed Minimum experience 8 hours/80 HESLO cycles/5 HESLO missions Minimum 300 hours PIC(H) HESLO 1 proficiency
HESLO 2	CPL(H) or ATPL(H) PPL(H) only for non-commercial operations HESLO level 1 completed Type rating completed Minimum 10 hours PIC on type HESLO 2 ground instruction completed Task specialist syllabus reviewed Minimum 100 HESLO cycles HESLO 2 flight instruction completed: Minimum 2 hours/20 HESLO cycles with long line HESLO 2 flights under supervision completed Minimum experience 5 hours/50 HESLO 2 cycles/5 HESLO 2 missions HESLO 2 proficiency
HESLO 3	CPL(H) or ATPL(H) PPL(H) only for non-commercial operations HESLO level 1 completed to 20m Min. 500 HESLO cycles Type rating completed Minimum 10 hours PIC on type HESLO 3 ground instruction completed Task specialist syllabus reviewed Practical Task specialist training for logging HESLO 3 flight instruction completed HESLO 3 flights under supervision completed HESLO 3 proficiency

HESLO 4	CPL(H) or ATPL(H) PPL(H) only for non-commercial operations Minimum 1 000 hours (H) HESLO level 2 or 3 completed Minimum 2 000 HESLO cycles Type rating completed Minimum 10 hours PIC on type HESLO 4 ground instruction completed Practical load preparation training HESLO 4 flight instruction completed HESLO 4 flights under supervision completed HESLO 4 proficiency

HESLO ground instruction, HESLO flight training, HESLO flights under supervision and HESLO proficiency assessments may be combined with the operator's conversion course.

SECTION 2 – HUMAN EXTERNAL CARGO OPERATIONS (HEC)

AMC1 SPO.HEC.100 Standard operating procedures

(See SPO.HEC.100 Standard operating procedures)

Standard Operating Procedures

(a) Before conducting any HEC operations, the operator should develop its SOPs taking into account the elements below.

(b) Nature and complexity of the activity

(1) Nature of the activity and exposure:

HEC operations are usually performed at a low height.

(2) Complexity of the activity:

(i) The complexity of the activity varies with the length of the rope and characteristics of the pick-up and drop-off zones, etc.

HEC levels	
HEC 1:	Sling or cable length is less or equal to 25 m
HEC 2:	Sling or cable length is greater than 25 m

(3) Operational environment and geographical area:

HEC may be performed over any geographical area. Special attention should be given to:

(i) hostile congested and non-congested environment;

(ii) mountains;

(iii) sea;

(iv) jungle;

(v) desert;

(vi) artic;

(vii) lakes and river canyons; and

(viii) environmentally sensitive areas (e.g. national parks, noise sensitive areas).

(c) Equipment

(1) The helicopter may be equipped with:

(i) additional mirror(s) and/or video camera(s);

(ii) a bubble window;

(iii) supplementary hook(s) or multi-hook device(s); and

(iv) load data recorder (lifts, weights, torques, power, forces, shocks and electrical activities).

(2) When conducting single-pilot vertical reference operations with no assistance of a task specialist or other crew member, additional engine monitoring in the pilot line of vision or an audio warning system is recommended.

(3) Adequate radio communication equipment (e.g. VHF, UHF, FM) should be installed in the helicopter for co-ordination with the task specialist involved in the operation.

(4) Task specialists involved in the operation should be equipped with hand-held communication equipment, protective helmets with integrated earphones and microphones as well as personal protective equipment.

(d) Crew members

(1) Crew composition:

(i) The minimum flight crew is stated in the approved AFM. For operational or training purposes, an additional qualified crew member may assist the PIC in a single-pilot operation. In such a case:

(A) procedures are in place for a member of the flight crew to monitor the flight, especially during the departure, approach and HEC operations, to ensure that a safe flight path is maintained; and

(B) when a task specialist is tasked with assisting the pilot, the procedures according to which this assistance is taking place should be clearly defined.

(ii) For safety and/or operational purposes, a task specialist may be required by the operator to fulfil the task (e.g. to establish vertical reference or to operate the release safety device for the belly rope).

(2) Pilot initial training:

Before acting as PIC, the pilot should demonstrate to the operator that he has the required skills and knowledge, as follows:

(i) Theoretical knowledge:

(A) load rigging techniques;

(B) external load procedures;

(C) site organisation and safety measures;

(D) short line, long line, construction, wire stringing or cable laying flying techniques, as required for the operation.

(ii) Pilot experience prior to commencing the training:

(A) 10 hours flight experience on the helicopter type;

(B) type rating completed;

(C) HESLO type 1 or 2 completed;

(D) relevant experience in the field of operation;

(E) training in human factor principles; and

(F) ground instruction completed (marshaller syllabus).

(iii) Pilot experience prior to commencing unsupervised HEC flights:

(A) HEC flight instruction completed.

(B) 1 000 hours helicopter flight experience as PIC.

(C) for mountain operations, 500 hours of flight experience as PIC in mountain operations.

(D) for HEC 2, HESLO type 2 completed.

(3) Pilot proficiency prior to commencing unsupervised HEC flights:

Pilot proficiency has been assessed as sufficient for the intended operations and environment under the relevant HEC level, by a HEC instructor nominated by the operator.

(4) Pilot recurrent training and checking at least every two years:

(i) review of the sling technique;

(ii) external load procedures;

(iii) training in human factor principles; and

(iv) review of the applicable flying techniques, which should take place during a training flight if the pilot has not performed HEC or HHO operations within the past 24 months.

(5) Conditions of HEC instruction:

(i) Maximum sling length according to the level applicable:

(A) 1 task specialist (with radio) at pickup point;

(B) 1 task specialist (with radio) at drop off point/on the line;

(C) helicopter fitted with cargo mirror/bubble window;

(D) flight instruction DC/: Cycles DC/minimum 10 cycles which of 5 Human Cargo Sling; and

(E) flight instruction solo with onsite supervision/Cycles solo/minimum 10 cycles.

(ii) HEC instructor:

The HEC instructor should be assigned by the operator on the basis of the following:

(A) the HEC instructor for pilots should:

a. have a minimum experience of 100 cycles in HEC operations at HEC levels equal to or greater than that on which instruction, supervision and proficiency assessment are to be provided; and

b. have attended the 'teaching and learning' part of the flight instructor or type rating instructor training, or have prior experience as an aerial work instructor subject to national rules;

(B) the HEC instructor for task specialists should be suitably qualified as determined by the operator and have at least 2 years of experience in HEC operations as a task specialist.

(e) Task specialists

Before acting as task specialists, they should demonstrate to the operator that they have been appropriately trained and have the required skills and knowledge including training on human factor principles.

(1) Task specialists should receive training relevant to their tasks including:

(i) fitting and removal of system; and

(ii) normal procedure.

For task specialists in charge of assisting the pilot, the relevant CRM training elements.

(2) Briefings

Briefings on the organisation and coordination between flight crew and task specialist involved in the operation should take place prior to each operation. These briefings should include at least the following:

(i) location and size of pick-up and drop-off site, operating altitude;

(ii) location of refuelling site and procedures to be applied; and

(iii) load sequence, danger areas, performance and limitations, emergency procedures.

(iv) for task specialists who have not received the relevant elements of CRM training, the operator's crew coordination concept including relevant elements of crew resource management.

(3) Recurrent training

(i) The annual recurrent training should include the items listed in the initial training as described in (e)(1) above.

(ii) The operator should establish a formal qualification list for each task specialist.

(iii) The operator should establish a system of record keeping that allows adequate storage and reliable traceability of:

(A) the initial and recurrent training;

(B) qualifications (qualification list).

(f) Performance

HEC should be performed with the following power margins: the mass of the helicopter should not exceed the maximum mass specified in accordance with SPO.346(c)(1).

(g) Normal procedures

(1) Operating procedures:

HEC should be performed in accordance with the AFM. Operating procedures should include, for each type of operation:

(i) crew individual safety equipment (e.g. helmet, fire retardant suits);

(ii) crew responsibilities;

(iii) crew coordination and communication;

(iv) selection and size of pick-up and drop-off sites;

(v) selection of flight routes;

(vi) fuel management in the air and on the ground;

(vii) task management; and

(viii) third party risk management.

(2) Ground procedures:

The operator should specify appropriate procedures, including:

(i) use of ground equipment;

(ii) load rigging;

(iii) size and weight assessment of loads;

(iv) attachment of suitably prepared loads to the helicopter;

(v) two-way radio communication procedures;

(vi) selection of suitable pick-up and drop-off sites;

(vii) safety instructions for ground task specialists or other persons required for the safe conduct of the operation;

(viii) helicopter performances information;

(ix) fuel management on the ground;

(x) responsibility and organisation of the personnel on the ground involved in the operation;

(xi) task management of personnel on the ground involved in the operation;

(xii) third party risk management; and

(xiii) environmental protection.

(h) Emergency procedures

(1) Operating procedures:

In addition to the emergency procedures published in the AFM or OM, the operator should ensure that the flight crew:

(i) is familiar with the appropriate emergency procedures;

(ii) has appropriate knowledge of the emergency procedures for personnel on the ground involved in the operation; and

(iii) reports emergencies as specified in the AFM or OM.

(2) Ground procedures:

The operator should ensure that the task specialist on the ground involved in the operation:

(i) is familiar with the appropriate emergency procedures;

(ii) has appropriate knowledge of the emergency procedures for personnel on the ground involved in the operation;

(iii) reports emergencies as specified in the AFM or OM; and

(iv) prevents, as far as possible, environmental pollution.

AMC1 SPO.HEC.105(b) Specific HEC equipment

(See SPO.HEC.105 Specific HEC equipment)

Airworthiness Approval for HEC Equipment

(a) Hoist or cargo hook installations that have been certificated according to any of the following standards should be considered to satisfy the airworthiness criteria for HEC operations:

(1) CS 27.865 or CS 29.865;

(2) JAR 27 Amendment 2 (27.865) or JAR 29 Amendment 2 (29.865) or later;

(3) FAR 27 Amendment 36 (27.865) or later - including compliance with CS 27.865(c)(6); or

(4) FAR 29 Amendment 43 (29.865) or later.

(b) Hoist or cargo hook installations that have been certified prior to the issuance of the airworthiness criteria for HEC as defined in (a) may be considered as eligible for HEC provided that following a risk assessment either:

(1) the service history of the hoist or cargo hook installation is found satisfactory to the Authority; or

(2) for hoist or cargo hook installations with an unsatisfactory service history, additional substantiation to allow acceptance by the Authority should be provided by the hoist or cargo hook installation certificate holder (type certificate (TC) or supplemental type certificate (STC)) on the basis of the following requirements:

(i) The hoist or cargo hook installation should withstand a force equal to a limit static load factor of 3.5, or some lower load factor, not less than 2.5, demonstrated to be the maximum load factor expected during hoist operations, multiplied by the maximum authorised external load.

(ii) The reliability of the primary and back up quick release systems at helicopter level should be established and failure mode and effect analysis at equipment level should be available. The assessment of the design of the primary and back up quick release systems should consider any failure that could be induced by a failure mode of any other electrical or mechanical rotorcraft system.

(iii) The appropriate manual should contain one-engine-inoperative (OEI) hover performance data or single engine failures procedures for the weights, altitudes, and temperatures throughout the flight envelope for which hoist or cargo hook operations are accepted.

(iv) Information concerning the inspection intervals and retirement life of the hoist or cargo hook cable should be provided in the instructions for continued airworthiness.

SECTION 5 – INSPECTION AND VALIDATION FLIGHTS (IVFs))

AMC1 SPO.IVF.100 Standard operating procedures

(See SPO.IVF.100 Standard operating procedures)

Introduction

(a) ICAO Annex 10 Volume 1 requires that Navigational Aids are routinely flight inspected. ICAO Doc 8071 provides guidance on how to conduct the flight inspection. ICAO Doc 8071 also provides some guidance on the make-up of flight inspection organisation. This includes People, Equipment and Procedures.

(b) Although there are no internationally agreed standards for the oversight of flight inspection service providers, the Authority provides oversight of the service providers through published regulatory material. Air Navigation Service Providers may require that the flight inspection service provider is approved by their Authority.

(c) A flight inspection is considered to be a maintenance activity therefore the flight inspection arrangement should be fit for its intended purpose.

(d) This AMC covers the measurement of the Signal in Space of a Navigational Aid. The AMC does not include Procedure Validation as detailed in Doc 9906 Volume 5.

Capabilities

(a) A Flight Inspection Service Provider shall be capable of:

(1) Using flight inspection techniques to measure accurately the signals in space radiated by those navigational aids which they are intending to inspect.

(2) Evaluating the measured signals with respect to applicable standards and tolerances which should be established by the local regulator. Examples of typical standards are ICAO (Doc 8071 and Annex 10), or FAA 8200.1, or UK CAP 670.

(3) Communicating with ground engineers and technicians to advise if any adjustments are required to the equipment being inspected.

(4) Providing a flight inspection report to the customer.

Approval Procedure

(a) Applicants shall detail the overall Flight Inspection operation in an Exposition. The Exposition shall include evidence based demonstration that each of the requirements detailed below are adequately met.

(b) A practical demonstration of the Flight Inspection Operation may be necessary to demonstrate the performance of the Inspection Service. A practical demonstration does not replace the evidence based demonstration of the requirements. Details of a practical demonstration can be found below.

(c) The exposition should include references to associated documentation as appropriate.

(d) The exposition should address how the provider uses design, process monitoring, training and procedures to ensure the quality of the Flight Inspection results.

(e) The exposition should be approved by the accountable manager. Details of the Accountable Manager can be found below.

The Exposition

The content of the Exposition should detail the overall Flight Inspection operation. The following provide some headings that would normally be included in an Exposition. The detail is not exhaustive and may vary from one flight inspection operator to another. The headings assume that the flight inspection organisation does have a Quality Management System. The most appropriate headings that would normally be contained in a Quality Management System have been included.

(a) Scope of Tasks

It is important that the exposition clearly identifies the scope of tasks that the exposition covers. This would include the types of navigational aids to be inspected, category of operation (for ILS) and the types of inspection e.g. routine or commissioning.

(b) Organisation

(1) Organisation name;

This should be the name that the flight inspection organisation trades under. This would normally be the legal entity.

(2) Contact details;

Address, Email and Telephone Contacts.

(3) Flight inspection organisation chart;

An organisational Chart should be provided detailing the roles that make up the flight inspection organisation. This should show the reporting lines up the accountable manager or board as appropriate. It is sometimes also necessary to show functions within the organisation; this is typically the case where several people perform the same task. For example, surveying.

(4) Interfaces with other internal departments and divisions.

Where the flight inspection operation is part of a larger organisation it is important to ensure that all contributing departments, divisions or other organization involved directly or indirectly with the flight inspection operation comply with the flight inspection organisations exposition or quality management system as appropriate.

(c) Personnel Responsibilities

(1) Objective

The Organisation shall ensure that all personnel concerned with the flight inspection are competent to conduct their job functions.

(2) Acceptable Mean of Compliance

(i) The organization should establish a written procedure for determining required job competencies and continued competence checking of all personnel through regular assessment.

(ii) The procedure should consider all personnel directly engaged in the flight inspection operation, this includes but is not limited to the pilot (in terms of flying the correct flight inspection procedure), flight inspector, surveyor, documentation controller and auditor.

(iii) Flight inspection methods and strategies vary according to the type of equipment and procedure to be inspected. Consequently, different types of qualification must be considered such as ILS, VOR, NDB, MLS, commissioning or routine inspection.

(iv) The organisation shall maintain records of competency including any on-going competency checking.

(d) Change Process

(1) Objective

The organisation shall ensure that all changes to the flight inspections operations are assessed and recorded.

(2) Acceptable Means of Compliance

(i) The organisation shall establish procedures for, assessing and documenting changes to all areas of the operation, this would normally include but is not limited to the:

(A) Organisational changes

(B) System changes

(C) Procedure changes

(ii) Changes shall be identified and records maintained. The changes shall be reviewed, verified and validated, as appropriate, and approved before implementation. The review shall include evaluation of the effect of the changes on the flight inspection operation.

(iii) Records should be established to provide evidence of conformity to requirements and of the effective operation of the QM system shall be controlled, identifiable, stored, retrievable and protected according to procedure description (ICAO Doc 9001-4.2.4).

(iv) Documents required by the QM system shall be controlled according to established procedures to ensure proper handling of revision and changes (ICAO Doc 9001-4.2.3).

(v) Design and development changes shall be identified and records maintained. The changes shall be reviewed, verified and approved before implementation (ICAO Doc 9001-7.3.7).

(vi) Significant equipment modifications and renewal might still need approval by the Authority before implementation.

(e) Documentation Control

(1) Objective

(i) The organisation shall ensure that all documents that support the flight inspection operation should be controlled so that the correct version of any document can be easily identified and used.

(2) Acceptable Means of Compliance

(i) A documented procedure shall be established to define the controls needed

(A) to approve documents for adequacy prior to issue,

(B) to review and update as necessary and re-approve documents,

(C) to ensure that changes and the current revision status of documents are identified,

(D) to ensure that relevant versions of applicable documents are available at points of use,

(E) to ensure that documents remain legible and readily identifiable,

(F) to ensure that documents of external origin determined by the organization to be necessary for the planning and operation of the quality management system are identified and their distribution controlled, and

(G) to prevent the unintended use of obsolete documents, and to apply suitable identification to them if they are retained for any purpose.

(f) Auditing

(1) Objective

(i) The organisation shall plan and implement the monitoring, measurements, analysis and improvement processed needed to ensure conformity of the QM system.

(2) Acceptable Means of Compliance

(i) To ensure consistent meeting of customer requirements and continual improvement of the QM system, the audit schedule must at least identify the following action items:

(A) Internal audits.

(B) Customer satisfaction monitoring.

(C) Management reviews.

(D) Audits with independent certification body.

(E) External audits with sub-contractors, the Authority and/or customer as appropriate.

(g) Control of Sub-Contractors

(1) Objective

(i) The organisation shall ensure that sub-contractors are controlled.

(2) Acceptable Means of Compliance

(i) The organisation shall evaluate and select sub-contractors based on their ability to supply products and services in accordance with the organisation's exposition.

(ii) Criteria for selection, evaluation and re-evaluation shall be established.

(iii) Records of the results of evaluations and any necessary actions arising from the evaluation shall be maintained.

(iv) The types of organisations that would be considered under this heading include:

(A) Test equipment calibration company.

(B) Other flight inspection organisations.

(C) Contracted Personal (e.g. Pilots, Flight Inspectors).

(v) The same requirements for documents and records must be established and maintained by sub-contractors as appropriate and verified by auditing. This task will normally be simplified if the sub-contractors have equal QM system.

(vi) Monitoring of Subcontractor performance metrics covering areas such as reporting, testing and acceptance, issue resolution and mitigation and documentation version control.

(vii) A clearly written and well managed procedure defining all of the responsibilities associated with the role of a subcontractor or supplier will not only result in the success of the primary organization and their customer, but it will create a positive relationship with the other company or individual themselves. This procedure must contain the following key components:

(A) A Source/Selection plan which establishes all guidelines beginning with first contact and issuance of initial documentation (e.g. proposed SOW, RFI, etc), continuing through the proposal evaluation and selection criteria, and terminating with the communication of the final choice.

(B) Development of a work plan detailing key organizational reports, negotiation and management schedule, exit strategy details, expected milestones and deliverables.

(3) Other Flight Inspection Organisation

If a service provider has limited recourses, like only one aircraft, or lack of capability to perform all sorts of required procedure tasks, it will make sense to establish a relationship with another such organization to make sure the inspections can be performed at all times without disruption. In such a case, the other organization should be described in the organizational details with adequate responsibility and performance. It is strongly recommended that such an addendum is applied for and approved by the principal, with all roles and responsibilities described, in due time before it may become required to use the additional service.

(4) Calibration Equipment Suppliers

Instruments like Signal Generator need to be calibrated regularly as described by the instrument supplier. The service provider must make sure that all calibration tasks are fully described, like regular calibration intervals of the equipment as well as calibration of the signal sources.

(h) Technical Requirements

(1) Flight Inspection System

(i) Built State

(A) The applicant shall maintain a built state document for the Flight Inspection System (see Note).

(B) The build state document shall include the following major components:

a. Manufacturer

b. Make

c. Model

d. Modification status

(C) The built state document shall also include version numbers of all Software and Firmware.

(D) Details of all uses of Software and Firmware in the measurement system. Also details of Software and Firmware support.

(E) The design authority for all equipment shall be stated.

Note: Doc 8071 Vol I, section 1.12.6 states "The build state of all equipment, including test equipment, should be recorded and the records should be updated whenever modifications or changes are made. All modifications should be accurately documented and cross-referenced to modification strikes or numbers on the equipment. After making any modification, tests and analyses should ensure that the modification fulfils its intended purpose and that it has no undesired side effects".

(ii) Functional Description

Function block diagram and discussion of that diagram.

(iii) Technical Specification

e.g. Data processing, storage capability and HMI.

(iv) System Design

(A) Physical block diagrams and discussion.

(B) Manufacturer's type number for all major items of the flight inspection system.

(v) Firmware and Software Design Description

(A) Where the software or firmware is used within the system.

(B) Process ensuring that the software performs as specified.

(C) Version control.

(D) Algorithms for the measurements being made.

(E) To a level to support the measurement uncertainty. Listing of source code is not required.

(vi) Recording and Graphs

(A) All recordings shall be time synchronised so that they can be correlated with the aircraft's position at the time of the measurement.

(B) If recordings or graphs are used to derive figures for the inspection report, the scales shall be commensurate with the permitted measurement uncertainty limits.

(C) All recordings or graphs shall have sufficient resolution.

(vii) Environmental Conditions

(A) The applicant shall define the environmental conditions (temperature range, humidity range, etc.). Evidence may be in the form of test results made by the operator, or manufacturer's specifications.

(B) If the measuring equipment requires any warm-up or cooling time, this shall be clearly indicated in the operating instructions.

(C) Temperature dependent equipment may need to be fitted in a temperature controlled enclosure to maintain compliance with the performance standard.

(D) An indicator/alarm may need be fitted to inform the operator of any change in temperature that may affect the accuracy of the system.

(E) Consider monitoring of all parameter that influence the measurement uncertainty – provide examples.

(2) Aircraft

(i) Details of the aircraft used for flight inspection (make and type).

(ii) The aircraft with the installed flight inspection system should be airworthy and approved by the airworthiness authorities for the intended operation in the area it operates.

Note: Aircraft type preference should be given to multiengine turbine aircraft, for their reliability and performance. Pressurization and air conditioning should be available as a mean to reduce crew workload, increase safety and keep the FIS equipment within the technical specification. Standard avionics must match the airspace requirements.

(iii) Interference

(A) The navigation aid measuring equipment shall not interfere with the operation or accuracy of the aircraft's normal navigation and general avionics equipment.

(B) The Organisation still needs to ensure that all safety or regulatory requirements associated with the safe operation of the aircraft are met.

(C) The flight inspection measurements shall be adequately protected against the prevailing EMC environment internal or external to the aircraft. Abnormal interference effects shall be clearly identified on the inspection results.

(iv) Propeller Modulation

(A) It shall be shown how propeller modulation can be avoided by suing the following formula;

*Propeller Mod Frequency (Hz) = Shaft Rotation Speed (rpm) * Number of Propeller Blades / 60s*

(v) Independence from aircraft's operational avionics fit

(A) As far as is reasonably possible the flight inspection equipment, including associated aerials should be totally independent from the aircraft's operational avionics fit.

(B) This is to protect both the integrity of the FI results and the operation capability of the aircraft avionics.

(C) If not, show effect on measurement accuracy.

(D) If duplicated FIS navigation aid measuring receivers are used they may use a common aerial.

(E) Location, characteristic and type of all measurement aerials on the aircraft.

(F) Consideration should be made to the aerials being positioned in such a manner that they are not obscured from the signal during any normal inspection flight profile.

Note: To achieve this may require the use of more than one measuring aerial for one particular function.

(G) Aircraft antennas are far from ideal isotropic receptors and the antenna gain will vary with both frequency and received angles (azimuth, elevation and bank).

(H) Antenna characteristics for relevant sectors and frequencies must be compensated manually or automatically by the flight inspection system to obtain necessary accuracy for coverage measurements.

(I) If duplicated navigation aid measuring receivers are used it may be possible to use a common aerial.

(J) ICAO Doc 8071 Vol I, Attachment 1 to Chapter 1 describes recommended requirements for Flight Inspection Aircrafts.

(vi) Policy on Crew, Training and FTL (Flight Time Limitations)

(A) Flight Inspection aircraft shall be employed as multicrew aircraft, with two pilots and a system operator. When a mission requires seating provision for other technical persons on board these should be available for e.g. training or observation.

(B) Training shall be as such that initial and recurrent training and checking syllabi are approved by the Authority and clearly specified in the Operations Manual.

(vii) Policy on aircraft maintenance

Strict adherence to manufacturer and Authority technical requirements are mandatory.

(i) Measurement Uncertainty

(1) The measurement uncertainty for any parameter must be small compared with the operational limits for that parameter.

(2) ICAO Doc 8071 section 4.3.86 includes a description of a 5th of the value being measured.

(3) The measurement uncertainty to 95% probability must be calculated for each of the parameters to be measured. The method of calculation and any assumptions made must be clearly shown. This includes all uncertainty contributions.

(4) Where several measurements are combined to produce a single result, these errors should be added using a statistical model such as the RSS method (the square-root of the sum of the squares.

(5) For measurements which can only be derived from recordings, the accuracy and resolution of the recording equipment shall be included in calculating the expected results.

(6) Details of statistical methods or interpolative techniques which may be applied shall be described.

(7) The flight inspection system shall include equipment which can determine and record the aircraft's position in space relative to the aircraft reference point.

(8) The provider must clearly indicate the measures taken in order to reduce the budget errors in the positioning (e.g. use of DGPS, geodetic database, care in setting up the positioning system on the ground).

(9) The aerials to be used for tracked structure measurements shall be positioned with due regard to the tracking reference on the aircraft. If the aerials and the reference are not in close proximity, this error must be addressed in the measurement uncertainty calculations and in setting the operational crosswind limit. Alternatively, the errors may be corrected using information from attitude and heading sensors to calculate the true position of the aerial's phase centre.

(j) Maintenance

(1) Objective

Maintenance on all involved systems and equipment shall be performed.

(2) Acceptable Means of Compliance

(i) All equipment used in the maintenance and calibration process shall have traceability to national or international standards e.g. ISO standards.

(ii) ICAO Doc 8071 Vol 1 describe requirements for calibration in Chapter 1.12.8 - 1.12.10. This requirements should be fulfilled.

(iii) Procedure for the control of Equipment used for calibrating the Flight Inspection system.

(iv) Procedures for maintenance and calibration of the Flight inspection System:

(A) Interval.

(B) Description of the procedures.

(C) Consider Who, Where, What, When.

(v) The flight inspection receivers of the system shall be calibrated at suitable intervals to maintain the system uncertainty within allowable tolerances between calibrations. The calibration interval recommended by the manufacturer should be monitored and adjusted if required in order to maintain system accuracy under the actual operational conditions.

(vi) The purpose of the calibration is the determination and compensation of non-ideal receiver characteristics for achieving the highest possible accuracy.

(vii) Reference signals from suitable, calibrated signal generator(s) shall be used as reference for the receiver calibration.

(viii) The receiver error shall be determined throughout the required measurement range of the receiver, in numerous steps.

(ix) The connection of the signal generator to the receiver under calibration should preferably be automatically (if technically feasible).

(x) The calibration process shall compensate cable loss during calibration.

(xi) Due to the numerous signal generator settings during the calibration, the signal generator(s) shall preferably be steered automatically by the system.

Note: Incorrect settings of signal generators during calibration can be avoided to the highest extend by automatic control.

(xii) The determined receiver error shall be applied for compensation of receiver output in order to improve the measurement accuracy of the system during flight inspection.

(xiii) The receiver output errors shall be checked against equipment specifications throughout the required measurement range. Automatic warning shall be given if a receiver error is out of specified tolerance.

(xiv) It is recommended to check the resulting performance of the calibrated receivers in the system against independent signal generator(s). This allows detection of errors during the calibration process or detection of a defective signal generator used for calibration.

(xv) The check of the calibrated receiver shall preferably also be automatically throughout the receiver's measurement range.

(xvi) The result of the calibrated receiver check shall be recorded as evidence for the overall system performance.

(xvii) Details of inspections, calibration and checks shall be recorded as evidence.

(k) Operating Instructions

(1) The Exposition should at least include concise details of:

(i) Planning and scheduling process.

(ii) The flight profile to be used for each individual measurement.

(iii) Pre-flight inspection of measuring equipment.

(iv) Siting of any necessary ground tracking or position fixing equipment.

(v) Operation of the measuring equipment.

(vi) Production of the flight inspection report.

(vii) The method of calculating all results in the Flight Inspection Report.

(viii) Pilot operating procedures.

(ix) Cross wind limits - to allow measurement accuracies to be within the limits required.

(x) ATC coordination.

(l) Flight Inspection Report

(1) The minimum information to be provided on the report shall be:

(i) Station name and facility designation.

(ii) Category of operation.

(iii) Date(s) of inspection.

(iv) Serial number of report/Unique Identifier.

(v) Type of inspection, e.g. Routine or Annual.

(vi) Aircraft registration.

(vii) Manufacturer and type of system being inspected.

(viii) Wind conditions. (To allow cross wind to be established).

(ix) Names and functions of all personnel involved in the inspection.

(x) Method of making each measurement (where alternatives are available). These may be referenced to the operating instructions.

(xi) Details of associated attachments (e.g. recordings).

(xii) l) Details of extra flights made necessary by system adjustments.

(xiii) An assessment by the flight crew of the navigational aid's performance. Comment by the Navaid inspector/equipment operator.

(xiv) Details of any immediately notifiable deficiencies.

(xv) Statement of conformance/non-conformance.

(xvi) Signatures of appropriate personnel.

(xvii) Results and tolerance.

(xviii) A confirmation of the status of the inspection should be provided immediately after the inspection.

(m) Retention of Flight Inspection Data

(1) Flight inspection reports and data required to generate flight Inspection Reports shall be retained.

(2) The flight inspection organisation shall have means to reproduce Flight Inspection Reports.

Note: ICAO Doc 8071 Vol I, Attachment 2 to Chapter 1 section 5 states:

Each flight inspection organization is responsible for ensuring that sufficient historical data are retained to legally establish the trends in facility performance over a reasonable interval of time. As a minimum, all commissioning inspection reports and data recordings should be retained in the facility file along with reports and data recordings from the last five periodic inspections. All special flight inspections carried out during this time period should be retained on file.

Practical Demonstration

(a) The Authority reserve the right to observe the flight inspection operation first hand either on board the aircraft or on the ground.

(b) During practical demonstration or flight inspection observation, repeatability of measurement results shall be demonstrated. The variation of results measured by subsequent flights shall be within the measurement uncertainty as stated by the performance analysis. It shall be demonstrated that results are independent from external circumstances e.g.:

(1) - Results independent from normal speed variation

(2) - Independent from direction to fly (CW/CCW or inbound/outbound)

(c) The repeatability should be checked for the most sensitive parameters of the navigation aids under inspection.

Example: Typical parameters for demonstration of repeatability for ILS calibration could be:

- Course alignment accuracy
- Glide path angle
- Displacement sensitivity
- Height of reference datum

Accountable Manager

(a) The Accountable Manager has the overall responsibility to respond to the requirements. He is responsible to establish a Quality System for ensuring that all flight inspection activities are carried out according to the required standards.

(b) In particular, he is responsible for ensuring that adequate contractual arrangements exist. This includes, amongst others, provision of facilities and sufficient competent and qualified personnel in relation to the work to be undertaken.

(c) All of this with a view to ensure that all flight inspection activities are performed on time and in accordance with the applicable requirements, regulations and approved standards, and that all aircrafts have a valid Certificate of Airworthiness for all flights undertaken activities.

Applicable Standards

(a) The flight inspection should comply with the guidance and recommendations given in ICAO Doc 8071 to support the measurement of the parameters in ICAO Annex 10 Volume 1. Alternative methods may be proposed in the exposition as long as it is demonstrated that it meets the specific objective of Doc 8071 or Annex 10.

(b) ICAO DOC 8071 provides tables with flight inspection requirements and tolerances for each type of navigation aid.