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REGIÃO ADMINISTRATIVA ESPECIAL DE MACAU
民航局
AUTORIDADE DE AVIAÇÃO CIVIL
CIVIL AVIATION AUTHORITY

AC
No. : AC/OPS/002R11
Date : 01 Mar 2022

AERONAUTICAL CIRCULAR
CIVIL AVIATION AUTHORITY – MACAO, CHINA

SUBJECT: ***Operations Manual Requirements***

EFFECTIVE DATE:

15 March 2022

CANCELLATION:

AC/OPS/002R10

GENERAL:

The President of Civil Aviation Authority – Macao, China, in exercise of his power under Paragraph 89 of the Air Navigation Regulation of Macao (ANRM) and Article 35 of the Statutes of Civil Aviation Authority, approved by the Decree-Law 10/91/M, established this AC.

1 Introduction

(a) In accordance with paragraph 24 (2) (b) of the ANRM, the operations manual shall contain all such information as may be necessary to enable the operating staff to perform their duties as such including, in particular, information and instructions relating to the matters specified in Part A of Ninth Schedule to ANRM.

(b) An operator shall ensure that the contents of the operations manual, including all amendments or revisions, do not contravene the conditions contained in the Air Operator Certificate (AOC) or any applicable regulations and are acceptable to, or, where applicable, approved by the AACM.

(c) The following items in the operations manual require the approval of the AACM:

- Method of control and supervision of flight operations;
- Procedures for retention of aircraft tracking data;
- Flight time limitation scheme;
- Method of determining aerodrome and landing location operating minima;
- Method of establishing minimum flight altitudes;
- Policies and procedures for in-flight fuel checks and fuel management;
- Minimum Equipment List (MEL);
- Margin of time for the estimated time of use of an aerodrome;

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- Flight crew training programs;
- Cabin crew training programs;
- Flight operations officer/flight dispatcher training programs; and
- Dangerous goods training programs.

(d) An operator must ensure that operations manual, which may be established in separate parts corresponding to specific aspects of operations, is organized with the following structure and the contents of the operations manual are presented in a form in which they can be used without difficulty.

- General
- Aircraft operating information
- Areas, routes and aerodromes
- Training

Where the operations manual is established in separate parts, a master list of all current operations manuals shall be at best presented in the main operations manual, such as General/Flight Operations Manual, as a reference to its operating staff.

(e) An operator must ensure that information taken from approved documents, and any amendment of such approved documentation, is correctly reflected in the operations manual and that the operations manual contains no information contrary to any approved documentation. However, this requirement does not prevent an operator from using more conservative data and procedures.

(f) Each holder of an operations manual, or appropriate parts of it, shall keep it up to date with the amendments or revisions supplied by the operator.

(g) An operator shall amend or revise operations manuals as is necessary to ensure that the information contained therein is kept up to date and shall incorporate all amendments and revisions required by the AACM.

2 Operations Manual Amendments

(a) An operator is required, under ANRM Part V Paragraph 24 (4), to furnish the AACM with a copy of the whole of the operations manuals for the time being in effect together with all amendments and/or revisions, for review and acceptance and, where required, approval.

(b) An operator shall supply AACM with any intended amendments to its operations manual together with,

i. Summary of Changes; and

ii. List of Effective Pages (LEP),

in advance of the intended effective date. AACM considers that “in advance of the intended effective date” should normally be a period of not less than 28 days. This will allow a proper review of the intended amendments to take place and any approvals or acceptance to be issued or amended.

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(c) Intended amendments shall be accompanied by a Summary of Changes. Such Summary of Changes could be presented in the form of a revision summary sheet or by similar means, and shall contain the 'Reference (ie. Part/Section/Paragraph)' and 'Description (and Reason, as applicable)' for each of the changes as a minimum.

(d) The List of Effective Pages (LEP) is used to ensure that every manual contains current and correct information. The LEP shows the revision status of each page. By checking the status of each page, it can be ensured that the information contained therein is up-to-date.

(e) When immediate amendments are required in the interest of safety, they may be published and applied immediately, provided that any approval or acceptance required has been applied for.

(f) Intended amendments shall be highlighted on the relevant operations manual page(s) by a vertical line in the margin or by similar means.

(g) On completion of the review of the intended amendments, AACM will indicate to the operator in writing, that the intended amendment is acceptable and process the issuance of any approval or acceptance as applicable, as a consequence, or the amendment of any existing approval or acceptance held.

(h) AACM are to stop the review process upon finding significant errors in the submitted intended amendments. The operator will be notified of the decision.

Note: Significant errors are considered to be errors with respect to compliance with applicable standards and requirements. Significant errors are not spelling or formatting errors. However, poor organization or presentation of material is a significant error.

3 Operations Manual Requirements

The requirements on those parts of the operations manual to be developed by the operator are laid down in Appendix 1 to this AC. The AACM also establishes the Organization and Contents of an operations manual in Appendix 2 to this AC.

- END -

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Appendix 1

Operations Manual Requirements

1 PURPOSE AND SCOPE OF MANUAL

1.1 The Air Navigation Regulation of Macao (ANRM) requires the operator of every commercial air transport aircraft registered in Macao, with certain minor exceptions, to:

(a) make available an operations manual to each member of his operating staff;

(b) ensure that on each flight every member of the crew has access to a copy of every part of the operations manual which is relevant to his duties on the flight;

(c) ensure that each copy of the operations manual is kept up to date;

(d) provide the Civil Aviation Authority – Macao, China (AACM) with a copy of the operations manual and any amendments or additions to it; and

(e) make such amendments or additions to the manual that the AACM may require for the purpose of ensuring the safety of the aircraft or of persons or property carried in it, or the safety, efficiency or regularity of air navigation

1.2 The operations manual shall contain "all such information and instructions as may be necessary to enable the operating staff to perform their duties". The ANRM defines operating staff as "the servants and agents employed by the operator, whether or not as members of the crew of the aircraft, to ensure that the flights of the aircraft are conducted in a safe manner and includes an operator who himself performs these functions".

1.3 The form and scope of manuals will vary considerably with the nature and complexity of the operator's organization and types of aircraft in use. A "manual" may comprise a number of separate volumes and may well include individual forms, such as prepared navigation flight plans supplied by the operator to his crew. Instructions and information to particular groups of operating staff – e.g. traffic manuals, cabin crew manuals, crew rostering instructions and information on weight and balance supplied to handling agents - can all be regarded as part of the operations manual. Applicants will be required to lodge copies of their manuals and associated documents with the AACM together with copies of all amendments and temporary instructions. An exception is made in the case of the route guide (see paragraph 14).

1.4 A list of particular matters to be covered in the operations manual is prescribed in the ANRM. The purpose of this appendix is to give some indication of the manner in which the requirements relating to the operation of aircraft should be met. The Flight Manual forms part of the aircraft's Certificate of Airworthiness (C of A) and is therefore one of the documents which must be carried on the aircraft. Exceptionally Flight Manual information may be incorporated into the operations manual, and provided written permission is obtained from the AACM, the Flight Manual need not be carried. In either case, the operator is responsible for ensuring that all such information is kept up-to-date on a regular basis. It is not sufficient for operators to rely solely upon the C of A renewal process to highlight deviations from the Flight Manual.

1.5 The operations manual will be regarded by the AACM as a primary indication of the standards likely to be achieved by an operator. The operation of commercial aircraft is a highly complex matter requiring clearly defined standards and procedures. The form and scope of a manual will vary with the size of the undertaking but the basic principles remain the same.

1.6 Great importance will also be attached to the suitability of manuals for regular use by the operating staff and, in particular, by crews in flight. For all but the simplest of operations, the division of the manual into a number of separate volumes or parts will be essential. Manuals may be divided in such a way that essential information is immediately available on the flight deck; extracts or "digests" of information and instructions may sometimes be necessary to supplement drill cards and checks lists.

1.7 Each copy of a manual should normally bear a serial number and a list of holders should be maintained by the person responsible for issuing amendments. Where this system is not used, an operator should have satisfactory alternative arrangements for controlling the issue and amendment of manuals. Each volume of a manual should be numbered and bear a title and list of contents, giving a clear indication of its scope. The title of the person or department responsible for the issue of the manual should also be indicated. At the front of each volume there should be an amendment page to indicate amendment number, date of incorporation, signature or initials of the person amending. Amended pages should be dated. The numbering of pages, sections, paragraphs etc. should be orderly and systematic to facilitate immediate identification of any part of the subject matter. The standard of printing, duplication, binding, section dividers, indexing of sections etc. should be sufficient to enable the document to be read without difficulty and to ensure that it remains intact and legible during normal use.

1.8 The amendment of a manual in manuscript will not be acceptable. Changes or additions, however slight, must be incorporated by the issue of a fresh or additional page on which the amendment material is clearly indicated. It is therefore recommended that items likely to be subject of frequent change are shown on pages that do not include more permanent text. Amendments to operations manuals must not conflict with instructions in the aircraft Flight Manual.

1.9 It is most important for operators to appreciate that it is their responsibility under the relevant statutory provisions to provide adequate instructions and accurate information to their operating staff. Inspectors will check manuals lodged with the AACM and will suggest amendments, where they appear to be necessary. The primary purpose of these checks will be to verify the adequacy of the operator's systems and procedures for keeping instructions and information under review and for issuing timely amendments, as necessary. There can be no question of the AACM assuming responsibility for the detailed information provided in manuals. This responsibility rests with the operator who should designate a suitably qualified person to see that it is properly discharged.

NOTE: For the purposes of the remainder of this Appendix it is assumed that readers are aware of the provisions of the ANRM and associated regulations currently in force in respect of operations manuals and their contents.

1.10 Operations manuals and other standing instructions must be supplemented by a systematic procedure for bringing urgent or purely temporary information to the notice of operating staff. This can be achieved by a numbered series of instructions or notices issued by or under the direct authority of a senior operations official. When amendment must be made without undue delay and periodical check lists issued to show which of the temporary instruction are current. These instructions bring significant Aeronautical Information Circulars (AICs), Aeronautical Circulars (ACs), NOTAMS, Aerodrome Information Publications (AIPs) and Aerodrome Information Regulation and control (AIRAC), and changes in Aerodrome Operating Minima, for example, to the attention of operating staff.

1.11 The operations manuals shall include:

(a) A statement that the operations manuals comply with applicable regulations and the conditions contained in the Air Operator Certificate (AOC) and associated Operations Specifications;

(b) A list of a summarized description of the different parts of the manuals, their contents, applicability and utilization;

(c) A statement that operations manuals contain operating instructions which must be followed by all operating staff;

(d) A registration sheet for amendments and revisions, including dates of registration;

(e) A list of effective pages and their effective dates;

(f) A system for recording temporary revisions; and

(g) A description of the distribution system for the manuals, amendments and revisions.

1.12 The operations manuals shall be established in the flight safety documents system principle which is a set of inter-related documentation compiling and organizing information necessary for flight and ground operations, and comprising, as a minimum, the operations manuals and the operator's maintenance control manual.

NOTE: Guidance on the development and organization of a flight safety documents system is contained in Macao Aeronautical Circular – AC/OPS/003 – "Flight Safety Documents System".

1A ORGANIZATIONAL STRUCTURE

1A.1 The operations manual is the means to define the organizational structure of the operator and individual duties and responsibilities.

1A.2 Operators shall pursue the regulatory requirements set forth in Aeronautical Circular *AC/OPS/026 – Organization and Post-Holders Requirements.*

1B OPERATIONAL CONTROL AND SUPERVISION

1B.1 Operators shall include in their operations manual the method of control and supervision of flight operations.

Note: Requirements on operational control are contained in Aeronautical Circular *AC/OPS/027 – "Operational Control Requirements"*.

2 CREW TO BE CARRIED

2.1 Generally only the minimum flight crew required by paragraph 18 of ANRM for commercial air transport flights, need be specified for each type of aircraft. The minimum flight crew for commercial air transport will not necessarily be the same as the minimum flight crew specified in the aircraft's Certificate of Airworthiness (Flight Manual). In some cases the operator will need to consider whether a particular circumstance of the operation, for example long range flights, calls for the carriage of additional crew. It is a statutory requirement that an aircraft shall have a flight crew "adequate in number and description" to ensure the safety of the flight.

2.2 The ANRM specifies areas of the world through which aircraft engaged on a flight for the purpose of commercial air transport shall carry a flight navigator as a member of the flight crew or navigation equipment specifically approved for the purpose by the AACM. An operator wishing to operate through airspace prescribed in the ANRM for the purpose of Minimum Navigation Performance will required to obtain approval of the proposed navigation systems and procedures to be used.

3 RESPONSIBILITIES OF AIRCRAFT CREW AND OTHER OPERATING STAFF

3.1 In this context the term "operating staff", as distinct from the crew, means staff having specific duties, in relation to particular flights, which fall within the general pre-flight and in-flight responsibility of the aircraft commander. The manual should therefore define, where appropriate, the duties and responsibilities of people employed as:

(h) Flight dispatchers/flight operations officers;

(i) Flight planning assistants who prepare navigation flight plans and flight briefs, compute fuel requirements, Regulated Take-Off Weights (RTOWs) and aerodrome operating minima;

(j) Rostering and scheduling staff; and

(k) Traffic officers or "loadmasters" responsible for calculating maximum payload and/or fuel uplifts or for supervising the loading of aircraft and completing load/trim sheets.

3.1.1 It is important in this connection that operating staff should be made fully aware of the over-riding responsibility and the ultimate authority of the aircraft commander. Manuals must state that in order to secure the safety of a particular flight the commander is authorized to apply greater safety margins e.g. aerodrome operating minima, fuel reserves and terrain clearance standards than those specified by the operator for normal operations.

3.2 In defining the duties of members of the crew, the operator should include instructions on:

(a) pre-departure briefings of flight crew and cabin crews;

(b) carriage of current documents (or copies thereof) such as Certificate of Registration, Certificate of Airworthiness, Load sheet, Technical Log, Noise Certificate, Aircraft Radio License, Third Party Liability Insurance Certificate(s) and valid flight crew licenses on each flight;

(c) the pilot-in-command's responsibility for the safety of all crew members, passengers and cargo on board when the doors are closed. The pilot-in-command shall also be responsible for the operation and safety of the aircraft from the moment the aircraft is ready to move for the purpose of taking 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;

(d) the briefing of passengers on emergency exits, procedures and equipment (including safety belts, harnesses and, where appropriate, life-jackets, automatic drop-out oxygen equipment and floor path lighting systems), restrictions on smoking and on the use of electronic equipment;

(e) the responsibility, in the absence of competent ground engineering staff, for supervising refueling and ensuring that filler caps, refueling valves, freight hold doors and other aircraft panels are secure;

(f) the responsibility for ensuring the correct completion of the technical log, before and after flight, where the flight crew are required to carry out day to day servicing of the aircraft, any pre-flight maintenance checks, ground de-icing or other special pre-flight servicing;

(g) the responsibility, in the absence of competent traffic staff, for supervising the loading of the aircraft;

(h) the duties of special personnel e.g. animal attendants;

(i) the responsibility for taking precautions for the safety of passengers, when they are permitted to embark, disembark or to remain on board during fuelling operations;

(j) the responsibility, when an Auxiliary Power Unit (APU) is ground running and passengers are on board the aircraft or are in the process of embarking or disembarking, for ensuring that there are satisfactory arrangements for cabin crews to be warned immediately of any APU or other emergency condition which might require the rapid evacuation of passengers from the aircraft;

(k) limitations on the extent to which pilots, flight engineers and cabin crews may be allowed to operate on more than one aircraft type or variant.

(l) except where the flight crew is limited to one or two pilots, brief instructions should be included as to the order and circumstances in which command is to be assumed by members of the flight crew.

3.3 Crew members must not be under the influence of alcohol, drugs or medication during flying duty periods. Operators are to issue instructions to crews as to their personal responsibilities. They should include clear guidance on abstention from alcoholic drinks for a suitable period prior to duty. The minimum acceptable period will be eight hours but may need to be longer depending upon the amount of alcohol consumed. Aircraft crews should also be advised of the precautions to be taken if they are taking medication.

3.4 Special consideration must be given to instructions on the allocation of duties between members of the flight crew at pre-flight and throughout all stages of flight. Operators are required to specify such procedures in detail in the form of Standards Operating Procedures (SOP), with particular reference to the division of duties during take-off and in the execution of an instrument approach procedure and missed approach procedure.

3.5 The procedure for an instrument approach in IMC should relieve the commander of as much work-load as possible, and through a proper division of duties and monitoring functions, provide adequate safeguards against errors or omissions. The difficulty of transition from instruments in poor visibility should be taken fully into account, together with the need for a clear and systematic procedure for initiating a missed approach if there is any doubt about the advisability of continuing the approach by visual reference to the ground.

4 FLIGHT DUTY AND REST PERIOD LIMITATIONS

4.1 Operators must satisfy the statutory provisions prescribed in the ANRM and the requirements contained in Macao Aeronautical Circular - AC/OPS/013 – “Avoidance of Fatigue in Aircrews".

4.2 In accordance with the statutory provisions, operators' schemes for the prevention of fatigue of all crew must be approved by the AACM and incorporated in the operations manual. Any amendment to the operations manual in this connection must be approved by the AACM in advance. Applications for approval, amendment or variation of schemes should also be addressed to the AACM.

4.3 Instructions, issued for the guidance of rostering, planning or scheduling staff must be compatible with the provisions of the scheme and a copy must be lodged with the AACM.

4.4 Provision is made in AC/OPS/013 for aircraft commanders to exercise discretion to extend a flying duty period or reduce a rest period. Copies of reports by commanders on the exercise of discretion, whether or not required to be submitted to the AACM, must be retained by the operator for a period of six months. Reports should contain at least all of the items specified in AC/OPS/013.

4.5 The ANRM requires operators to include in their schemes, provisions to prevent fatigue of any crew members carried in addition to flight or cabin crew. Should their duties have a direct bearing on flight safety, e.g. if the operator or aircraft commander assigns duties in the interests of passenger safety, similar provisions to those applied to cabin crew must be included.

4.6 Operators may from time to time apply for a variation to the requirements of their approved scheme. Such variations may be either for a 'one-off voyage or for a series of flights. Any such application must include a detailed justification for the variation and all relevant supporting documents should be attached. Approved variations must be published in the operations manual and indicate expiry dates if applicable. Those of very limited duration may be published as crew notices or in a commander's brief.

4.7 Flight time limitations contained in AC/OPS/013 are intended to apply to all crew members; however, in the event of unavoidable operational contingencies on the day, those crewmembers with regulatory responsibilities must be protected.

4.8 Operators should remind all crew members that it is their responsibility to make optimum use of the facilities for rest provided by the operator at outstations, and to plan their rest periods so as to minimize the risk of sleep deficit and cumulative fatigue.

4.9 It must be further brought to their attention that in accordance with the provisions of the ANRM it is the responsibility of each crew member not to fly if he is suffering or is likely during flight to suffer from such fatigue as may endanger the safety of the aircraft and its occupants. It should be made clear that the provisions of the ANRM are not intended to cover instances where normal tiredness resulting from the physical and mental effort of a flight is likely.

4.10 Operators should draw to the attention of flight crew that, in accordance with the provisions of the ANRM, it is the responsibility of each flight crew member to notify anyone who employs his services as a flight crew member, of all flying he has undertaken within the previous 28 days, other than flying in an aircraft not exceeding 1600 kg maximum weight and not flying for the purpose of commercial air transport or aerial work.

4.11 Responsibility within an operator's organization for issuing instructions and making decisions on questions of flight duty and rest periods and for processing discretion reports must be clearly defined and assigned to a member of the management staff. The name of the person concerned or the job title must be included in the operations manual.

4.12 Operators are required to maintain and provide readily interpreted records for each aircraft crew member. It follows that suitable arrangements must exist for collecting the information necessary to compile the records. Accurate records are essential to persons responsible for the rostering of aircraft crews. These records should meet the requirements of AC/OPS/013.

5 AIRCRAFT TECHNICAL PARTICULARS, PERFORMANCE AND OPERATING PROCEDURES

5.1 Technical Particulars of the Aircraft

In meeting the requirement to provide these, operators should take care to distinguish between specific information to be used in the course of flight operations and the more general basic information that a pilot might need to prepare for a type rating examination. If detailed descriptive matter is included as part of the manual, it should be in a separate volume. Information on the following matters, in particular, should be provided, as appropriate, in a form suitable for use as an immediate reference in day-to-day operations:

(a) action to be taken in the event of a system malfunction that cannot be covered by an emergency check list. Information should be provided about the effect on essential systems and services of serious faults. Information to be provided will vary with the type of aircraft and, together with the emergency drills, it should be in a readily identifiable section of the manual e.g. on distinctively colored pages;

(b) operational guidance given on the actions required in the event of the failure of generated electrical power sources should include the capabilities and expected duration of the emergency or standby power sources, and advice on the effect that a failed attempt to start the APU will have on battery capability, if applicable. The operations manual should specify at what stage an aircraft should be diverted to an alternate aerodrome following a failure or combination of failures in the electrical system;

(c) procedure for pre-departure inspection, as required by the approved maintenance schedule, including a check of the fuel system for water contamination where this is required to be carried out by the crew;

(d) replenishment of the aircraft's fuel, oil, hydraulic fluid, de-icing fluid, dematerialized water and water methanol supplies to an approved specification. In the case of a helicopter, a maximum rotor running time must be specified, after which the helicopter must be shut down to enable engine and gear box oil level checks to be carried out. In the case of a rotors-running-refuel, a water contamination check should be made prior to the fuel uplift;

(e) supervising refueling and the topping up of tires, oleos, de-icing and hydraulic systems, including oxygen and air reservoirs. The refueling information must include any specific precautions called for by:

(i) the use of wide cut fuels;

(ii) the ‘off aerodrome’ situation where either a fuelling vehicle or a barreled supply is used; and

(iii) quality control which may, in appropriate circumstances, call for the flight crew to view the day's test fuel sample record or witness the sample test themselves.

(f) calculation of significant airspeeds and Mach numbers, reduced thrust and trim settings;

(g) manufacturer's and operator's limitations that affect the handling of engines and pressurization systems;

(h) compliance with any special handling instructions; and

(i) procedures to be observed in the event of lightning-strike, bird-strike, heavy landing, ACAS, GPWS, windshear alerts and warning etc.

5.2 Performance

5.2.1 Operators shall establish procedures to ensure that the Flight Manual is updated by implementing changes made mandatory by the AACM.

5.2.2 Flight Manual for each individual aircraft registered in Macao shall be approved by the AACM and the amendments thereto shall be controlled in accordance with the requirement set out in the Airworthiness Procedure AP15 – "Approval of Flight Manual".

5.2.3 Operators must provide commanders with simplified performance information from which they can readily determine, without reference to a Flight Manual or performance schedule, the maximum weights for take-off and landing on all flights. The maximum weight referred to is that derived from the statutory weight and performance requirements or limitations, such as zero fuel weight. In many cases, on regular or scheduled operations, it is only necessary to indicate that there is no restriction imposed by performance requirements; in others, it may be necessary to indicate which of the requirements is critical and to provide a tabular or other clear presentation of limiting weights in varying conditions of wind and/or temperature. There will also be instances where it is both practicable and desirable for the operator to indicate any special flight procedures, such as minimum height for setting course in IMC or an emergency turn after take-off in the event of engine failure, essential to secure compliance with the performance requirements. Where applicable, clear instructions must be given for the calculation and selection of reduced thrust for take-off when specifically permitted by the Flight Manual.

NOTE: As Standard Instrument Departure (SID) routes do not guarantee adequate terrain clearance for all aircraft in the engine out case, the operator must check that the performance requirements are met for all SIDs used by company aircraft. Similarly any emergency turn after take-off on to routes contained in the aircraft's operations manual and approved for use by the local air traffic control, must also have been checked for compliance with the performance requirements.

5.3 Operating Procedures

5.3.1 *Ground maneuvering in low visibility.* Procedures should cover the following:

(a) a means to ensure that cockpit procedures do not conflict with the necessity to maintain increased vigilance;

(b) increased emphasis on the importance of ensuring that the correct taxiway or runway is being used and of complying with Air Traffic Control (ATC) procedures. Full use should be made of ATC and visual aids;

(c) an appreciation that there may be differences in runway/ taxiway lighting and guidance systems between aerodromes in different regions and countries;

(d) the necessity to use standard and unambiguous Radio Telephony (RT) Transmissions and to verify instructions or clearances, whenever there is any doubt;

(e) the necessity to maintain increased vigilance in monitoring RT transmissions in order to determine the position of other traffic on the aerodrome;

(f) guidance on how to make the maximum use of aircraft lighting in order to be visible to others; and

(g) a reminder about the need for general awareness and the use of all flight deck resources.

5.3.2 *Operation on slippery runways.* Particular emphasis should be placed on handling techniques, crosswind limitations and any prohibition on movement, when the reported braking action is degraded below specified values.

5.3.3 *Take-off and landing on runways affected by snow, slush or water.* This section should explain how each of these contaminants may affect aircraft performance, especially acceleration and retardation, and should address the operation of engines, systems and lifting surfaces.

5.3.4 *Runway overrun.* The ability to stop effectively either during a rejected take-off or during a landing run as a result of runway contamination, crosswind, asymmetric considerations, tire temperature or not using the full braking capacity of the aeroplane will be enhanced by both pilots sharing the workload.

5.3.5 *Increased Distance.* Methods of calculating increased distances inherent in operating from both wet and dry grass, where relevant.

5.3.6 *Minimum Equipment.* Allowances to be made for the effect of unserviceable devices e.g. flaps, reversers, spoilers or other equipment allowed in the Minimum Equipment List (MEL).

5.3.7 *Crosswind limits for take-off and landing.* It is not sufficient to repeat a statement in a flight manual that a particular crosswind component has been found to be acceptable; operators' limitations should be stated in unequivocal terms and account taken of the effect of gusts and surface conditions. Limits in excess of any figure mentioned in the flight manual will not be acceptable. Lower limits must be set to take account of contaminated runways or degraded handling characteristics due to system or engine failure.

5.3.8 *Windshear.* Operators must be aware of the extremely hazardous and insidious nature of severe low level windshear resulting from various meteorological situations. Operators are to ensure that their operations and training manuals contain adequate instructions and guidance regarding severe low level windshear, with emphasis on avoidance of these conditions during take-off and landing.

5.3.9 *Wake Turbulence.* Information on spacing standards required to avoid wake turbulence at take-off and landing.

5.3.10 *Snow Banks.* Minimum strip width required after the clearance of snow, together with the maximum height allowed of associated snow banks.

5.3.11 *Ground Maneuvering.* Maximum permissible wind velocities for taxiing as well as take-off and landing,

5.3.12 *En-route Engine Failure.* Procedures to be followed on specific routes after failure of an engine, if the aircraft's stabilizing altitude is likely to be critical in terms of Minimum Safe Altitude (MSA):

(a) Operators should be aware of the routes on which the en-route performance of their aircraft, following the failure of one or two engines, will be critical and should include instructions, relating to such routes, in their operations manuals in order to reduce the risks which could arise from indecision or error in the case of engine failure.

(b) In the case of critical routes it may, in some cases, be possible to regulate the aircraft's planned take-off weight to such an extent that its drift-down performance following engine failure (in

the case of a turbine-engined aircraft from a height not exceeding the maximum re-light altitude) will enable it to clear all obstacles on its route by the required margin regardless of the point at which the failure occurs. In other cases it may be necessary to calculate a critical point, or a number of critical points, which would determine the action to be taken in the event of engine failure at any given position i.e. turn back, continue along the planned route or divert along an alternative route.

(c) Instructions should take into account the accuracy of navigation which may be expected of the flight crew in view of the crew complement and the aids available. Account should also be taken of the effect of varying meteorological conditions. Assumed winds and temperatures used in the calculation of the critical point(s) must be indicated because, if forecast or actual conditions differ from those used at the planning stage, the commander may need to amend the drift-down procedure.

5.3.13 *Noise Abatement.* Noise abatement regulations frequently require special handling techniques and routeings after take-off. The flight manuals of the more recently certificated aircraft contain performance data related to noise abatement procedures. Details of the procedures for each airfield or runway used by the operator, for which noise abatement regulations exist, should be provided in the operations manual. Instructions to ignore noise abatement procedures in emergency situations should also be included. Where, in exceptional circumstances, it may be appropriate in the course of noise abatement procedures to start a turn at less than 500 feet above ground level (AGL), pilots should be given suitable instructions about restricting the angle of bank. Pilots should also be instructed not to reduce thrust below 500 feet AGL or to an extent that would result in a gross gradient of climb of less than 4%.

5.3.14 *Ground Proximity Warning Systems (GPWS).* Operators must provide guidance in their operations manuals on the operation of aircraft that are required to carry GPWS or GPWS which has a forward looking terrain avoidance function. Flight crew should be reminded that they must respond immediately to all alerts and warnings. A check of configuration as well as correct flight path should be made, since the GPWS might be quite correctly warning of an abnormal or unsafe landing configuration.

5.3.15 *Simulated Emergencies.* A statement must be made that simulated instrument flight and the simulation of emergency situations which might affect the flight characteristics of the aircraft or otherwise degrade safety standards e.g. by affecting performance, are prohibited on passenger carrying flights.

5.3.16 *Multi-type Operation.* Where relevant, the policy in use for the crewing of aircraft, where more than one type or variant of aircraft is used must be stated. Pilots must not operate aircraft with significant differences in flight deck instrumentation, except by agreement with the AACM.

5.3.17 *Co-pilots.* Detailed instructions should be included as to the circumstances in which co-pilots may be permitted to fly the aircraft e.g. lower cross-wind limits, higher operating minima.

5.3.18 *Winter operation.* A flight planned or expected to operate in suspected or known ground icing conditions shall not take off unless the aircraft has been inspected for icing and, if necessary, has been given appropriate de/anti-icing. Instructions should include:

(a) guidance on the completion of airframe ground de-icing/anti-icing, where this is required to be carried out or supervised by the flight crew, including fluid temperature and concentration and the likely duration of the de-icing effect in typical ambient temperatures (hold-over times);

(b) drills conforming to the flight manual and manufacturers' manual;

(c) operation of aircraft de-icing and anti-icing equipment.

5.3.19 *ACAS.* Procedures to be observed in response to ACAS advisories and alerts.

5.3.20 Stabilized Approach. A stabilized approach is one of the key features of safe approaches and landings involving transport category aircraft. Operators are to include in their operations manual the minimum Height Above the Threshold (HAT) acceptable for a stabilized approach. At the minimum HAT published, the flight must be stabilized and all briefings and checklists completed. In all meteorological conditions, except special cases (i.e. circling and some engine inoperative approaches etc.), the minimum HAT for a stabilized approach is to be no lower than 1000' HAT.

5.3.21 *Jettisoning fuel.* Procedures and precautions to be observed in order to jettison fuel.

5.3.22 *Rotors turning under power.* A helicopter rotor shall not be turned under its own power unless there is a qualified pilot at the controls.

5.3.23 *Refuelling of helicopters.* Operator shall establish procedures and specify conditions under which refuelling with passengers on board may be carried out. The operator shall ensure that:

(a) A helicopter shall not be refuelled with AVGAS (aviation gasoline) or wide-cut type fuel or a mixture of these types of fuel, when passengers are on board.

(b) When the helicopter is refuelled with passengers on board, rotors stopped or turning, it shall be properly attended by sufficient qualified personnel, ready to initiate and direct an evacuation of the helicopter by the most practical, safe and expeditious means available. The flight crew shall ensure that the passengers are briefed on what actions to take if an incident occurs during refuelling. A constant two-way communication shall be maintained by the helicopter's inter-communication system or other suitable means between the ground crew supervising the refuelling and the qualified personnel on board the helicopter. During an emergency shut down procedure, the flight crew shall ensure that any personnel or passengers outside the helicopter are clear of the rotor area.

(c) In addition to the requirements of sub-paragraphs (a) and (b) above, the operational procedures shall specify that at least the following precautions are taken:

(i) doors on the refuelling side of the helicopter remain closed where possible, unless these are the only suitable exits;

(ii) doors on the non-refuelling side of the helicopter remain open, weather permitting, unless otherwise specified by the Helicopter Flight Manual;

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

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

(v) the ground or deck area beneath the exits intended for emergency evacuation be kept clear;

(vi) seat belts shall be unfastened to facilitate rapid egress; and

(vii) with rotors turning, only ongoing passengers shall remain on board.

6 PROVISION AND USE OF OXYGEN AND ASSOCIATED EQUIPMENT

6.1 The statutory requirements regarding the carriage of oxygen and oxygen equipment are laid down in Fifth Schedule to the ANRM. The requirements are complex, and therefore clear information and instructions must be included in the operations manual to enable a commander to verify that the minimum acceptable oxygen quantity or pressures and associated equipment is carried. Guidance must also be given on the use of the equipment.

6.2 The instructions should include the procedures and routes to be adopted, when necessary, to ensure that a safe operating altitude can be quickly achieved. Due account should be taken of such variables as the amount of oxygen available and the time likely to be spent at an intermediate altitude at which the use of oxygen will be required.

6.3 If oxygen is not carried or if an aircraft is not correctly equipped, either temporarily or permanently, instructions on restricting operating altitudes and/or routes must be included.

7 MINIMUM EQUIPMENT LISTS

7.1 Operators may not operate aircraft with unserviceable equipment, except under the terms of an Exemption from the relevant paragraphs of the ANRM granted by the AACM. Such exemption will be granted only after the content of the proposed Minimum Equipment List (MEL) has been vetted and found acceptable by the AACM. Operators shall prepare their MELs in accordance with Part F of Ninth Schedule to ANRM.

7.2 The introduction to any MEL must contain a statement reminding the aircraft commander of his responsibility to ensure that the aircraft is in every way fit for the intended flight, and that he may apply a higher minimum standard if, in his opinion, it is necessary to do so in order to secure the safe operation of the aircraft.

7.3 MELs must be submitted to the AACM at the time of an application for an AOC or a variation which covers the introduction of a new aircraft type, as should instructions and guidance to commanders on the operation of aircraft with deferred defects. The content of operators' MELs may not be less restrictive than that of the associated Master Minimum Equipment List (MMEL). Should an MMEL become more restrictive due to amendment action, operators must amend their MELs similarly.

7.4 When the carriage of unserviceable equipment results in a deviation from the normal drills, satisfactory alternative drills must be specified in the manual. For example, when thrust reversers are listed as minimum equipment, the operator must publish alternative drills.

8 FUEL PLANNING AND MANAGEMENT – AEROPLANES

8.1 Basic Principles

8.1.1 The total amounts of fuel and oil carried on board an aeroplane must be sufficient for the intended flight and must include a safe margin for contingencies. The manner in which the amounts should be calculated and the records that should be made before, during and after flight must all be specified.

8.1.2 General considerations for calculating and recording fuel and oil requirements and usage are listed below. Instructions, similar to those given for fuel planning, should be specified for calculating the amount of oil needed to lubricate the engine(s) and associated systems, and for recording before, during and after flight, as appropriate, the quantities on board.

8.1.3 Operators must ensure that their fuel planning policy allows for the carriage of additional fuel, wherever it is known or suspected that there may be excessive landing delays due to traffic or Air Traffic Control (ATC) problems at destination or diversion airfields. Furthermore, operating flight crews should be reminded that vigilance and early decision-making is necessary in exercising fuel management in order to ensure that the contingency, alternate and holding fuel allowances are not eroded to such an extent that operational safety is compromised.

8.1.4 There should be instructions and guidance on the effect on fuel consumption of engine or system failure. This could be a significant factor on long ocean or desert crossings, or where no suitable En-Route Alternates (ERAs) are available.

8.2 Basic Planning Tables

Fuel planning tables should be provided for all aeroplanes, except light single engine types. The tables must take account of aeroplane weight, outside air temperature and altitude and, where possible, head or tail wind components. Where tables are not provided, clear statements of the hourly rates of consumption must be made. All circumstances of flight that can reasonably be foreseen should be specified, including climb, cruise, descent, holding and abnormal configurations.

8.3 Planning Considerations

8.3.1 The following items should be included in the fuel planning process. The items may be combined but constituent parts of combinations should be fully described:

(a) Taxi fuel;

(b) Trip fuel;

(c) Contingency fuel;

(d) Destination alternate fuel, if a destination alternate is required;

(e) Final reserve fuel;

(f) Additional fuel, if required by the type of operation; and

(g) Discretionary fuel, if required by the pilot-in-command.

8.3.2 Where analysis of fuel records shows a deterioration in performance of a particular aircraft compared to that predicted in the manufacturer's fuel flow tables, a percentage correction should be established and applied to sector fuel calculations.

8.4 Monitoring Fuel on Board

8.4.1 There must be instructions for ascertaining before departure that the amount of fuel on board meets the commander's requirements. There must also be procedures for ensuring that, if in flight the amount of fuel calculated to remain overhead the aerodrome of intended landing is likely to become less than any minimum quantity specified, this fact becomes apparent at an early stage.

8.4.2 Before signing the technical log record page, the commander must satisfy himself that the correct type and quantity of fuel is on board and that it has been loaded in accordance with any instructions that may have been given. Units of weight or volume shown on the sector record page must be the same as those on fuel gauges visible to the pilot. Exceptionally, where there is

a difference between the units on the fuel gauges and those on the sector record page, use of conversion tables may be approved. To have loadsheet fuel recorded in kilograms, uplifts in liters and aircraft gauges calibrated in pounds is to be avoided. Operators should provide all flight crews with simple fuel conversion charts/tables to reduce the likelihood of errors.

8.4.3 Instructions must be given on the frequency of fuel checks, the recording of information and the application of that information. In-flight checks should be carried out at least once on every sector and at intervals not exceeding 60 minutes on flights longer than 90 minutes. A calculation to determine the amount of fuel remaining and to predict the amount of fuel expected to remain overhead the aerodrome of intended landing should follow every check.

8.5 Fuel Alternates

8.5.1 An aerodrome suitable in all respects for use as an alternate, if a landing cannot be made at the intended destination, must be identified on both the pilot navigation log (plog) and on the ATC flight plan.

8.5.2 When the planned alternate aerodrome is in the same busy area as the destination, for instance Hong Kong and Macao, the track miles on which the fuel requirement for flying to the alternate is calculated should be realistically assessed taking account of the extended routing which can reasonably be expected during busy periods.

8.6 Minimum Fuel

8.6.1 Under ICAO terminology, 'minimum fuel' describes a situation in which an aircraft's fuel supply has reached a state where all planned aerodrome or landing location options have been reduced to a specific aerodrome or landing location of intended landing and any change to existing clearance may result in landing with less than planned final reserve fuel. This is not an emergency situation but an indication that an emergency situation is possible should any additional delay occur. The pilot-in-command of the aircraft shall advise Air Traffic Control of a minimum fuel state by declaring MINIMUM FUEL when, having committed to land at a specific aerodrome or landing location, the pilot calculates that any change to the existing clearance to that aerodrome or landing location, or other air traffic delays, may result in landing with less than the planned final reserve fuel.

8.6.2 *Minimum Fuel.* For operations under a Macao AOC, the minimum fuel is the planned final reserve fuel refers to the value calculated in sub-paragraph 8.8.3 (e) for aeroplane and sub-paragraph 9.6 (e) for helicopter and is the minimum amount of fuel required upon landing at any aerodrome or landing location. The pilot-in-command of the aircraft shall declare a situation of fuel emergency by broadcasting MAYDAY MAYDAY MAYDAY FUEL, when the calculated usable fuel predicted to be available upon landing at the nearest aerodrome or landing location, where a safe landing can be made is less than the planned final reserve fuel.

8.7 ETOPS

Operations manuals should, if applicable, specify fuel planning requirements and procedures for flights operated under Extended Range Twin Operations (ETOPS) rules.

8.8 Fuel Planning - Specific Requirements

8.8.1 At the planning stage the quantity of fuel required to be on board before the aeroplane departs should be calculated and recorded. Only those procedures that are specified in operations manuals may be used.

8.8.2 In establishing fuel policy for the purpose of flight planning and in-flight re-planning, the amount of usable fuel to be carried shall, as a minimum, be based on:

(a) the following data:

(i) current aeroplane-specific data derived from a fuel consumption monitoring system, if available; or

(ii) if current aeroplane-specific data are not available, data provided by the aeroplane manufacturer;

(b) the procedure contained in or derived from the Operations Manual; and

(c) the operating conditions for the planned flight including:

(i) anticipated aeroplane mass;

(ii) Notices to Airmen;

(iii) current meteorological reports or a combination of current reports and forecasts;

(iv) air traffic services procedures, restrictions and anticipated delays; and

(v) the effects of deferred maintenance items and/or configuration deviations.

8.8.3 The usable fuel to be on board for departure shall be the sum of the following:

(a) Taxi fuel, which shall be the amount of fuel expected to be consumed before take-off, taking into account local conditions at the departure aerodrome and auxiliary power unit (APU) fuel consumption;

(b) Trip fuel, which shall be the amount of fuel required to enable the aeroplane to fly from take-off or the point of in-flight re-planning until landing at the destination aerodrome taking into account the operating conditions of sub-paragraph 8.8.2 (c) above;

(c) Contingency fuel, which shall be the amount of fuel required to compensate for unforeseen factors. It shall be 5 % of the planned trip fuel or of the fuel required from the point of in-flight re-planning based on the consumption rate used to plan the trip fuel but in any case shall not be lower than the amount required to fly for five minutes at holding speed at 450 m (1 500 ft) above the destination aerodrome in standard conditions;

Note: Unforeseen factors are those which could have an influence on the fuel consumption to the destination aerodrome, such as deviations of an individual aeroplane from the expected fuel consumption data, deviations from forecast meteorological conditions, extended delays and deviations from planned routings and/or cruising levels.

(d) Destination alternate fuel, which shall be:

(i) where a destination alternate aerodrome is required, the amount of fuel required to enable the aeroplane to:

(A) perform a missed approach at the destination aerodrome;
(B) climb to the expected cruising altitude;
(C) fly the expected routing;
(D) descend to the point where the expected approach is initiated; and
(E) conduct the approach and landing at the destination alternate aerodrome; or

(ii) where two destination alternate aerodromes are required, the amount of fuel, as calculated in sub-paragraph (d)(i) above, required to enable the aeroplane to proceed to the destination alternate aerodrome which requires the greater amount of alternate fuel; or

(iii) where a flight is operated without a destination alternate aerodrome, the amount of fuel required to enable the aeroplane to fly for 15 minutes at holding speed at 450 m (1 500 ft) above destination aerodrome elevation in standard conditions; or

(iv) where the aerodrome of intended landing is an isolated aerodrome:

(A) for a reciprocating engine aeroplane, the amount of fuel required to fly for 45 minutes plus 15 % of the flight time planned to be spent at cruising level, including final reserve fuel, or two hours, whichever is less; or

(B) for a turbine-engine aeroplane, the amount of fuel required to fly for two hours at normal cruise consumption above the destination aerodrome, including final reserve fuel;

(e) Final reserve fuel, which shall be the amount of fuel calculated using the estimated mass on arrival at the destination alternate aerodrome, or the destination aerodrome when no destination alternate aerodrome is required:

(i) for a reciprocating engine aeroplane, the amount of fuel required to fly for 45 minutes, under speed and altitude conditions specified by the AACM; or

(ii) for a turbine-engined aeroplane, the amount of fuel required to fly for 30 minutes at holding speed at 450 m (1 500 ft) above aerodrome elevation in standard conditions;

(f) Additional fuel, which shall be the supplementary amount of fuel required if the minimum fuel calculated in accordance with sub-paragraphs (b) to (e) above is not sufficient to:

(i) allow the aeroplane to descend as necessary and proceed to an alternate aerodrome in the event of engine failure or loss of pressurization, whichever requires the greater amount of fuel based on the assumption that such a failure occurs at the most critical point along the route;

(A) fly for 15 minutes at holding speed at 450 m (1 500 ft) above aerodrome elevation in standard conditions; and

(B) make an approach and landing;

(ii) allow an aeroplane engaged in extended range operations by aeroplanes with two turbine engines (ETOPS) to comply with the ETOPS critical fuel scenario as established by the AACM;

(iii) meet additional requirements not covered above;

(g) Discretionary fuel, which shall be the extra amount of fuel to be carried at the discretion of the pilot-in-command.

9 FUEL PLANNING AND MANAGEMENT – HELICOPTERS

9.1 Whilst the requirements for helicopters follow the same general rules as those for aeroplanes, the ability of the helicopter to land safely away from aerodromes has been taken into account.

9.2 A minimum in-flight indicated fuel state must be stated for each type of helicopter and operation, with instructions on what actions to take when this fuel state is reached. Particular attention must be given to specialized activities, such as aerial crane work and winching operations.

9.3 The majority of paragraph 8 is applicable to helicopters and must be taken into account for fuel calculations where relevant.

9.4 Where helicopters have the facility for cross feeding or balancing of fuel in flight, instructions on the procedures to be followed should be contained in the operations manual.

9.5 In establishing fuel policy for the purpose of flight planning and in-flight re-planning, the fuel and oil to be carried shall consider at least the following:

(a) meteorological conditions forecast:

(b) expected air traffic control routings and traffic delays;

(c) for IFR flight, one instrument approach at the destination heliport, including a missed approach;

(d) the procedures prescribed in the operations manual for loss of pressurization, where applicable, or failure of one engine while en route; and

(e) any other conditions that may delay the landing of the helicopter or increase fuel and/or oil consumption.

9.6 The usable fuel to be on board for departure shall be the sum of the following:

(a) Taxi fuel, which shall not be less than the amount, expected to be used prior to take-off. Local conditions at the departure heliport or landing location and APU consumption shall be taken into account.

(b) Trip fuel, which shall include:

(i) fuel for take-off and climb from heliport or landing location elevation to initial cruising level/altitude, taking into account the expected departure routing;

(ii) fuel from top of climb to top of descent, including any step climb/descent;

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

(iv) fuel for approach and landing at the destination heliport or landing location.

(c) Contingency fuel, which shall be:

(i) for IFR flights, or for VFR flights in a hostile environment, 10 % of the planned trip fuel; or

(ii) for VFR flights in a non-hostile environment, 5 % of the planned trip fuel;

(d) Destination alternate fuel, which shall be sufficient for:

(i) a missed approach from the applicable MDA/DH at the destination heliport or landing location to missed approach altitude, taking into account the complete missed approach procedure;

(ii) a climb from missed approach altitude to cruising level/altitude;

(iii) the cruise from top of climb to top of descent;

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

(v) executing an approach and landing at the destination alternate heliport;

(e) Final reserve fuel, which shall be:

(i) for VFR flights navigating by day with reference to visual landmarks, 20 minutes fuel at best range speed; or

(ii) for IFR flights or when flying VFR and navigating by means other than by reference to visual landmarks or at night, fuel to fly for 30 minutes at holding speed at 450 m (1500 ft) above the destination heliport or landing location in standard conditions calculated with the estimated mass on arrival above the alternate, or the destination, when no alternate is required;

(f) Additional fuel, if required by the type of operation;

(g) Discretionary fuel, which shall be at the discretion of the pilot-in-command.

9.7 Isolated heliport or landing location IFR procedure. If an operator's fuel policy includes planning to an isolated heliport or landing location flying IFR, or when flying VFR and navigating by means other than by reference to visual landmarks, for which a destination alternate does not exist, the amount of fuel at departure shall include:

(a) Taxi fuel;

(b) Trip fuel;

(c) Contingency fuel calculated in accordance with sub-paragraph 9.6 (c) above;

(d) Additional fuel to fly for two hours at holding speed including final reserve fuel; and

(e) Discretionary fuel at the discretion of the pilot-in-command.

9.8 Sufficient fuel shall be carried at all times to ensure that following the failure of an engine occurring at the most critical point along the route, the helicopter is able to:

(a) descent as necessary and proceed to an adequate heliport or landing location;

(b) hold there for 15 minutes at 450 m (1500 ft) above heliport or landing location elevation in standard conditions; and

(c) make an approach and landing.

9.9 Alternate landing sites must meet the single engine landing requirements of the helicopter.

9.10 Instructions on IMC alternate fuel requirements must provide for an approach to land at destination, a missed approach from Decision Height/Minimum Descent Height, diversion to a suitable alternate using a realistic altitude (at least the MSA). Departure from this principle will be acceptable only in exceptional circumstances and subject to the provision of special instructions in the operations manual on fuel checks, calculations of Point of No Return (PNR) and weather minima at intended destination.

10 CHECK-LISTS

10.1 The drills and checks to be followed including those for emergency and abnormal conditions should be listed in full in the operations manual in the form of expanded check-lists. In addition, abbreviated working check-lists should be provided on the flight deck for the use of the flight crew.

10.2 The check-lists and drill cards provided by an operator for use by his crews must correctly reflect the requirements, instructions, drills and procedures specified in the aircraft operating manual and the aircraft flight manual or other documents associated with the Certificate of airworthiness and otherwise in the operations manual. The check-lists shall be used by flight crews prior to, during and after all phases of operations, and in emergency. The design and utilization of checklists shall observe human factors principles.

Note: Guidance material on the application of Human Factors principles can be found in the Human Factors Training Manual (ICAO Doc 9683).

10.3 For convenience in handling, the check-list for normal operations should be separate from the abnormal and emergency check-list. The color of the emergency and abnormal check-lists should be sufficiently distinctive to avoid them being mistaken for other volumes. They must be stowed on the flight deck separately from other documents in such a manner as to be immediately ready for use.

10.4 Separate check lists or drill cards must be provided for each flight crew member, including the flight engineer if appropriate. In 'single pilot' aircraft, check lists can be supplemented by placarding vital actions for final approach and landing.

10.5 All check lists or drill cards must be of a quality sufficient to withstand heavy wear and remain legible.

10.6 Details of cabin crews' ditching, crash landing and emergency evacuation drills should be readily available. This may be achieved either by issuing to each cabin crew a copy of their emergency drills - which they should be required to carry with them - or stowing the drill cards at appropriate positions in the cabin.

10.7 On multi-crew aircraft, instructions must be given that check lists are always to be used. On single pilot aircraft the operator may allow in-flight drills to be carried out from memory but must ensure that a check list is readily available to the pilot. Memorized drills must be carried out strictly in accordance with the check list and emergency drills must be verified as soon as possible by reference to the check list.

10.8 On multi-crew aircraft, drills should be so constructed that the handling pilot, as far as possible, has only to control the aircraft's flight path and cross check the correct selection of a lever or a switch before it is used. The use of responses such as "SET" or "AS REQUIRED" should be avoided and are better replaced by a specific indication of what is required.

10.9 Where emergency and abnormal drills do not include all the necessary items and actions to re-land, a clear instruction referring the crew back to the normal check-list must be made.

10.10 An abbreviated version of the normal check-list may be produced for use by training captains whilst on circuit training. This should retain the sequences of the normal check-list.

10.11 Each page of a check-list must be dated and the amendment state of the check-list ascertainable by means of a simple amendment record. This record should be incorporated at a suitable place in the check-list.

10.12 The following items, where applicable, must be included at the appropriate point in the normal check-list (the actual form of words may be varied):

(a) crew seats, seat belts and harnesses fastened/locked for take-off and landing;

(b) flying controls unlocked and checked for freedom of movement;

(c) cabin prepared for take-off and landing;

(d) reference speeds noted and/or bugs set and cross checked;

(e) instruments checked before take-off and prior to commencing approach;

(f) altimeters set and cross checked and required setting (QFE, QNH, QNE) at each stage of flight;

(g) pre-take-off/landing signal to cabin crew - PA or chime;

(h) radio aids set and identified (by more than one crew member on multi-crew operations)

(i) RTOW and performance data checked valid for runway in use immediately before take-off;

(j) performance data for approach and landing (normally before commencing descent);

(k) MSA check prior to descent.

10.13 There should be check-list prompts requiring the aircraft commander to brief the flight crew on the following topics:

(a) Prior to take-off:

(i) the actions to be taken if an emergency occurs during or immediately after take-off;

(ii) special techniques for take-off in crosswinds and on wet or otherwise contaminated runways;

(iii) noise abatement procedures;

(iv) selection of radio aids; and

(v) selection and checking of reduced thrust for take-off, when permitted.

(b) Prior to landing:

(i) selection of radio aids;

(ii) missed approach procedures;

(iii) any special techniques or system configurations for landing; and

(iv) selected alternate for diversion.

NOTE: It is not necessary to include these items in detail if suitable instructions are provided elsewhere. The word 'briefing' is sufficient at the appropriate points in the check-lists.

10.14 Abnormal operation check-lists should include such drills as:

(a) hydraulic failures;

(b) fuel system failures;

(c) air-conditioning/pressurization failures; and

(d) electrical system failures.

10.15 Examples of emergency drills to be covered in checklist are:

- engine failure;
- engine fires and severe engine damage;
- propeller malfunctions;
- failure of normal feathering system;
- fuel filter icing
- relighting of turbine engines;
- bus-bar and other serious electrical failures;
- pressurization failures and emergency descent;
- cabin and hold fires;
- smoke removal;
- landing
  - * with gear asymmetry
  - * with gear up
  - * ditching
- hydraulic failures; and
- evacuation drills;

11 USE AND CHECKING OF ALTIMETERS

11.1 Operators must have a clear policy on altimeter setting procedures, particularly their use of QFE and QNH; this policy must be clearly described in operations manuals to cover all phases of flight.

11.2 This policy must incorporate:

(a) Pre-flight serviceability tests;

(b) Flight crew altimeter setting procedures, including:

(i) the setting to be used for each phase of flight;

(ii) the correct challenge and response for altimeter cross-check(s), particularly during climb, descent and approach and when nearing an assigned altitude/level;

(iii) alternative settings and procedures, if appropriate, for use when QFE is either not available or cannot be used e.g. at high altitude aerodromes;

(iv) the manner of checking and of use of any radio altimeter(s);

(v) special precautions to be taken if an altimeter is suspect or becomes unserviceable in flight;

(vi) confirmation that, unless special conditions exist, the standard setting procedure will be used irrespective of which seat the handling pilot occupies on take-off;

(vii) the annotation of check lists with the actual setting to be used e.g. QNH/QFE; phrases such as ’altimeters set’ should not be used;

(viii) the correct report of altitude/level changes to ATC; such reports should not be made before reaching or leaving a particular altitude/level;

(ix) provision for one altimeter to be set to the appropriate QNH, when flying at or near to the MSA; this has particular relevance to single-pilot unpressurized aircraft.

(x) a check of aerodrome elevation during the approach phase; this is to be cross-checked to establish the difference between QFE and QNH, when QFE is used for landing;

(xi) the procedure for indicating decision heights for landing, e.g. a figure in the navigation log, altimeter 'bugs' and/or landing data cards;

(xii) the requirement for crews to inform ATC prior to its commencement if it is intended to use QNH settings throughout a radar approach procedure;

(xiii) the calls to be made by monitoring pilots during instrument approaches e.g. at the outer marker, 100 feet above DH etc. The calls and responses required for approaches in Category 2 or 3 weather minima conditions will need to be specified in greater detail; and

(xiv) the procedures to be used when flying in airspace where metric units are in use. If no metric altimeter is fitted, detailed instructions must be provided on the method of cross-checking conversions from meters to feet and vice-versa.

12 EMERGENCY EVACUATION PROCEDURES

Procedures for the evacuation of an aircraft and care of passengers following a forced landing, ditching or other emergency are to be specified. Much of the information will be descriptive but the basic drills to be followed by the various members of the aircraft crew must be summarized and tabulated. Particular attention should be paid to the following points:

(a) the correct setting for pressurization system controls prior to ditching;

(b) the ground positioning of the aircraft relative to the wind, wherever possible, to allow for the safest possible evacuation in the event of an aircraft fire;

(c) the use of emergency escape chutes and evacuation slides/rafts;

(d) the fitting of life-jackets to small children and the use of flotation cots;

(e) the briefing of passengers and warning of impact;

(f) flight deck drills should be memory drills and all flight deck crew members should carry them out in a coordinated manner, when ordered to do so by the captain;

(g) cabin drills should nominate individual responsibility for initiating evacuation and detail cabin crews' duties inside and outside of the aircraft;

(h) the location and use of each item of emergency and survival equipment. Any variation between such equipment carried in individual aircraft of the same type must be shown;

(i) the carriage of disabled passengers, how they are dealt with, should an emergency evacuation of the aircraft be necessary, and any need to carry additional cabin crew; the aircraft commander must be informed when severely disabled persons are on board; and

(j) the procedure for warning the cabin crews of any emergency which might require the rapid evacuation of passengers from the aircraft.

NOTES: (1) Operators may be required to arrange a demonstration emergency evacuation, if concern arises as to the effectiveness of procedures that are proposed.

(2) If electrical power is maintained or re-applied after an accident or incident, the Flight Data Recorder (FDR) or Cockpit Voice Recorder (CVR) may continue to run and hence obliterate accident or incident data. Crews should wherever possible ensure electrical isolation of the FDR/CVR, particularly if re-applying power.

13 RADIO WATCH

Radio watch instructions must contain the requirement for a continuous watch on operational frequencies not equipped with SELCAL and shall include the requirement for flight crews to monitor distress frequency 121.5 MHz at all times when operationally possible.

14 ROUTE GUIDE

14.1 Operators shall establish a route guide to be used by its flight crew for each flight. The route guide shall contain information relating to communication facilities, navigation aids, aerodromes, instrument approaches, instrument arrivals and instrument departures, as applicable, for the operation and such other information as the operator may deem necessary for the proper conduct of flight operations.

14.2 The route guide provided in accordance with the provisions of the ANRM should be a volume or series of volumes separate from the rest of the operations manual. Jeppesen or similar publications will normally meet the requirement, provided that flight crews are given adequate advice on the route to be followed. An operator providing his own guide should ensure that it meets the needs of crews in every respect. If flights are to be made only on airways or Advisory Routes (ADRs), it will be sufficient to include instructions to that effect; otherwise routes regularly flown should be specified in detail, normally on prepared navigation flight plans. For other flights, routes should be specified in a commander's flight brief, a copy being retained at base. Operators are not required to lodge copies of standard Jeppesen flight guides with the AACM.

14.3 Particular care should be taken to ensure that adequate information is provided on search and rescue facilities, obstructions in the approach pattern, radio failure procedures, prohibited and danger areas and standard Terminal Maneuvering Area (TMA) routings. Only recognized instrument approach or let-down procedures in general use should normally be included in the flight guide. Exceptionally, a special 'break cloud' procedure proposed by the operator may be considered by the AACM, provided it is acceptable to the appropriate Airport Authority. Proposals to use such special procedures, accompanied by the associated aerodrome operating minima, should be submitted to the AACM.

14.4 Normally, the cancellation of Instrument Flight Rules (IFR) flight plans at night or in congested terminal areas should be prohibited and instructions to this effect included in the operations manual. If an operator does not wish to impose a total prohibition, detailed instructions should be included in the operations manual, setting out the minimum conditions that must be satisfied before cancellation of an IFR flight plan.

14.5 In order to facilitate effective monitoring of an instrument approach by members of the flight crew, operators of multi-crew aircraft should provide for use on the flight deck at least two copies of the Instrument Approach charts to be used.

15 METEOROLOGICAL REPORTS FROM AIRCRAFT

15.1 Operators shall establish policy and procedures for its flight crews to record and report on:

(a) routine meteorological observation during en-route and climb-out phases of the flight; and

(b) special and other non-routine observations during any phase of the flight; and

(c) volcanic activity.

15.2 The procedures for making meteorological observations on board aircraft in flight and for recording and reporting them shall refer to the PANS-ATM (ICAO Doc 4444) and guidance in the Macao Aeronautical Information Publication (AIP) and/or on any special requirements of foreign authorities.

16 MINIMUM SAFE ALTITUDES

16.1 Minimum safe altitudes are to be prescribed by the operator for each sector from take-off, on each route to be flown, including routes to alternate aerodromes. For this purpose 'sector' means the intended track from a reporting or turning point to the next, until the aircraft starts the instrument approach procedure or joins the traffic pattern at the aerodrome to be used for landing. Minimum safe altitudes must be specified by the operator in the appropriate volume of the manual, in a prepared navigation flight plan or in the commander's flight brief.

16.2 To provide the commander with guidance for the calculation of minimum safe altitudes, when he is obliged to depart from the planned or normal route, operators must include a formula in the manual, expressed as simply as possible, from which the minimum safe altitude can be calculated. The formula must secure at least the normal terrain clearance standards laid down by the operator,

16.3 When specifying minimum safe altitudes, operators must take account of local regulations.

16.4 The criteria upon which minimum safe altitudes are based, related to the track guidance facilities available to the commander. The minimum acceptable standards are as below; however such standards are modified when flying over high terrain or when the ambient air temperature is very low. These variations are covered in paragraphs 16.5 and 16.7.

16.4.1 *For general application.* Where the terrain or obstacle is 5000 feet Above Mean Sea Level (AMSL) or lower, the minimum safe altitude is 1000 feet above the highest terrain or obstacle within 20 nm of the route center line. Where that terrain or obstacle is higher than 5000 feet AMSL, the minimum safe altitude is 2000 feet or more above the highest terrain or obstacle within 20 nm of the route center line.

16.4.2 *For flight in controlled airspace.* Where the track is well defined by two separate aids, the minimum safe altitude is 1000 feet above the highest terrain or obstacle within 10 nm of the route center line. Where the highest terrain or obstacle, within 10 nm of the route center line, is higher than 5000 ft AMSL, the minimum safe altitude is 2000 feet or more above that terrain or obstacle. When the sector length between navigational aids which define turning points is such that the aircraft could be more than 5 nm from the center line, due to inherent errors in the system used to define an airway, the limit of protection must be increased by the extent to which the divergence exceeds 5 nm.

16.4.3 *For radar controlled flight within 25 nm of the aerodrome of departure or intended landing.* The minimum safe altitude is 1000 feet above the highest terrain or obstacle within 5 nm of the intended track. Commanders must be instructed to monitor all radar instructions by reference to other aids and be reminded that, when under radar control, it is their individual responsibility to ensure adequate terrain clearance. Minimum safe altitudes within 25 nm of aerodromes are referred to as minimum sector altitudes.

16.4.4 *Use of flight guides.* An operator may use minimum safe altitudes and minimum sector altitudes given in a recognized Flight Guide, provided that the basis of the publisher's calculations will give at least an equal standard to that required by this section. If necessary, corrections can be made and promulgated in the manual so that the prescribed vertical separation is maintained.

16.5 Corrections to Planned Minimum Safe Altitudes for Flights Over High Ground

When the selected cruising altitude or flight level or one-engine-inoperative stabilizing altitude is at or close to the calculated minimum safe altitude and the flight is within 20 nm of terrain having a maximum elevation exceeding 2000 feet, the previously calculated MSA must be increased as follows:

HEIGHT INCREASE FOR FLIGHT OVER HIGH GROUND

	Windspeed in Knots			
Elevation of terrain	*0-30*	*31-50*	*51-70*	*Over 70*
2000-8000 ft	500ft	1000ft	1500ft	2000ft
Above 8000 ft	1000ft	1500ft	2000ft	2500ft

NOTE: Relevant instructions must be included in the Operations Manual.

16.6 Manuals must include a reference to the effect of mountain waves on the maintenance of vertical separation and instruct commanders to take suitable precautions when such conditions are reported or forecast.

16.7 Adequate allowances to calculated minimum safe altitudes must be made when the ambient temperature on the surface is much lower than that predicted by the standard atmosphere. When the ambient temperature is lower than International Standard Atmosphere (ISA) -15°C, the following additions to minimum safe altitude must be made:

Lower than	ISA -15°C	Not less than 10%
Lower than	ISA -30°C	Not less than 20%
Lower than	ISA -50°C	Not less than 25%

16.8 For any route the maximum altitude obtainable with all engines operating, or the appropriate stabilizing altitude with one-engine-inoperative, must be greater than the calculated minimum safe altitude for that route.

16A MINIMUM FLIGHT ALTITUDES

16A.1 An operator shall be permitted to establish minimum flight altitudes for those routes flown for which minimum flight altitudes have been established by the State flown over or the responsible State, provided that they shall not be less than those established by that State, unless specifically approved.

16A.2 An operator shall specify the method by which it is intended to determine minimum flight altitudes for operations conducted over routes for which minimum flight altitudes have not been established by the State flown over, or the responsible State, and shall include this method in the operations manual. The minimum flight altitudes determined in accordance with the above method shall not be lower than specified in Eleventh Schedule to the ANRM.

16A.3 The method for establishing the minimum flight altitude shall consider the probable effects of the following factors on the safety of the operation in question and such method shall be approved by the AACM.

(a) the accuracy and reliability with which the position of the aircraft can be determined;

(b) the inaccuracies in the indications of the altimeters used;

(c) the characteristics of the terrain (e.g. sudden changes in the elevation);

(d) the probability of encountering unfavourable meteorological conditions (e.g. severe turbulence and descending air currents);

(e) possible inaccuracies in aeronautical charts; and

(f) airspace restrictions.

17 AERODROME OPERATING MINIMA (AOM)

17.1 An operator shall specify aerodrome operating minima in accordance with Part D of the ninth schedule to the ANRM for each departure, destination or alternate aerodrome authorized to be used.

17.2 Minima for airfields in regular use and associated alternates must be listed in the operations manual, for take-off, landing and visual maneuvering. For airfields visited infrequently the minima may be listed in the commander's brief; a copy must be retained for 6 months.

17.2.1 Operators' instructions on aerodrome operating minima are particularly important. They should be stated clearly for the benefit of flight crew members. The instructions and tables have two purposes:

(a) to enable the commander to appreciate the operator's intentions and requirements; and

(b) to decide whether to commence or continue an approach.

17.3 Minima for take-off and landing must be specified for each type of aircraft and for each runway and associated approach aid at each aerodrome. Take-off minima will vary with the performance group of the aircraft.

17.4 It is the responsibility of operators to establish and specify appropriate minima. The AACM cannot assume any responsibility for the minima specified and every instruction issued. The operator must designate a suitably qualified person to keep the instructions under review and amend, as necessary.

17.5 Minima and associated instructions must be presented so that the information is readily available to and easily interpreted by the flight crew.

17.6 Only 'notified' or approved instrument approach procedures may be included in the tables. Runways or landing strips and approach aids which are not authorized for either take-off or landing must be specified either in the AOM tables or by a general instruction.

17.7 For the guidance of commanders, who may be obliged to take off from or land at aerodromes for which values have not been specified, operators must give data and instructions which allow for the calculation of minima. The data and instructions should be expressed as simply as possible and secure, as a minimum the normal operating standards observed by the operator. In these circumstances it may not be practicable for the commander to give the same detailed consideration to all the relevant factors as the operator. Therefore, the minima calculated in this way will usually be higher than those which would have been pre-calculated. When an aircraft commander calculates AOM in accordance with these criteria, the calculations must be retained with other flight documentation.

17.8 Operators must state that a commander is authorized to exercise discretion and apply minima higher than those prescribed by the operator, when it is necessary to secure the safety of the aircraft.

17.9 Selection of Alternate Aerodromes

17.9.1 Alternate aerodromes designated by the operator must be specified either in the manual or in the commander's flight brief. Instructions must be given on the factors to be taken into account by commanders in the selection of alternates for particular flights.

17.9.2 When the weather conditions are below landing minima at the departure aerodrome, take-off is prohibited unless a suitable return alternate is available within a specified time or distance, as set out below:

Number/Type of engines	*Time/distance at one-engine-inoperative speed*
4 turbine	120 minutes
4 piston	120 minutes
3 turbine	120 minutes
3 piston	60 minutes
2 turbine	60 minutes
2 piston	60 minutes
2 turbine (helicopters)	60 minutes

17.9.3 At the flight planning stage, operators using Category II or Category III equipped aircraft must consider the possibility of a failure preventing this operation and ensure that the alternate chosen, has weather that is forecast to be at or above Category I limits.

18 HELICOPTER OPERATIONS OVER WATER

18.1 The operations manual should contain the requirements governing all en-route overwater operations by multi-engined helicopters.

18.2 Offshore platforms

18.2.1 For operations to offshore platforms an alternate heliport must be available.

18.2.2 An offshore alternate should only be used in exceptional circumstances (these must not include payload enhancement in adverse weather conditions).

18.2.3 An offshore alternate shall only be used after a point of no return (PNR) is reached. Prior to PNR an on-shore alternate must be available.

When committed to an offshore alternate:

(i) Heliport availability shall be guaranteed.

(ii) One engine inoperative performance capability shall be attainable prior to arrival at the alternate.

(iii) Weather information must be reliable and accurate.

(iv) Mechanical reliability of critical control systems and critical components shall be considered and taken into account when determining the suitability of the alternate for a given type of helicopter. For example, the landing technique specified in the flight manual following control system failure may preclude the nomination of certain helidecks as alternate heliports.

18.3 No alternate heliport available

18.3.1 In exceptional circumstances where no suitable alternate is available, a point of no return shall be determined. For flights in instrument flying conditions sufficient fuel shall be carried to fly to the destination and thereafter hold for a period of two hours at holding speed.

19 LOADING

19.1 Operators shall include in their operations manual all such information and operating instructions as may be necessary to enable applicable personnel to perform the functions of aircraft loading.

Note: Requirements on aircraft loading are contained in ANRM Part V Paragraph 27 and Aeronautical Circular AC/OPS/030 – 'Aircraft Loading Requirements'.

20 DANGEROUS GOODS, WEAPONS AND MUNITIONS OF WAR

20.1 Carriage of Dangerous Goods

20.1.1 Operators shall obtain permission from the AACM before the carriage of dangerous goods as cargo in its aircraft by air and that such goods shall be carried in accordance with the provisions of Annex 18 to the Convention on International Civil Aviation, International Civil Aviation Organization (ICAO) Technical Instructions for the Safe Transport of Dangerous Goods by Air as well as Paragraph 41 and Twentieth Schedule to the ANRM.

20.1.2 Operators, whether or not approved to transport dangerous goods, shall incorporate dangerous goods procedures and training programmes in the operations manual as part of the flight safety documents system. The operations manual must state whether or not a Permission for the carriage of dangerous goods is held. Such manual shall be provided to operator's staff and the ground handling agent to carry out their responsibilities.

20.1.3 Operators shall have procedures and system to warn passengers of the types of dangerous goods that they are prohibited or restricted from transporting aboard an aircraft.

20.1.4 Where a Permission is not held, the operator shall specify policies and procedures in its manuals:

a) to identify and reject undeclared dangerous goods, including Company Material (COMAT) classified as dangerous goods;

b) on exceptions related to passengers;

c) to not transport spare parts for maintenance purposes that should be categorized as dangerous goods (e.g. COMAT); and

d) to report dangerous goods accidents, incidents and any occasions when undeclared dangerous goods are discovered in cargo or mail, to the AACM and the appropriate authorities in which it occurred.

20.1.5 Where a Permission for the carriage of dangerous goods is held, the operator shall specify policies and procedures in its manuals:

a) to identify and reject undeclared or misdeclared dangerous goods, including Company Material (COMAT) classified as dangerous goods;

b) to accept, handle, store, transport, load and unload dangerous goods, including COMAT classified as dangerous goods as cargo on board on aircraft;

c) for the use of an acceptance checklist to prevent acceptance of dangerous goods for transport by air unless they are accompanied by a completed dangerous goods transport document, and to ensure the dangerous goods' marking, package, overpack or freight container have been inspected in accordance with the acceptance procedure contained in the ICAO Technical Instructions;

d) to ensure dangerous goods will not be loaded into the aircraft unless the appropriate loading, segregation and inspection for damage or leakage procedures are followed;

e) to ensure written information (e.g. Notification to Captain or NOTOC) is provided to the pilot-in-command with accurate and legible information concerning dangerous goods that are to be carried as cargo; and written information is retained on the ground and readily accessible to the aerodromes of last departure and next scheduled arrival, as specified in the ICAO Technical Instructions;

f) for in-flight emergency response for aircraft incidents involving dangerous goods;

g) to convey information to emergency services and to appropriate authorities in the event of an incident or accident of an aircraft carrying dangerous goods;

h) to report dangerous goods accidents, incidents and any occasions when undeclared or misdeclared dangerous goods are discovered in cargo or mail, to the AACM and the appropriate authorities in which it occurred;

i) to report any occasions, when dangerous goods are discovered to have been carried when not loaded, segregated, separated or secured in accordance with the ICAO Technical Instructions or without information having been provided to the pilot-in-command, to AACM and the appropriate authorities in which it occurred.

20.1.6 Accidents and incidents arising from the carriage of dangerous goods are reportable under the Mandatory Occurrence Reporting Scheme.

20.2 Carriage of Weapons and Munitions of War

20.2.1 The carriage of munitions of war is prohibited by the ANRM, and this prohibition should be repeated in the loading instructions contained in the operations manual.

20.2.2 Munitions of war are defined as weapons and ammunition designed for use in warfare or against the person, including parts designed for such weapons and ammunition.

21 CARRIAGE OF ANIMALS

21.1 General

21.1.1 Operators who intend to carry animals must hold a current edition of the International Air Transport Association (IATA) Live Animals Regulations. The Regulations give guidance on such matters as the types of containers that should be used, labeling and marking of containers, animal health and hygiene, feeding, loading and sedation.

21.2 Livestock, Horses and Other Large Animals

21.2.1 When livestock or other large animals are carried, information must be given on action in emergencies, as well as the carriage and use of animal first aid and emergency kits. including the use of a tranquillizer kit or any other specific type of equipment used for the sedation of animals. Tranquillizers may be administered in certain circumstances by the animal attendant in accordance with the relevant IATA Live Animals Regulations, and normally after consultation with the Commander.

21.2.2 The determination of the weight of the consignment and where this weight is recorded on the load-sheet must be given. Guidance on loading should include:

(a) the weight, dimensions, construction, method of attachment and required restraint for horse boxes or animal pens;

(b) the checks necessary, before loading horse boxes or animal pens, on the general condition and serviceability of fitting and lashing points;

(c) the loading of horse boxes and the tethering of horses;

(d) the stowage of loose equipment such as food and water containers and horse paraphernalia; and

(e) the number and type of food and water containers and the quantities of food and water required, based on the duration of the flight and the number of animals carried.

21.2.3 Instructions must be given on checking an aircraft after a flight on which livestock, horses or other large animals have been carried for damage to the structure, fittings, wiring etc and for any adverse effects resulting from high humidity and urination.

21.2.4 When horses are carried, the minimum number of grooms for particular loading configurations must be specified.

22 GROUND HANDLING AND AIRCRAFT DISPATCH

22.1 Operators are responsible for the safe dispatch of their aircraft following cargo and passenger loading, refueling, cleaning, catering and the completion of preflight maintenance and servicing. Any damage to the aircraft must be reported and assessed for airworthiness significance prior to flight.

22.2 Instructions must be given to ensure that dispatch tasks are carried out in a standard manner, that each task is fully and correctly completed, and that any damage is reported immediately.

22.3 Instructions on training requirements, subcontracting policies, handling processes, procedures and practices for all ground handling operations should be developed in the form of a Ground / Aircraft Handling Manual.

22.4 Where dispatch tasks are contracted out to other organizations, contracts must include the operator's requirements for safe conduct of the task and the performance of the contractor, in respect of safety, must be monitored regularly. Even when all or part of the functions and tasks have been contracted to contractor, operators' ground handling responsibility must be permanently maintained.

23 SAFETY MANAGEMENT SYSTEM

Operators shall implement a safety management system acceptable to the AACM.

Note: Requirement and Guidance on safety management system are contained in ANRM Part V Paragraph 26 (7), Aeronautical Circular AC/GEN/005 – 'Safety Management System Requirements' and ICAO Doc 9859 – 'Safety Management Manual'.

24 ACCIDENT REPORTING

24.1 Provision must be made for all operating staff to have ready access to the prescribed requirements for the reporting and investigation of accidents. In particular, operating staff should be familiar with the definitions used in the legislation, the duty to furnish information, and the rules governing the removal of damaged aircraft.

24.2 Instructions must be issued on the reporting of accidents occurring overseas to the regulating authority of the country concerned and the action necessary to prevent removal or interference with any part of the aircraft without proper permission. This is in addition to operators' existing responsibility to inform the AACM.

24.3 The operations manual should contain the address and telephone numbers of this notification and related procedures.

Note: Guidance on Accidents and Incidents reporting is contained in Macao AIC A 03/08 – "Rules Concerning Aeronautical Accidents and Incidents".

25 OCCURRENCE REPORTING

25.1 Operators and commanders of Macao registered commercial air aircraft shall submit to the AACM without delay, a report of any act of unlawful interference or any other occurrence which may endanger or, unless corrected, would have endangered an aircraft. Types of occurrence which must be reported are prescribed in the Macao Aeronautical Circular - AC/GEN/003 – "Mandatory Occurrence Reporting Scheme".

25.2 Operations manuals must specify the persons responsible for raising occurrence reports and give such guidance as will enable them to comply with the statutory requirements.

25.3 Operators of aircraft that do not fall within the MOR scheme should include instructions in the manuals on the procedure for the reporting of incidents.

25.4 Operators must give guidance on the submission of Mandatory Occurrence Reports (MORs) relating to Extended Range Twin Operations (ETOPS) aircraft. Any occurrence report on aircraft types subject to ETOPS approval, must be prominently annotated 'ETOPS'.

26 LOW VISIBILITY OPERATIONS (LVO)

26.1 Operators wishing to operate Low Visibility Take-Off, Categories II or III operations shall pursue the approval process and regulatory requirements set forth in the Macao Aeronautical

Circular – AC/OPS/031 "Low Visibility Operations" for the issuance of LVO operational approval.

Note: Guidance material on Low Visibility Operations may be found in ICAO Doc 9365 – 'Manual of All Weather Operations'.

27 EXTENDED RANGE TWIN-ENGINED OPERATIONS (ETOPS)

27.1 Operators shall not operate ETOPS flights without approval from the AACM.

27.2 Operators wishing to operate ETOPS flights shall pursue the approval process and regulatory requirements set forth in the Macao Aeronautical Circular – AC/OPS/018 "Operational Approval of Extended Range Operations (ETOPS)" for the issuance of ETOPS operational approval.

28 PERFORMANCE-BASED NAVIGATION (PBN) and MINIMUM NAVIGATION PERFORMANCE SPECIFICATION (MNPS) OPERATIONS

28.1 Operators wishing to operate flights in designated airspace where navigation specification for Performance-based Navigation (PBN) has been prescribed shall pursue the approval process and regulatory requirements set forth in the Macao Aeronautical Circular – AC/OPS/022 "Operation in Performance-based Navigation (PBN) Prescribed Airspace" for the issuance of PBN operational approval.

28.2 Operators should refer to ICAO Doc 9613 – Performance-based Navigation (PBN) Manual for detailed guidance on the implementation of a particular navigation specification.

28.3 Operators wishing to operate in MNPS airspace are to submit their proposed procedures to the AACM for acceptance, prior to including such procedures in their operations manual. Guidance material may be found in the North Atlantic MNPS Airspace Operations Manual.

28.4 For flights in defined portions of airspace where, based on Regional Air Navigation Agreement, MNPS are prescribed, an aeroplane shall be provided with navigation equipment which:

(a) continuously provides indications to the flight crew of adherence to or departure from track to the required degree of accuracy at any point along that track; and

(b) has been approved by AACM for operations concerned.

29 REDUCED VERTICAL SEPARATION MINIMA (RVSM) OPERATIONS

29.1 Operators wishing to operate flights in RVSM airspace shall pursue the approval process and regulatory requirements set forth in the Macao Aeronautical Circular – AC/OPS/020 "Operation in Reduced Vertical Separation Minimum (RVSM) Airspace" for the issuance of RVSM approval.

29.2 Operators should also refer to Aeronautical Circular AC/ATS/006 – 'Manual of Standards – Air Traffic Management' for complementary procedures in RVSM airspace.

30 AUTOMATIC DEPENDENT SURVEILLANCE-BROADCAST (ADS-B) OPERATIONS

30.1 Operators wishing to operate flights in ADS-B airspace shall pursue the approval process and regulatory requirements set forth in the Macao Aeronautical Circular – AC/OPS/023 "Operations in Automatic Dependent Surveillance-Broadcast (ADS-B) Prescribed Airspace" for the issuance of ADS-B operational approval.

31 RESCUE AND FIRE FIGHTING SERVICES (RFFS) LEVELS – AEROPLANES

31.1 General Requirements

31.1.1 Operator shall consider the available RFFS as one element of a risk assessment process conducted under their Safety Management System (SMS), to ensure that the overall safety of the operation can be maximized. The risk assessment shall also include considerations of aerodrome facilities, availability, terrain, weather conditions etc. to ensure that the most appropriate aerodrome is selected.

31.1.2 For flight planning purposes, operator shall utilize an aerodrome whose RFFS category matches or exceeds the aeroplane RFFS category.

31.2 Planning

31.2.1 In principle, operator shall ensure that the RFFS category for each of the aerodromes used for a given flight is equal to or better than the aeroplane RFFS category. However, if the aeroplane RFFS category is not available at one or more of the aerodromes intended to be used, the operator shall ensure that the aerodrome has a level of RFFS category which is deemed acceptable, based on a risk assessment conducted as part of the operator's safety management system (SMS). When establishing acceptable levels of RFFS category for these situations, the operator shall use the criteria in Tables 31-1 and 31-2 below.

31.2.2 Operator shall coordinate with the aerodrome operator if the intended operations to aerodrome with RFFS category is below the aeroplane RFFS category.

31.2.3 For departure and destination aerodromes, during flight planning, the acceptable RFFS protection level shall equal or exceed the values specified in Table 31-1.

Table 31-1. Acceptable aerodrome category for rescue and fire fighting

(departure and destination aerodrome)

Aerodromes *Note.— If an individual aerodrome serves more than one purpose, the highest required category corresponding to that purpose at the time of expected use applies.*	**Acceptable aerodrome RFFS category** (Based on published aerodrome RFFS category, including any modification by NOTAM)
Departure and destination aerodrome	RFFS category for each aerodrome shall be equal to or better than the aeroplane RFFS category. Where a suitable risk assessment has been conducted by the operator: **One** category below the aeroplane RFFS category, or **Two** categories below the aeroplane RFFS category, in the case of a temporary downgrade of 72 hours or less but not lower than aerodrome RFFS Category 4 for aeroplanes with maximum certificated take-off mass of over 27 000 kg and not lower than Category 1 for other aeroplanes.

31.2.4 During flight planning, the acceptable aerodrome RFFS category at a selected alternate aerodrome shall equal or exceed the values specified in Table 31-2.

Table 31-2 Acceptable aerodrome category for rescue and fire fighting

(alternate aerodrome)

Aerodromes *Note.— If an individual aerodrome serves more than one purpose, the highest required category corresponding to that purpose at the time of expected use applies.*	**Acceptable aerodrome RFFS category** (Based on published aerodrome RFFS category, including any modification by NOTAM)
Take-off alternate and destination alternate aerodromes	Where a suitable risk assessment has been conducted by the operator: **Two** categories below the aeroplane RFFS category, or **Three** categories below the aeroplane RFFS category in the case of a temporary downgrade of 72 hours or less but not lower than aerodrome RFFS Category 4 for aeroplanes with maximum certificated take-off mass of over 27 000 kg and not lower than Category 1 for other aeroplanes.
En-route alternate aerodromes	• If at least 30 minutes notice is given to the aerodrome operator prior to the arrival of the aeroplane, a minimum of RFFS Category 4 for aeroplanes with maximum certificated take-off mass of over 27 000 kg, and RFFS Category 1 for other aeroplanes. • If less than 30 minutes notice can be given to the aerodrome operator prior to the arrival of the aeroplane: - **Two** categories below the aeroplane RFFS category; or - **Three** categories below the aeroplane RFFS category in the case of a temporary downgrade of 72 hours or less. but not lower than aerodrome RFFS Category 4 for aeroplanes with maximum certificated take-off mass of over 27 000 kg and not lower than Category 1 for other aeroplanes.

31.2.5 For all-cargo operations, further reductions might be acceptable provided that the RFFS capability is adequate to arrest fire around the flight deck area long enough for the persons on board to safely evacuate the aeroplane.

31.3 Variations

31.3.1 Notwithstanding the requirements in paragraph 31.2.1, an aerodrome RFFS category below the protection levels defined in Tables 31-1 and 31-2 may be acceptable if other considerations prevail, such as weather conditions, runway(s) characteristics, or length of diversion. Such variations shall be based on a specific risk assessment conducted by the operator as part of its safety management system (SMS).

Note: Guidance on Variations to the acceptable aerodrome category for RFFS is contained in ICAO Annex 6 Part I Attachment I.

31.4 In flight

31.4.1 The information contained in the operations manual about the aerodrome RFFS category acceptable at the planning stage (including Tables 31-1, 31-2 and, where usable, the variations in paragraph 31.3) is applicable at the in-flight re-planning point.

31.4.2 In flight, the pilot-in-command may decide to land at an aerodrome regardless of the RFFS category if, in the pilot's judgement after due consideration of all prevailing circumstances, to do so would be safer than to divert.

32 HEAD-UP DISPLAYS (HUD) AND ENHANCED VISION SYSTEMS (EVS) OPERATIONS

32.1 When aeroplanes or helicopters are equipped with HUD and/or EVS, operators shall include the instructions and training requirements for the use of HUD and EVS equipment in the operations and/or training manuals where applicable.

32.2 When operatos wish to use HUD and/or EVS to gain operational benefit, such as operating in visibilities lower than the normal aerodrome operating minima or heliport operating minima, approval must be obtained from AACM in writing prior to the use of such systems. To support such approval, the instructions and training requirements, and also the instructions for determining the aerodrome operating minima or heliport operating minima for instrument approaches using HUD and EVS shall be included in the operations and/or training manuals.

Note: Guidance on HUD and EVS is contained in ICAO Annex 6 Part I Attachment H.

33 ELECTRONIC FLIGHT BAG (EFB) OPERATIONS

33.1 Operators wishing to use EFB onboard Macao registered aircraft shall pursue the approval process and regulatory requirements set forth in the Macao Aeronautical Circular – AC/OPS/029 "Electronic Flight Bag" for the issuance of EFB operational approval.

34 SUSPECTED COMMUNICABLE DISEASE

34.1 Operators shall establish procedures for its crews to evaluate a traveler with suspected communicable disease on board the aircraft based on the presence of a fever and certain other signs or symptoms. The procedures shall include transmission of a General Declaration form, including the Health/Hygiene part, to notify the appropriate authority designated by the State or Region in case of identification of suspected case(s) of communicable disease.

34.2 Operators shall establish procedures for the pilot-in-command, upon identifying suspected case(s) of communicable disease on board the aircraft, to notify Air Traffic Control the suspected case(s) of communicable disease with transmission of the following information:

(a) aircraft identification;

(b) departure aerodrome;

(c) destination aerodrome;

(d) estimated time of arrival;

(e) number of persons on board;

(f) number of suspected case(s) on board; and

(g) nature of the public health risk, if know.

Note: The procedures to be followed by the pilot-in-command in communication with air traffic control for notification of suspected communicable diseases can be found in the Procedures for Air Traffic Services – Air Traffic Management (ICAO Doc 4444).

35 STANDARD OPERATING PROCEDURS

35.1 Operators shall establish standard operating procedures (SOPs) for each phase of flight. Crew briefings for departure and approach and checklists shall be developed as an integral part of its SOPs.

35.2 Operators shall provide instructions to its flight and cabin crew on how to use the SOPs.

36 PRESERVATION OF FLIGHT RECORDER RECORDS

36.1 Operators shall establish instructions for the preservation of flight recorder records in accordance with the provisions prescribed in the ANRM Part V Paragraph 38.

37 SECURITY INSTRUCTIONS AND SEARCH PROCEDURE CHECKLIST

37.1 Operators shall establish policy and procedures to enable cabin crew to discreetly communicate to flight crew in the event of suspicious activity or security breaches in the passenger cabin, and policy and procedures with respect to flight crew compartment access.

37.2 Operators shall ensure that there is on board a checklist of the procedures to be followed in searching for a bomb in case of suspected sabotage and for inspecting aeroplanes for concealed weapons, explosives or other dangerous devices when a well-founded suspicion exists that the aeroplane may be the object of an act of unlawful interference. The checklist shall be supported by guidance on the appropriate course of action to be taken should the bomb or suspicious object be found and information on the least-risk bomb location specific to the aeroplane.

38 CARGO COMPARTMENT SAFETY

38.1 Operators shall establish policies and procedures for the transport of items in the cargo compartment, which include the conduct of a specific safety risk assessment. The risk assessment shall include at least the:

(a) hazards associated with the properties of the items to be transported;

(b) capabilities of the operator;

(c) operational considerations (e.g. area of operations, diversion time);

(d) capabilities of the aeroplane and its systems (e.g. cargo compartment fire suppression capabilities);

(e) containment characteristics of unit load devices;

(f) packing and packaging;

(g) safety of the supply chain for items to be transported; and

(h) quantity and distribution of dangerous goods items to be transported.

38.2 Operators shall establish policies and procedures that address the items to be transported in the cargo compartment. These shall ensure to a reasonable certainty that in the event of a fire involving those items, it can be detected and sufficiently suppressed or contained by the elements of the aeroplane design associated with cargo compartment fire protection, until the aeroplane makes a safe landing.

Note : Guidance on policies and procedures that address the items to be transported in the cargo compartment are provided in the Guidance for Safe Operations Involving Aeroplane Cargo Compartments (ICAO Doc 10102).

Appendix 2

Organization and Contents of an Operations Manual

1. Organization

An operations manual, which may be issued in separate parts corresponding to specific aspects of operations, shall be organized with the following structure:

a) General;
b) Aircraft operating information;
c) Areas, routes and aerodromes; and
d) Training.

2. Contents

The operations manual shall contain at the least the following:

2.1 General

2.1.1 Administration and control of the operations manual.

2.1.2 Organization and responsibilities.

2.1.3 Method of control and supervision of flight operations.

2.1.4 Information and policy relating to fatigue management including rules pertaining to flight time, flight duty period, duty period limitations and rest requirements for flight and cabin crew members as required by regulations (AC/OPS/013 – Avoidance of Fatigue in Aircrews).

2.1.5 A list of the navigational equipment to be carried including any requirements relating to operations where performance-based navigation is prescribed.

2.1.6 Where relevant to the operations, the long-range navigation procedures, engine failure procedure for ETOPS and the nomination and utilization of diversion aerodromes.

2.1.7 The circumstances in which a radio listening watch is to be maintained.

2.1.8 The methods for determining minimum flight altitudes.

2.1.9 The methods for determining aerodrome operating minima.

2.1.10 Safety precautions during refueling with passengers on board.

2.1.11 Ground handling arrangements and procedures.

2.1.12 Procedures, as prescribed in ICAO Annex 12, for pilots-in-command observing an accident.

2.1.13 The flight crew for each type of operation including the designation of the succession of command.

2.1.14 Specific instructions for the computation of the quantities of fuel and oil to be carried, taking into account all circumstances of the operation including the possibility of loss of pressurization and the failure of one or more engines while en route.

2.1.15 The conditions under which oxygen shall be used and the amount of oxygen determined in accordance with the regulations.

2.1.16 Instructions for mass and balance control.

2.1.17 Instructions for the conduct and control of ground de/anti-icing operations.

2.1.18 The specifications for the operational flight plan.

2.1.19 Standard operating procedures (SOPs) for each phase of flight and instructions on how to use SOPs.

Note: Guidance materials on the design and use of SOPs can be in PANS-OPS (Doc 8168), Part III, Section 5.

2.1.20 Instructions on the use of normal checklists and the timing of their use.

2.1.21 Departure contingency procedures.

2.1.22 Instructions on the maintenance of altitude awareness and the use of automated or flight crew altitude call-out.

2.1.23 Instructions on the use of autopilots and auto-throttles in IMC.

2.1.24 Instructions on the clarification and acceptance of ATC clearances, particularly where terrain clearance is involved.

2.1.25 Departure and approach briefings.

2.1.26 Procedures for familiarization with areas, routes and aerodromes.

2.1.27 Stabilized approach procedure. (Not applicable to helicopter operations.)

2.1.28 Limitation on high rates of descent near the surface. (Not applicable to helicopter operations.)

2.1.29 Conditions required to commence or to continue an instrument approach.

2.1.30 Instructions for the conduct of precision and non-precision instrument approach procedures.

2.1.31 Allocation of flight crew duties and procedures for the management of crew workload during night and IMC instrument approach operations.

2.1.32 Instructions and training requirements for the avoidance of controlled flight into terrain and policy for the use of the ground proximity warning systems (GPWS). (Not applicable to helicopter operations.)

2.1.33 Policy, instructions, procedures and training requirements for the avoidance of collisions and the use of the airborne collision avoidance system (ACAS).

Note: Procedures for the operation of ACAS are contained in PANS-OPS (Doc 8168), Volume 1, and PANS-ATM (Doc 4444), Chapters 12 and 15.

2.1.34 Information and instructions relating to the interception of civil aircraft including:

a) procedures, as prescribed in ICAO Annex 2, for pilots-in-command of intercepted aircraft; and

b) visual signals for use by intercepting and intercepted aircraft, as contained in ICAO Annex 2.

2.1.35 For aeroplanes intended to be operated above 15000m (49000ft): (Not applicable to helicopter operations.)

a) information which will enable the pilot to determine the best course of action to take in the event of exposure to solar cosmic radiation; and

b) procedures in the event that a decision to descend is taken, covering:

1) the necessity of giving the appropriate ATS unit prior warning of the situation and of obtaining a provisional descent clearance; and

2) the action to be taken in the event that communication with the ATS unit cannot be established or is interrupted.

Note: Guidance material on the information to be provided is contained in ICAO Circular 126 – Guidance Material on SST Aircraft Operations.

2.1.36 Details of the safety management system (SMS) provided in accordance with regulations (AC/GEN/005 – Safety Management System Requirements).

2.1.37 Information and instructions on the carriage of dangerous goods, including action to be taken in the event of an emergency.

Note: Guidance material on the development of policies and procedures for dealing with dangerous goods incidents on board aircraft is contained in Emergency Response Guidance for Aircraft Incidents involving Dangerous Goods (Doc 9481).

2.1.38 Security instructions and guidance.

2.1.39 The search procedure checklist.

2.1.40 Instructions and training requirements for the use of head-up displays (HUD) and enhanced vision systems (EVS) equipment as applicable.

2.1.41 Instructions and training requirements for the use of the Electronic Flight Bag (EFB), as applicable.

2.1.42 Procedures for suspected communicable diseases.

2.1.43 Policy and Procedures for recording and reporting meteorological observation.

2.1.44 Instructions for preservation of flight recorder records.

2.1.45 Procedures for retention for aircraft tracking data.

2.2 Aircraft operating information

2.2.1 Certification limitations and operating limitations.

2.2.2 The normal, abnormal and emergency procedures to be used by the flight crew, the checklists relating thereto and aircraft systems information as required.

Note: AACM generally accepts aircraft checklists from a credible source, e.g. the aircraft manufacturer.

2.2.3 Operating instructions and information on climb performance with all engines operating.

2.2.4 Flight planning data for pre-flight and in-flight planning with different thrust/power and speed settings.

2.2.5 The maximum crosswind and tailwind components for each aeroplane type operated and the reductions to be applied to these values having regard to gusts, low visibility, runway surface conditions, crew experience, use of autopilot, abnormal or emergency circumstances, or any other relevant operational factors.

2.2.6 Instructions and data for mass and balance calculations.

2.2.7 Instructions for aircraft loading and securing of load.

2.2.8 Aircraft systems, associated controls and instructions for their use.

2.2.9 The minimum equipment list and configuration deviation list for the aircraft types operated and specific operations authorized, including any requirements relating to operations where performance-based navigation is prescribed.

2.2.10 Checklist of emergency and safety equipment and instructions for its use.

2.2.11 Emergency evacuation procedures, including type-specific procedures, crew coordination, assignment of crew's emergency positions and the emergency duties assigned to each crew member.

2.2.12 The normal, abnormal and emergency procedures to be used by the cabin crew, the checklists relating thereto and aircraft systems information as required, including a statement related to the necessary procedures for the coordination between flight and cabin crew.

2.2.13 Survival and emergency equipment for different routes and the necessary procedures to verify its normal functioning before take-off, including procedures to determine the required amount of oxygen and the quantity available.

2.2.14 The ground-air visual signal code for use by survivors, as contained in ICAO Annex 12.

2.3 Routes and aerodromes

2.3.1 A route guide to ensure that the flight crew will have, for each flight, information relating to communication facilities, navigation aids, aerodromes, instrument approaches, instrument arrivals and instrument departures as applicable for the

operation, and such other information as the operator may deem necessary for the proper conduct of flight operations.

2.3.2 The minimum flight altitudes for each route to be flown.

2.3.3 Aerodrome operating minima for each of the aerodromes that are likely to be used as aerodromes of intended landing or as alternate aerodromes.

2.3.4 The increase of aerodrome operating minima in case of degradation of approach or aerodrome facilities.

2.3.5 Instructions for determining aerodrome operating minima for instrument approaches using HUD and EVS.

2.3.6 The necessary information for compliance with all flight profiles required by regulations, including but not limited to, the determination of:

a) take-off runway length requirements for dry, wet and contaminated conditions, including those dictated by system failures which affect the take-off distance;

b) take-off climb limitations;

c) en-route climb limitations;

d) approach climb limitations and landing climb limitations;

e) landing runway length requirements for dry, wet and contaminated conditions, including systems failures which affect the landing distance; and

f) supplementary information, such as tire speed limitations.

2.4 Training

2.4.1 Details of the flight crew training program (see Aeronautical Circular AC/OPS/025 – *Training and Testing Requirements for Flight Crew Member and Flight Operations Officer*)

2.4.2 Details of the cabin crew duties training program (AC/OPS/016 – *Qualifications and Training Requirements for Cabin Crew*).

2.4.3 Details of the flight operations officer/flight dispatcher training program when employed in conjunction with a method of flight supervision (see Aeronautical Circular AC/OPS/025 - *Training and Testing Requirements for Flight Crew Member and Flight Operations Officer*).