CIVIL AVIATION AUTHORITY OF BANGLADESH

AIR NAVIGATION ORDERS

ANO (OPS) — PART- SPA (SPECIFIC APPROVAL)

ISSUE 01

JUNE 2021

BANGLADESH

[THIS PAGE INTENTIONALLY LEFT BLANK]

Civil Aviation Authority of Bangladesh

Gazette

Dhaka, ……….,1428/…….........., 2021

No, CAAB 30.31.0000.111.33.043.21– In exercise of the power conferred by Section 47, read with Section 14 of the Civil Aviation Act, 2017 (Act No. 18 of 2017), hereinafter referred as the "Act", the Chairman of the Civil Aviation Authority of Bangladesh is pleased to issue the following Air Navigation Order ANO (OPS) Part-SPA (Specific Approval).

2. It shall come into force immediately.

Air Vice Marshal M Mafidur Rahman,
BBP, BSP, BUP, ndu, afwc, psc
Chairman
Civil Aviation Authority of Bangladesh

[THIS PAGE INTENTIONALLY LEFT BLANK]

AMENDMENTS

Location	Date	Description

CONTENTS

[THIS PAGE INTENTIONALLY LEFT BLANK]

SPECIFIC APPROVALS
[PART-SPA]

1.1 SHORT TITLE AND COMMENCEMENT

This Air Navigation Order (ANO) may be called the ANO (OPS) Part-SPA (Specific Approval) in accordance with the Annex-6 and 18 to the Chicago Convention and referred herein as the ANO (OPS) Part-SPA.

1.2 ABBREVIATIONS

(a) The following abbreviations are used in ANO (AOC).

(1) **AOC** – Air Operator Certificate

(2) **OPS SPEC** – Operations Specifications

(3) **GEN** – General Requirements

(4) **AMC** – Acceptable Means of Compliance

(5) **GM** – Guidance Material

(6) **ATP** – Air Transport Pilot

(7) **CAT** – Commercial Air Transport

(8) **CDL** – Configuration Deviation List

(9) **IFR** – Instrument Flight Rules

(10) **IMC** – Instrument Meteorological Conditions

(11) **MEL** – Minimum Equipment List

(12) **PIC** – Pilot-In-Command

(13) **SMS –** Safety Management System

(14) **UN –** United Nations

(15) **VFR –** Visual Flight Rules

(16) **VMC –** Visual Meteorological Conditions

(17) **ETOPS –** Extended Range Operations with Two-Engine Aeroplane

(18) **RVSM –** Reduced Vertical Separation Minima

(19) **DG –** Dangerous Goods

(20) **PBN –** Performance-Based Navigation

1.3 DEFINITIONS

For the purpose of ANO (Ops) Part-SPA, the following definitions shall apply—

(1) **Accepted.** A statement or notification does not need to be issued.

(2) **Accountable manager.** The person acceptable to the CAAB who has corporate authority for ensuring that all operations and maintenance activities can be financed and carried out to the standard required by the CAAB, and any additional requirements defined by the operator.

(3) **Acceptance checklist.** A document used to assist in carrying out a check on the external appearance of packages of dangerous goods and their associated documents to determine that all appropriate requirements have been met.

(4) **Acceptable Means of Compliance** (AMC). A non-binding standard of CAAB. The AMC serves as a means by which the requirements contained in ANO can be met. However, applicants may decide to show compliance with the requirements using other means. Both CAAB and applicant/organization may propose alternative means of compliance. 'Alternative Means of Compliance' are those that propose an alternative to an existing AMC. Those Alternative Means of Compliance proposals must be accompanied by evidence of their ability to meet the intent of the requirement of ANO.

(5) **Aeroplane.** Means an engine-driven fixed-wing aircraft heavier than air that is supported in flight by the dynamic reaction of the air against its wings;

(6) **Air Operator Certificate (AOC).** A certificate authorizing an operator to carry out specified commercial air transport operations.

(7) **Air operator.** Any organization which undertakes to engage in domestic commercial air transport or international commercial air transport, whether directly or indirectly or by a lease or any other arrangement. (Law)

(8) **Aircraft operating manual.** A manual, acceptable to the State of the Operator, containing normal, abnormal and emergency procedures, checklists, limitations, performance information, details of the aircraft systems, and other material relevant to the operation of the aircraft.

(9) **Aircraft technical log.** Documentation for an aircraft that includes the maintenance record for the aircraft and a record for each flight made by the aircraft. The aircraft technical log is comprised of a journey records section and a maintenance section.

(10) **Approved.** A statement or certificate must be issued.

(11) **Approved by the Authority.** Approved by the Authority directly or in accordance with a procedure approved by the Authority.

(12) **Cabin crew member.** A crew member who performs, in the interest of safety of passengers, duties assigned by the operator or the pilot-in-command of the aircraft, but who shall not act as a flight crew member.

(13) **Commercial operation.** Any operation of an aircraft, in return for remuneration or other valuable consideration, which is available to the public or when not made available to the public, which is performed under a contract between an operator and a customer where the later has no control over the operator.

(14) **Commercial air transport (CAT).** Any aircraft operation involving the transport of passengers, cargo or mail for remuneration or hire.

(15) **Guidance Material** (**GM**). A non-binding explanatory and interpretation material on how to achieve the requirements contained in ANO, AMCs and the CSs. It contains information, including examples, to assist the user in the interpretation and application of requirements of ANO, AMCs etc.

1.4. INTERPRETATION

(a) In these orders, unless there is anything repugnant in the subject or context, the definitions contained in each order shall apply in respect of that order.

(b) These orders contain minimum requirements, and it is essential that they be interpreted and applied against a background of civil aviation knowledge.

(c) These orders are arranged in such a way which is considered as ANO (OPS) Part-SPA and in descending orders as GEN, AMC, GM and appendices.

(d) For the purpose of these orders, mandatory clauses are denoted by use of the words "shall" or "must", whereas the words "may" or "should" are used for permissive or recommended clauses.

(e) Where there is any doubt of the technical content or interpretation of these orders, the ruling of the Chairman, CAAB shall be final.

SUBPART A:
GENERAL REQUIREMENTS

SPA.GEN.100 CAAB

(a) The Civil Aviation Authority of Bangladesh (CAAB) is the authority for issuing a specific approval in accordance with this Part:

(1) for the commercial operator which has the principal place of business in Bangladesh;

(2) for aircraft registered in Bangladesh when used in non-commercial operations.

SPA.GEN.105 Application for a specific approval

(a) The operator applying for the initial issue of a specific approval shall provide to the CAAB the documentation required in the applicable Subpart, together with the following information:

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

(2) a description of the intended operation.

(b) The operator shall provide the following evidence to the CAAB

(1) compliance with the requirements of the applicable Subpart;

(2) that the relevant data provided by the manufacturer is taken into account;

(c) The operator shall retain records relating to (a) and (b) at least for the duration of the operation requiring a specific approval, or, if applicable, in accordance with ANO (OPS).

AMC1 SPA.GEN.105(a) Application for a specific approval

DOCUMENTATION

(a) Operating procedures should be documented in the operator's operations manual.

(b) If an operations manual is not required, operating procedures may be described in a manual specifying procedures (procedures manual). If the aircraft flight manual (AFM) or the pilot operating handbook (POH) contains such procedures, they should be considered as acceptable means to document the procedures.

SPA.GEN.110 Privileges of an operator holding a specific approval

The scope of the activity that an operator is approved to conduct shall be documented and specified:

(a) for operators holding an air operator certificate (AOC) in the operations specifications to the AOC; (b) for all other operators in the list of specific approvals.

SPA.GEN.115 Changes to a specific approval

When the conditions of a specific approval are affected by changes, the operator shall provide the relevant documentation to the CAAB and obtain prior approval for the operation.

SPA.GEN.120 Validity of a specific approval

Specific approvals shall be issued for the AOC validity period and shall remain valid within the AOC validity period subject to the operator remaining in compliance with the requirements associated with the specific approval and taking into account the relevant data provided by the manufacturer.

SUBPART B:
PERFORMANCE-BASED NAVIGATION (PBN) OPERATIONS

SPA.PBN.100 PBN operations

(a) An approval is required for each of the following PBN specifications:

(1) RNP AR APCH; and
(2) RNP 0.3 for helicopter operation.

(b) An approval for RNP AR APCH operations shall allow operations on public instrument approach procedures which meet the applicable ICAO procedure design criteria.

(c) A procedure-specific approval for RNP AR APCH or RNP 0.3 shall be required for private instrument approach procedures or any public instrument approach procedure that does not meet the applicable ICAO procedure design criteria, or where required by the Aeronautical Information Publication (AIP) or the CAAB;

GM1 SPA.PBN.100 PBN operations

GENERAL

(a) PBN operations are based on performance requirements, which are expressed in navigation specifications (RNAV specification and RNP specification) in terms of accuracy, integrity, continuity, availability and functionality needed for the proposed operation in the context of a particular airspace concept.

Table 1 provides a simplified overview of:

(1) PBN specifications and their applicability for different phases of flight; and

(2) PBN specifications requiring a specific approval.

(b) More detailed guidance material for the operational use of PBN applications can be found in ICAO Doc 9613 Performance-Based Navigation (PBN) Manual.

(c) Guidance material for the design of RNP AR APCH procedures can be found in ICAO Doc 9905 RNP AR Procedure Design Manual.

(d) Guidance material for the operational approval of PBN operations can be found in ICAO Doc 9997 Performance-Based Navigation (PBN) Operational Approval Manual.

FLIGHT PHASE								
	En-route		Arrival	Approach				Departure
	Oceanic	Continental		Initial	Intermediate	Final	Missed	
RNAV 10	10							
RNAV 5		5	5					
RNAV 2		2	2					2
RNAV 1		1	1	1	1		1	1
RNP 4	4							
RNP 2	2	2						
RNP 1			1	1	1		1	1
A-RNP	2	2 or 1	1–0.3	1–0.3	1–0.3	0.3	1–0.3	1–0.3
RNP APCH (LNAV)				1	1	0.3	1	
RNP APCH (LNAV/VNAV)				1	1	0.3	1	
RNP APCH (LP)				1	1		1	
RNP APCH (LPV)				1	1		1	
RNP AR APCH				1–0.1	1–0.1	0.3–0.1	1–0.1	
RNP 0.3 (H)		0.3	0.3	0.3	0.3		0.3	0.3

Numbers specify the accuracy level no specific approval required specific approval required

SPA.PBN.105 PBN operational approval

To obtain a PBN specific approval from the CAAB the operator shall provide evidence that:

(a) the relevant airworthiness approval, suitable for the intended PBN operation, is stated in the AFM or other document that has been approved by the certifying authority as part of an airworthiness assessment or is based on such approval;

(b) a training program for the flight crew members and relevant personnel involved in the flight preparation has been established;

(c) a safety assessment has been carried out;

(d) operating procedures have been established specifying:

  (1) the equipment to be carried, including its operating limitations and appropriate entries in the minimum equipment list (MEL);
  (2) flight crew composition, qualification and experience;
  (3) normal, abnormal and contingency procedures; and
  (4) electronic navigation data management;

(e) a list of reportable events has been specified; and

(f) a management RNP monitoring program has been established for RNP AR APCH operations, if applicable.

AMC1 SPA.PBN.105(b) PBN operational approval

FLIGHT CREW TRAINING AND QUALIFICATIONS — GENERAL PROVISIONS

(a) The operator should ensure that flight crew members training programs for RNP AR APCH include structured courses of ground and FSTD training.

(1) Flight crew members with no RNP AR APCH experience should complete the full training program prescribed in (b), (c), and (d) below.

(2) Flight crew members with RNP AR APCH experience with another CAAB operator may undertake an:

(i) abbreviated ground training course if operating a different type or class from that on which the previous RNP AR experience was gained;

(ii) abbreviated ground and FSTD training course if operating the same type or class and variant of the same type or class on which the previous RNP. AR experience was gained.

(iii) the abbreviated course should include at least the provisions of (d)(1), (c)(1) and (c)(2)(x) as appropriate.

(iv) The operator may reduce the number of approaches/landings required by (c)(2)(xii) if the type/class or the variant of the type or class has the same or similar:

(A) level of technology (flight guidance system (FGS));

(B) operating procedures for navigation performance monitoring; and

(C) handling characteristics as the previously operated type or class.

(3) Flight crew members with RNP AR APCH experience with the operator may undertake an abbreviated ground and FSTD training course:

(i) when changing aircraft type or class, the abbreviated course should include at least the provisions of (d)(1), (c)(1), (c)(2);

(ii) when changing to a different variant of aircraft within the same type or class rating that has the same or similar of all of the following:

(A) level of technology (flight guidance system (FGS));

(B) operating procedures for navigation performance monitoring; and

(C) handling characteristics as the previously operated type or class.

1) A difference course or familiarization appropriate to the change of variant should fulfill the abbreviated course provisions.

(iii) when changing to a different variant of aircraft within the same type or class rating that has significantly different at least one of the following:

(A) level of technology (FGS);

(B) operating procedures for navigation performance monitoring; and

(C) handling characteristics, the provisions of (c)(1) and (c)(2) should be fulfilled.

(4) The operator should ensure when undertaking RNP AR APCH operations with different variant(s) of aircraft within the same type or class rating, that the differences and/or similarities of the aircraft concerned justify such operations, taking into account at least the following:

(i) the level of technology, including the:

(A) FGS and associated displays and controls;

(B) FMS and its integration or not with the FGS; and

(C) on-board performance monitoring and alerting (OBPMA) system;

(ii) operating procedures, including:

(A) navigation performance monitoring;

(B) approach interruption and missed approach including while in turn along anRF leg;

(C) abnormal procedures in case of loss of system redundancy affecting the guidance or the navigation; and

(D) abnormal and contingency procedures in case of total loss of RNP capability; and

(iii) handling characteristics, including:

(A) manual approach with RF leg;

(B) manual landing from automatic guided approach; and

(C) manual missed approach procedure from automatic approach.

(b) Ground training

(1) Ground training for RNP AR APCH should address the following subjects during the initial introduction of a flight crew member to RNP AR APCH systems and operations. For recurrent programs, the curriculum need only review initial curriculum items and address new, revised, or emphasized items.

(2) General concepts of RNP AR APCH operation

(i) RNP AR APCH training should cover RNP AR APCH systems theory to the extent appropriate to ensure proper operational use. Flight crew members should understand basic concepts of RNP AR APCH systems, operation, classifications, and limitations.

(ii) The training should include general knowledge and operational application of RNP AR APCH instrument approach procedures. This training module should in particular address the following specific elements:

(A) the definitions of RNAV, RNP, RNP APCH, RNP AR APCH, RAIM, and containment areas;

(B) the differences between RNP AR APCH and RNP APCH;

(C) the types of RNP AR APCH procedures and familiarity with the charting of these procedures;

(D) the programming and display of RNP and aircraft specific displays, e.g. actual navigation performance;

(E) the methods to enable and disable the navigation updating modes related to RNP;

(F) the RNP values appropriate for different phases of flight and RNP AR APCH instrument procedures and how to select, if necessary;

(G) the use of GNSS RAIM (or equivalent) forecasts and the effects of RAIM 'holes' on RNP AR APCH procedures availability;

(H) when and how to terminate RNP navigation and transfer to conventional navigation due to loss of RNP and/or required equipment;

(I) the method to determine if the navigation database is current and contains required navigational data;

(J) the explanation of the different components that contribute to the total system error and their characteristics, e.g. drift characteristics when using IRU with no radio updating, QNH mistakes;

(K) the temperature compensation: Flight crew members operating avionics systems with compensation for altimetry errors introduced by deviations from ISA may disregard the temperature limits on RNP AR APCH procedures if flight crew training on use of the temperature compensation function is provided by the operator and the compensation function is utilized by the crew. However, the training should also recognize if the temperature compensation by the system is applicable to the VNAV guidance and is not a substitute for the flight crew compensating for the temperature effects on minimum altitudes or the DA/H;

(L) the effect of wind on aircraft performance during RNP AR APCH operations and the need to positively remain within RNP containment area, including any operational wind limitation and aircraft configuration essential to safely complete an RNP AR APCH operation;

(M) the effect of groundspeed on compliance with RNP AR APCH procedures and bank angle restrictions that may impact on the ability to remain on the course center line. For RNP procedures, aircraft are expected to maintain the standard speeds associated with the applicable category unless more stringent constraints are published;

(N) the relationship between RNP and the appropriate approach minima line on an approved published RNP AR APCH procedure and any operational limitations if the available RNP degrades or is not available prior to an approach (this should include flight crew operating procedures outside the FAF versus inside the FAF);

(O) understanding alerts that may occur from the loading and use of improper RNP values for a desired segment of an RNP AR APCH procedure;

(P) understanding the performance requirement to couple the autopilot/flight director to the navigation system's lateral guidance on RNP AR APCH procedures requiring an RNP of less than RNP 0.3;

(Q) the events that trigger a missed approach when using the aircraft's RNP capability to complete an RNP AR APCH procedure;

(R) any bank angle restrictions or limitations on RNP AR APCH procedures;

(S) ensuring flight crew members understand the performance issues associated with reversion to radio updating, know any limitations on the use of DME and VOR updating; and

(T) the familiarization with the terrain and obstacles representations on navigation displays and approach charts.

(3) ATC communication and coordination for use of RNP AR APCH

(i) Ground training should instruct flight crew members on proper flight plan classifications and any ATC procedures applicable to RNP AR APCH operations.

(ii) Flight crew members should receive instruction on the need to advise ATC immediately when the performance of the aircraft's navigation system is no longer adequate to support continuation of an RNP AR APCH operation.

(4) RNP AR APCH equipment components, controls, displays, and alerts

(i) Theoretical training should include discussion of RNP terminology, symbology, operation, optional controls, and display features, including any items unique to an operator's implementation or systems. The training should address applicable failure alerts and limitations.

(ii) Flight crew members should achieve a thorough understanding of the equipment used in RNP operations and any limitations on the use of the equipment during those operations.

(iii) Flight crew members should also know what navigation sensors form the basis for their RNP AR APCH compliance, and they should be able to assess the impact of failure of any avionics or a known loss of ground systems on the remainder of the flight plan.

(5) AFM information and operating procedures

(i) Based on the AFM or other aircraft eligibility evidence, the flight crew should address normal and abnormal operating procedures, responses to failure alerts, and any limitations, including related information on RNP modes of operation.

(ii) Training should also address contingency procedures for loss or degradation of the RNP AR APCH capability.

(iii) The manuals used by the flight should contain this information.

(6) MEL operating provisions

Flight crew members should have a thorough understanding of the MEL entries supporting RNP AR APCH operations.

(c) Initial FSTD training

(1) In addition to ground training, flight crew members should receive appropriate practical skill training in an FSTD.

(i) Training programs should cover the proper execution of RNP AR APCH operations in compliance with the manufacturer's documentation.

(ii) The training should include:

(A) RNP AR APCH procedures and limitations;

(B) standardization of the set-up of the cockpit's electronic displays during an RNP AR APCH operation;

(C) recognition of the aural advisories, alerts and other annunciations that can impact on compliance with an RNP AR APCH procedure; and

(D) the timely and correct responses to loss of RNP AR APCH capability in a variety of scenarios embracing the breadth of the RNP AR APCH procedures the operator plans to complete.

(2) FSTD training should address the following specific elements:

(i) procedures for verifying that each flight crew member's altimeter has the current setting before commencing the final approach of an RNP AR APCH operation, including any operational limitations associated with the source(s) for the altimeter setting and the latency of checking and setting the altimeters for landing;

(ii) use of aircraft RADAR, TAWS or other avionics systems to support the flight crew's track monitoring and weather and obstacle avoidance;

(iii) concise and complete flight crew briefings for all RNP AR APCH procedures and the important role crew resource management (CRM) plays in successfully completing an RNP AR APCH operation;

(iv) the importance of aircraft configuration to ensure the aircraft maintains any mandated speeds during RNP AR APCH operations;

(v) the potentially detrimental effect of reducing the flap setting, reducing the bank angle or increasing airspeeds may have on the ability to comply with an RNP AR APCH operation;

(vi) flight crew members understand and are capable of programming and/or operating the FMC, autopilot, auto throttles, RADAR, GNSS, INS, EFIS (including the moving map), and TAWS in support of RNP AR APCH operations;

(vii) handling of TOGA to LNAV transition as applicable, particularly while in turn;

(viii) monitoring of flight technical error (FTE) and related go-around operation;

(ix) handling of loss of GNSS signals during a procedure;

(x) handling of engine failure during the approach operation;

(xi) applying contingency procedures for a loss of RNP capability during a missed approach. Due to the lack of navigation guidance, the training should emphasize

(xii) the flight crew contingency actions that achieve separation from terrain and obstacles. The operator should tailor these contingency procedures to their specific RNP AR APCH procedures; and

(xiii) as a minimum, each flight crew member should complete two RNP approach procedures for each duty position (pilot flying and pilot monitoring) that employ the unique RNP AR APCH characteristics of the operator's RNP AR APCH procedures (e.g. RF legs, missed approach). One procedure should culminate in a transition to landing and one procedure should culminate in execution of an RNP missed approach procedure.

FLIGHT CREW TRAINING AND QUALIFICATIONS — CONVERSION TRAINING

(d) Flight crew members should complete the following RNP AR APCH training if converting to a new type or class or variant of aircraft in which RNP AR operations will be conducted. For abbreviated courses, the provisions prescribed in (a)(2), (a)(3) and (a)(4) should apply.

(1) Ground training

(i) Taking into account the flight crew member's RNP AR APCH previous training and experience, flight crew members should undertake an abbreviated ground training that should include at least the provisions of (b)(2)(D) to (I), (b)((2)(N) to (R), (b)(2)(S), and (b)(3) to (6).

(2) FSTD training

(i) The provisions prescribed in (a) should apply, taking into account the flight crew member's RNP AR APCH training and experience.

FLIGHT CREW TRAINING AND QUALIFICATIONS — RNP AR APCH PROCEDURES REQUIRING A PROCEDURE- SPECIFIC APPROVAL

(e) Before starting an RNP AR APCH procedure for which a procedure-specific approval is required, flight crew members should undertake additional ground training and FSTD training, as appropriate.

(1) The operator should ensure that the additional training programs for such procedures include as at least all of the following:

(i) the provisions of (c)(1), (c)(2)(x) as appropriate and customized to the intended operation;

(ii) the crew training recommendations and mitigations stated in the procedure flight operational safety assessment (FOSA); and

(iii) specific training and operational provision published in the AIP, where applicable.

(2) Flight crew members with prior experience of RNP AR APCH procedures for which a procedure-specific approval is required may receive credit for all or part of these provisions provided the current operator's RNP AR APCH procedures are similar and require no new pilot skills to be trained in an FSTD.

(3) Training and checking may be combined and conducted by the same person with regard to (f)(2).

(4) In case of a first RNP AR APCH application targeting directly RNP AR APCH procedures requiring procedure-specific approvals, a combined initial and additional training and checking, as appropriate, should be acceptable provided the training and checking includes all provisions prescribed by (a), (b), (c), (d) as appropriate, (e) and (f).

FLIGHT CREW TRAINING AND QUALIFICATIONS — CHECKING OF RNP AR APCH KNOWLEDGE

(f) Initial checking of RNP AR APCH knowledge and procedures

(1) The operator should check flight crew members' knowledge of RNP AR APCH procedures prior to employing RNP AR APCH operations. As a minimum, the check should include a thorough review of flight crew procedures and specific aircraft performance requirements for RNP AR APCH operations.

(2) The initial check should include one of the followings:

(i) A check by an examiner using an FSTD.

(ii) A check by a TRE, CRE, SFE or a pilot-in-command nominated by the operator during LPCs, OPCs or line flights that incorporate RNP AR APCH operations that employ the unique RNP AR APCH characteristics of the operator's RNP AR APCH procedures.

(iii) Line-oriented flight training (LOFT)/line-oriented evaluation (LOE). LOFT/LOE programs using an FSTD that incorporates RNP AR APCH operations that employ the unique RNP AR APCH characteristics (i.e. RF legs, RNP missed approach) of the operator's RNP AR APCH procedures.

(3) Specific elements that should be addressed are:

(i) demonstration of the use of any RNP AR APCH limits/minimums that may impact various RNP AR APCH operations;

(ii) demonstration of the application of radio-updating procedures, such as enabling and disabling ground-based radio updating of the FMC (e.g. DME/DME and VOR/DME updating) and knowledge of when to use this feature;

(iii) demonstration of the ability to monitor the actual lateral and vertical flight paths relative to programd flight path and complete the appropriate flight crew procedures when exceeding a lateral or vertical FTE limit;

(iv) demonstration of the ability to read and adapt to a RAIM (or equivalent) forecast, including forecasts predicting a lack of RAIM availability;

(v) demonstration of the proper set-up of the FMC, the weather RADAR, TAWS, and moving map for the various RNP AR APCH operations and scenarios the operator plans to implement;

(vi) demonstration of the use of flight crew briefings and checklists for RNP AR APCHv operations with emphasis on CRM;

(vii) demonstration of knowledge of and ability to perform an RNP AR APCH missed approach procedure in a variety of operational scenarios (i.e. loss of navigation or failure to acquire visual conditions);

(viii) demonstration of speed control during segments requiring speed restrictions to ensure compliance with an RNP AR APCH procedure;

(ix) demonstration of competent use of RNP AR APCH plates, briefing cards, and checklists;

(x) demonstration of the ability to complete a stable RNP AR APCH operation: bank angle, speed control, and remaining on the procedure's centerline; and

(xi) knowledge of the operational limit for deviation from the desired flight path and of how to accurately monitor the aircraft's position relative to vertical flight path.

FLIGHT CREW TRAINING AND QUALIFICATIONS — RECURRENT TRAINING

(g) The operator should incorporate recurrent training that employs the unique RNP AR APCH characteristics of the operator's RNP AR APCH procedures as part of the overall training program.

(1) A minimum of two RNP AR APCH should be flown by each flight crew member, one for each duty position (pilot flying and pilot monitoring), with one culminating in a landing and one culminating in a missed approach and may be substituted for any required 3D approach operation.

(2) In case of several procedure-specific RNP AR APCH approvals, the recurrent training should focus on the most demanding RNP AR APCH procedures giving credit on the less demanding ones.

TRAINING FOR PERSONNEL INVOLVED IN THE FLIGHT PREPARATION

(h) The operator should ensure that training for flight operation officers/dispatchers should include:

(1) the different types of RNP AR APCH procedures;

(2) the importance of specific navigation equipment and other equipment during RNP AR APCH operations and related RNP AR APCH requirements and operating procedures;

(3) the operator's RNP AR APCH approvals;

(4) MEL requirements;

(5) aircraft performance, and navigation signal availability, e.g. GNSS RAIM/predictive RNP capability tool, for destination and alternate aerodromes.

AMC1 SPA.PBN.105(c) PBN operational approval

FLIGHT OPERATIONAL SAFETY ASSESSMENT (FOSA)

(a) For each RNP AR APCH procedure, the operator should conduct a flight operational safety assessment (FOSA) proportionate to the complexity of the procedure.

(b) The FOSA should be based on:

(1) restrictions and recommendations published in AIPs;

(2) the fly ability check;

(3) an assessment of the operational environment;

(4) the demonstrated navigation performance of the aircraft; and

(5) the operational aircraft performance.

(c) The operator may take credit from key elements from the safety assessment carried out by the ANSP or the aerodrome operator.

GM1 SPA.PBN.105(c) PBN operational approval

FLIGHT OPERATIONAL SAFETY ASSESSMENT (FOSA)

(a) Traditionally, operational safety has been defined by a target level of safety (TLS) and specified as a risk of collision of 10-7 per approach operation. For RNP AR APCH operations, conducting the FOSA methodology contributes to achieving the TLS. The FOSA is intended to provide a level of flight safety that is equivalent to the traditional TLS, but using methodology oriented to performance-based flight operations. Using the FOSA, the operational safety objective is met by considering more than the aircraft navigation system alone. The FOSA blends quantitative and qualitative analyses and assessments by considering navigation systems, aircraft performance, operating procedures, human factor aspects and the operational environment. During these assessments conducted under normal and failure conditions, hazards, risks and the associated mitigations are identified. The FOSA relies on the detailed criteria for the aircraft capabilities and instrument procedure design to address the majority of general technical, procedure and process factors. Additionally, technical and operational expertise and prior operator experience with RNP AR APCH operations are essential elements to be considered in the conduct and conclusion of the FOSA.

(b) The following aspects need to be considered during FOSA, in order to identify hazards, risks and mitigations relevant to RNP AR APCH operations:

(1) Normal performance: lateral and vertical accuracy are addressed in the aircraft airworthiness standards, aircraft and systems operate normally in standard configurations and operating modes, and individual error components are monitored/truncated through system design or flight crew procedure.

(2) Performance under failure conditions: lateral and vertical accuracy are evaluated for aircraft failures as part of the aircraft certification. Additionally, other rare-normal and abnormal failures and conditions for ATC operations, flight crew procedures, infrastructure and operating environment are assessed. Where the failure or condition results are not acceptable

for continued operation, mitigations are developed or limitations established for the aircraft, flight crew and/or operation.

(3) Aircraft failures

(i) System failure: Failure of a navigation system, flight guidance system, flight instrument system for the approach, or missed approach (e.g. loss of GNSS updating, receiver failure, autopilot disconnect, FMS failure, etc.). Depending on the aircraft, this may be addressed through aircraft design or operating procedure to cross-check guidance (e.g. dual equipage for lateral errors, use of terrain awareness and warning system).

(ii) Malfunction of air data system or altimetry: flight crew procedure cross-check between two independent systems may mitigate this risk.

(4) Aircraft performance

(i) Inadequate performance to conduct the approach operation: the aircraft capabilities and operating procedures ensure that the performance is adequate on each approach, as part of flight planning and in order to begin or continue the approach. Consideration should be given to aircraft configuration during approach and any configuration changes associated with a missed approach operation (e.g. engine failure, flap retraction, re-engagement of autopilot in LNAV mode).

(ii) Loss of engine: loss of an engine while on an RNP AR APCH operation is a rare occurrence due to high engine reliability and the short exposure time. The operator needs to take appropriate action to mitigate the effects of loss of engine, initiating a go-around and manually taking control of the aircraft if necessary.

(5) Navigation services

(i) Use of a navigation aid outside of designated coverage or in test mode: aircraft airworthiness standards and operating procedures have been developed to address this risk.

(ii) Navigation database errors: instrument approach procedures are validated through flight validation specific to the operator and aircraft, and the operator should have a process defined to maintain validated data through updates to the navigation database.

(6) ATC operations

(i) Procedure assigned to non-approved aircraft: flight crew are responsible for rejecting the clearance.

(ii) ATC provides ‘direct to’ clearance to or vectors aircraft onto approach such that performance cannot be achieved.

(iii) Inconsistent ATC phraseology between controller and flight crew.

(7) Flight crew operations

(i) Erroneous barometric altimeter setting: flight crew entry and cross-checkprocedures may mitigate this risk.

(ii) Incorrect procedure selection or loading: flight crew procedures should be available to verify that the loaded procedure matches the published procedure, line of minima and aircraft airworthiness qualification.

(iii) Incorrect flight control mode selected: training on importance of flight control mode, flight crew procedure to verify selection of correct flight control mode.

(iv) Incorrect RNP entry: flight crew procedure to verify RNP loaded in system matches the published value.

(v) Missed approach: balked landing or rejected landing at or below DA/H.

(vi) Poor meteorological conditions: loss or significant reduction of visual reference that may result in a go-around.

(8) Infrastructure

(i) GNSS satellite failure: this condition is evaluated during aircraft qualification to ensure obstacle clearance can be maintained, considering the low likelihood of this failure occurring.

(ii) Loss of GNSS signals: relevant independent equipage, e.g. IRS/INS, is mandated for RNP AR APCH procedures with RF legs and approaches where the accuracy for the missed approach is less than 1 NM. For other approaches, operating procedures are used to approximate the published track and climb above obstacles.

(iii) Testing of ground navigation aids in the vicinity of the approach: aircraft and operating procedures should detect and mitigate this event.

(9) Operating conditions

(i) Tailwind conditions: excessive speed on RF legs may result in inability to maintain track. This is addressed through aircraft airworthiness standards on the limits of command guidance, inclusion of 5 degrees of bank maneuverability margin, consideration of speed effect and flight crew procedure to maintain speeds below the maximum authorized for the RNP AR APCH procedure.

(ii) Wind conditions and effect on FTE: nominal FTE is evaluated under a variety of wind conditions, and flight crew procedures to monitor and limit deviations to ensure safe operation.

(iii) Extreme temperature effects of barometric altitude (e.g. extreme cold temperatures, known local atmospheric or weather phenomena, high winds, severe turbulence, etc.): the effect of this error on the vertical path is mitigated through the procedure design and flight crew procedures, with an allowance for aircraft that compensate for this effect to conduct procedures regardless of the published temperature limit. The effect of this error on minimum segment altitudes and the DA/H are addressed in an equivalent manner to all other approach operations.

AMC1 SPA.PBN.105(d) PBN operational approval

OPERATIONAL CONSIDERATIONS FOR RNP AR APCH

(a) MEL

(1) The operator's MEL should be developed/revised to address the equipment provisions for RNP AR APCH operations.

(2) An operational TAWS Class A should be available for all RNP AR APCH operations. The TAWS should use altitude values that are compensated for local pressure and temperature effects (e.g. corrected barometric and GNSS altitude), and include significant terrain and obstacle data.

(b) Autopilot and flight director

(1) For RNP AR APCH operations with RNP values less than RNP 0.3 or with RF legs, the autopilot or flight director driven by the area navigation system should be used. Thus, the flight crew should check that the autopilot/flight director is installed and operational.

(c) Pre-flight RNP assessment

(1) The operator should have a predictive performance capability, which can determine if the specified RNP will be available at the time and location of a desired RNP operation. This capability can be a ground service and need not be resident in the aircraft's avionics equipment. The operator should establish procedures requiring use of this capability as both a preflight preparation tool and as a flight-following tool in the event of reported failures.

(2) This predictive capability should account for known and predicted outages of GNSS satellites or other impacts on the navigation system's sensors. The prediction program should not use a mask angle below 5 degrees, as operational experience indicates that satellite signals at low elevations are not reliable. The prediction should use the actual GNSS constellation with the RAIM (or equivalent) algorithm identical to or more conservative than that used in the actual equipment.

(3) The RNP assessment should consider the specific combination of the aircraft capability (sensors and integration), as well as their availability.

(d) NAVAID exclusion

(1) The operator should establish procedures to exclude NAVAID facilities in accordance with NOTAMs (e.g. DMEs, VORs, localisers). Internal avionics reasonableness checks may not be adequate for RNP operations.

(e) Navigation database currency

(1) During system initialisation, the flight crew should confirm that the navigation database is current. Navigation databases should be current for the duration of the flight. If the AIRAC cycle is due to change during flight, the flight crew should follow procedures established by the operator to ensure the accuracy of navigation data.

(2) The operator should not allow the flight crew to use an expired database.

AMC2 SPA.PBN.105(d) PBN operational approval

FLIGHT CONSIDERATIONS

(a) Modification of flight plan

The flight crew should not be authorized to fly a published RNP AR APCH procedure unless it is retrievable by the procedure name from the aircraft navigation database and conforms to the charted procedure. The lateral path should not be modified; with the exception of accepting a clearance to go direct to a fix in the approach procedure that is before the FAF and that does not immediately precede an RF leg. The only other acceptable modification to the loaded procedure is to change altitude and/or airspeed waypoint constraints on the initial, intermediate, or missed approach segments flight plan fixes (e.g. to apply temperature corrections or comply with an ATC clearance/instruction).

(b) Mandatory equipment

The flight crew should have either a mandatory list of equipment for conducting RNP AR APCH operations or alternate methods to address in-flight equipment failures that would prohibit RNP AR APCH operations (e.g. crew warning systems, quick reference handbook).

(c) RNP management

Operating procedures should ensure that the navigation system uses the appropriate RNP values throughout the approach operation. If the navigation system does not extract and set the navigation accuracy from the on-board navigation database for each segment of the procedure, then operating procedures should ensure that the smallest navigation accuracy required to complete the approach or the missed approach is selected before initiating the approach operation (e.g. before the IAF). Different IAFs may have different navigation accuracy, which are annotated on the approach chart.

(d) Loss of RNP

The flight crew should ensure that no loss of RNP annunciation is received prior to commencing the RNP AR APCH operation. During the approach operation, if at any time a loss of RNP annunciation is received, the flight crew should abandon the RNP AR APCH operation unless the pilot has in sight the visual references required to continue the approach operation.

(e) Radio updating

Initiation of all RNP AR APCH procedures is based on GNSS updating. The flight crew should comply with the operator's procedures for inhibiting specific facilities.

(f) Approach procedure confirmation

The flight crew should confirm that the correct procedure has been selected. This process includes confirmation of the waypoint sequence, reasonableness of track angles and distances, and any other parameters that can be altered by the flight crew, such as altitude or speed constraints. A navigation system textual display or navigation map display should be used.

(g) Track deviation monitoring

(1) The flight crew should use a lateral deviation indicator, flight director and/or autopilot in lateral navigation mode on RNP AR APCH operations. The flight crew of an aircraft with a lateral deviation indicator should ensure that lateral deviation indicator scaling (full- scale deflection) is suitable for the navigation accuracy associated with the various segments of the RNP AR APCH procedure. The flight crew is expected to maintain procedure centerlines, as depicted by on-board lateral deviation indicators and/or flight guidance during the entire RNP AR APCH operations unless authorized to deviate by ATC or demanded under emergency conditions. For normal operations, cross-track error/deviation (the difference

between the area-navigation-system-computed path and the aircraft position relative to the path) should be limited to the navigation accuracy (RNP) associated with the procedure segment.

(2) Vertical deviation should be monitored above and below the glide-path; the vertical deviation should be within ±75 ft of the glide-path during the final approach segment.

(3) Flight crew should execute a missed approach operation if:

(i) the lateral deviation exceeds one time the RNP value; or

(ii) the deviation below the vertical path exceeds 75 ft or half-scale deflection where angular deviation is indicated, at any time; or

(iii) the deviation above the vertical path exceeds 75 ft or half-scale deflection where angular deviation is indicated; at or below 1 000 ft above aerodrome level;

(iv) unless the pilot has in sight the visual references required to continue the approach operation.

(4) Where a moving map, low-resolution vertical deviation indicator (VDI), or numeric display of deviations are to be used, flight crew training and procedures should ensure the effectiveness of these displays. Typically, this involves demonstration of the procedure with a number of trained flight crew members and inclusion of this monitoring procedure in the recurrent RNP AR APCH training program.

(5) For installations that use a CDI for lateral path tracking, the AFM should state which navigation accuracy and operations the aircraft supports and the operational effects on the CDI scale. The flight crew should know the CDI full-scale deflection value. The avionics may automatically set the CDI scale (dependent on phase of flight) or the flight crew may manually set the scale. If the flight crew manually selects the CDI scale, the operator should have procedures and training in place to assure the selected CDI scale is appropriate for the intended RNP operation. The deviation limit should be readily apparent given the scale (e.g. full-scale deflection).

(h) System cross-check

The flight crew should ensure the lateral and vertical guidance provided by the navigation system is consistent.

(i) Procedures with RF legs

(1) When initiating a missed approach operation during or shortly after the RF leg, the flight crew should be aware of the importance of maintaining the published path as closely as possible. Operating procedures should be provided for aircraft that do not stay in LNAV when a missed approach is initiated to ensure the RNP AR APCH ground track is maintained.

(2) The flight crew should not exceed the maximum airspeed values shown in Table 1 throughout the RF leg. For example, a Category C A320 should slow to 160 KIAS at the FAF or may fly as fast as 185 KIAS if using Category D minima. A missed approach operation prior to DA/H may require compliance with speed limitation for that segment.

Table 1: Maximum airspeed by segment and category

Indicated airspeed (Knots)					
Segment	Indicated airspeed by aircraft category				
	Cat A	Cat B	Cat C	Cat D	Cat
Initial & intermediate (IAF to FAF)	150	180	240	250	250
Final (FAF to DA)	100	130	160	185	as specified
Missed approach (DA/H to MAHP)	110	150	240	265	as specified
Airspeed restriction*	as specified				

Note: Airspeed restrictions may be used to reduce turn radius regardless of aircraft category.

(j) Temperature compensation

For aircraft with temperature compensation capabilities, the flight crew may disregard the temperature limits on RNP procedures if the operator provides pilot training on the use of the temperature compensation function. It should be noted that temperature compensation by the system is applicable to the VNAV guidance and is not a substitute for the flight crew compensating for temperature effects on minimum altitudes or DA/H. The flight crew should be familiar with the effects of the temperature compensation on intercepting the compensated path as described in EUROCAE ED-75/RTCA DO-236C Appendix H or CAAB recognized standard.

(k) Altimeter setting

Due to the performance-based obstruction clearance inherent in RNP instrument procedures, the flight crew should verify that the most current aerodrome altimeter is set prior to the FAF. The operator should take precautions to switch altimeter settings at appropriate times or locations and request a current altimeter setting if the reported setting may not be recent, particularly at times when pressure is reported or expected to be rapidly decreasing. Execution of an RNP operation necessitates the current altimeter setting for the aerodrome of intended landing. Remote altimeter settings should not be allowed.

(l) Altimeter cross-check

(1) The flight crew should complete an altimetry cross-check ensuring both pilots' altimeters agree within ±100 ft prior to the FAF but no earlier than when the altimeters are set for the aerodrome of intended landing. If the altimetry cross-check fails, then the approach operation should not be continued.

(2) This operational cross-check should not be necessary if the aircraft systems automatically compare the altitudes to within 75 ft.

(m) Missed approach operation

(1) Where possible, the missed approach operation should necessitate RNP 1.0. The missed approach portion of these procedures should be similar to a missed approach of an RNP APCH procedure.

(2) Where necessary, navigation accuracy less than RNP 1.0 may be used in the missed approach segment.

(i) In many aircraft, executing a missed approach activating take-off/go-around (TOGA) may cause a change in lateral navigation. In many aircraft, activating TOGA disengages the autopilot and flight director from LNAV guidance, and the flight director reverts to track hold derived from the inertial system. LNAV guidance to the autopilot and flight director should be re-engaged as quickly as possible.

(ii) Flight crew procedures and training should address the impact on navigation capability and flight guidance if the pilot initiates a missed approach while the aircraft is in a turn. When initiating an early missed approach operation, the flight crew should follow the rest of the approach track and missed approach track unless a different clearance has been issued by ATC. The flight crew should also be aware that RF legs are designed based on the maximum true airspeed at normal altitudes and initiating an early missed approach operation will reduce the maneuverability margin and potentially even make holding the turn impractical at missed approach speeds.

(n) Contingency procedures

(1) Failure while en route

The flight crew should be able to assess the impact of GNSS equipment failure on the anticipated RNP AR APCH operation and take appropriate action.

(2) Failure on approach

The operator's contingency procedures should address at least the following conditions:

(i) failure of the area navigation system components, including those affecting lateral and vertical deviation performance (e.g. failures of a GPS sensor, the flight director or autopilot);

(ii) loss of navigation signal-in-space (loss or degradation of external signal).

AMC3 SPA.PBN.105(d) PBN operational approval

NAVIGATION DATABASE MANAGEMENT

(a) The operator should validate every RNP AR APCH procedure before using the procedure in instrument meteorological conditions (IMC) to ensure compatibility with their aircraft and to ensure the resulting path matches the published procedure. As a minimum, the operator should:

(1) compare the navigation data for the procedure(s) to be loaded into the FMS with the published procedure.

(2) validate the loaded navigation data for the procedure, either in an FSTD or in the actual aircraft in VMC. The depicted procedure on the map display should be compared to the published procedure. The entire procedure should be flown to ensure the path is flyable, does not have any apparent lateral or vertical path disconnects and is consistent with the published procedure.

(3) Once the procedure is validated, a copy of the validated navigation data should be retained for comparison with subsequent data updates.

(4) For published procedures, where FOSA demonstrated that the procedure is not in a challenging operational environment, the flight or FSTD validation may be credited from already validated equivalent RNP AR APCH procedures.

(b) If an aircraft system required for RNP AR APCH operations is modified, the operator should assess the need for a validation of the RNP AR APCH procedures with the navigation database and the modified system. This may be accomplished without any direct evaluation if the manufacturer verifies that the modification has no effect on the navigation database or path computation. If no such assurance from the manufacturer is available, the operator should conduct initial data validation with the modified system.

(c) The operator should implement procedures that ensure timely distribution and insertion of current and unaltered electronic navigation data to all aircraft that require it.

AMC1 SPA.PBN.105(e) PBN operational approval

REPORTABLE EVENTS

The operator should report events which are listed in ANO (AOC) and ANO (OPS).

AMC1 SPA.PBN.105(f) PBN operational approval

RNP MONITORING PROGRAM

(a) The operator approved to conduct RNP AR APCH operations, should have an RNP monitoring program to ensure continued compliance with applicable rules and to identify any negative trends in performance.

(b) During an interim approval period, which should be at least 90 days, the operator should at least submit the following information every 30 days to the CAAB.

(1) Total number of RNP AR APCH operations conducted;

(2) Number of approach operations by aircraft/system which were completed as planned without any navigation or guidance system anomalies;

(3) Reasons for unsatisfactory approaches, such as:

(i) UNABLE REQ NAV PERF, NAV ACCUR DOWNGRAD, or other RNP messages during approaches;

(ii) excessive lateral or vertical deviation;

(iii) TAWS warning;

(iv) autopilot system disconnect;

(v) navigation data errors; or

(vi) flight crew reports of any anomaly;

(4) Flight crew comments.

(c) Thereafter, the operator should continue to collect and periodically review this data to identify potential safety concerns and maintain summaries of this data.

SUBPART C:
OPERATIONS WITH SPECIFIED MINIMUM NAVIGATION PERFORMANCE (MNPS)

SPA.MNPS.100 MNPS operations

Aircraft shall only be operated in designated minimum navigation performance specifications (MNPS) airspace in accordance with regional supplementary procedures, where minimum navigation performance specifications are established, if the operator has been granted an approval by the CAAB to conduct such operations.

GM1 SPA.MNPS.100 MNPS operations

DOCUMENTATION

MNPS and the procedures governing their application are published in the Regional Supplementary Procedures, ICAO Doc 7030, as well as in national AIPs.

SPA.MNPS.105 MNPS operational approval

To obtain an MNPS operational approval from the CAAB, the operator shall provide evidence that:

(a) the navigation equipment meets the required performance;

(b) navigation displays, indicators and controls are visible and operable by either pilot seated at his/her duty station;

(c) a training program for the flight crew members involved in these operations has been established;

(d) operating procedures have been established specifying:

  (1) the equipment to be carried, including its operating limitations and appropriate entries in the MEL;

  (2) flight crew composition and experience requirements;

  (3) normal procedures;

  (4) contingency procedures including those specified by the authority responsible for the airspace concerned;

  (5) monitoring and incident reporting.

AMC1 SPA.MNPS.105 MNPS operational approval

LONG RANGE NAVIGATION SYSTEM (LRNS)

(a) For unrestricted operation in MNPS airspace an aircraft should be equipped with two independent LRNSs.

(b) An LRNS may be one of the following:

(1) one inertial navigation system (INS);

(2) one global navigation satellite system (GNSS); or

(3) one navigation system using the inputs from one or more inertial reference system (IRS) or any other sensor system complying with the MNPS requirement.

(c) In case of the GNSS is used as a stand-alone system for LRNS, an integrity check should be carried out.

(d) For operation in MNPS airspace along notified special routes the aero plane should be equipped with one LRNS.

SUBPART D:

OPERATIONS IN AIRSPACE WITH REDUCED VERTICAL SEPARATION MINIMA (RVSM)

SPA.RVSM.100 RVSM operations

Aircraft shall only be operated in designated airspace where a reduced vertical separation minimum of 300 m (1000 ft) applies between flight level (FL) 290 and FL 410, inclusive, if the operator has been granted an approval by the CAAB to conduct such operations.

SPA.RVSM.105 RVSM operational approval

To obtain an RVSM operational approval from the CAAB, the operator shall provide evidence that:

(a) the RVSM airworthiness approval has been obtained;

(b) procedures for monitoring and reporting height-keeping errors have been established;

(c) a training program for the flight crew members involved in these operations has been established;

(d) operating procedures have been established specifying:

(1) the equipment to be carried, including its operating limitations and appropriate entries in the MEL;

(2) flight crew composition and experience requirements;

(3) flight planning;

(4) pre-flight procedures;

(5) procedures prior to RVSM airspace entry;

(6) in-flight procedures;

(7) post-flight procedures;

(8) incident reporting;

(9) specific regional operating procedures.

AMC1 SPA.RVSM.105 RVSM operational approval

CONTENT OF OPERATOR RVSM APPLICATION

The following material should be made available to the CAAB, in sufficient time to permit evaluation, before the intended start of RVSM operations:

(a) Airworthiness documents

Documentation that shows that the aircraft has RVSM airworthiness approval. This should include an aircraft flight manual (AFM) amendment or supplement.

(b) Description of aircraft equipment

A description of the aircraft appropriate to operations in an RVSM environment.

(c) Training programs, operating practices and procedures

The operator should submit training syllabi for initial and recurrent training programs together with other relevant material. The material should show that the operating practices, procedures and training items, related to RVSM operations in airspace that requires CAAB's operational approval, are incorporated.

(d) Manuals and checklists

The appropriate manuals and checklists should be revised to include information/guidance on standard operating procedures. Manuals should contain a statement of the airspeeds, altitudes and weights considered in RVSM aircraft approval, including identification of any operating limitations or conditions established for that aircraft type. Manuals and checklists may need to be submitted for review by the CAAB as part of the application process.

(e) Past performance

Relevant operating history, where available, should be included in the application. The applicant should show that any required changes have been made in training, operating or maintenance practices to improve poor height-keeping performance.

(f) Minimum equipment list

Where applicable, a minimum equipment list (MEL), adapted from the master minimum equipment list (MMEL), should include items pertinent to operating in RVSM airspace.

(g) Plan for participation in verification/monitoring programs

The operator should establish a plan for participation in any applicable verification/monitoring program acceptable to the CAAB. This plan should include, as a minimum, a check on a sample of the operator's fleet by an regional monitoring agency (RMA)'s independent height-monitoring system.

(h) Continuing airworthiness

Aircraft maintenance program and continuing airworthiness procedures in support of the RVSM operations.

AMC2 SPA.RVSM.105 RVSM operational approval

OPERATING PROCEDURES

(a) Flight planning

(1) During flight planning the flight crew should pay particular attention to conditions that may affect operation in RVSM airspace. These include, but may not be limited to:

(i) verifying that the airframe is approved for RVSM operations;

(ii) reported and forecast weather on the route of flight;

(iii) minimum equipment requirements pertaining to height-keeping and alerting systems; and

(iv) any airframe or operating restriction related to RVSM operations.

(b) Pre-flight procedures

(1) The following actions should be accomplished during the pre-flight procedure:

(i) Review technical logs and forms to determine the condition of equipment required for flight in the RVSM airspace. Ensure that maintenance action has been taken to correct defects to required equipment.

(ii) During the external inspection of aircraft, particular attention should be paid to the condition of static sources and the condition of the fuselage skin near each static source and any other component that affects altimetry system accuracy. This check may be accomplished by a qualified and authorized person other than the pilot (e.g. a flight engineer or ground engineer).

(iii) Before take-off, the aircraft altimeters should be set to the QNH (atmospheric pressure at nautical height) of the airfield and should display a known altitude, within the limits specified in the aircraft operating manuals. The two primary altimeters should also agree within limits specified by the aircraft operating manual. An alternative procedure using QFE (atmospheric pressure at aerodrome elevation/runway threshold) may also be used. The maximum value of acceptable altimeter differences for these checks should not exceed 23 m (75 ft). Any required functioning checks of altitude indicating systems should be performed.

(iv) Before take-off, equipment required for flight in RVSM airspace should be operative and any indications of malfunction should be resolved.

(c) Prior to RVSM airspace entry

(1) The following equipment should be operating normally at entry into RVSM airspace:

(i) two primary altitude measurement systems. A cross-check between the primary altimeters should be made. A minimum of two will need to agree within ±60 m (±200 ft). Failure to meet this condition will require that the altimetry system be reported as defective and air traffic control (ATC) notified;

(ii) one automatic altitude-control system;

(iii) one altitude-alerting device; and

(iv) operating transponder.

(2) Should any of the required equipment fail prior to the aircraft entering RVSM airspace, the pilot should request a new clearance to avoid entering this airspace.

(d) In-flight procedures

(1) The following practices should be incorporated into flight crew training and procedures:

(i) Flight crew should comply with any aircraft operating restrictions, if required for the specific aircraft type, e.g. limits on indicated Mach number, given in the RVSM airworthiness approval.

(ii) Emphasis should be placed on promptly setting the sub-scale on all primary and standby altimeters to 1013.2 hPa / 29.92 in Hg when passing the transition altitude, and rechecking for proper altimeter setting when reaching the initial cleared flight level.

(iii) In level cruise it is essential that the aircraft is flown at the cleared flight level. This requires that particular care is taken to ensure that ATC clearances are fully understood and followed. The aircraft should not intentionally depart from cleared flight level without a positive clearance from ATC unless the crew are conducting contingency or emergency maneuvers.

(iv) When changing levels, the aircraft should not be allowed to overshoot or undershoot the cleared flight level by more than 45 m (150 ft). If installed, the level off should be accomplished using the altitude capture feature of the automatic altitude-control system.

(v) An automatic altitude-control system should be operative and engaged during level cruise, except when circumstances such as the need to re-trim the aircraft or turbulence require disengagement. In any event, adherence to cruise altitude should be done by reference to one of the two primary altimeters. Following loss of the automatic height-keeping function, any consequential restrictions will need to be observed.

(vi) Ensure that the altitude-alerting system is operative.

(vii) At intervals of approximately 1 hour, cross-checks between the primary altimeters should be made. A minimum of two will need to agree within ±60 m (±200 ft). Failure to meet this condition will require that the altimetry system be reported as defective and ATC notified.

(viii) The usual scan of flight deck instruments should suffice for altimeter cross- checking on most flights.

(ix) In normal operations, the altimetry system being used to control the aircraft should be selected for the input to the altitude reporting transponder transmitting information to ATC.

(x) If the pilot is notified by ATC of a deviation from an assigned altitude exceeding ±90 m (±300 ft) then the pilot should take action to return to cleared flight level as quickly as possible.

(2) Contingency procedures after entering RVSM airspace are as follows:

(i) The pilot should notify ATC of contingencies (equipment failures, weather) that affect the ability to maintain the cleared flight level and coordinate a plan of action appropriate to the airspace concerned. The pilot should obtain to the guidance on contingency procedures is contained in the relevant publications dealing with the airspace.

(ii) Examples of equipment failures that should be notified to ATC are:

(A) failure of all automatic altitude-control systems aboard the aircraft;

(B) loss of redundancy of altimetry systems;

(C) loss of thrust on an engine necessitating descent; or

(D) any other equipment failure affecting the ability to maintain cleared flight level.

(iii) The pilot should notify ATC when encountering greater than moderate turbulence.

(iv) If unable to notify ATC and obtain an ATC clearance prior to deviating from the cleared flight level, the pilot should follow any established contingency procedures for the region of operation and obtain ATC clearance as soon as possible.

(e) Post-flight procedures

(1) In making technical log entries against malfunctions in height-keeping systems, the pilot should provide sufficient detail to enable maintenance to effectively troubleshoot and repair the system. The pilot should detail the actual defect and the crew action taken to try to isolate and rectify the fault.

(2) The following information should be recorded when appropriate:

(i) primary and standby altimeter readings;

(ii) altitude selector setting;

(iii) subscale setting on altimeter;

(iv) autopilot used to control the aircraft and any differences when an alternative autopilot system was selected;

(v) differences in altimeter readings, if alternate static ports selected;

(vi) use of air data computer selector for fault diagnosis procedure; and

(vii) the transponder selected to provide altitude information to ATC and any difference noted when an alternative transponder was selected.

(f) Crew training

(1) The following items should also be included in flight crew training programs:

(i) knowledge and understanding of standard ATC phraseology used in each area of operations;

(ii) importance of crew members cross-checking to ensure that ATC clearances are promptly and correctly complied with;

(iii) use and limitations in terms of accuracy of standby altimeters in contingencies.

Where applicable, the pilot should review the application of static source error correction/position error correction through the use of correction cards; such correction data should be available on the flight deck;

(iv) problems of visual perception of other aircraft at 300 m (1 000 ft) planned separation during darkness, when encountering local phenomena such as northern lights, for opposite and same direction traffic, and during turns;

(v) characteristics of aircraft altitude capture systems that may lead to overshoots;

(vi) relationship between the aircraft's altimetry, automatic altitude control and transponder systems in normal and abnormal conditions; and

(vii) any airframe operating restrictions, if required for the specific aircraft group, related to RVSM airworthiness approval.

AMC3 SPA.RVSM.105 RVSM operational approval

CONTINUING AIRWORTHINESS

(a) Maintenance program

The aircraft maintenance program should include the instructions for continuing airworthiness issued by the type certificate holder in relation to the RVSM operations certification in accordance with AMC1 ACNS.A.GEN.010.

(b) Continuing airworthiness procedures

The continuing airworthiness procedures should establish a process to:

(1) assess any modification or design change which in any way affects the RVSM approval;

(2) evaluate any repairs that may affect the integrity of the continuing RVSM approval, e.g. those affecting the alignment of pitot/static probes, repairs to dents, or deformation around static plates;

(3) ensure the proper maintenance of airframe geometry for proper surface contours and the mitigation of altimetry system error, surface measurements or skin waviness as specified in the instructions for continued airworthiness (ICA), to ensure adherence to RVSM tolerances. These checks should be performed following repairs or alterations having an effect on airframe surface and airflow.

(c) Additional training may be necessary for continuing airworthiness and maintenance staff to support RVSM approval. Areas that may need to be highlighted for the initial and recurrent training of relevant personnel are:

(1) Aircraft geometric inspection techniques;

(2) Test equipment calibration and use of that equipment; and

(3) Any special instructions or procedures introduced for RVSM approval.

(d) Test equipment

The operator should ensure that maintenance organizations use test equipment adequate for maintenance of the RVSM systems. The adequacy of the test equipment should be established in accordance with the type certificate holder recommendations and taking into consideration the required test equipment accuracy and the test equipment calibration.

GM1 SPA.RVSM.105(d)(9) RVSM operational approval

SPECIFIC REGIONAL PROCEDURES

The areas of applicability (by Flight Information Region) of RVSM airspace in identified ICAO regions is contained in the relevant sections of ICAO Document 7030/4. In addition, these sections contain operating and contingency procedures unique to the regional airspace concerned, specific flight planning requirements and the approval requirements for aircraft in designated region;

SPA.RVSM.110 RVSM equipment requirements

Aircraft used for operations in RVSM airspace shall be equipped with:

(a) two independent altitude measurement systems;
(b) an altitude alerting system;
(c) an automatic altitude control system;
(d) a secondary surveillance radar (SSR) transponder with altitude reporting system that can be connected to the altitude measurement system in use for altitude control.

AMC1 SPA.RVSM.110(a) RVSM equipment requirements

TWO INDEPENDENT ALTITUDE MEASUREMENT SYSTEMS

Each system should be composed of the following components:

(a) cross-coupled static source/system, with ice protection if located in areas subject to ice accretion;
(b) equipment for measuring static pressure sensed by the static source, converting it to pressure altitude and displaying the pressure altitude to the flight crew:
(c) equipment for providing a digitally encoded signal corresponding to the displayed pressure altitude, for automatic altitude reporting purposes;

(d) static source error correction (SSEC), if needed to meet the performance criteria for RVSM flight envelopes; and
(e) signals referenced to a flight crew selected altitude for automatic control and alerting. These signals will need to be derived from an altitude measurement system meeting the performance criteria for RVSM flight envelopes.

SPA.RVSM.115 RVSM height-keeping errors

(a) The operator shall report recorded or communicated occurrences of height-keeping errors caused by malfunction of aircraft equipment or of operational nature, equal to or greater than:

(1) a total vertical error (TVE) of ± 90 m (± 300 ft);

(2) an altimetry system error (ASE) of ± 75 m (± 245 ft); and

(3) an assigned altitude deviation (AAD) of ± 90 m (± 300 ft).

(b) Reports of such occurrences shall be sent to the CAAB within 72 hours. Reports shall include an initial analysis of causal factors and measures taken to prevent repeat occurrences.

(c) When height-keeping errors are recorded or received, the operator shall take immediate action to rectify the conditions that caused the errors and provide follow-up reports, if requested by the CAAB.

SUBPART E: LOW VISIBILITY OPERATIONS (LVO)

SPA.LVO.100 Low visibility operations

The operator shall only conduct the following low visibility operations (LVO) when approved by the CAAB:

(a) low visibility take-off (LVTO) operation;

(b) lower than standard category I (LTS CAT I) operation;

(c) standard category II (CAT II) operation;

(d) other than standard category II (OTS CAT II) operation;

(e) standard category III (CAT III) operation;

(f) approach operation utilizing enhanced vision systems (EVS) for which an operational credit is applied to reduce the runway visual range (RVR) minima by no more than one third of the published RVR.

AMC1 SPA.LVO.100 Low visibility operations

LVTO OPERATIONS – AEROPLANES

For a low visibility take-off (LVTO) with an aero plane the following provisions should apply:

(a) for an LVTO with a runway visual range (RVR) below 400 m the criteria specified in Table 1.A;

(b) for an LVTO with an RVR below 150 m but not less than 125 m:

   (1) high intensity runway Centre line lights spaced 15 m or less apart and high intensity edge lights spaced 60 m or less apart that are in operation;

   (2) a 90 m visual segment that is available from the flight crew compartment at the start of the take-off run; and

   (3) the required RVR value is achieved for all of the relevant RVR reporting points;

(c) for an LVTO with an RVR below 125 m but not less than 75 m:

   (1) runway protection and facilities equivalent to CAT III landing operations are available; and

   (2) the aircraft is equipped with an approved lateral guidance system.

Table 1.A: LVTO – aero planes RVR vs. facilities

Facilities	RVR (m) *, **
Day: runway edge lights and runway centre line markings Night: runway edge lights and runway end lights or runway centre line lights and runway end lights	300
Runway edge lights and runway Centre line lights	200
Facilities	**RVR (m) *, ****
Runway edge lights and runway Centre line lights	TDZ, MID, rollout 150***
High intensity runway Centre line lights spaced 15 m or less and high intensity edge lights spaced 60 m or less are in operation	TDZ, MID, rollout 125***
Runway protection and facilities equivalent to CAT III landing operations are available and the aircraft is equipped either with an approved lateral guidance system or an approved HUD / HUDLS for take-off.	TDZ, MID, rollout 75

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

**: Multi-engine aeroplane that in the event of an engine failure at any point during take-off can either stop or continue the take-off to a height of 1 500 ft above the aerodrome while clearing obstacles by the required margins.

***: The required RVR value to be achieved for all relevant RVRs

TDZ: touchdown zone, equivalent to the initial part of the take-off run

MID: midpoint

AMC2 SPA.LVO.100 Low visibility operation

LVTO OPERATIONS – HELICOPTERS

For LVTOs with helicopters the provisions specified in Table 1.H should apply.

Table 1.H: LVTO – helicopters RVR vs. facilities

Facilities	**RVR**
Onshore aerodromes with IFR departure procedures	
No light and no markings (day only)	250 or the rejected takeoff distance, whichever is the greater
No markings (night)	800
Runway edge/FATO light and centre line marking	200
Runway edge/FATO light, centre line marking and relevant RVR information	150
Offshore helideck *	
Two-pilot operations	250
Single-pilot operations	500

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

FATO: final approach and take-off area

AMC3 SPA.LVO.100 Low visibility operations

LTS CAT I OPERATIONS

(a) For lower than Standard Category I (LTS CAT I) operations the following provisions should apply:

(1) The decision height (DH) of an LTS CAT I operation should not be lower than the highest of:

(i) the minimum DH specified in the AFM, if stated;

(ii) the minimum height to which the precision approach aid can be used without the specified visual reference;

(iii) the applicable obstacle clearance height (OCH) for the category of aero plane;

(iv) the DH to which the flight crew is qualified to operate; or

(v) 200 ft.

(2) An instrument landing system / microwave landing system (ILS/MLS) that supports an LTS CAT I operation should be an unrestricted facility with a straight-in course, ≤3º offset, and the ILS should be certified to:

(i) class I/T/1 for operations to a minimum of 450 m RVR; or

(ii) class II/D/2 for operations to less than 450 m RVR. Single ILS facilities are only acceptable if level 2 performance is provided.

(3) The following visual aids should be available:

(i) standard runway day markings, approach lights, runway edge lights, threshold lights and runway end lights;

(ii) for operations with an RVR below 450 m, additionally touch-down zone and/or runway Centre line lights.

(4) The lowest RVR / converted meteorological visibility (CMV) minima to be used are specified in Table 2.

Table 2

LTS CAT I operation minima RVR/CMV vs. approach lighting system

DH (ft)	**Class of light facility ***			
	FALS	**IALS**	**BALS**	**NAL**
	RVR/CMV (m)			
200 – 210	400	500	600	750
211 – 220	450	550	650	800
221 – 230	500	600	700	900
231 – 240	500	650	750	1000
241 – 249	550	700	800	1100

❖ FALS: full approach lighting system

IALS: intermediate approach lighting system

BALS: basic approach lighting system

NALS: no approach lighting system

AMC4 SPA.LVO.100 Low visibility operations

CAT II AND OTS CAT II OPERATIONS

(a) For CAT II and other than Standard Category II (OTS CAT II) operations the following provisions should apply:

(1) The ILS / MLS that supports OTS CAT II operation should be an unrestricted facility with a straight in course (≤ 3º offset) and the ILS should be certified to class II/D/2.

Single ILS facilities are only acceptable if level 2 performance is provided.

(2) The DH for CAT II and OTS CAT II operation should not be lower than the highest of:

(i) the minimum DH specified in the AFM, if stated;

(ii) the minimum height to which the precision approach aid can be used without the specified visual reference;

(iii) the applicable OCH for the category of aeroplane;

(iv) the DH to which the flight crew is qualified to operate; or

(v) 100 ft.

(3) The following visual aids should be available:

(i) standard runway day markings and approach and the following runway lights: runway edge lights, threshold lights and runway end lights;

(ii) for operations in RVR below 450 m, additionally touch-down zone and/or runway Centre line lights;

(iii) for operations with an RVR of 400 m or less, additionally Centre line lights.

(4) The lowest RVR minima to be used are specified:

(i) for CAT II operations in Table 3; and

(ii) for OTS CAT II operations in Table 4.

(b) For OTS CAT II operations, the terrain ahead of the runway threshold should have been surveyed.

Table 3: CAT II operation minima RVR vs. DH

DH (ft)	Auto-coupled or approved HUDLS to below DH *	
	Aircraft categories A, B, C RVR (m)	Aircraft category D RVR (m)
100 – 120	300	300/350**
121 – 140	400	400
141 – 199	450	450

*: This means continued use of the automatic flight control system or the HUDLS down to a height of

80 % of the DH.

**: An RVR of 300 m may be used for a category D aircraft conducting an auto-land.

Table 4: OTS CAT II operation minima RVR vs. approach lighting system

	Auto-land or approved HUDLS utilised to touchdown				
	Class of light facility				
	Aircraft categories A – C	**Aircraft category D**	**Aircraft categories A – D**	**Aircraft categories A – D**	**Aircraft categories A - D**
DH (ft)	**RVR (m)**				
100 - 120	350	400	450	600	700
121 - 140	400	450	500	600	700
141 - 160	400	500	500	600	750
161 - 199	400	500	550	650	750

AMC5 SPA.LVO.100 Low visibility operations

CAT III OPERATIONS

The following provisions should apply to CAT III operations:

(a) Where the DH and RVR do not fall within the same category, the RVR should determine in which category the operation is to be considered.

(b) For operations in which a DH is used, the DH should not be lower than:

(1) the minimum DH specified in the AFM, if stated;
(2) the minimum height to which the precision approach aid can be used without the specified visual reference; or
(3) the DH to which the flight crew is qualified to operate.

(c) Operations with no DH should only be conducted if:

(1) the operation with no DH is specified in the AFM;
(2) the approach aid and the aerodrome facilities can support operations with no DH; and
(3) the flight crew is qualified to operate with no DH.

(d) The lowest RVR minima to be used are specified in Table 5.

Table 5: CAT III operations minima

RVR vs. DH and rollout control/guidance system

CAT	**DH (ft) ***	**Rollout control/guidance system**	**RVR (m)**
IIIA	Less than 100	Not required	200
IIIB	Less than 100	Fail-passive	150**

IIIB	Less than 50	Fail-passive	125
IIIB	Less than 50 or no DH	Fail-operational ***	75

*: Flight control system redundancy is determined under CS-AWO by the minimum certified DH.

**: For aeroplanes certified in accordance with CS-AWO 321(b)(3) or equivalent.

***: The fail-operational system referred to may consist of a fail-operational hybrid system.

AMC6 SPA.LVO.100 Low visibility operations

OPERATIONS UTILISING EVS

The pilot using a certified enhanced vision system (EVS) in accordance with the procedures and limitations of the AFM:

(a) may reduce the RVR/CMV value in column 1 to the value in column 2 of Table 6 for CAT I operations, APV operations and NPA operations flown with the CDFA technique;

(b) for CAT I operations:

(1) may continue an approach below DH to 100 ft above the runway threshold elevation provided that a visual reference is displayed and identifiable on the EVS image; and

(2) should only continue an approach below 100 ft above the runway threshold elevation provided that a visual reference is distinctly visible and identifiable to the pilot without reliance on the EVS;

(c) for APV operations and NPA operations flown with the CDFA technique:

(1) may continue an approach below DH/MDH to 200 ft above the runway threshold elevation provided that a visual reference is displayed and identifiable on the EVS image; and

(2) should only continue an approach below 200 ft above the runway threshold elevation provided that a visual reference is distinctly visible and identifiable to the pilot without reliance on the EVS.

Table 6: Operations utilizing EVS RVR/CMV reduction vs. normal RVR/CMV

RVR/CMV (m) normally required	RVR/CMV (m) utilizing EVS
550	350
600	400
650	450
700	450
750	500
800	550
900	600
1 000	650
1 100	750
1 200	800
1 300	900
1 400	900
1 500	1 000
1 600	1 100
1 700	1 100
1 800	1 200
1 900	1 300
2 000	1 300
2 100	1 400
2 200	1 500
2 300	1 500
2 400	1 600
2 500	1 700
2 600	1 700
2 700	1 800
2 800	1 900
2 900	1 900

3 000	2 000
3 100	2 000
3 200	2 100
3 300	2 200
3 400	2 200
3 500	2 300
3 600	2 400
3 700	2 400
3 800	2 500
3 900	2 600
4 000	2 600
4 100	2 700
4 200	2 800
4 300	2 800
4 400	2 900
4 500	3 000
4 600	3 000
4 700	3 100
4 800	3 200
4 900	3 200
5 000	3 300

AMC7 SPA.LVO.100 Low visibility operations

EFFECT ON LANDING MINIMA OF TEMPORARILY FAILED OR DOWNGRADED EQUIPMENT

(a) General

These instructions are intended for use both pre-flight and in-flight. It is however not expected that the pilot-in-command would consult such instructions after passing 1 000 ft above the aerodrome. If failures of ground aids are announced at such a late stage, the approach could be continued at the pilot-in-command's discretion. If failures are announced before such a late stage in the approach, their effect on the approach should be considered as described in Table 7, and the approach may have to be abandoned.

(b) The following conditions should be applicable to the tables below:

(1) multiple failures of runway/FATO lights other than indicated in Table 7 are not acceptable;

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

(3) for CAT II and CAT III operations, a combination of deficiencies in runway/FATO lights and RVR assessment equipment are not permitted; and

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

Table 7

Failed or downgraded equipment – effect on landing minima

Operations with an LVO approval

Failed or downgraded equipment	**Effect on landing minima**			
	CAT IIIB (no DH)	**CAT IIIB**	**CAT IIIA**	**CAT II**
ILS/MLS stand-by transmitter	Not allowed	RVR 200 m	No effect	
Outer marker	No effect if replaced by height check at 1 000 ft			
Middle marker	No effect			
RVR assessment systems	At least one RVR value to be available on the aerodrome	On runways equipped with two or more RVR assessment units, one may be inoperative		
Approach lights	No effect	Not allowed for operations with DH >50 ft		Not allowed
Approach lights except the last 210 m	No effect			Not allowed
Approach lights				

except the last 420 m	No effect			
Standby power for approach lights	No effect			
Edge lights, threshold lights and runway end lights	No effect		Day: no effect	Day: no effect
			Night: RVR 550 m	Night: not allowed
Centre line lights	Day: RVR 200 m	Not allowed	Day: RVR 300 m	Day: RVR 350 m
	Night: not allowed		Night: RVR 400 m	Night: RVR 550 m (400 m with HUDL or auto-land)
Centre line lights spacing increased to 30 m	RVR 150 m		No effect	
Failed or downgraded equipment	**Effect on landing minima**			
	CAT IIIB (no DH)	**CAT IIIB**	**CAT IIIA**	**CAT II**
Touchdown zone lights	No effect	Day: RVR 200 m	Day: RVR 300 m	
		Night: RVR 300 m	Night: RVR 550 m, 350 m with HUDLS or auto-land	
Taxiway light system	No effect			

GM1 SPA.LVO.100 Low visibility operations

DOCUMENTS CONTAINING INFORMATION RELATED TO LOW VISIBILITY OPERATIONS

The following documents provide further information to low visibility operations (LVO):

(a) ICAO Annex 2 Rules of the Air;
(b) ICAO Annex 6 Operation of Aircraft;
(c) ICAO Annex 10 Telecommunications Vol. 1;
(d) ICAO Annex 14 Aerodromes Vol. 1;
(e) ICAO Doc 8168 PANS - OPS Aircraft Operations;
(f) ICAO Doc 9365 AWO Manual;
(g) ICAO Doc 9476 Manual of surface movement guidance and control systems (SMGCS);
(h) ICAO Doc 9157 Aerodrome Design Manual;
(i) ICAO Doc 9328 Manual of RVR Observing and Reporting Practices;

GM2 SPA.LVO.100 Low visibility operations

ILS CLASSIFICATION

The ILS classification system is specified in ICAO Annex 10.

GM1 SPA.LVO.100(c),(e) Low visibility operations

ESTABLISHMENT OF MINIMUM RVR FOR CAT II AND CAT III OPERATIONS

(a) General

(1) When establishing minimum RVR for CAT II and CAT III operations, operators should pay attention to the following information that originates in GM! SPA.LVO.100.

(2) Since the inception of precision approach and landing operations various methods have been devised for the calculation of aerodrome operating minima in terms of DH and RVR. It is a comparatively straightforward matter to establish the DH for an operation but establishing the minimum RVR to be associated with that DH so as to provide a high probability that the required visual reference will be available at that DH has been more of a problem.

(3) The methods adopted by various States to resolve the DH/RVR relationship in respect of CAT II and CAT III operations have varied considerably. In one instance there has been a simple approach that entailed the application of empirical data based on actual operating experience in a particular environment. This has given satisfactory results for application within the environment for which it was developed. In another instance a more sophisticated method was employed which utilized a fairly complex computer program to take account of a wide range of variables. However, in the latter case, it has been found that with the improvement in the performance of visual aids, and the increased use of automatic equipment in the many different types of new aircraft, most of the variables cancel each other out and a simple tabulation can be constructed that is applicable to a wide range of aircraft. The basic principles that are observed in establishing the values in such a table are that the scale of visual reference required by a pilot at and below DH depends on the task that he/she has to carry out, and that the degree to which his/her vision is obscured depends on the obscuring medium, the general rule in fog being that it becomes more dense with increase in height. Research using flight simulation training devices (FSTDs) coupled with flight trials has shown the following:

(i) most pilots require visual contact to be established about 3 seconds above DH though it has been observed that this reduces to about 1 second when a fail operational automatic landing system is being used;

(ii) to establish lateral position and cross-track velocity most pilots need to see not less than a three-light segment of the Centre line of the approach lights, or runway Centre line, or runway edge lights;

(iii) for roll guidance most pilots need to see a lateral element of the ground pattern, i.e. an approach light cross bar, the landing threshold, or a barrette of the touchdown zone light; and

(iv) to make an accurate adjustment to the flight path in the vertical plane, such as a flare, using purely visual cues, most pilots need to see a point on the ground which has a low or zero rate of apparent movement relative to the aircraft.

(v) With regard to fog structure, data gathered in the United Kingdom over a 20 year period have shown that in deep stable fog there is a 90 % probability that the slant visual range from eye heights higher than 15 ft above the ground will be less than the horizontal visibility at ground level, i.e. RVR. There are at present no data available to show what the relationship is between the slant visual range and RVR in other low visibility conditions such as blowing snow, dust or heavy rain, but there is some evidence in pilot reports that the lack of contrast between visual aids and the background in such conditions can produce a relationship similar to that observed in fog.

(b) CAT II operations

The selection of the dimensions of the required visual segments that are used for CAT II operations is based on the following visual provisions:

(1) a visual segment of not less than 90 m will need to be in view at and below DH for pilot to be able to monitor an automatic system;

(2) a visual segment of not less than 120 m will need to be in view for a pilot to be able to maintain the roll attitude manually at and below DH; and

(3) for a manual landing using only external visual cues, a visual segment of 225 m will be required at the height at which flare initiation starts in order to provide the pilot with sight of a point of low relative movement on the ground.

Before using a CAT II ILS for landing, the quality of the localizer between 50 ft and touchdown should be verified.

(c) CAT III fail-passive operations

(1) CAT III operations utilizing fail-passive automatic landing equipment were introduced in the late 1960s and it is desirable that the principles governing the establishment of the minimum RVR for such operations be dealt with in some detail.

(2) During an automatic landing the pilot needs to monitor the performance of the aircraft system, not in order to detect a failure that is better done by the monitoring devices built into the system, but so as to know precisely the flight situation. In the final stages the pilot should establish visual contact and, by the time the pilot reaches DH, the pilot should have checked the aircraft position relative to the approach or runway Centre line lights. For this the pilot will need sight of horizontal elements (for roll reference) and part of the touchdown area. The pilot should check for lateral position and cross-track velocity and, if not within the pre-stated lateral limits, the pilot should carry out a missed approach

procedure. The pilot should also check longitudinal progress and sight of the landing threshold is useful for this purpose, as is sight of the touchdown zone lights.

(3) In the event of a failure of the automatic flight guidance system below DH, there are two possible courses of action; the first is a procedure that allows the pilot to complete the landing manually if there is adequate visual reference for him/her to do so, or to initiate a missed approach procedure if there is not; the second is to make a missed approach procedure mandatory if there is a system disconnect regardless of the pilot's assessment of the visual reference available:

(i) If the first option is selected then the overriding rule in the determination of a minimum RVR is for sufficient visual cues to be available at and below DH for the pilot to be able to carry out a manual landing. Data presented in ECAC Doc 17 showed that a minimum value of 300 m would give a high probability that the cues needed by the pilot to assess the aircraft in pitch and roll will be available and this should be the minimum RVR for this procedure.

(ii) The second option, to require a missed approach procedure to be carried out should the automatic flight-guidance system fail below DH, will permit a lower minimum RVR because the visual reference provision will be less if there is no need to provide for the possibility of a manual landing. However, this option is only acceptable if it can be shown that the probability of a system failure below DH is acceptably low. It should be recognized that the inclination of a pilot who experiences such a failure would be to continue the landing manually but the results of flight trials in actual conditions and of simulator experiments show that pilots do not always recognize that the visual cues are inadequate in such situations and present recorded data reveal that pilots' landing performance reduces progressively as the RVR is reduced below 300 m. It should further be recognized that there is some risk in carrying out a manual missed approach procedure from below 50 ft in very low visibility and it should therefore be accepted that if an RVR lower than 300 m is to be approved, the flight deck procedure should not normally allow the pilot to continue the landing manually in such conditions and the aircraft system should be sufficiently reliable for the missed approach procedure rate to be low.

(4) These criteria may be relaxed in the case of an aircraft with a fail-passive automatic landing system that is supplemented by a head-up display that does not qualify as a fail- operational system but that gives guidance that will enable the pilot to complete a landing in the event of a failure of the automatic landing system. In this case it is not necessary to make a missed approach procedure mandatory in the event of a failure of the automatic landing system when the RVR is less than 300 m.

(d) CAT III fail-operational operations - with a DH

(1) For CAT III operations utilizing a fail-operational landing system with a DH, a pilot should be able to see at least one Centre line light.

(2) For CAT III operations utilizing a fail-operational hybrid landing system with a DH, a pilot should have a visual reference containing a segment of at least three consecutive lights of the runway Centre line lights.

(e) CAT III fails operational operations - with no DH

(1) For CAT III operations with no DH the pilot is not required to see the runway prior to touchdown. The permitted RVR is dependent on the level of aircraft equipment.

(2) A CAT III runway may be assumed to support operations with no DH unless specifically restricted as published in the AIP or NOTAM.

GM1 SPA.LVO.100(e) Low visibility operations

CREW ACTIONS IN CASE OF AUTOPILOT FAILURE AT OR BELOW DH IN FAIL-PASSIVE CAT III OPERATIONS

For operations to actual RVR values less than 300 m, a missed approach procedure is assumed in the event of an autopilot failure at or below DH. This means that a missed approach procedure is the normal action. However, the wording recognizes that there may be circumstances where the safest action is to continue the landing. Such circumstances include the height at which the failure occurs, the actual visual references, and other malfunctions. This would typically apply to the late stages of the flare. In conclusion, it is not forbidden to continue the approach and complete the landing when the pilot-in-command determines that this is the safest course of action. The operator’s policy and the operational instructions should reflect this information.

GM1 SPA.LVO.100(f) Low visibility operations

OPERATIONS UTILISING EVS

(a) Introduction

(1) Enhanced vision systems use sensing technology to improve a pilot's ability to detect objects, such as runway lights or terrain, which may otherwise not be visible. The image produced from the sensor and/or image processor can be displayed to the pilot in a number of ways including use of a HUD. The systems can be used in all phases of flight and can improve situational awareness. In particular, infra-red systems can display terrain during operations at night, improve situational awareness during night and low- visibility taxiing, and may allow earlier acquisition of visual references during instrument approaches.

(b) Background to EVS provisions

(1) The provisions for EVS were developed after an operational evaluation of two different EVS systems, along with data and support provided by the FAA. Approaches using EVS were flown in a variety of conditions including fog, rain and snow showers, as well as at night to aerodromes located in mountainous terrain. The infra-red EVS performance can vary depending on the weather conditions encountered. Therefore, the provisions take a conservative approach to cater for the wide variety of conditions which may be encountered. It may be necessary to amend the provisions in the future to take account of greater operational experience.

(2) Provisions for the use of EVS during take-off have not been developed. The systems evaluated did not perform well when the RVR was below 300 m. There may be some benefit for use of EVS during take-off with greater visibility and reduced light; however, such operations would need to be evaluated.

(3) Provisions have been developed to cover use of infra-red systems only. Other sensing technologies are not intended to be excluded; however, their use will need to be evaluated to determine the appropriateness of this, or any other provision. During the development, it was envisaged what minimum equipment should be fitted to the aircraft. Given the present state of technological development, it is considered that a HUD is an essential element of the EVS equipment.

(4) In order to avoid the need for tailored charts for approaches utilizing EVS, it is envisaged that the operator will use AMC6 SPA.LVO.110 Table 6 Operations utilizing EVS

RVR/CMV reduction vs. normal RVR/CMV to determine the applicable RVR at the commencement of the approach.

(c) Additional operational considerations

(1) EVS equipment should have:

(i) a head-up display system (capable of displaying, airspeed, vertical speed, aircraft attitude, heading, altitude, command guidance as appropriate for the approach to be flown, path deviation indications, flight path vector and flight path angle reference cue and the EVS imagery);

(ii) a head-down view of the EVS image, or other means of displaying the EVS- derived information easily to the pilot monitoring the progress of the approach; and

(iii) means to ensure that the pilot monitoring is kept in the 'loop' and crew resource management (CRM) does not break down.

SPA.LVO.105 LVO approval

To obtain an LVO approval from the CAAB, the operator shall demonstrate compliance with the requirements of this Subpart.

AMC1 SPA.LVO.105 LVO approval

OPERATIONAL DEMONSTRATION – AEROPLANES

(a) General

(1) The purpose of the operational demonstration should be to determine or validate the use and effectiveness of the applicable aircraft flight guidance systems, including HUDLS if appropriate, training, flight crew procedures, maintenance program, and manuals applicable to the CAT II/III program being approved.

(i) At least 30 approaches and landings should be accomplished in operations using the CAT II/III systems installed in each aircraft type if the requested DH is 50 ft or higher. If the DH is less than 50 ft, at least 100 approaches and landings should be accomplished.

(ii) If the operator has different variants of the same type of aircraft utilizing the same basic flight control and display systems, or different basic flight control and display systems on the same type of aircraft, the operator should show that the various variants have satisfactory performance, but need not conduct a full operational demonstration for each variant. The number of approaches and landings may be based on credit given for the experience gained by another operator, using the same aero plane type or variant and procedures.

(iii) If the number of unsuccessful approaches exceeds 5 % of the total, e.g. unsatisfactory landings, system disconnects, the evaluation program should be extended in steps of at least 10 approaches and landings until the overall failure rate does not exceed 5 %.

(2) The operator should establish a data collection method to record approach and landing performance. The resulting data and a summary of the demonstration data should be made available to the CAAB for evaluation.

(3) Unsatisfactory approaches and/or automatic landings should be documented and analyzed.

(b) Demonstrations

(1) Demonstrations may be conducted in line operations or any other flight where the operator's procedures are being used.

(2) In unique situations where the completion of 100 successful landings could take an unreasonably long period of time and equivalent reliability assurance can be achieved, a reduction in the required number of landings may be considered on a case-by-case basis. Reduction of the number of landings to be demonstrated requires a justification for the reduction. This justification should take into account factors such as a small number of aircraft in the fleet, limited opportunity to use runways having CAT II/III procedures or the inability to obtain ATS sensitive area protection during good weather conditions. However, at the operator's option, demonstrations may be made on other runways and facilities. Sufficient information should be collected to determine the cause of any unsatisfactory performance (e.g. sensitive area was not protected).

(3) If the operator has different variants of the same type of aircraft utilizing the same basic flight control and display systems, or different basic flight control and display systems on the same type or class of aircraft, the operator should show that the various variants have satisfactory performance, but need not conduct a full operational demonstration for each variant.

(4) Not more than 30 % of the demonstration flights should be made on the same runway.

(c) Data collection for operational demonstrations

(1) Data should be collected whenever an approach and landing is attempted utilising the CAT II/III system, regardless of whether the approach is abandoned, unsatisfactory, or is concluded successfully.

(2) The data should, as a minimum, include the following information:

(i) Inability to initiate an approach. Identify deficiencies related to airborne equipment that preclude initiation of a CAT II/III approach.

(ii) Abandoned approaches. Give the reasons and altitude above the runway at which approach was discontinued or the automatic landing system was disengaged.

(iii) Touchdown or touchdown and rollout performance. Describe whether or not the aircraft landed satisfactorily within the desired touchdown area with lateral velocity or cross track error that could be corrected by the pilot or automatic system so as to remain within the lateral confines of the runway without unusual pilot skill or technique. The approximate lateral and longitudinal position of the actual touchdown point in relation to the runway Centre line and the runway threshold, respectively, should be indicated in the report. This report should also include any CAT II/III system abnormalities that required manual intervention by the pilot to ensure a safe touchdown or touchdown and rollout, as appropriate.

(d) Data analysis

Unsuccessful approaches due to the following factors may be excluded from the analysis:

(1) ATS factors. Examples include situations in which a flight is vectored too close to the final approach fix/point for adequate localizer and glide slope capture, lack of protection of ILS sensitive areas, or ATS requests the flight to discontinue the approach.

(2) Faulty navaid signals. Navaid (e.g. ILS localizer) irregularities, such as those caused by other aircraft taxiing, over-flying the navaid (antenna).

(3) Other factors. Any other specific factors that could affect the success of CAT II/III operations that are clearly discernible to the flight crew should be reported.

AMC2 SPA.LVO.105 LVO approval Reserved

OPERATIONAL DEMONSTRATION – HELICOPTERS

AMC3 SPA.LVO.105 LVO approval

CONTINUOUS MONITORING – ALL AIRCRAFT

(a) After obtaining the initial approval, the operations should be continuously monitored by the operator to detect any undesirable trends before they become hazardous. Flight crew reports may be used to achieve this.

(b) The following information should be retained for a period of 12 months:

(1) the total number of approaches, by aircraft type, where the airborne CAT II or III equipment was utilized to make satisfactory, actual or practice, approaches to the applicable CAT II or III minima; and

(2) reports of unsatisfactory approaches and/or automatic landings, by aerodrome and aircraft registration, in the following categories:

(i) airborne equipment faults;
(ii) ground facility difficulties;
(iii) missed approaches because of ATC instructions; or
(iv) other reasons.

(c) The operator should establish a procedure to monitor the performance of the automatic landing system or HUDLS to touchdown performance, as appropriate, of each aircraft.

AMC4 SPA.LVO.105 LVO approval

TRANSITIONAL PERIODS FOR CAT II AND CAT III OPERATIONS

(a) Operators with no previous CAT II or CAT III experience

(1) The operator without previous CAT II or III operational experience, applying for a CAT II or CAT IIIA operational approval, should demonstrate to the CAAB that it has gained a minimum experience of 6 months of CAT I operations on the aircraft type.

(2) The operator applying for a CAT IIIB operational approval should demonstrate to the CAAB that it has already completed 6 months of CAT II or IIIA operations on the aircraft type.

(b) Operators with previous CAT II or III experience

(1) The operator with previous CAT II or CAT III experience, applying for a CAT II or CAT III operational approval with reduced transition periods as set out in (a), should demonstrate to the CAAB that it has maintained the experience previously gained on the aircraft type.

(2) The operator approved for CAT II or III operations using auto-coupled approach procedures, with or without auto-land, and subsequently introducing manually flown CAT II or III operations using a HUDLS should provide the operational demonstrations set out in AMC1 SPA.LVO.105 and AMC2 SPA.LVO.105 as if it would be a new applicant for a CAT II or CAT III approval.

AMC5 SPA.LVO.105 LVO approval

MAINTENANCE OF CAT II, CAT III AND LVTO EQUIPMENT

Maintenance instructions for the on-board guidance systems should be established by the operator, in liaison with the manufacturer, and included in the operator's aircraft maintenance program in accordance with applicable ANO (AW).

AMC6 SPA.LVO.105 LVO approval

ELIGIBLE AERODROMES AND RUNWAYS

(a) Each aircraft type/runway combination should be verified by the successful completion of at least one approach and landing in CAT II or better conditions, prior to commencing CAT III operations.

(b) For runways with irregular pre-threshold terrain or other foreseeable or known deficiencies, each aircraft type/runway combination should be verified by operations in CAT I or better conditions, prior to commencing LTS CAT I, CAT II, OTS CAT II or CAT III operations.

(c) If the operator has different variants of the same type of aircraft in accordance with (d), utilizing the same basic flight control and display systems, or different basic flight control and display systems on the same type of aircraft in accordance with (d), the operator should show that the variants have satisfactory operational performance, but need not conduct a full operational demonstration for each variant/runway combination.

(d) For the purpose of this AMC, an aircraft type or variant of an aircraft type should be deemed to be the same type/variant of aircraft if that type/variant has the same or similar:

(1) level of technology, including the following:

(i) flight control/guidance system (FGS) and associated displays and controls;
(ii) FMS and level of integration with the FGS; and
(iii) use of HUDLS;

(2) operational procedures, including:

(i) alert height;
(ii) manual landing /automatic landing;
(iii) no DH operations; and
(iv) use of HUD/HUDLS in hybrid operations;

(3) handling characteristics, including:

(i) manual landing from automatic or HUDLS guided approach;
(ii) manual missed approach procedure from automatic approach; and
(iii) automatic/manual rollout.

(e) Operators using the same aircraft type/class or variant of a type in accordance with (d) above may take credit from each other’s experience and records in complying with this subparagraph.

(f) Where an approval is sought for OTS CAT II, the same provisions as set out for CAT II should be applied.

GM1 SPA.LVO.105 LVO approval

CRITERIA FOR A SUCCESSFUL CAT II, OTS CAT II, CAT III APPROACH AND AUTOMATIC LANDING

(a) The purpose of this GM is to provide operators with supplemental information regarding the criteria for a successful approach and landing to facilitate fulfilling the requirements prescribed in SPA.LVO.105.

(b) An approach may be considered to be successful if:

(1) from 500 ft to start of flare:

(i) speed is maintained as specified in AMC-AWO 231, paragraph 2 'Speed Control'; and

(ii) no relevant system failure occurs; and

(2) from 300 ft to DH:

(i) no excess deviation occurs; and

(ii) no centralized warning gives a missed approach procedure command (if installed).

(c) An automatic landing may be considered to be successful if:

(1) no relevant system failure occurs;

(2) no flare failure occurs;

(3) no de-crab failure occurs (if installed);

(4) longitudinal touchdown is beyond a point on the runway 60 m after the threshold and before the end of the touchdown zone light (900 m from the threshold);

(5) lateral touchdown with the outboard landing gear is not outside the touchdown zone light edge;

(6) sink rate is not excessive;

(7) bank angle does not exceed a bank angle limit; and

(8) no rollout failure or deviation (if installed) occurs.

SPA.LVO.110 General operating requirements

(a) The operator shall only conduct LTS CAT I operations if:

(1) each aircraft concerned is certified for operations to conduct CAT II operations; and

(2) the approach is flown:

(i) auto-coupled to an auto-land that needs to be approved for CAT IIIA operations; or

(ii) using an approved head-up display landing system (HUDLS) to at least 150 ft above the threshold.

(b) The operator shall only conduct CAT II, OTS CAT II or CAT III operations if:

(1) each aircraft concerned is certified for operations with a decision height (DH) below 200 ft, or no DH, and equipped in accordance with the applicable airworthiness requirements;

(2) a system for recording approach and/or automatic landing success and failure is established and maintained to monitor the overall safety of the operation;

(3) the DH is determined by means of a radio altimeter;

(4) the flight crew consists of at least two pilots;

(5) all height call-outs below 200 ft above the aerodrome threshold elevation are determined by a radio altimeter.

(c) The operator shall only conduct approach operations utilizing an EVS if:

(1) the EVS is certified for the purpose of this Subpart and combines infra-red sensor image and flight information on the HUD;

(2) for operations with an RVR below 550 m, the flight crew consists of at least two pilots;

(3) for CAT I operations, natural visual reference to runway cues is attained at least at 100 ft above the aerodrome threshold elevation;

(4) for approach procedure with vertical guidance (APV) and non-precision approach (NPA) operations flown with CDFA technique, natural visual reference to runway cues is attained at least at 200 ft above the aerodrome threshold elevation and the following requirements are complied with:

(i) the approach is flown using an approved vertical flight path guidance mode;

(ii) the approach segment from final approach fix (FAF) to runway threshold is straight and the difference between the final approach course and the runway centerline is not greater than 2o;

(iii) the final approach path is published and not greater than 3,7o;

(iv) the maximum cross-wind components established during certification of the EVS are not exceeded.

GM1 SPA.LVO.110(c)(4)(i) General operating requirements

APPROVED VERTICAL FLIGHT PATH GUIDANCE MODE

The term ‘approved’ means that the vertical flight path guidance mode has been certified by the Authority of the country of design as part of the avionics product.

SPA.LVO.115 Aerodrome related requirements

(a) The operator shall not use an aerodrome for LVOs below a visibility of 800 m unless:

(1) the aerodrome has been approved for such operations by the State of the aerodrome; and

(2) low visibility procedures (LVP) have been established.

(b) If the operator selects an aerodrome where the term LVP is not used, the operator shall ensure that there are equivalent procedures that adhere to the requirements of LVP at the aerodrome. This situation shall be clearly noted in the operations manual or procedures manual including guidance to the flight crew on how to determine that the equivalent LVP are in effect.

SPA.LVO.120 Flight crew training and qualifications

The operator shall ensure that, prior to conducting an LVO:

(a) each flight crew member:

(1) complies with the training and checking requirements prescribed in the operations manual, including flight simulation training device (FSTD) training, in operating to the limiting values of RVR/VIS (visibility) and DH specific to the operation and the aircraft type;

(2) is qualified in accordance with the standards prescribed in the operations manual;

(b) the training and checking is conducted in accordance with a detailed syllabus.

AMC1 SPA.LVO.120 Flight crew training and qualifications

GENERAL PROVISIONS

(a) The operator should ensure that flight crew member training programs for LVO include structured courses of ground, FSTD and/or flight training.

(1) Flight crew members with no CAT II or CAT III experience should complete the full training program prescribed in (b), (c), and (d) below.

(2) Flight crew members with CAT II or CAT III experience with a similar type of operation (auto coupled/auto-land, HUDLS/hybrid HUDLS or EVS) or CAT II with manual land, if appropriate, with another Bangladeshi operator may undertake an:

(i) abbreviated ground training course if operating a different type or class from that on which the previous CAT II or CAT III experience was gained;

(ii) abbreviated ground, FSTD and/or flight training course if operating the same type or class and variant of the same type or class on which the previous CAT II or CAT III experience was gained. The abbreviated course should include at least the provisions of (d)(1), (d)(2)(i) or (d)(2)(ii) as appropriate and (d)(3)(i). The operator may reduce the number of approaches/landings required by (d)(2)(i) if the type/class or the variant of the type or class has the same or similar:

(A) level of technology - flight control/guidance system (FGS);

(B) operating procedures;

(C) handling characteristics;

(D) use of HUDLS/hybrid HUDLS; and

(E) use of EVS,

as the previously operated type or class, otherwise the provisions of (d)(2)(i) should be met.

(3) Flight crew members with CAT II or CAT III experience with the operator may undertake an abbreviated ground, FSTD and/or flight training course.

(i) When changing aircraft type or class, the abbreviated course should include at least the provisions of (d)(1), (d)(2)(i) or (d)(2)(ii) as appropriate and (d)(3)(i).

(ii) When changing to a different variant of aircraft within the same type or class rating that has the same or similar:

(A) level of technology - FGS;

(B) operating procedures - integrity;

(C) handling characteristics;

(D) use of HUDLS/Hybrid HUDLS; and

(E) use of EVS, as the previously operated type or class, a difference course or familiarization appropriate to the change of variant should fulfill the abbreviated course provisions.

(iii) When changing to a different variant of aircraft within the same type or class rating that has a significantly different:

(A) level of technology - FGS;

(B) operating procedures - integrity;

(C) handling characteristics;

(D) use of HUDLS/Hybrid HUDLS; or

(E) use of EVS, the provisions of (d)(1), (d)(2)(i) or (d)(2)(ii) as appropriate and (d)(3)(i) should be fulfilled.

(4) The operator should ensure when undertaking CAT II or CAT III operations with different ariant(s) of aircraft within the same type or class rating that the differences and/or similarities of the aircraft concerned justify such operations, taking into account at least the following:

(i) the level of technology, including the:

(A) FGS and associated displays and controls;

(B) FMS and its integration or not with the FGS; and

(C) use of HUD/HUDLS with hybrid systems and/or EVS;

(ii) operating procedures, including:

(A) fail-passive / fail-operational, alert height;

(B) manual landing / automatic landing;

(C) no DH operations; and

(D) use of HUD/HUDLS with hybrid systems;

(iii) handling characteristics, including:

(A) manual landing from automatic HUDLS and/or EVS guided approach;

(B) manual missed approach procedure from automatic approach; and

(C) automatic/manual rollout.

GROUND TRAINING

(b) The initial ground training course for LVO should include at least the following:

(1) characteristics and limitations of the ILS and/or MLS;

(2) characteristics of the visual aids;

(3) characteristics of fog;

(4) operational capabilities and limitations of the particular airborne system to include HUD symbology and EVS characteristics, if appropriate;

(5) effects of precipitation, ice accretion, low level wind shear and turbulence;

(6) effect of specific aircraft/system malfunctions;

(7) use and limitations of RVR assessment systems;

(8) principles of obstacle clearance requirements;

(9) recognition of and action to be taken in the event of failure of ground equipment;

(10) procedures and precautions to be followed with regard to surface movement during operations when the RVR is 400 m or less and any additional procedures required for takeoff in conditions below 150 m;

(11) significance of DHs based upon radio altimeters and the effect of terrain profile in the approach area on radio altimeter readings and on the automatic approach/landing systems;

(12) importance and significance of alert height, if applicable, and the action in the event of any failure above and below the alert height;

(13) qualification requirements for pilots to obtain and retain approval to conduct LVOs; and

(14) importance of correct seating and eye position.

FSTD TRAINING AND/OR FLIGHT TRAINING

(c) FSTD training and/or flight training

(1) FSTD and/or flight training for LVO should include at least:

(i) checks of satisfactory functioning of equipment, both on the ground and in flight;

(ii) effect on minima caused by changes in the status of ground installations;

(iii) monitoring of:

(A) automatic flight control systems and auto-land status annunciators with emphasis on the action to be taken in the event of failures of such systems; and

(B) HUD/HUDLS/EVS guidance status and annunciators as appropriate, to include head-down displays;

(iv) actions to be taken in the event of failures such as engines, electrical systems, hydraulics or flight control systems;

(v) the effect of known serviceability and use of MELs;

(vi) operating limitations resulting from airworthiness certification;

(vii) guidance on the visual cues required at DH together with information on maximum deviation allowed from glide path or localizer; and

(viii) the importance and significance of alert height if applicable and the action in the event of any failure above and below the alert height.

(2) Flight crew members should be trained to carry out their duties and instructed on the coordination required with other crew members. Maximum use should be made of suitably equipped FSTDs for this purpose.

(3) Training should be divided into phases covering normal operation with no aircraft or equipment failures but including all weather conditions that may be encountered and detailed scenarios of aircraft and equipment failure that could affect CAT II or III operations. If the aircraft system involves the use of hybrid or other special systems, such as HUD/HUDLS or enhanced vision equipment, then flight crew members should practice the use of these systems in normal and abnormal modes during the FSTD phase of training.

(4) Incapacitation procedures appropriate to LVTO, CAT II and CAT III operations should be practiced.

(5) For aircraft with no FSTD available to represent that specific aircraft, operators should ensure that the flight training phase specific to the visual scenarios of CAT II operations is conducted in a specifically approved FSTD. Such training should include a minimum of four approaches. Thereafter, the training and procedures that are type specific should be practiced in the aircraft.

(6) Initial CAT II and III training should include at least the following exercises:

(i) approach using the appropriate flight guidance, autopilots and control systems installed in the aircraft, to the appropriate DH and to include transition to visual flight and landing;

(ii) approach with all engines operating using the appropriate flight guidance systems, autopilots, HUDLS and/or EVS and control systems installed in the aircraft down to the appropriate DH followed by missed approach - all without external visual reference;

(iii) where appropriate, approaches utilizing automatic flight systems to provide automatic flare, hover, landing and rollout; and

(iv) normal operation of the applicable system both with and without acquisition of visual cues at DH.

(7) Subsequent phases of training should include at least:

(i) approaches with engine failure at various stages on the approach;

(ii) approaches with critical equipment failures, such as electrical systems, auto flight systems, ground and/or airborne ILS, MLS systems and status monitors;

(iii) approaches where failures of auto flight equipment and/or HUD/HUDLS/EVS at low level require either:

(A) reversion to manual flight to control flare, hover, landing and rollout or missed approach; or

(B) reversion to manual flight or a downgraded automatic mode to control missed approaches from, at or below DH including those which may result in a touchdown on the runway;

(iv) failures of the systems that will result in excessive localizer and/or glideslope deviation, both above and below DH, in the minimum visual conditions specified for the operation. In addition, a continuation to a manual landing should be practiced if a head-up display forms a downgraded mode of the automatic system or the head-up display forms the only flare mode; and

(v) failures and procedures specific to aircraft type or variant.

(8) The training program should provide practice in handling faults which require a reversion to higher minima.

(9) The training program should include the handling of the aircraft when, during a fail passive CAT III approach, the fault causes the autopilot to disconnect at or below DH when the last reported RVR is 300 m or less.

(10) Where take-offs are conducted in RVRs of 400 m and below, training should be established to cover systems failures and engine failure resulting in continued as well as rejected takeoffs.

(11) The training program should include, where appropriate, approaches where failures of the HUDLS and/or EVS equipment at low level require either:

(i) reversion to head down displays to control missed approach; or

(ii) reversion to flight with no, or downgraded, HUDLS guidance to control missed approaches from DH or below, including those which may result in a touchdown on the runway.

(12) When undertaking LVTO, LTS CAT I, OTS CAT II, CAT II and CAT III operations utilizing a HUD/HUDLS, hybrid HUD/HUDLS or an EVS, the training and checking program should include, where appropriate, the use of the HUD/HUDLS in normal operations during all phases of flight.

CONVERSION TRAINING

(d) Flight crew members should complete the following low visibility procedures (LVPs) training if converting to a new type or class or variant of aircraft in which LVTO, LTS CAT I, OTS CAT II, approach operations utilizing EVS with an RVR of 800 m or less and CAT II and CAT III operations will be conducted. Conditions for abbreviated courses are prescribed in (a)(2), (a)(3) and (a)(4).

(1) Ground training

The appropriate provisions are as prescribed in (b), taking into account the flight crew member's CAT II and CAT III training and experience.

(2) FSTD training and/or flight training

(i) A minimum of six, respectively eight for HUDLS with or without EVS, approaches and/or landings in an FSTD. The provisions for eight HUDLS approaches may be reduced to six when conducting hybrid HUDLS operations.

(ii) Where no FSTD is available to represent that specific aircraft, a minimum of three, respectively five for HUDLS and/or EVS, approaches including at least one missed approach procedure is required on the aircraft. For hybrid HUDLS operations a minimum of three approaches is required, including at least one missed approach procedure.

(iii) Appropriate additional training if any special equipment is required such as head- up displays or enhanced vision equipment. When approach operations utilizing EVS are conducted with an RVR of less than 800 m, a minimum of five approaches, including at least one missed approach procedure are required on the aircraft.

(3) Flight crew qualification

The flight crew qualification provisions are specific to the operator and the type of aircraft operated.

(i) The operator should ensure that each flight crew member completes a check before conducting CAT II or III operations.

(ii) The check specified in (d)(3)(i) may be replaced by successful completion of the FSTD and/or flight training specified in (d)(2).

(4) Line flying under supervision

Flight crew member should undergo the following line flying under supervision (LIFUS):

(i) For CAT II when a manual landing or a HUDLS approach to touchdown is required, a minimum of:

(A) three landings from autopilot disconnect; and

(B) four landings with HUDLS used to touchdown, except that only one manual landing, respectively two using HUDLS, to touchdown is required when the training required in (d)(2) has been carried out in an FSTD qualified for zero flight time conversion.

(ii) For CAT III, a minimum of two auto-lands, except that:

(A) only one auto-land is required when the training required in (d)(2) has been carried out in an FSTD qualified for zero flight time conversion;

(B) no auto-land is required during LIFUS when the training required in (d)(2) has been carried out in an FSTD qualified for zero flight time (ZFT) conversion and the flight crew member successfully completed the ZFT type rating conversion course; and

(C) the flight crew member, trained and qualified in accordance with (B), is qualified to operate during the conduct of LIFUS to the lowest approved DA/H and RVR as stipulated in the operations manual.

(iii) For CAT III approaches using HUDLS to touchdown, a minimum of four approaches.

TYPE AND COMMAND EXPERIENCE

(e) Type and command experience

(1) Before commencing CAT II operations, the following additional provisions should be applicable to pilots-in-command or pilots to whom conduct of the flight may be delegated, who are new to the aircraft type or class:

(i) 50 hours or 20 sectors on the type, including LIFUS; and

(ii) 100 m should be added to the applicable CAT II RVR minima when the operation requires a CAT II manual landing or use of HUDLS to touchdown until:

(A) a total of 100 hours or 40 sectors, including LIFUS, has been achieved on the type; or

(B) a total of 50 hours or 20 sectors, including LIFUS, has been achieved on the type where the flight crew member has been previously qualified for CAT II manual landing operations with a Bangladeshi operator;

(C) for HUDLS operations the sector provisions in (e)(1) and (e)(2)(i) should always be applicable; the hours on type or class do not fulfill the provisions.

(2) Before commencing CAT III operations, the following additional provisions should be applicable to pilots-in-command/pilot in commands, or pilots to whom conduct of the flight may be delegated, who are new to the aircraft type:

(i) 50 hours or 20 sectors on the type, including LIFUS; and

(ii) 100 m should be added to the applicable CAT II or CAT III RVR minima unless he/she has previously qualified for CAT II or III operations with a Bangladeshi operator, until a total of 100 hours or 40 sectors, including LIFUS, has been achieved on the type.

RECURRENT TRAINING AND CHECKING

(f) Recurrent training and checking – LVO

(1) The operator should ensure that, in conjunction with the normal recurrent training and operator's proficiency checks, the pilot's knowledge and ability to perform the tasks associated with the particular category of operation, for which the pilot is authorized by the operator, are checked. The required number of approaches to be undertaken in the FSTD within the validity period of the operator's proficiency check should be a minimum of two, respectively four when HUDLS and/or EVS is utilized to touchdown, one of which should be a landing at the lowest approved RVR. In addition, one, respectively two for HUDLS and/or operations utilizing EVS, of these approaches may be substituted by an approach and landing in the aircraft using approved CAT II and CAT III procedures. One missed approach should be flown during the conduct of an operator proficiency check. If the operator is approved to conduct take-off with RVR less than 150 m, at least one LVTO to the lowest applicable minima should be flown during the conduct of the operator's proficiency check.

(2) For CAT III operations the operator should use an FSTD approved for this purpose.

(3) For CAT III operations on aircraft with a fail-passive flight control system, including HUDLS, a missed approach should be completed by each flight crew member at least once over the period of three consecutive operator proficiency checks as the result of an autopilot failure at or below DH when the last reported RVR was 300 m or less.

LVTO OPERATIONS

(g) LVTO with RVR less than 400 m

(1) Prior to conducting take-offs in RVRs below 400 m, the flight crew should undergo the following training:

(i) normal take-off in minimum approved RVR conditions;

(ii) take-off in minimum approved RVR conditions with an engine failure:

(A) for aero planes between V1 and V2 (take-off safety speed), or as soon as safety considerations permit;

(B) for helicopters at or after take-off decision point (TDP); and

(iii)take-off in minimum approved RVR conditions with an engine failure:

(A) for aeroplanes before V1 resulting in a rejected take-off; and

(B) for helicopters before the TDP.

(2) The operator approved for LVTOs with an RVR below 150 m should ensure that the training specified by (g)(1) is carried out in an FSTD. This training should include the use of any special procedures and equipment.

(3) The operator should ensure that a flight crew member has completed a check before conducting LVTO in RVRs of less than 150 m. The check may be replaced by successful completion of the FSTD and/or flight training prescribed in (g)(1) on conversion to an aircraft type.

LTS CAT I, OTS CAT II, OPERATIONS UTILISING EVS

(h) Additional training provisions

(1) General

Operators conducting LTS CAT I operations, OTS CAT II operations and operations utilizing EVS with RVR of 800 m or less should comply with the provisions applicable to CAT II operations and include the provisions applicable to HUDLS, if appropriate. The operator may combine these additional provisions where appropriate provided that the operational procedures are compatible.

(2) LTS CAT I

During conversion training the total number of approaches should not be additional to the requirements of ANO 6-1 provided the training is conducted utilizing the lowest applicable RVR. During recurrent training and checking the operator may also combine the separate requirements provided the above operational procedure provision is met and at least one approach using LTS CAT I minima is conducted at least once every 18 months.

(3) OTS CAT II

During conversion training the total number of approaches should not be less than those to complete CAT II training utilizing a HUD/HUDLS. During recurrent training and checking the operator may also combine the separate provisions provided the above operational procedure provision is met and at least one approach using OTS CAT II minima is conducted at least once every 18 months.

(4) Operations utilizing EVS with RVR of 800 m or less

During conversion training the total number of approaches required should not be less than that required to complete CAT II training utilizing a HUD. During recurrent training and checking the operator may also combine the separate provisions provided the above operational procedure provision is met and at least one approach utilizing EVS is conducted at least once every 12 months.

GM1 SPA.LVO.120 Flight crew training and qualifications

FLIGHT CREW TRAINING

The number of approaches referred to in AMC1 SPA.LVO.120 (f)(1) includes one approach and landing that may be conducted in the aircraft using approved CAT II/III procedures. This approach and landing may be conducted in normal line operation or as a training flight.

SPA.LVO.125 Operating procedures

(a) The operator shall establish procedures and instructions to be used for LVOs. These procedures and instructions shall be included in the operations manual or procedures manual and contain the duties of flight crew members during taxiing, take-off, approach, flare, landing, rollout and missed approach operations, as appropriate.

(b) Prior to commencing an LVO, the pilot-in-command shall be satisfied that:

(1) the status of the visual and non-visual facilities is sufficient;

(2) appropriate LVPs are in force according to information received from air traffic services (ATS);

(3) flight crew members are properly qualified.

AMC1 SPA.LVO.125 Operating procedures

GENERAL

(a) LVOs should include the following:

(1) manual take-off, with or without electronic guidance systems or HUDLS/hybrid HUD/HUDLS;

(2) approach flown with the use of a HUDLS/hybrid HUD/HUDLS and/or EVS;

(3) auto-coupled approach to below DH, with manual flare, hover, landing and rollout;

(4) auto-coupled approach followed by auto-flare, hover, auto-landing and manual rollout; and

(5) auto-coupled approach followed by auto-flare, hover, auto-landing and auto-rollout, when the applicable RVR is less than 400 m.

PROCEDURES AND INSTRUCTIONS

(b) The operator should specify detailed operating procedures and instructions in the operations manual or procedures manual.

(1) The precise nature and scope of procedures and instructions given should depend upon the airborne equipment used and the flight deck procedures followed. The operator should clearly define flight crew member duties during take-off, approach, flare, hover, rollout and missed approach in the operations manual or procedures manual. Particular emphasis should be placed on flight crew responsibilities during transition from non- visual conditions to visual conditions, and on the procedures to be used in deteriorating visibility or when failures occur. Special attention should be paid to the distribution of flight deck duties so as to ensure that the workload of the pilot making the decision to land or execute a missed approach enables him/her to devote himself/herself to supervision and the decision-making process.

(2) The instructions should be compatible with the limitations and mandatory procedures contained in the AFM and cover the following items in particular:

(i) checks for the satisfactory functioning of the aircraft equipment, both before departure and in flight;

(ii) effect on minima caused by changes in the status of the ground installations and airborne equipment;

(iii) procedures for the take-off, approach, flare, hover, landing, rollout and missed approach;

(iv) procedures to be followed in the event of failures, warnings to include HUD/HUDLS/EVS and other non-normal situations;

(v) the minimum visual reference required;

(vi) the importance of correct seating and eye position;

(vii) action that may be necessary arising from a deterioration of the visual reference; (viii) allocation of crew duties in the carrying out of the procedures according to (b)(2)(i) to (iv) and (vi), to allow the pilot-in-command to devote himself/herself mainly to supervision and decision making;

(viii) the rule for all height calls below 200 ft to be based on the radio altimeter and for one pilot to continue to monitor the aircraft instruments until the landing is completed;

(ix) the rule for the localizer sensitive area to be protected;

(x) the use of information relating to wind velocity, wind shear, turbulence, runway contamination and use of multiple RVR assessments;

(xi) procedures to be used for:

(A) LTS CAT I;

(B) OTS CAT II;

(C) approach operations utilizing EVS; and

(D) practice approaches and landing on runways at which the full CAT II or CAT III aerodrome procedures are not in force;

(xii) operating limitations resulting from airworthiness certification; and

(xiii) information on the maximum deviation allowed from the ILS glide path and/or localizer.

SPA.LVO.130 Minimum equipment

(a) The operator shall include the minimum equipment that has to be serviceable at the commencement of an LVO in accordance with the aircraft flight manual (AFM) or other approved document in the operations manual or procedures manual, as applicable.

(b) The pilot-in-command shall be satisfied that the status of the aircraft and of the relevant airborne systems is appropriate for the specific operation to be conducted.

SUBPART F:
EXTENDED RANGE OPERATIONS WITH TWO-ENGINED AEROPLANES (ETOPS)

SPA.ETOPS.100 ETOPS

In commercial air transport operations, two-engine aeroplane shall only be operated beyond the threshold distance determined in accordance with CAT.OP.MPA.140 if the operator has been granted an ETOPS operational approval by the CAAB.

SPA.ETOPS.105 ETOPS operational approval

To obtain an ETOPS operational approval from the CAAB, the operator shall provide evidence that:

(a) the aero plane/engine combination holds an ETOPS type design and reliability approval for the intended operation;

(b) a training program for the flight crew members and all other operations personnel involved in these operations has been established and the flight crew members and all other operations personnel involved are suitably qualified to conduct the intended operation;

(c) the operator’s organization and experience are appropriate to support the intended operation;

(d) operating procedures have been established.

AMC1 SPA.ETOPS.105 ETOPS operational approval

1. METHODS FOR OBTAINING ETOPS OPERATIONS APPROVAL

1.1 There are two methods for obtaining an ETOPS approval, depending on the availability and amount of prior experience with the candidate airframe/engine combination:

1.1.1 “Accelerated ETOPS approval”, does not require prior in-service experience with the candidate airframe/engine combination;

1.2 "In-service ETOPS Approval", based on a pre-requisite amount of prior in-service experience with the candidate airframe/engine combination. Elements from the "accelerated ETOPS approval" method may be used to reduce the amount of prior in- service experience.

2. ACCELERATED ETOPS APPROVAL

2.1 The criteria defined in this section permit approval of ETOPS operations up to 180 minutes, when the operator has established that those processes necessary for successful ETOPS are in place and are proven to be reliable. The basis of the accelerated approval is that the operator will meet equivalent levels of safety and satisfy the objectives of this AMC.

2.2 The Accelerated ETOPS approval process includes the following phases:

2.2.1 Application phase

2.2.2 Validation of the operator's ETOPS processes

2.2.3 Validation of Operator ETOPS Continuing Airworthiness and Operations Capability.

2.2.4 Issue of ETOPS Operations Approval by CAAB

2.3 Application phase

2.3.1 The operator should submit an Accelerated ETOPS Operations Approval Plan to the CAAB six (6) months before the proposed start of ETOPS. This time will permit CAAB to review the documented plans and ensure adequate ETOPS processes are in place.

2.3.2 Accelerated ETOPS Operations approval plan:

The Accelerated ETOPS Operations approval plan should define:

2.3.2.1 the proposed routes and the ETOPS diversion time necessary to support those routes;

2.3.2.2 The proposed one-engine-inoperative cruise speed, which may be area specific depending upon anticipated aeroplane loading and likely fuel penalties associated with the planned procedures;

2.3.2.3 How to comply with the ETOPS Processes listed in paragraph (B);

2.3.2.4 The resources allocated to each ETOPS process to initiate and sustain ETOPS operations in a manner that demonstrates commitment by management and all personnel involved in ETOPS continuing airworthiness and operational support;

2.3.2.5 How to establish compliance with the build standard required for Type Design Approval, e.g. CMP document compliance;

2.3.2.6 Review Gates: A review gate is a milestone of the tracking plan to allow for the orderly tracking and documentation of specific provisions of this section. Normally, the review gate process will start six months before the proposed start of ETOPS and should continue until at least six months after the start of ETOPS. The review gate process will help ensure that the proven processes comply with the provisions of this AMC and are capable of continued ETOPS operations.

2.3.3 Operator ETOPS process elements

The operator seeking Accelerated ETOPS Operations Approval should also demonstrate to CAAB that it has established an ETOPS process that includes the following ETOPS elements:

2.3.3.1 Airframe/engine combination and engine compliance to ETOPS Type Design Build Standard (CMP);

2.3.3.2 Compliance with the continuing airworthiness requirements as defined in Appendix 8, which should include:

2.3.3.2.1 A Maintenance Program;

2.3.3.2.2 A proven ETOPS Reliability Program;

2.3.3.2.3 A proven Oil Consumption Monitoring Program;

2.3.3.2.4 A proven Engine Condition Monitoring and Reporting system;

2.3.3.2.5 A propulsion system monitoring program;

2.3.3.2.6 An ETOPS parts control program;

2.3.3.2.7 A proven plan for resolution of aeroplane discrepancies.

2.3.3.3 ETOPS operations manual supplement or its equivalent in the Operations Manual;

2.3.3.4 The operator should establish a program that results in a high degree of confidence that the propulsion system reliability appropriate to the ETOPS diversion time would be maintained;

2.3.3.5 Initial and recurrent training and qualification programs in place for ETOPS related personnel, including flight crew and all other operations personnel;

2.3.3.6 Compliance with the Flight Operations Program as defined in this AMC;

2.3.3.7 Proven flight planning and dispatch programs appropriate to ETOPS;

2.3.3.8 Procedures to ensure the availability of meteorological information and MEL appropriate to ETOPS; and

2.3.3.9 Flight crew and dispatch personnel familiar with the ETOPS routes to be flown; in particular the requirements for, and selection of ETOPS en-route alternate aerodromes.

2.3.4 Process elements Documentation:

Documentation should be provided for the following elements:

2.3.4.1 Technology new to the operator and significant differences in ETOPS significant systems (engines, electrical, hydraulic and pneumatic), compared to the aeroplane currently operated and the aeroplane for which the operator is seeking Accelerated ETOPS Operations Approval;

2.3.4.2 The plan to train the flight and continuing airworthiness personnel to the different ETOPS process elements;

2.3.4.3 The plan to use proven or manufacturer validated Training and Maintenance and Operations Manual procedures relevant to ETOPS for the aeroplane for which the operator is seeking Accelerated ETOPS Operations Approval;

2.3.4.4 Changes to any previously proven or manufacturer validated Training, Maintenance or Operations Manual procedures described above. Depending on the nature of any changes, the operator may be required to provide a plan for validating such changes;

2.3.4.5 The validation plan for any additional operator unique training and procedures relevant to ETOPS, if any;

2.3.4.6 Details of any ETOPS support program from the airframe/engine combination or engine (S)TC holder, other operators or any foreign authority; and

2.3.4.7 The control procedures when a contracted maintenance organization or flight dispatch organization is used.

2.4 Validation of the Operator's ETOPS Processes

2.4.1 This section identifies process elements that need to be validated and approved prior to the start of Accelerated ETOPS. For a process to be considered proven, the process should first be described, including a flow chart of process elements. The roles and responsibilities of the personnel managing the process should be defined including any training requirement. The operator should demonstrate that the process is in place and functions as intended. This may be accomplished by providing data, documentation and analysis results and/or by demonstrating in practise that the process works and consistently provides the intended results. The operator should also demonstrate that a feedback loop exists to facilitate the surveillance of the process, based on in-service experience.

2.4.2 If any operator is currently approved for conducting ETOPS with a different engine and/or airframe/engine combination, it may be able to document proven ETOPS processes. In this case only minimal further validation may be necessary. It will be necessary to demonstrate that processes are in place to assure equivalent results on the engine and/or airframe/engine combination being proposed for Accelerated ETOPS Operations Approval.

2.4.2.1 Reduction in the validation requirements:

The following elements will be useful or beneficial in justifying a reduction by CAAB in the validation requirements of ETOPS processes:

2.4.2.1.1 Experience with other airframes and/or engines;

2.4.2.1.2 Previous ETOPS experience;

2.4.2.1.3 Experience with long range, over-water operations with two, three or four engine aeroplanes;

2.4.2.1.4 Any experience gained by flight crews, continuing airworthiness personnel and flight dispatch personnel, while working with other ETOPS approved operators, particularly when such experience is with the same airframe or airframe/engine combination.

2.4.2.1.5 Process validation may be done on the airframe/engine combination, which will be used in Accelerated ETOPS operation or on a different aeroplane type than that for which approval is being sought.

2.4.2.2 Validation program:

A process could be validated by demonstrating that it produces equivalent results on a different aeroplane type or airframe/engine combination. In this case, the validation program should address the following:

2.4.2.2.1 The operator should show that the ETOPS validation program can be executed in a safe manner;

2.4.2.2.2 The operator should state in its application any policy guidance to personnel involved in the ETOPS process validation program. Such guidance should clearly state that ETOPS process validation exercises should not be allowed to adversely impact the safety of actual operations, especially during periods of abnormal, emergency, or high cockpit workload operations. It should emphasize that during periods of abnormal or emergency operation or high cockpit workload ETOPS process validation exercises may be terminated;

2.4.2.2.3 The validation scenario should be of sufficient frequency and operational exposure to validate maintenance and operational support systems not validated by other means;

2.4.2.2.4 A means should be established to monitor and report performance with respect to accomplishment of tasks associated with ETOPS process elements. Any recommended changes resulting from the validation program to ETOPS continuing airworthiness and/or operational process elements should be defined.

2.4.2.3 Documentation requirements for the process validation

The operator should:

2.4.2.3.1 Document how each element of the ETOPS process was utilised during the validation;

2.4.2.3.2 Document any shortcomings with the process elements and measures in place to correct such shortcomings;

2.4.2.3.3 Document any changes to ETOPS processes, which were required after an in-flight shut down (IFSD), unscheduled engine removals, or any other significant operational events;

2.4.2.3.4 Provide periodic Process Validation reports to CAAB (this may be addressed during Review Gates).

2.4.2.4 Validation program information

Prior to the start of the validation process, the following information should be submitted to CAAB:

2.4.2.4.1 Validation periods, including start dates and proposed completion dates;

2.4.2.4.2 Definition of aeroplane to be used in the validation (List should include registration numbers, manufacturer and serial number and model of the airframe and engines);

2.4.2.4.3 Description of the areas of operation (if relevant to validation) proposed for validation and actual operations;

2.4.2.4.4 Definition of designated ETOPS validation routes. The routes should be of duration required to ensure necessary process validation occurs;

2.4.2.4.5 Process validation reporting. The operator should compile results of ETOPS process validation.

2.5 Validation of Operator ETOPS Continuing Airworthiness and Operations Capability

2.5.1 The operator should demonstrate competence to safely conduct and adequately support the intended operation. Prior to ETOPS approval, the operator should demonstrate that the ETOPS continuing airworthiness processes are being properly conducted.

2.5.2 The operator should also demonstrate that ETOPS flight dispatch and release practices, policies, and procedures are established for operations.

2.5.3 An operational validation flight may be required so that the operator can demonstrate dispatch and normal in-flight procedures. The content of this validation flight will be determined by CAAB based on the previous experience of the operator.

2.5.4 Upon successful completion of the validation flight, when required, the operator should modify the operational manuals to include approval for ETOPS as applicable

2.6 ETOPS Operations Approval issued by CAAB

2.6.1 Operations approvals granted with reduced in-service experience may be limited to those areas determined by CAAB at time of issue. An application for a change is required for new areas to be added.

2.6.2 The approval issued by CAAB for ETOPS up to 180 minutes should be based on the information required in Appendix 1 section 3.

3. IN-SERVICE ETOPS APPROVAL

Approval based on in-service experience on the particular airframe/engine combination.

3.1 Application

3.1.1 Any operator applying for ETOPS approval should submit a request, with the required supporting data, to CAAB at least 3 months prior to the proposed start of ETOPS with the specific airframe/engine combination.

3.2 Operator Experience

3.2.1 Each operator seeking approval via the in-service route should provide a report to CAAB, indicating the operator’s capability to maintain and operate the specific airframe/engine combination for the intended extended range operation. This report should include experience with the engine type or related engine types, experience with the aeroplane systems or related aeroplane systems, or experience with the particular airframe/engine combination on non-extended range routes. Approval would be based on a review of this information.

3.2.2 Each operator requesting Approval to conduct ETOPS beyond 180 minutes should already have ETOPS experience and hold a 180 minute ETOPS approval.

3.2.3 Note 1: The operator’s authorized maximum diversion time may be progressively increased by CAAB as the operator gains experience on the particular airframe/engine combination. Not less than 12 consecutive months experience will normally be required before authorization of ETOPS up to 180 minutes maximum diversion time, unless the operator can demonstrate compensating factors. The factors to consider may include duration of experience, total number of flights, operator’s diversion events, record of the airframe/engine combination with other operators, quality of operator’s programs and route structure. However, the operator will still need, in the latter case, to demonstrate his capability to maintain and operate the new airframe/engine combination at a similar level of reliability.

3.2.4 In considering an application from an operator to conduct extended range operations, an assessment should be made of the operator’s overall safety record, past performance, flight crew training and experience, and maintenance program. The data provided with the request should substantiate the operator’s ability and competence to safely conduct and support these operations and should include the means used to satisfy the considerations outlined in this paragraph. (Any reliability assessment obtained, either through analysis or service experience, should be used as guidance in support of operational judgements regarding the suitability of the intended operation.)

3.3 Assessment of the Operator's Propulsion System Reliability

3.3.1 Following the accumulation of adequate operating experience by the world fleet of the specified airframe/engine combination and the establishment of an IFSD rate objective for use in ensuring the propulsion system reliability necessary for extended range operations, an assessment should be made of the applicant’s ability to achieve and maintain this level of propulsion system reliability.

3.3.2 This assessment should include trend comparisons of the operator’s data with other operators as well as the world fleet average values, and the application of a qualitative judgement that considers all of the relevant factors. The operator's past record of propulsion system reliability with related types of power units should also be reviewed, as well as its record of achieved systems reliability with the airframe/engine combination for which authorization is sought to conduct extended range operations.

3.3.3 Note: Where statistical assessment alone may not be applicable, e.g., when the fleet size is small, the applicant's experience will be reviewed on a case-by-case basis.

3.4 Validation of Operator ETOPS Continuing Airworthiness and Operations Capability

3.4.1 The operator should demonstrate competence to safely conduct and adequately support the intended operation. Prior to ETOPS approval, the operator should demonstrate that the ETOPS continuing airworthiness processes are being properly conducted.

3.4.2 The operator should also demonstrate that ETOPS flight dispatch and release practices, policies, and procedures are established for operations.

3.4.3 An operational validation flight may be required so that the operator can demonstrate dispatch and normal in-flight procedures. The content of this validation flight will be determined by CAAB based on the previous experience of the operator.

3.4.4 Upon successful completion of a validation flight, where required, the operational specifications and manuals should be modified accordingly to include approval for ETOPS as applicable.

3.5 ETOPS Operations Approval issued by CAAB

3.5.1 Operations approvals based on in-service experience are limited to those areas agreed by CAAB at time of issue. Additional approval is required for new areas to be added.

3.5.2 The approval issued by CAAB for ETOPS should specifically include provisions as described in Appendix 1 section 4.

4. ETOPS APPROVAL CATEGORIES

4.1 There are 4 approval categories:

4.1.1 Approval for 90 minutes or less diversion time

4.1.2 Approval for diversion time above 90 minutes up to 180 minutes

4.1.3 Approval for diversion time above 180 minutes

4.1.4 Approval for diversion times above 180 minutes of operators of two-engine aeroplanes with a maximum passenger seating configuration of 19 or less and a maximum take-off mass less than 45 360 kg

An operator seeking ETOPS approval in one of the above categories should comply with the requirements common to all categories and the specific requirements of the particular category for which approval is sought.

4.2 REQUIREMENTS COMMON TO ALL ETOPS APPROVAL CATEGORIES:

4.2.1 Continuing Airworthiness

The operator should comply with the continuing airworthiness considerations of Appendix 6.

4.2.2 Release Considerations

4.2.2.1 Minimum Equipment List (MEL)

4.2.2.1.1 Aeroplanes should only be operated in accordance with the provisions of the approved Minimum Equipment List (MEL).

4.2.2.2 Weather

4.2.2.2.1 To forecast terminal and en-route weather, an operator should only use weather information systems that are sufficient reliable and accurate in the proposed area of operation.

4.2.2.3 Fuel

4.2.2.3.1 Fuel should be sufficient to comply with the critical fuel scenario as described in Appendix 2 to this AMC.

4.2.3 Flight Planning

4.2.3.1 The effects of wind and temperature at the one-engine-inoperative cruise altitude should be accounted for in the calculation of equal-time point. In addition to the nominated ETOPS en- route alternates, the operator should provide flight crews with information on adequate aerodromes on the route to be flown which are not forecast to meet the ETOPS en-route alternate weather minima. Aerodrome facility information and other appropriate planning data concerning these aerodromes should be provided before commencement of the flight to flight crews for use when executing a diversion.

4.2.4 Flight Crew Training

4.2.4.1 The operator's ETOPS training program should provide initial and recurrent training for flight crew in accordance with Appendix 4.

4.2.5 En-route Alternate

4.2.5.1 Appendix 3 to this AMC should be implemented when establishing the company operational procedures for ETOPS.

4.2.6 Communications Equipment (VHF/HF, Data Link, Satellite Communications)

4.2.6.1 For all routes where voice communication facilities are available, the communication equipment required by operational requirements should include at least one voice-based system.

4.3 SPECIFIC REQUIREMENTS:

4.3.1 APPROVAL FOR 90 MINUTES OR LESS DIVERSION TIME

4.3.1.1 The Operator's Approved Diversion Time is an operational limit that should not exceed either:

4.3.1.1.1 the Maximum Approved Diversion Time or,

4.3.1.1.2 the time-limited system capability minus 15 minutes.

4.3.1.2 If the airframe/engine combination does not yet have a Type Design approval for at least 90 minutes diversion time, the aircraft should satisfy the relevant ETOPS design requirements.

4.3.1.3 Consideration may be given to the approval of ETOPS up to 90 minutes for operators with minimal or no in-service experience with the airframe/engine combination. This determination considers such factors as the proposed area of operations, the operator's demonstrated ability to successfully introduce aeroplanes into operations and the quality of the proposed continuing airworthiness and operations programs.

4.3.1.4 Minimum Equipment List (MEL) restrictions for 120 minutes ETOPS should be used unless there are specific restrictions for 90 minutes or less.

4.3.2 APPROVAL FOR DIVERSION TIME ABOVE 90 MINUTES UP TO 180 MINUTES

4.3.2.1 Prior to approval, the operator's capability to conduct operations and implement effective ETOPS programs, in accordance with the criteria detailed in this AMC and the relevant appendices, will be examined.

4.3.2.2 The Operator's Approved Diversion Time is an operational limit that should not exceed either:

4.3.2.2.1 the Maximum Approved Diversion Time, or,

4.3.2.2.2 the time-limited system capability minus 15 minutes.

4.3.2.3 Additional Considerations for aircraft with 120 minutes Maximum Approved Diversion Time

In the case of an aircraft approved for 120 minutes Maximum Approved Diversion Time, an operator may request an increase in the operator's approved diversion time for specific routes provided:

4.3.2.3.1 The requested Operator's Approved Diversion Time does not exceed either:

- 115% of the Maximum Approved Diversion Time or,
- the time-limited system capability minus 15 minutes.

4.3.2.3.2 The aeroplane fuel carriage supports the requested Operator's Approved Diversion Time.

4.3.2.3.3 It can be shown that the resulting routing will not reduce the overall safety of the operation.

Such increases will require:

4.3.2.3.3.1 CAAB to accept overall type design including time-limited systems, demonstrated reliability; and

4.3.2.3.3.2 the development of an appropriate MEL related to the diversion time required.

4.3.2.4 Additional Considerations for aircraft with 180 minutes Maximum Approved Diversion Time

In the case of an aircraft certified for 180 minutes Maximum Approved Diversion Time, an operator may request an increase in the operator's approved diversion time for specific routes provided:

4.3.2.4.1 The requested Operator's Approved Diversion Time does not exceed either:

- 115% of the Maximum Approved Diversion Time or,
- the time-limited system capability minus 15 minutes

4.3.2.4.2 The aeroplane fuel carriage supports the requested Operator's Approved Diversion Time diversion time

4.3.2.4.3 It can be shown that the resulting routing will not reduce the overall safety of the operation.

Such increases will require:

4.3.2.4.3.1 CAAB to accept overall type design including time-limited systems, demonstrated reliability; and

4.3.2.4.3.2 the development of an appropriate MEL related to the diversion time required.

4.3.3 APPROVAL FOR DIVERSION TIME ABOVE 180 MINUTES

4.3.3.1 Approval to conduct operations with diversion times exceeding 180 minutes may be granted to operators with previous ETOPS experience on the particular engine/airframe combination and an existing 180 minute ETOPS approval on the airframe/engine combination listed in their application.

4.3.3.2 Operators should minimize diversion time along the preferred track. Increases in diversion time by disregarding ETOPS adequate aerodromes along the route, should only be planned in the interest of the overall safety of the operation.

4.3.3.3 The approval to operate more than 180 minutes from an adequate aerodrome shall be area specific, based on the availability of adequate ETOPS en-route alternate aerodromes.

4.3.3.4 Operating limitations

4.3.3.4.1 In view of the long diversion time involved (above 180 minutes), the operator is responsible to ensure at flight planning stage, that on any given day in the forecast conditions, such as prevailing winds, temperature and applicable diversion procedures, a diversion to an ETOPS en-route alternate aerodrome will not exceed the:

4.3.3.4.1.1 Engine-related time-limited systems capability minus 15 minutes at the approved one-engine-inoperative cruise speed; and

4.3.3.4.1.2 Non engine-related time-limited system capability minus 15 minutes, such as cargo fire suppression, or other non engine-related system capability at the all engine operative cruise speed.

4.3.3.5 Communications Equipment (VHF/HF, Data Link and Satellite based communications)

4.3.3.5.1 Operators should use any or all of these forms of communications to ensure communications capability when operating ETOPS in excess of 180 minutes.

4.3.4 APPROVAL FOR DIVERSION TIMES ABOVE 180 MINUTES OF OPERATORS OF TWO-ENGINE AEROPLANES WITH A MAXIMUM PASSENGER SEATING CONFIGURATION OF 19 OR LESS AND A MAXIMUM TAKE-OFF MASS LESS THAN 45 360 KG

4.3.4.1 Type Design

4.3.4.1.1 The airframe/engine combination should have the appropriate Type Design approval for the requested maximum diversion times in accordance with standards acceptable to CAAB.

4.3.4.2 Operations Approval

4.3.4.2.1 Approval to conduct operations with diversion times exceeding 180 minutes may be granted to operators with experience on the particular airframe/engine combination or existing ETOPS approval on a different airframe/engine combination, or equivalent experience. Operators should minimize diversion time along the preferred track to 180 minutes or less whenever possible. The approval to operate more than 180 minutes from an adequate aerodrome shall be area specific, based on the availability of alternate aerodromes, the diversion to which would not compromise safety.

4.3.4.3 Note: Exceptionally for this type of aeroplanes, operators may use the accelerated ETOPS approval method to gain ETOPS approval. This method is described in section 2.

4.4 ETOPS OPERATIONS MANUAL SUPPLEMENT

4.4.1 The ETOPS operations manual supplement or its equivalent material in the operations manual, and any subsequent amendments, are subject to approval by CAAB.

4.4.2 CAAB will review the actual ETOPS in-service operation. Amendments to the Operations Manual may be required as a result. Operators should provide information for and participate in such reviews, with reference to the (S)TC holder where necessary. The information resulting from these reviews should be used to modify or update flight crew training programs, operations manuals and checklists, as necessary.

4.4.3 An example outline of ETOPS Operations Manual Supplement content is provided in Appendix 5 to this AMC.

4.5 FLIGHT PREPARATION AND IN-FLIGHT PROCEDURES

4.5.1 The operator should establish pre-flight planning and dispatch procedures for ETOPS and they should be listed in the Operations Manual. These procedures should include, but not be limited to, the gathering and dissemination of forecast and actual weather information, both along the route and at the proposed ETOPS alternate aerodromes. Procedures should also be established to ensure that the requirements of the critical fuel scenario are included in the fuel planning for the flight.

4.5.2 The procedures and manual should require that sufficient information is available for the aeroplane pilot-in-command, to satisfy him/her that the status of the aeroplane and relevant airborne systems is appropriate for the intended operation. The manual should also include guidance on diversion decision-making and en-route weather monitoring.

4.5.3 Additional guidance on the content of the "Flight Preparation and In-Flight Procedures" section of the operations manual is provided in Appendix 2 to this AMC.

4.6 OPERATIONAL LIMITATIONS

4.6.1 The operational limitations to the area of operations and the Operator's Approved Diversion

4.6.2 Time are detailed in Appendix 1 to this AMC – "Operational Limitations".

4.7 ETOPS EN-ROUTE ALTERNATE AERODROMES

4.7.1 An operator should select ETOPS en-route alternate aerodromes in accordance with the applicable operational requirements and Appendix 3 to this AMC - Route Alternate.

4.8 INITIAL/RECURRENT TRAINING

4.8.1 An operator should ensure that prior to conducting ETOPS, each crew member has completed successfully ETOPS training and checking in accordance with a syllabus compliant with Appendix 5 to this AMC, approved by CAAB and detailed in the Operations Manual.

4.8.2 This training should be type and area specific in accordance with the applicable operational requirements.

4.8.3 The operator should ensure that crew members are not assigned to operate ETOPS routes for which they have not successfully passed the training.

4.9 ETOPS OPERATIONS APPROVAL

4.9.1 There are two methods for obtaining an ETOPS approval, depending on the availability and amount of prior experience with the candidate airframe/engine combination:

4.9.2 "Accelerated ETOPS approval", does not require prior in-service experience with the candidate airframe/engine combination;

4.9.3 "In-service ETOPS Approval", based on a pre-requisite amount of prior in-service experience with the candidate airframe/engine combination. Elements from the "accelerated ETOPS approval" method may be used to reduce the amount of prior in-service experience.

APPENDIX- 1
OPERATIONAL LIMITATIONS

1. AREA OF OPERATION

An operator is, when specifically approved, authorised to conduct ETOPS flights within an area where the diversion time, at any point along the proposed route of flight, to an adequate ETOPS en-route alternate aerodrome, is within the operator's approved diversion time (under standard conditions in still air) at the approved one-engine-inoperative cruise speed.

2. OPERATOR'S APPROVED DIVERSION TIME

The procedures established by the operator should ensure that ETOPS is only planned on routes where the Operator's Approved Diversion Time to an Adequate ETOPS en-route alternate Aerodrome can be met.

3. ISSUE OF THE ETOPS OPERATIONS APPROVAL BY CAAB

The approval issued by CAAB for ETOPS operations should be based on the following information provided by the operator:

(a) Specification of the particular airframe/engine combinations, including the current approved CMP document required for ETOPS as normally identified in the AFM;

(b) Authorised area of operation;

(c) Minimum altitudes to be flown along planned and diversionary routes;

(d) Operator's Approved Diversion Time;

(e) Aerodromes identified to be used, including alternates, and associated instrument approaches and operating minima;

(f) The approved maintenance and reliability program for ETOPS;

(g) Identification of those aeroplanes designated for ETOPS by make and model as well as serial number and registration;

(h) Specification of routes and the ETOPS diversion time necessary to support those routes;

(i) The one-engine-inoperative cruise speed, which may be area specific, depending upon anticipated aeroplane loading and likely fuel penalties associated with the planned procedures;

(j) Processes and related resources allocated to initiate and sustain ETOPS operations in a manner that demonstrates commitment by management and all personnel involved in ETOPS continued airworthiness and operational support;

(k) The plan for establishing compliance with the build standard required for Type Design Approval.

APPENDIX- 2
FLIGHT PREPARATION AND IN-FLIGHT PROCEDURES

1. GENERAL

The flight release considerations specified in this paragraph are in addition to the applicable operational requirements. They specifically apply to ETOPS. Although many of the considerations in this AMC are currently incorporated into approved programs for other aeroplane or route structures, the unique nature of ETOPS necessitates a re-examination of these operations to ensure that the approved programs are adequate for this purpose.

2. MINIMUM EQUIPMENT LIST (MEL)

The system redundancy levels appropriate to ETOPS should be reflected in the Master Minimum Equipment List (MMEL). An operator’s MEL may be more restrictive than the MMEL considering the kind of ETOPS operation proposed, equipment and in-service problems unique to the operator. Systems and equipment considered to have a fundamental influence on safety may include, but are not limited to, the following:

(a) electrical;

(b) hydraulic;

(c) pneumatic;

(d) flight instrumentation, including warning and caution systems;

(e) fuel;

(f) flight control;

(g) ice protection;

(h) engine start and ignition;

(i) propulsion system instruments;

(j) navigation and communications, including any route specific long range navigation and communication equipment;

(k) auxiliary power-unit;

(l) air conditioning and pressurization;

(m) cargo fire suppression;

(n) engine fire protection;

(o) emergency equipment;

(p) systems and equipment required for engine condition monitoring.

In addition, the following systems are required to be operative for dispatch for ETOPS with diversion times above 180 minutes:

(q) Fuel Quantity Indicating System (FQIS);

(r) APU (including electrical and pneumatic supply to its designed capability), if necessary to comply with ETOPS requirements;

(s) Automatic engine or propeller control system;

(t) Communication system(s) relied on by the flight crew to comply with the requirement for communication capability.

3. COMMUNICATION AND NAVIGATION FACILITIES

For releasing an aeroplane on an ETOPS flight, the operators should ensure that:

(a) Communications facilities are available to provide under normal conditions of propagation at all planned altitudes of the intended flight and the diversion scenarios, reliable two- way voice and/or data link communications;

(b) Visual and non-visual aids are available at the specified alternates for the anticipated types of approaches and operating minima.

4. FUEL SUPPLY

(a) General

For releasing an aeroplane on an ETOPS flight, the operators should ensure that it carries sufficient fuel and oil to meet the applicable operational requirements and any additional fuel that may be determined in accordance with this Appendix.

(b) Critical Fuel Reserve

(i) In establishing the critical fuel reserves, the applicant is to determine the fuel necessary to fly to the most critical point (at normal cruise speed and altitude, taking into account the anticipated meteorological conditions for the flight) and execute a diversion to an ETOPS en-route alternate under the conditions outlined in this Appendix, the 'Critical Fuel Scenario' (paragraph c. below).

(ii) These critical fuel reserves should be compared to the normal applicable operational requirements for the flight. If it is determined by this comparison that the fuel to complete the critical fuel scenario exceeds the fuel that would be on board at the most critical point, as determined by applicable operational requirements, additional fuel should be included to the extent necessary to safely complete the Critical Fuel Scenario. When considering the potential diversion distance flown account should be taken of the anticipated routing and approach procedures, in particular any constraints caused by airspace restrictions or terrain.

(c) Critical Fuel Scenario.

The following describes a scenario for a diversion at the most critical point. The applicant should confirm compliance with this scenario when calculating the critical fuel reserve necessary.

(a) Note 1: If an APU is one of the required power sources, then its fuel consumption should be accounted for during the appropriate phases of flight.

(b) Note 2: Additional fuel consumptions due to any MEL or CDL items should be accounted for during the appropriate phases of flight, when applicable.

(c) The aeroplane is required to carry sufficient fuel taking into account the forecast wind and weather to fly to an ETOPS route alternate assuming the greater of:

(i) A rapid decompression at the most critical point followed by descent to a 10,000 ft or a higher altitude if sufficient oxygen is provided in accordance with the applicable operational requirements.

(ii) Flight at the approved one-engine-inoperative cruise speed assuming a rapid decompression and a simultaneous engine failure at the most critical point followed by descent to a 10,000 ft or a higher altitude if sufficient oxygen is provided in accordance with the applicable operational requirements.

(iii) Flight at the approved one-engine-inoperative cruise speed assuming an engine failure at the most critical point followed by descent to the one-engine-inoperative cruise altitude.

(1) Upon reaching the alternate, hold at 1500 ft above field elevation for 15 minutes and then conduct an instrument approach and landing.

(2) Add a 5% wind speed factor (i.e., an increment to headwind or a decrement to tailwind) on the actual forecast wind used to calculate fuel in the greater of (1), (2) or (3) above to account for any potential errors in wind forecasting. If an operator is not using the actual forecast wind based on wind model acceptable to CAAB, allow

(3) 5% of the fuel required for (1), (2) or (3) above, as reserve fuel to allow for errors in wind data. A wind aloft forecasting distributed worldwide by the World Area Forecast System (WAFS) is an example of a wind model acceptable to CAAB.

(d) Icing

Correct the amount of fuel obtained in paragraph c. above taking into account the greater of:

(i) the effect of airframe icing during 10% of the time during which icing is forecast (including ice accumulation on unprotected surfaces, and the fuel used by engine and wing anti-ice during this period).

(ii) fuel for engine anti-ice, and if appropriate wing anti-ice for the entire time during which icing is forecast.

(1) Note: Unless a reliable icing forecast is available, icing may be presumed to occur when the total air temperature (TAT) at the approved one-engine-inoperative cruise speed is less than +10ºC, or if the outside air temperature is between 0ºC and -20ºC with a relative humidity (RH) of 55% or greater.

(2) The operator should have a program established to monitor aeroplane in-service deterioration in cruise fuel burn performance and including in the fuel supply calculations sufficient fuel to compensate for any such deterioration. If there is no data available for such a program the fuel supply should be increased by 5% to account for deterioration in cruise fuel burn performance.

5. ALTERNATE AERODROMES

(a) To conduct an ETOPS flight, the ETOPS en-route alternate aerodromes, should meet the weather requirements of planning minima for an ETOPS en-route alternate aerodromes contained in the applicable operational requirements. ETOPS planning minima apply until dispatch. The planned en-route alternates for using in the event of propulsion system failure or aeroplane system failure(s) which require a diversion should be identified and listed in the cockpit documentation (e.g. computerized flight plan) for all cases where the planned route to be flown contains an ETOPS point

(b) See also Appendix 3 to this AMC 'ETOPS En-route Alternate Aerodromes'.

6. IN-FLIGHT RE-PLANNING AND POST-DISPATCH WEATHER MINIMA

(a) An aeroplane whether or not dispatched as an ETOPS flight may not re-route post dispatch without meeting the applicable operational requirements and satisfy by a procedure that dispatch criteria have been met. The operator should have a system in place to facilitate such re-routes.

(b) Post-dispatch, weather conditions at the ETOPS en-route alternates should be equal to or better than the normal landing minima for the available instrument approach.

7. DELAYED DISPATCH

If the dispatch of a flight is delayed by more than one hour, pilots and/or operations personnel should monitor weather forecasts and airport status at the nominated en-route alternates to ensure that they stay within the specified planning minima requirements until dispatch.

8. DIVERSION DECISION MAKING

(a) Operators shall establish procedures for flight crew, outlining the criteria that indicate when a diversion or change of routing is recommended whilst conducting an ETOPS flight. For an ETOPS flight, in the event of the shutdown of an engine, these procedures should include the shutdown of an engine, fly to and land at the nearest aerodrome appropriate for landing.

(b) Factors to be considered when deciding upon the appropriate course of action and suitability of an aerodrome for diversion may include but are not limited to:

(1) Aircraft configuration/weight/systems status;

(2) Wind and weather conditions en route at the diversion altitude;

(3) Minimum altitudes en route to the diversion aerodrome;

(4) Fuel required for the diversion;

(5) Aerodrome condition, terrain, weather and wind;

(6) Runways available and runway surface condition;

(7) Approach aids and lighting;

(8) RFFS* capability at the diversion aerodrome;

(9) Facilities for aircraft occupants - disembarkation & shelter;

(10) Medical facilities;

(11) Pilot's familiarity with the aerodrome;

(12) Information about the aerodrome available to the flight crew.

(c) Contingency procedures should not be interpreted in any way that prejudices the final authority and responsibility of the pilot-in-command for the safe operation of the aeroplane.

(d) Note: for an ETOPS en-route alternate aerodrome, a published RFFS category equivalent to ICAO category 4, available at 30 minutes notice, is acceptable.

9. IN-FLIGHT MONITORING

During the flight, the flight crew should remain informed of any significant changes in conditions at designated ETOPS en-route alternate aerodromes. Prior to the ETOPS Entry Point, the forecast weather, established aeroplane status, fuel remaining, and where possible field conditions and aerodrome services and facilities at designated ETOPS en-route alternates are to be evaluated. If any conditions are identified which could preclude safe approach and landing on a designated en-route alternate aerodrome, then the flight crew should take appropriate action, such as re-routing as necessary, to remain within the operator's approved diversion time of an en-route alternate aerodrome with forecast weather to be at or above landing minima. In the event this is not possible, the next nearest en-route alternate aerodrome should be selected provided the diversion time does not exceed the maximum approved diversion time. This does not override the pilot in command's authority to select the safest course of action.

10. AEROPLANE PERFORMANCE DATA

(a) The operator should ensure that the Operations Manual contains sufficient data to support the critical fuel reserve and area of operations calculation.

(b) The following data should be based on the information provided by the (S)TC holder. The requirements for one-engine-inoperative performance en-route can be found in the applicable operational requirements.

(c) Detailed one-engine-inoperative performance data including fuel flow for standard and non-standard atmospheric conditions and as a function of airspeed and power setting, where appropriate, covering:

(i) drift down (includes net performance);

(ii) cruise altitude coverage including 10,000 feet;

(iii) holding;

(iv) altitude capability (includes net performance);

(v) missed approach.

Detailed all-engine-operating performance data, including nominal fuel flow data, for standard and non-standard atmospheric conditions and as a function of airspeed and power setting, where appropriate, covering:

(d) Cruise (altitude coverage including 10,000 feet); and b. Holding.

(i) It should also contain details of any other conditions relevant to extended range operations which can cause significant deterioration of performance, such as ice accumulation on the unprotected surfaces of the aeroplane, Ram Air Turbine (RAT) deployment, thrust reverser deployment, etc.

(ii) The altitudes, airspeeds, thrust settings, and fuel flow used in establishing the ETOPS area of operations for each airframe/engine combination should be used in showing the corresponding terrain and obstruction clearances in accordance with the applicable operational requirements.

11. OPERATIONAL FLIGHT PLAN

The type of operation (i.e. ETOPS, including the diversion time used to establish the plan) should be listed on the operational flight plan as required by the applicable operational requirements.

APPENDIX- 3

ETOPS EN-ROUTE ALTERNATE AERODROMES

1. SELECTION OF EN-ROUTE ALTERNATE AERODROMES

(a) For an aerodrome to be nominated as an ETOPS en-route alternate for the purpose of this AMC, it should be anticipated that at the expected times of possible use it is an adequate ETOPS aerodrome that meets the weather and field conditions defined in the paragraph below titled 'Dispatch Minima – En-Route Alternate Aerodromes' or the applicable operational requirements.

(b) To list an aerodrome as an ETOPS en-route alternate, the following criteria should be met:

i The landing distances required as specified in the AFM for the altitude of the aerodrome, for the runway expected to be used, taking into account wind conditions, runway surface conditions, and aeroplane handling characteristics, permit the aeroplane to be stopped within the landing distance available as declared by the aerodrome authorities and computed in accordance with the applicable operational requirements.

ii The aerodrome services and facilities are adequate to permit an instrument approach procedure to the runway expected to be used while complying with the applicable aerodrome operating minima.

iii The latest available forecast weather conditions for a period commencing at the earliest potential time of landing and ending one hour after the latest nominated time of use of that aerodrome, equals or exceeds the authorised weather minima for en-route alternate aerodromes as provided for by the increments listed in Table 1 of this Appendix. In addition, for the same period, the forecast crosswind component plus any gusts should be within operating limits and within the operators maximum crosswind limitations taking into account the runway condition (dry, wet or contaminated) plus any reduced visibility limits.

iv In addition, the operator's program should provide flight crews with information on adequate aerodromes appropriate to the route to be flown which are not forecast to meet en-route alternate weather minima. Aerodrome facility information and other appropriate planning data concerning these aerodromes should be provided to flight crews for use when executing a diversion.

2. DISPATCH MINIMA – EN-ROUTE ALTERNATE AERODROMES

(a) An aerodrome may be nominated as an ETOPS en-route alternate for flight planning and release purposes if the available forecast weather conditions for a period commencing at the earliest potential time of landing and ending one hour after the latest nominated time of use of that aerodrome, equal or exceed the criteria required by Table 1 below.

Table- 1

Planning Minima

Approach Facility	Ceiling	Visibility
Precision Approach	Authorized DH/DA plus an increment of 200 ft	Authorized visibility plus an increment of 800 metres
Non-Precision Approach or Circling approach	Authorized MDH/MDA plus an increment of 400 ft	Authorized visibility plus an increment of 1500 metres

(b) The above criteria for precision approaches are only to be applied to Category 1 approaches.

(c) When determining the usability of an Instrument Approach (IAP), forecast wind plus any gusts should be within operating limits, and within the operators maximum crosswind limitations taking into account the runway condition (dry, wet or contaminated) plus any reduced visibility limits. Conditional forecast elements need not be considered, except that a PROB 40 or TEMPO condition below the lowest applicable operating minima should be taken into account.

(d) When dispatching under the provisions of the MEL, those MEL limitations affecting instrument approach minima should be considered in determining ETOPS alternate minima.

3. EN-ROUTE ALTERNATE AERODROME PLANNING MINIMA – ADVANCED LANDING SYSTEMS

(a) The increments required by Table 1 are normally not applicable to Category II or III minima unless specifically approved by CAAB.

(b) Approval will be based on the following criteria:

i Aircraft is capable of engine-inoperative Cat II/III landing; and b. Operator is approved for normal Cat II/III operations.

ii CAAB may require additional data (such as safety assessment or in-service records) to support such an application. For example, it should be shown that the specific aeroplane type can maintain the capability to safely conduct and complete the Category II/III approach and landing having encountered failure conditions in the airframe and/or propulsion systems associated with an inoperative engine that would result in the need for a diversion to the route alternate aerodrome.

iii Systems to support one-engine inoperative Category II or III capability should be serviceable if required to take advantage of Category II or III landing minima at the planning stage.

APPENDIX- 4

ETOPS TRAINING PROGRAM

The operator's ETOPS training program should provide initial and recurrent training for flight crew as follows:

1. INTRODUCTION TO ETOPS REGULATIONS

(a) Brief overview of the history of ETOPS;

(b) ETOPS regulations;

(c) Definitions;

(d) Approved One-Engine-Inoperative Cruise Speed;

(e) ETOPS Type Design Approval – a brief synopsis;

(f) Maximum approved diversion times and time-limited systems capability;

(g) Operator's Approved Diversion Time;

(h) Routes and aerodromes intended to be used in the ETOPS area of operations;

(i) ETOPS Operations Approval;

(j) ETOPS Area and Routes;

(k) ETOPS en-route alternates aerodromes including all available let-down aids;

(l) Navigation systems accuracy, limitations and operating procedures;

(m) Meteorological facilities and availability of information;

(n) In-flight monitoring procedures;

(o) Computerized Flight Plan;

(p) Orientation charts, including low level planning charts and flight progress charts usage (including position plotting);

(q) Equal Time Point;

(r) Critical fuel.

2. NORMAL OPERATIONS

(a) Flight planning and Dispatch

i ETOPS Fuel requirements

ii Route Alternate selection - weather minima

iii Minimum Equipment List – ETOPS specific
iv ETOPS service check and Tech log
v Pre-flight FMS Set up

(b) Flight performance progress monitoring

i Flight management, navigation and communication systems
ii Aeroplane system monitoring
iii Weather monitoring
iv In-flight fuel management – to include independent cross checking of fuel quantity

3. ABNORMAL AND CONTINGENCY PROCEDURES:

(a) Diversion Procedures and Diversion 'decision making'.

Initial and recurrent training to prepare flight crews to evaluate potential significant system failures. The goal of this training should be to establish crew competency in dealing with the most probable contingencies. The discussion should include the factors that may require medical, passenger related or non-technical diversions.

(b) Navigation and communication systems, including appropriate flight management devices in degraded modes.

(c) Fuel Management with degraded systems.

(d) Initial and recurrent training which emphasises abnormal and emergency procedures to be followed in the event of foreseeable failures for each area of operation, including:

i Procedures for single and multiple failures in flight affecting ETOPS sector entry and diversion decisions. If standby sources of electrical power significantly degrade the cockpit instrumentation to the pilots, then training for approaches with the standby generator as the sole power source should be conducted during initial and recurrent training.

ii Operational restrictions associated with these system failures including any applicable MEL considerations.

4. ETOPS LINE FLYING UNDER SUPERVISION (LIFUS)

(a) During the introduction into service of a new ETOPS type, or conversion of pilots not previously ETOPS qualified where ETOPS approval is sought, a minimum of two ETOPS sectors should be completed including an ETOPS line check.

(b) ETOPS subjects should also be included in annual refresher training as part of the normal process.

5. FLIGHT OPERATIONS PERSONNEL OTHER THAN FLIGHT CREW

(a) The operator's training program in respect to ETOPS should provide training where applicable for operations personnel other than flight crew (e.g. dispatchers), in addition to refresher training in the following areas:

i ETOPS Regulations/Operations Approval

ii Aeroplane performance/Diversion procedures

iii Area of Operation

iv Fuel Requirements

v Dispatch Considerations MEL, CDL, weather minima, and alternate airports

vi Documentation

APPENDIX- 5

TYPICAL ETOPS OPERATIONS MANUAL SUPPLEMENT

The ETOPS operations manual can take the form of a supplement or a dedicated manual, and it could be divided under these headings as follows:

1. PART- A GENERAL/BASIC

(a) Introduction

- i Brief description of ETOPS
- ii Definitions

(b) Operations approval

- i Criteria
- ii Assessment
- iii Approved diversion time c. Training and Checking

(c) Operating procedures

(d) ETOPS operational procedures

(e) ETOPS Flight Preparation and Planning

- i Aeroplane serviceability
- ii ETOPS Orientation charts
- iii ETOPS alternate aerodrome selection
- iv En-route alternate weather requirements for planning
- v ETOPS computerized Flight Plans

(f) Flight Crew Procedures

i Dispatch
ii Re-routing or diversion decision-making
iii ETOPS verification (following maintenance) flight requirements
iv En-route Monitoring

2. PART- B AEROPLANE OPERATING MATTERS

This part should include type-related instructions and procedures needed for ETOPS.

(a) Specific type-related ETOPS operations

i ETOPS specific limitations
ii Types of ETOPS operations that are approved
iii Placards and limitations
iv OEI speed(s)
v Identification of ETOPS aeroplanes

(b) Dispatch and flight planning, plus in-flight planning

i Type-specific flight planning instructions for use during dispatch and post-dispatch

ii Procedures for engine(s)-out operations, ETOPS (particularly the one-engine- inoperative cruise speed and maximum distance to an adequate aerodrome should be included)

(c) ETOPS Fuel Planning

(d) Critical Fuel Scenario

(e) MEL/CDL considerations

(f) ETOPS specific Minimum Equipment List items

(g) Aeroplane Systems

i Aeroplane performance data including speed schedules and power settings

ii Aeroplane technical differences, special equipment (e.g. satellite communications) and modifications required for ETOPS

3. PART- C ROUTE AND AERODROME INSTRUCTIONS

This part should comprise all instructions and information needed for the area of operation, to include the following as necessary:

(a) ETOPS area and routes, approved area(s) of operations and associated limiting distances

(b) ETOPS an-route alternates

(c) Meteorological facilities and availability of information for in-flight monitoring

(d) Specific ETOPS computerized Flight Plan information

(e) Low altitude cruise information, minimum diversion altitude, minimum oxygen requirements and any additional oxygen required on specified routes if MSA restrictions apply

(f) Aerodrome characteristics (landing distance available, take off distance available) and weather minima for aerodromes that are designated as possible alternates

4. PART- D TRAINING

(a) This part should contain the route and aerodrome training for ETOPS operations. This training should have twelve-months of validity or as required by the applicable operational requirements. Flight crew training records for ETOPS should be retained for 3 years or as required by the applicable requirements.

(b) The operator's training program in respect to ETOPS should include initial and recurrent training/checking as specified in this AMC.

APPENDIX- 6

CONTINUING AIRWORTHINESS CONSIDERATIONS

1. APPLICABILITY

The requirements of this Appendix apply to the continuing airworthiness management organisations (CAMO) managing the aircraft for which an ETOPS operational approval is sought, and they are to be complied with in addition to the applicable continuing airworthiness requirements of Part-M. They specifically affect:

(a) Occurrence reporting;

(b) Aircraft maintenance program and reliability program;

(c) Continuing airworthiness management exposition;

(d) Competence of continuing airworthiness and maintenance personnel.

2. OCURRENCE REPORTING

(a) In addition to the items generally required to be reported in accordance with ANO 19, the following items concerning ETOPS should be included:

i in-flight shutdowns;

ii diversion or turn-back;

iii un-commanded power changes or surges;

iv inability to control the engine or obtain desired power; and

v failures or malfunctions of ETOPS significant systems having a detrimental effect to ETOPS flight.

(b) Note: status messages, transient failures, intermittent indication of failure, messages tested satisfactorily on ground not duplicating the failure should only be reported after an assessment by the operator that an unacceptable trend has occurred on the system

(c) The report should identify as applicable the following:

i aircraft identification;

ii engine, propeller or APU identification (make and serial number);

iii total time, cycles and time since last shop visit;

iv for systems, time since overhaul or last inspection of the defective unit;

v phase of flight; and

vi corrective action.

(d) CAAB and the (S)TC holder should be notified within 72 hours of events reportable through this program.

3. MAINTENANCE PROGRAM AND RELIABILITY PROGRAM

The quality of maintenance and reliability programs can have an appreciable effect on the reliability of the propulsion system and the ETOPS Significant Systems. CAAB should assess the proposed maintenance and reliability program's ability to maintain an acceptable level of safety for the propulsion system and the ETOPS Significant Systems of the particular airframe/engine combination.

3.1 MAINTENANCE PROGRAM:

(a) The maintenance program of an aircraft for which ETOPS operational approval is sought, should contain the standards, guidance and instructions necessary to support the intended operation. The specific ETOPS maintenance tasks identified by the (S)TC holder in the Configuration, Maintenance and Procedures document (CMP) or equivalent should be included in the maintenance program and identified as ETOPS tasks.

(b) An ETOPS Maintenance task could be an ETOPS specific task or/and a maintenance task affecting an ETOPS significant system. An ETOPS specific task could be either an existing task with a different interval for ETOPS, a task unique to ETOPS operations, or a task mandated by the CMP further to the in-service experience review (note that in the case ETOPS is considered as baseline in the development of a maintenance program, no "ETOPS specific" task may be identified in the MRB).

(c) The maintenance program should include tasks to maintain the integrity of cargo compartment and pressurization features, including baggage hold liners, door seals and drain valve condition. Processes should be implemented to monitor the effectiveness of the maintenance program in this regard.

3.1.1 PRE-DEPARTURE SERVICE CHECK

An ETOPS service check should be developed to verify the status of the aeroplane and the ETOPS significant systems. This check should be accomplished by an authorised and trained person prior to an ETOPS flight. Such a person may be a member of the flight crew.

3.2 RELIABILITY PROGRAM:

3.2.1 GENERAL

3.2.1.1 The reliability program of an ETOPS operated aircraft should be designed with early identification and prevention of failures or malfunctions of ETOPS significant systems as the primary goal. Therefore the reliability program should include assessment of ETOPS Significant Systems performance during scheduled inspection/testing, to detect system failure trends in order to implement appropriate corrective action such as scheduled task adjustment.

3.2.1.2 The reliability program should be event-orientated and incorporate:

(a) reporting procedures in accordance with section 2: Occurrence reporting
(b) operator’s assessment of propulsion systems reliability
(c) APU in-flight start program
(d) Oil consumption program
(e) Engine Condition Monitoring program f. Verification program

3.2.2 ASSESSMENT OF PROPULSION SYSTEMS RELIABILITY

3.2.2.1 The operator’s assessment of propulsion systems reliability for the ETOPS fleet should be made available to CAAB (with the supporting data) on at least a monthly basis, to ensure that the approved maintenance program continues to maintain a level of reliability necessary for ETOPS operations as established in chapter II section 6.3.

3.2.2.2 The assessment should include, as a minimum, engine hours flown in the period, in-flight shutdown rate for all causes and engine removal rate, both on a 12-months moving average basis. Where the combined ETOPS fleet is part of a larger fleet of the same aircraft/engine combination, data from the total fleet will be acceptable.

3.2.2.3 Any adverse sustained trend to propulsion systems would require an immediate evaluation to be accomplished by the operator in consultation with CAAB. The evaluation may result in corrective action or operational restrictions being applied.

3.2.2.4 A high engine in-flight shutdown rate for a small fleet may be due to the limited number of engine operating hours and may not be indicative for an unacceptable trend. The underlying causes for such an increase in the rate will have to be reviewed on a case-by- case basis in order to identify the root cause of events so that the appropriate corrective action is implemented.

3.2.2.5 If an operator has an unacceptable engine in-flight shutdown rate caused by maintenance or operational practices, then the appropriated corrective actions should be taken.

3.2.3 APU IN-FLIGHT START PROGRAM

3.2.3.1 Where an APU is required for ETOPS and the aircraft is not operated with this APU running prior to the ETOPS entry point, the operator should initially implement a cold soak in-flight starting program to verify that start reliability at cruise altitude is above 95%.

3.2.3.2 Once the APU in-flight start reliability is proven, the APU in-flight start monitoring program may be alleviated. The APU in-flight start monitoring program should be acceptable to CAAB.

3.2.3.3 The Maintenance procedures should include the verification of in-flight start reliability following maintenance of the APU and APU components, as defined by the OEM, where start reliability at altitude may have been affected.

3.2.4 OIL CONSUMPTION MONITORING PROGRAM

3.2.4.1 The oil consumption monitoring program should reflect the (S)TC holder's recommendations and track oil consumption trends. The monitoring program must be continuous and include all oil added at the departure station.

3.2.4.2 If oil analysis is recommended to the type of engine installed, it should be included in the program.

3.2.4.3 If the APU is required for ETOPS dispatch, an APU oil consumption monitoring program should be added to the oil consumption monitoring program.

3.2.5 ENGINE CONDITION MONITORING PROGRAM

3.2.5.1 The engine condition monitoring program should ensure that a one-engine-inoperative diversion may be conducted without exceeding approved engine limits (e.g. rotor speeds, exhaust gas temperature) at all approved power levels and expected environmental conditions. Engine limits established in the monitoring program should account for the effects of additional engine loading demands (e.g. anti-icing, electrical, etc.), which may be required during the one-engine-inoperative flight phase associated with the diversion.

3.2.5.2 The engine condition monitoring program should describe the parameters to be monitored, method of data collection and corrective action process. The program should reflect manufacturer's instructions and industry practice. This monitoring will be used to detect deterioration at an early stage to allow for corrective action before safe operation of the aircraft is affected.

3.2.6 VERIFICATION PROGRAM

3.2.6.1 The operator should develop a verification program to ensure that the corrective action required to be accomplished following an engine shutdown, any ETOPS significant system failure or adverse trends or any event which require a verification flight or other verification action are established. A clear description of who must initiate verification actions and the section or group responsible for the determination of what action is necessary should be identified in this verification program. ETOPS significant systems or conditions requiring verification actions should be described in the Continuing Airworthiness Management Exposition (CAME). The CAMO may request the support of (S)TC holder to identify when these actions are necessary. Nevertheless the CAMO may propose alternative operational procedures to ensure system integrity. This may be based on system monitoring in the period of flight prior to entering an ETOPS area.

4. CONTINUING AIRWORTHINESS MANAGEMENT EXPOSITION

(a) The CAMO should develop appropriate procedures to be used by all personnel involved in the continuing airworthiness and maintenance of the aircraft, including supportive training programs, duties, and responsibilities.

(b) The CAMO should specify the procedures necessary to ensure the continuing airworthiness of the aircraft particularly related to ETOPS operations. It should address the following subjects as applicable:

i General description of ETOPS procedures

ii ETOPS maintenance program development and amendment

iii ETOPS reliability program procedures

(A) Engine/APU oil consumption monitoring

(B) Engine/APU Oil analysis

(C) Engine conditioning monitoring

(D) APU in-flight start program

(E) Verification program after maintenance

(F) Failures, malfunctions and defect reporting

(G) Propulsion System Monitoring/Reporting

(H) ETOPS significant systems reliability

iv Parts and configuration control program

v Maintenance procedures that include procedures to preclude identical errors being applied to multiple similar elements in any ETOPS significant system

vi Interface procedures with the ETOPS maintenance contractor, including the operator ETOPS procedures that involve the maintenance organisation and the specific requirements of the contract

vii Procedures to establish and control the competence of the personnel involved in the continuing airworthiness and maintenance of the ETOPS fleet.

5. COMPETENCE OF CONTINUING AIRWORTHINESS AND MAINTENANCE PERSONNEL

(a) The CAMO organisation should ensure that the personnel involved in the continuing airworthiness management of the aircraft have knowledge of the ETOPS procedures of the operator.

(b) The CAMO should ensure that maintenance personnel that are involved in ETOPS maintenance tasks:

i Have completed an ETOPS training program reflecting the relevant ETOPS procedures of the operator, and,

ii Have satisfactorily performed ETOPS tasks under supervision, within the framework of the Part-145 approved procedures for Personnel Authorisation.

5.1 PROPOSED TRAINING PROGRAM FOR PERSONNEL INVOLVED IN THE CONTINUING AIRWORTHINESS AND MAINTENANCE OF THE ETOPS FLEET

The operator's ETOPS training program should provide initial and recurrent training for as follows:

5.1.1 INTRODUCTION TO ETOPS REGULATIONS

(a) Contents of this AMC and related type design approval consideration.

(b) ETOPS Type Design Approval – a brief synopsis

5.1.2 ETOPS OPERATIONS APPROVAL

(a) Maximum approved diversion times and time-limited systems capability
(b) Operator's Approved Diversion Time
(c) ETOPS Area and Routes d. ETOPS MEL

5.1.3 ETOPS CONTINUING AIRWORTHINESS CONSIDERATIONS

(a) ETOPS significant systems
(b) CMP and ETOPS aircraft maintenance program
(c) ETOPS pre-departure service check
(d) ETOPS reliability program procedures

(1) Engine/ APU oil consumption monitoring
(2) Engine/APU Oil analysis
(3) Engine conditioning monitoring
(4) APU in-flight start program
(5) Verification program after maintenance
(6) Failures, malfunctions and defect reporting
(7) Propulsion System Monitoring/Reporting
(8) ETOPS significant systems reliability

(e) Parts and configuration control program
(f) CAMO additional procedures for ETOPS
(g) Interface procedures between Part-145 organisation and CAMO

5.2 SPA.ETOPS.110 ETOPS en-route alternate aerodrome

5.2.1 An ETOPS en-route alternate aerodrome shall be considered adequate, if, at the expected time of use, the aerodrome is available and equipped with necessary ancillary services such as air traffic services (ATS), sufficient lighting, communications, weather reporting, navigation aids and emergency services and has at least one instrument approach procedure available.

5.2.2 Prior to conducting an ETOPS flight, the operator shall ensure that an ETOPS en-route alternate aerodrome is available, within either the operator's approved diversion time, or a diversion time based on the MEL generated serviceability status of the aero plane, whichever is shorter.

5.2.3 The operator shall specify any required ETOPS en-route alternate aerodrome(s) in the operational flight plan and ATS flight plan.

5.3 SPA.ETOPS.115 ETOPS en-route alternate aerodrome planning minima

5.3.1 The operator shall only select an aerodrome as an ETOPS en-route alternate aerodrome when the appropriate weather reports or forecasts, or any combination thereof, indicate that, between the anticipated time of landing until one hour after the latest possible time of landing, conditions will exist at or above the planning minima calculated by adding the additional limits of Table 1.

5.3.2 The operator shall include in the operations manual the method for determining the operating minima at the planned ETOPS en-route alternate aerodrome.

Table 1

Planning minima for the ETOPS en-route alternate aerodrome

Type of approach	Planning minima
Precision approach	DA/H + 200 ft RVR/VIS + 800 m(1)
Non-precision approach or	MDA/H + 400 ft(1)
(1) VIS: visibility; MDA/H: minimum descent altitude/height.	

SUBPART- G
TRANSPORT OF DANGEROUS GOODS

SPA.DG.100 Transport of dangerous goods

Except as provided for in ANO (OPS), the operator shall only transport dangerous goods by air if the operator has been approved by the CAAB.

SPA.DG.105 Approval to transport dangerous goods

To obtain the approval to transport dangerous goods, the operator shall in accordance with the technical instructions:

(a) establish and maintain a training program for all personnel involved and demonstrate to the CAAB that adequate training has been given to all personnel;

(b) establish operating procedures to ensure the safe handling of dangerous goods at all stages of air transport, containing information and instructions on:

(1) the operator's policy to transport dangerous goods;

(2) the requirements for acceptance, handling, loading, stowage and segregation of dangerous goods;

(3) actions to take in the event of an aircraft accident or incident when dangerous goods are being carried;

(4) the response to emergency situations involving dangerous goods;

(5) the removal of any possible contamination;

(6) the duties of all personnel involved, especially with relevance to ground handling and aircraft handling;

(7) inspection for damage, leakage or contamination; (8) dangerous goods accident and incident reporting.

AMC1 SPA.DG.105(a) Approval to transport dangerous goods

TRAINING PROGRAM

(a) The operator should indicate for the approval of the training program how the training will be carried out. For formal training courses, the course objectives, the training program syllabus/curricula and examples of the written examination to be undertaken should be included.

(b) Instructors should have knowledge of training techniques as well as in the field of transport of dangerous goods by air so that the subject is covered fully and questions can be adequately answered.

(c) Training intended to give general information and guidance may be by any means including handouts, leaflets, circulars, slide presentations, videos, computer-based training, etc., and may take place on-the-job or off-the-job. The person being trained should receive an overall awareness of the subject. This training should include a written, oral or computer- based examination covering all areas of the training program, showing that a required minimum level of knowledge has been acquired.

(d) Training intended to give an in-depth and detailed appreciation of the whole subject or particular aspects of it should be by formal training courses, which should include a written examination, the successful passing of which will result in the issue of the proof of qualification. The course may be by means of tuition, as a self-study program, or a mixture of both. The person being trained should gain sufficient knowledge so as to be able to apply the detailed rules of the Technical Instructions.

(e) Training in emergency procedures should include as a minimum:

(1) for personnel other than crew members:

(i) dealing with damaged or leaking packages; and

(ii) other actions in the event of ground emergencies arising from dangerous goods;

(2) for flight crew members:

(i) actions in the event of emergencies in flight occurring in the passenger compartment or in the cargo compartments; and

(ii) the notification to ATS should an in-flight emergency occur;

(3) for crew members other than flight crew members:

(i) dealing with incidents arising from dangerous goods carried by passengers; or

(ii) dealing with damaged or leaking packages in flight.

(f) Training should be conducted at intervals of no longer than 2 years. If the recurrent training is undertaken within the last 3 calendar months of the validity period, the new validity period should be counted from the original expiry date.

AMC1 SPA.DG.105(b) Approval to transport dangerous goods

PROVISION OF INFORMATION IN THE EVENT OF AN IN-FLIGHT EMERGENCY

If an in-flight emergency occurs the pilot-in-command/pilot in command should, as soon as the situation permits, inform the appropriate ATS unit of any dangerous goods carried as cargo on bo ard the aircraft, as specified in the Technical Instructions.

GM1 SPA.DG.105(b)(6) Approval to transport dangerous goods

PERSONNEL

Personnel include all persons involved in the transport of dangerous goods, whether they are employees of the operator or not.

SPA.DG.110 Dangerous goods information and documentation

The operator shall, in accordance with the technical instructions:

(a) provide written information to the pilot-in-command/pilot in command:

(1) about dangerous goods to be carried on the aircraft;

(2) for use in responding to in-flight emergencies;

(b) use an acceptance checklist;

(c) ensure that dangerous goods are accompanied by the required dangerous goods transport document(s), as completed by the person offering dangerous goods for air transport, except when the information applicable to the dangerous goods is provided in electronic form;

(d) ensure that where a dangerous goods transport document is provided in written form, a copy of the document is retained on the ground where it will be possible to obtain access to it within a reasonable period until the goods have reached their final destination;

(e) ensure that a copy of the information to the pilot-in-command/pilot in command is retained on the ground and that this copy, or the information contained in it, is readily accessible to the aerodromes of last departure and next scheduled arrival, until after the flight to which the information refers;

(f) retain the acceptance checklist, transport document and information to the pilot-in-command/pilot in command for at least three months after completion of the flight;

(g) retain the training records of all personnel for at least three years.

AMC1 SPA.DG.110(a) Dangerous goods information and documentation

INFORMATION TO THE PILOT-IN-COMMAND/PILOT IN COMMAND

If the volume of information provided to the pilot-in-command/pilot in command by the operator is such that it would be impracticable to transmit it in the event of an in-flight emergency, an additional summary of the information should also be provided, containing at least the quantities and class or division of the dangerous goods in each cargo compartment.

AMC1 SPA.DG.110(b) Dangerous goods information and documentation

ACCEPTANCE OF DANGEROUS GOODS

(a) The operator should not accept dangerous goods unless:

(1) the package, overpack or freight container has been inspected in accordance with the acceptance procedures in the Technical Instructions;

(2) they are accompanied by two copies of a dangerous goods transport document or the information applicable to the consignment is provided in electronic form, except when otherwise specified in the Technical Instructions; and

(3) the English language is used for:

(i) package marking and labeling; and

(ii) the dangerous goods transport document, in addition to any other language provision.

(b) The operator or his/her handling agent should use an acceptance checklist which allows for:

(1) all relevant details to be checked; and

(2) the recording of the results of the acceptance check by manual, mechanical or computerized means.

SUBPART J
HELICOPTER EMERGENCY MEDICAL SERVICE OPERATIONS

SPA.HEMS.100 Helicopter emergency medical service (HEMS) operations

(a) Helicopters shall only be operated for the purpose of HEMS operations if the operator has been approved by the CAAB.

(b) To obtain such approval by the CAAB, the operator shall:

(1) operate in CAT and hold a Air Operator Certificate in accordance with ANO (OPS);
(2) demonstrate to the CAAB compliance with the requirements contained in this Subpart.

GM1 SPA.HEMS.100(a) Helicopter emergency medical service (HEMS) operations

THE HEMS PHILOSOPHY

(a) Introduction

This GM outlines the HEMS philosophy. Starting with a description of acceptable risk and introducing a taxonomy used in other industries, it describes how risk has been addressed in this Subpart to provide a system of safety to the appropriate standard. It discusses the difference between HEMS and air ambulance - in regulatory terms.

(b) Acceptable risk

The broad aim of any aviation legislation is to permit the widest spectrum of operations with the minimum risk. In fact it may be worth considering who/what is at risk and who/what is being protected. In this view three groups are being protected:

(1) third parties (including property) - highest protection;
(2) passengers (including patients); and
(3) crew members (including technical crew members) – lowest.

(c) Risk management

Safety management textbooks' describe four different approaches to the management of risk. All but first have been used in the production of this section and, if it is considered that the engine failure accountability of performance class 1 equates to zero risk, then all four are used (this of course is not strictly true as there are a number of helicopter parts –such as the tail rotor which, due to a lack of redundancy, cannot satisfy the criteria):

(1) Applying the taxonomy to HEMS gives:

(i) zero risk; no risk of accident with a harmful consequence – performance class 1 (within the qualification stated above) - the HEMS operating base;

(ii) de minimis; minimised to an acceptable safety target - for example the exposure time concept where the target is less than 5 x 10-8 (in the case of elevated final approach and take-off areas (elevated FATOs) at hospitals in a congested hostile environment the risk is contained to the deck edge strike case - and so in effect minimised to an exposure of seconds);

(iii) comparative risk; comparison to other exposure - the carriage of a patient with a spinal injury in an ambulance that is subject to ground effect compared to the risk of a HEMS flight (consequential and comparative risk);

(iv) as low as reasonably practicable; where additional controls are not economically or reasonably practicable - operations at the HEMS operating site (the accident site).

(2) HEMS operations are conducted in accordance with the requirements contained in ANO (OPS), except for the variations contained in ANO (OPS) Part-SPA.HEMS, for which a specific approval is required. In simple terms there are three areas in HEMS operations where risk, beyond that allowed in ANO (OPS), are identified and related risks accepted:

(i) in the en-route phase, where alleviation is given from height and visibility rules;

(ii) at the accident site, where alleviation is given from the performance and size requirement; and

(iii) at an elevated hospital site in a congested hostile environment, where alleviation is given from the deck edge strike - providing elements of the ANO 6-3 are satisfied.

In mitigation against these additional and considered risks, experience levels are set, specialist training is required (such as instrument training to compensate for the increased risk of inadvertent entry into cloud) and operation with two crew (two pilots, or one pilot and a HEMS technical crew member) is mandated.

(d) Air ambulance

In regulatory terms, air ambulance is considered to be a normal transport task where the risk is no higher than for operations to the full compliance with ANO (OPS). This is not intended to contradict/complement medical terminology but is simply a statement of policy; none of the risk elements of HEMS should be extant and therefore none of the additional requirements of HEMS need be applied.

To provide a road ambulance analogy:

(1) if called to an emergency: an ambulance would proceed at great speed, sounding its siren and proceeding against traffic lights - thus matching the risk of operation to the risk of a potential death (= HEMS operations);

(2) for a transfer of a patient (or equipment) where life and death (or consequential injury of ground transport) is not an issue: the journey would be conducted without sirens and within normal rules of motoring - once again matching the risk to the task (= air ambulance operations).

(i) The underlying principle is that the aviation risk should be proportionate to the task.

(ii) It is for the medical professional to decide between HEMS or air ambulance - not the pilot. For that reason, medical staff who undertake to task medical sorties should be fully aware of the additional risks that are (potentially) present under HEMS operations (and the pre-requisite for the operator to hold a HEMS approval). (For example in some countries, hospitals have principal and alternative sites. The patient may be landed at the safer alternative site (usually in the grounds of the hospital) thus eliminating risk - against the small inconvenience of a short ambulance transfer from the site to the hospital.)

(iii) Once the decision between HEMS or air ambulance has been taken by the medical professional, the pilot in command makes an operational judgement over the conduct of the flight.

(iv) Simplistically, the above type of air ambulance operations could be conducted by any operator holding an Air Operator Certificate (AOC) (HEMS operators hold an AOC) - and usually are when the carriage of medical supplies (equipment, blood, organs, drugs etc.) is undertaken and when urgency is not an issue.

(e) Operating under a HEMS approval

There are only two possibilities: transportation as passengers or cargo under the full auspices of ANO (OPS) or operations under a HEMS approval as contained in this Subpart.

(f) HEMS operational sites

The HEMS philosophy attributes the appropriate levels of risk for each operational site; this is derived from practical considerations and in consideration of the probability of use. The risk is expected to be inversely proportional to the amount of use of the site. The types of site are as follows:

(1) HEMS operating base: from which all operations will start and finish. There is a high probability of a large number of take-offs and landings at this HEMS operating base and for that reason no alleviation from operating procedures or performance rules are contained in this Subpart.

(2) HEMS operating site: because this is the primary pick-up site related to an incident or accident, its use can never be pre-planned and therefore attracts alleviations from operating procedures and performance rules, when appropriate.

(3) The hospital site: is usually at ground level in hospital grounds or, if elevated, on a hospital building. It may have been established during a period when performance criteria were not a consideration. The amount of use of such sites depends on their location and their facilities; normally, it will be greater than that of the HEMS operating site but less than for a HEMS operating base. Such sites attract some alleviation under this Subpart.

(g) Problems with hospital sites

These sites are generally found in a congested hostile environment:

(1) in the grounds of hospitals; or
(2) on hospital buildings.

(i) The problem of hospital sites is mainly historical and, whilst the authority could insist that such sites are not used – or used at such a low weight that critical engine failure performance is assured – it would seriously curtail a number of existing operations.

(ii) Even though the rule for the use of such sites in hospital grounds for HEMS operations attracts alleviation, it is only partial and will still impact upon present operations.

(iii) Because such operations are performed in the public interest, it was felt that the authority should be able to exercise its discretion so as to allow continued use of such sites provided that it is satisfied that an adequate level of safety can be maintained - notwithstanding that the site does not allow operations to performance class 1 or 2 standards. However, it is in the interest of continuing improvements in safety that the alleviation of such operations be constrained to existing sites, and for a limited period.

(iv) It is felt that the use of public interest sites should be controlled. This will require that a State directory of sites be kept and approval given only when the operator has an entry in the route manual section of the operations manual.

(v) The directory (and the entry in the operations manual) should contain for each approved site:

A. the dimensions;
B. any non-conformance with ICAO Annex 14;
C. the main risks; and
D. the contingency plan should an incident occur.

Each entry should also contain a diagram (or annotated photograph) showing the main aspects of the site.

(h) Summary

In summary, the following points are considered to be pertinent to the HEMS philosophy and HEMS regulations:

(1) absolute levels of safety are conditioned by society;
(2) potential risk must only be to a level proportionate to the task;

(3) protection is afforded at levels appropriate to the occupants;

(4) this Subpart addresses a number of risk areas and mitigation is built in;

(5) only HEMS operations are dealt with by this Subpart;

(6) there are three main categories of HEMS sites and each is addressed appropriately; and

(7) State alleviation from the requirement at a hospital site is available but such alleviations should be strictly controlled by a system of registration.

SPA.HEMS.110 Equipment requirements for HEMS operations

The installation of all helicopter dedicated medical equipment and any subsequent modifications and, where appropriate, its operation shall be approved in accordance with applicable requirement (CAR-84).

SPA.HEMS.115 Communication

In addition to that required by ANO 6-3, helicopters conducting HEMS flights shall have communication equipment capable of conducting two-way communication with the organization for which the HEMS is being conducted and, where possible, to communicate with ground emergency service personnel.

SPA.HEMS.120 HEMS operating minima

(a) HEMS flights operated in performance class 1 and 2 shall comply with the weather minima in Table 1 for dispatch and en-route phase of the HEMS flight. In the event that during the en- route phase the weather conditions fall below the cloud base or visibility minima shown, helicopters certified for flights only under VMC shall abandon the flight or return to base. Helicopters equipped and certified for instrument meteorological conditions (IMC) operations may abandon the flight, return to base or convert in all respects to a flight conducted under instrument flight rules (IFR), provided the flight crew are suitably qualified.

Table 1

HEMS operating minima

2 PILOTS		**1 PILOTS**	
DAY			
Ceiling	visibility	Ceiling	visibility
500 ft and above	As defined by the applicable airspace VFR minima	500 ft and above	As defined by the applicable airspace VFR minima
499 - 400 ft	1000 m(*)	499 – 400 ft	2 000 m
2 PILOTS		1 PILOTS	
399 - 300 ft	2 000 m	399 – 300 ft	3 000 m
NIGHT			
Cloud base	Visibility	Cloud base	Visibility
1 200 ft(**)	2 500 m	1 200 ft(**)	3 000 m

(*) During the en-route phase visibility may be reduced to 800 m for short periods when in sight of land if the helicopter is manoeuvred at a speed that will give adequate opportunity to observe any obstacles in time to avoid a collision.

(**) During the en-route phase, cloud base may be reduced to 1 000 ft for short periods.

(b) The weather minima for the dispatch and en-route phase of a HEMS flight operated in performance class 3 shall be a cloud ceiling of 600 ft and a visibility of 1500 m. Visibility may be reduced to 800 m for short periods when in sight of land if the helicopter is manoeuvred at a speed that will give adequate opportunity to observe any obstacle and avoid a collision.

GM1 SPA.HEMS.120 HEMS operating minima

REDUCED VISIBILITY

(a) In the rule the ability to reduce the visibility for short periods has been included. This will allow the pilot in command to assess the risk of flying temporarily into reduced visibility against the need to provide emergency medical service, taking into account the advisory speeds included in Table 1. Since every situation is different it was not felt appropriate to define the short period in terms of absolute figures. It is for the pilot in command to assess the aviation risk to third parties, the crew and the aircraft such that it is proportionate to the task, using the principles of GM1 SPA.HEMS.100(a).

(b) When flight with a visibility of less than 5 km is permitted, the forward visibility should not be less than the distance travelled by the helicopter in 30 seconds so as to allow adequate opportunity to see and avoid obstacles (see table below).

Table 1

Operating minima – reduced visibility

Visibility (m)	Advisory speed (kt)
800	50
1500	100
2000	120

SPA.HEMS.125 Performance requirements for HEMS operations

(a) Performance class 3 operations shall not be conducted over a hostile environment.

(b) Take-off and landing

(1) Helicopters conducting operations to/from a final approach and take-off area (FATO) at a hospital that is located in a congested hostile environment and that is used as a HEMS operating base shall be operated in accordance with performance class 1, except when the operator holds an approval in accordance with ANO 6-3.

(2) Helicopters conducting operations to/from a HEMS operating site located in a hostile environment shall be operated in accordance with performance class 2 and be exempt from the approval required by ANO 6-3.

(3) The HEMS operating site shall be big enough to provide adequate clearance from all obstructions. Night operations shall be restricted to FATO at aerodromes.

GM1 SPA.HEMS.125(b)(3) Performance requirements for HEMS operations

PERFORMANCE CLASS 2 OPERATIONS AT A HEMS OPERATING SITE

As the risk profile at a HEMS operating site is already well known, operations without an assured safe forced landing capability do not need a separate approval and the requirements does not call for the additional risk assessment that is specified in ANO 6-3.

AMC1 SPA.HEMS.125(b)(4) Performance requirements for HEMS operations

HEMS OPERATING SITE DIMENSIONS

(a) When selecting a HEMS operating site it should have a minimum dimension of at least 2 x D (the largest dimensions of the helicopter when the rotors are turning). For night operations, unsurveyed HEMS operating sites should have dimensions of at least 4 x D in length and 2 x D in width.

(b) For night operations, the illumination may be either from the ground or from the helicopter.

SPA.HEMS.130 Crew requirements

(a) Selection. The operator shall establish criteria for the selection of flight crew members for the HEMS task, taking previous experience into account.

(b) Experience. The minimum experience level for the pilot in command conducting HEMS flights shall not be less than:

(1) either:

(i) 1 000 hours as pilot-in-command/pilot in command of aircraft of which 500 hours are as pilot-in-command/pilot in command on helicopters; or

(ii) 1 000 hours as co-pilot in HEMS operations of which 500 hours are as pilot- incommand under supervision and 100 hours pilot-in-command/pilot in command of helicopters;

(2) 500 hours' operating experience in helicopters, gained in an operational environment similar to the intended operation; and

(3) for pilots engaged in night operations, 20 hours of VMC at night as pilot- incommand/pilot in command.

(c) Operational training. Successful completion of operational training in accordance with the HEMS procedures contained in the operations manual.

(d) Recency. All pilots conducting HEMS operations shall have completed a minimum of 30 minutes' flight by sole reference to instruments in a helicopter or in an FSTD within the last six months.

(e) Crew composition

(1) Day flight. The minimum crew by day shall be one pilot and one HEMS technical crew member.

(i) This may be reduced to one pilot only when:

(A) at a HEMS operating site the pilot in command is required to fetch additional medical supplies. In such case the HEMS technical crew member may be left to give assistance to ill or injured persons while the pilot in command undertakes this flight;

(B) after arriving at the HEMS operating site, the installation of the stretcher precludes the HEMS technical crew member from occupying the front seat;

(ii) In the cases described in (i), the operational minima shall be as defined by the applicable airspace requirements; the HEMS operating minima contained in Table 1 of SPA.HEMS.120 shall not be used.

(iii) Only in the case described in (i)(A) may the pilot in command land at a HEMS operating site without the technical crew member assisting from the front seat.

(2) Night flight. The minimum crew by night shall be:

(i) two pilots.

(f) Crew training and checking

(1) Training and checking shall be conducted in accordance with a detailed syllabus approved by the CAAB and included in the operations manual.

(2) Crew members

(i) Crew training programs shall: improve knowledge of the HEMS working environment and equipment; improve crew coordination; and include measures to minimise the risks associated with en-route transit in low visibility conditions, selection of HEMS operating sites and approach and departure profiles.

(ii) The measures referred to in (f)(2)(i) shall be assessed during:

(A) VMC day proficiency checks, or VMC night proficiency checks when night HEMS operations are undertaken by the operator.

(B) line check

AMC1 SPA.HEMS.130(b)(2) Crew requirements

EXPERIENCE

The minimum experience level for a pilot in command conducting HEMS flights should take into account the geographical characteristics of the operation (sea, mountain, big cities with heavy traffic, etc.).

AMC1 SPA.HEMS.130(d) Crew requirements

RECENCY

This recency may be obtained in a visual flight rules (VFR) helicopter using vision limiting devices such as goggles or screens, or in an FSTD.

AMC1 SPA.HEMS.130(e) Crew requirements

HEMS TECHNICAL CREW MEMBER

(a) When the crew is composed of one pilot and one HEMS technical crew member, the latter should be seated in the front seat (co-pilot seat) during the flight, so as to be able to carry out his/her primary task of assisting the pilot in command in:

  (1) collision avoidance;

  (2) the selection of the landing site; and

  (3) the detection of obstacles during approach and take-off phases.

(b) The pilot in command may delegate other aviation tasks to the HEMS technical crew member, trained and checked in accordance with ANO 6-1, as necessary:

  (1) assistance in navigation;

  (2) assistance in radio communication/radio navigation means selection;

  (3) reading of checklists; and

  (4) monitoring of parameters.

(c) The pilot in command may also delegate to the HEMS technical crew member tasks on the ground:

(1) assistance in preparing the helicopter and dedicated medical specialist equipment for subsequent HEMS departure; or

(2) assistance in the application of safety measures during ground operations with rotors turning (including: crowd control, embarking and disembarking of passengers, refuelling etc.).

(d) There may be exceptional circumstances when it is not possible for the HEMS technical crew member to carry out his/her primary task as defined under (a).

This is to be regarded as exceptional and is only to be conducted at the discretion of the pilot in command, taking into account the dimensions and environment of the HEMS operating site.)

(e) When two pilots are carried, there is no requirement for a HEMS technical crew member, provided that the pilot monitoring performs the aviation tasks of a technical crew member.

AMC1 SPA.HEMS.130(e)(2)(ii)(B) Crew requirements

FLIGHT FOLLOWING SYSTEM

(a) A flight following system is a system providing contact with the helicopter throughout its operational area.

AMC1 SPA.HEMS.130(f)(1) Crew requirements

TRAINING AND CHECKING SYLLABUS

(a) The flight crew training syllabus should include the following items:

(1) meteorological training concentrating on the understanding and interpretation of available weather information;

(2) preparing the helicopter and specialist medical equipment for subsequent HEMS departure;

(3) practice of HEMS departures;

(4) the assessment from the air of the suitability of HEMS operating sites; and

(5) the medical effects air transport may have on the patient.

(b) The flight crew checking syllabus should include:

(1) proficiency checks, which should include landing and take-off profiles likely to be used at HEMS operating sites; and

(2) line checks, with special emphasis on the following:

(i) local area meteorology;

(ii) HEMS flight planning;

(iii) HEMS departures;

(iv) the selection from the air of HEMS operating sites; (v) low level flight in poor weather; and

(v) familiarity with established HEM Separating sites in the operator's local area register.

(c) HEMS technical crew members should be trained and checked in the following items:

(1) duties in the HEMS role;

(2) map reading, navigation aid principles and use;

(3) operation of radio equipment;

(4) use of on-board medical equipment;

(5) preparing the helicopter and specialist medical equipment for subsequent HEMS departure;

(6) instrument reading, warnings, use of normal and emergency checklists in assistance of the pilot as required;

(7) basic understanding of the helicopter type in terms of location and design of normal and emergency systems and equipment;

(8) crew coordination;

(9) practice of response to HEMS call out;

(10) conducting refuelling and rotors running refuelling;

(11) HEMS operating site selection and use;

(12) techniques for handling patients, the medical consequences of air transport and some knowledge of hospital casualty reception;

(13) marshalling signals;

(14) underslung load operations as appropriate;

(15) winch operations as appropriate;

(16) the dangers to self and others of rotor running helicopters including loading of patients; and

(17) the use of the helicopter inter-communications system.

AMC1 SPA.HEMS.130(f)(2)(ii)(B) Crew requirements

LINE CHECKS

Where due to the size, the configuration, or the performance of the helicopter, the line check cannot be conducted on an operational flight, it may be conducted on a specially arranged representative flight. This flight may be immediately adjacent to, but not simultaneous with, one of the biannual proficiency checks.

SPA.HEMS.135 Passenger and other personnel briefing

(a) Ground emergency service personnel. The operator shall take all reasonable measures to ensure that ground emergency service personnel are familiar with the HEMS working environment and equipment and the risks associated with ground operations at a HEMS operating site.

(b) Medical patient. a briefing shall only be conducted if the medical condition makes this practicable.

AMC1 SPA.HEMS.135(b) passenger and other personnel briefing

GROUND EMERGENCY SERVICE PERSONNEL

(a) The task of training large numbers of emergency service personnel is formidable. Wherever possible, helicopter operators should afford every assistance to those persons responsible for training emergency service personnel in HEMS support. This can be achieved by various means, such as, but not limited to, the production of flyers, publication of relevant information on the operator’s we b site and provision of extracts from the operations manual.

(b) The elements that should be covered include:

(1) two-way radio communication procedures with helicopters;

(2) the selection of suitable HEMS operating sites for HEMS flights;

(3) the physical danger areas of helicopters;

(4) crowd control in respect of helicopter operations; and

(5) the evacuation of helicopter occupants following an on-site helicopter accident.

SPA.HEMS.140 Information and documentation

(a) The operator shall ensure that, as part of its risk analysis and management process, risks associated with the HEMS environment are minimized by specifying in the operations manual: selection, composition and training of crews; levels of equipment and dispatch criteria; and operating procedures and minima, such that normal and likely abnormal operations are described and adequately mitigated.

(b) Relevant extracts from the operations manual shall be made available to the organization for which the HEMS is being provided.

AMC1 SPA.HEMS.140 Information and documentation

OPERATIONS MANUAL

The operations manual should include:

(a) the use of portable equipment on board;

(b) guidance on take-off and landing procedures at previously unsurveyed HEMS operating sites;

(c) the final reserve fuel, in accordance with SPA.HEMS.150; (d) operating minima;

(d) recommended routes for regular flights to surveyed sites, including the minimum flight altitude;

(e) guidance for the selection of the HEMS operating site in case of a flight to an unsurveyed site; (g) the safety altitude for the area overflown; and

(f) procedures to be followed in case of inadvertent entry into cloud.

SPA.HEMS.145 HEMS operating base facilities

(a) If crew members are required to be on standby with a reaction time of less than 45 minutes, dedicated suitable accommodation shall be provided close to each operating base.

(b) At each operating base the pilots shall be provided with facilities for obtaining current and forecast weather information and shall be provided with satisfactory communications with the appropriate air traffic services (ATS) unit. Adequate facilities shall be available for the planning of all tasks.

SPA.HEMS.150 Fuel supply

(a) When the HEMS mission is conducted under VFR within a local and defined geographical area, standard fuel planning can be employed provided the operator establishes final reserve fuel to ensure that, on completion of the mission the fuel remaining is not less than an amount of fuel sufficient for:

(1) 30 minutes of flying time at normal cruising conditions; or

(2) when operating within an area providing continuous and suitable precautionary landing sites, 20 minutes of flying time at normal cruising speed.

SPA.HEMS.155 Refuelling with passengers embarking, on board or disembarking

When the pilot in command considers refuelling with passengers on board to be necessary, it can be undertaken either rotors stopped or rotors turning provided the following requirements are met:

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

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

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

(d) sufficient personnel shall be immediately available to move patients clear of the helicopter in the event of a fire.

SUBPART- K

HELICOPTER OFFSHORE OPERATIONS

SPA.HOFO.100 Helicopter offshore operations (HOFO)

The requirements of this Subpart apply to:

(a) a commercial air transport operator holding a valid AOC in accordance with ANO (OPS);
(b) a specialised operations operator having declared its activity in accordance with ANO (OPS); or
(c) a non-commercial operator having declared its activity in accordance with ANO (OPS).

SPA.HOFO.105 Approval for helicopter offshore operations

(a) Prior to engaging in operations under this Subpart, a specific approval by the CAAB shall have been issued to the operator.

(b) To obtain such approval, the operator shall submit an application to the CAAB as specified in SPA.GEN.105, and shall demonstrate compliance with the requirements of this Subpart.

(c) The operator shall, prior to performing operations from a Member State other than the Member State that issued the approval under (a), inform the competent authorities in both Member States of the intended operation.

GM1 SPA.HOFO.105(c) Approval for offshore operations

The requirement to inform both Member States (MSs) allows the MSs to mutually decide on how best to exercise their obligations in accordance with ARO.GEN.300(d) and (e) when operations are intended to be performed in a MS other than the MS issuing the approval for offshore operations.

SPA.HOFO.110 Operating procedures

(a) The operator shall, as part of its safety management process, mitigate and minimise risks and hazards specific to helicopter offshore operations. The operator shall specify in the operations manual the:

(1) selection, composition and training of crews;

(2) duties and responsibilities of crew members and other involved personnel;

(3) required equipment and dispatch criteria; and

(4) operating procedures and minima, such that normal and likely abnormal operations are described and adequately mitigated.

(b) The operator shall ensure that:

(1) an operational flight plan is prepared prior to each flight;

(2) the passenger safety briefing also includes any specific information on offshore related items and is provided prior to boarding the helicopter;

(3) each member of the flight crew wears an approved survival suit:

(i) when the weather report or forecasts available to the pilot-in- command/pilot in command indicate that the sea temperature will be less than plus 10°C during the flight; or

(ii) when the estimated rescue time exceeds the calculated survival time; or

(iii) when the flight is planned to be conducted at night in a hostile environment;

(4) where established, the offshore route structure provided by the appropriate ATS is followed;

(5) pilots make optimum use of the automatic flight control systems (AFCS) throughout the flight;

(6) specific offshore approach profiles are established, including stable approach parameters and the corrective action to be taken if an approach becomes unstable;

(7) for multi-pilot operations, procedures are in place for a member of the flight crew to monitor the flight instruments during an offshore flight, especially during approach or departure, to ensure that a safe flight path is maintained;

(8) the flight crew takes immediate and appropriate action when a height alert is activated;

(9) procedures are in place to require the emergency flotation systems to be armed, when safe to do so, for all overwater arrivals and departures; and

(10) operations are conducted in accordance with any restriction on the routes or the areas of operation specified by the CAAB or the appropriate authority responsible for the airspace.

AMC1 SPA.HOFO.110(a) Operating procedures

RISK ASSESSMENT

The operator's risk assessment should include, but not be limited to, the following hazards:

(a) collision with offshore installations, vessels and floating structures;
(b) collision with wind turbines;
(c) collision with skysails;
(d) collision during low-level instrument meteorological conditions (IMC) operations;
(e) collision with obstacles adjacent to helidecks;
(f) collision with surface/water;
(g) IMC or night offshore approaches;
(h) loss of control during operations to small or moving offshore locations;
(i) operations to unattended helidecks; and
(j) weather and/or sea conditions that could either cause an accident or exacerbate its consequences.

AMC1 SPA.HOFO.110(b)(1) Operating procedures

OPERATIONAL FLIGHT PLAN

The operational flight plan should contain at least the items listed in ANO 6-3 Flight preparation.

AMC1 SPA.HOFO.110(b)(2) Operating procedures

PASSENGER BRIEFING

The following aspects applicable to the helicopter used should be presented and demonstrated to the passengers by audio-visual electronic means (video, DVD or similar), or the passengers should be informed about them by a crew member prior to boarding the aircraft:

(a) the use of the life jackets and where they are stowed if not in use;
(b) the proper use of survival suits, including briefing on the need to have suits fully zipped with, if applicable, hoods and gloves on, during take-off and landing or when otherwise advised by the pilot-in- command/pilot in command;

(c) the proper use of emergency breathing equipment;
(d) the location and operation of the emergency exits;

(e) life raft deployment and boarding;

(f) deployment of all survival equipment; and

(g) boarding and disembarkation instructions.

When operating in a non-hostile environment, the operator may omit items related to equipment that is not required.

AMC1.1 SPA.HOFO.110(b)(2) Operating procedures

PASSENGER BRIEFING

This AMC is applicable to passengers who require more knowledge of the operational concept, such as sea pilots and support personnel for offshore wind turbines.

The operator may replace the passenger briefing as set out in AMC1 SPA.HOFO.110(b)(2) with a passenger training and checking program provided that:

(a) the operator ensures that the passenger is appropriately trained and qualified on the helicopter types on which they are to be carried;

(b) the operator defines the training and checking program for each helicopter type, covering all safety and emergency procedures for a given helicopter type, and including practical training;

(c) the passenger has received the above training within the last 12 calendar months; and

(d) the passenger has flown on the helicopter type within the last 90 days.

AMC1 SPA.HOFO.110(b)(5) Operating procedures

AUTOMATIC FLIGHT CONTROL SYSTEM (AFCS)

To ensure competence in manual handling of the helicopter, the operator should provide instructions to the flight crew in the operations manual (OM) under which circumstances the helicopter may be operated in lower modes of automation. Particular emphasis should be given to flight in instrument meteorological conditions (IMC) and instrument approaches.

GM1 SPA.HOFO.110(b)(9) Operating Procedures

Emergency flotation systems (EFSs) cannot always be armed safely before the approach when a speed limitation needs to be complied with. In such case, the EFS should be armed as soon as safe to do so.

SPA.HOFO.115 Use of offshore locations

The operator shall only use offshore locations that are suitable in relation to size and mass of the type of helicopter and to the operations concerned.

AMC1 SPA.HOFO.115 Use of offshore locations

GENERAL

(a) The operations manual (OM) relating to the specific usage of offshore helicopter landing areas (Part C for CAT operators) should contain, or make reference to, a directory of helidecks (helideck directory (HD)) intended to be used by the operator. The directory should provide details of helideck limitations and a pictorial representation of each offshore location and its helicopter landing area, recording all necessary information of a permanent nature and using a standardised template. The HD entries should show, and be amended as necessary, the most recent status of each helideck concerning non-compliance with applicable national standards, limitations, warnings, cautions or other comments of operational importance. An example of a typical template is shown in Figure 1 of GM1 SPA.HOFO.115 below.

(b) In order to ensure that the safety of flights is not compromised, the operator should obtain relevant information and details in order to compile the HD, as well as the pictorial representation from the owner/operator of the offshore helicopter landing area.

(c) If more than one name for the offshore location exists, the common name painted on the surface of the landing area should be listed, but other names should also be included in the HD (e.g. radio call sign, if different). After renaming an offshore location, the old name should also be included in the HD for the following 6 months.

(d) Any limitations associated with an offshore location should be included in the HD. With complex installation arrangements, including combinations of installations/vessels (e.g. combined operations), a separate listing in the HD, accompanied by diagrams/pictures, where necessary, may be required.

(e) Each offshore helicopter landing area should be inspected and assessed based on limitations, warnings, instructions and restrictions, in order to determine its acceptability with respect to the following as a minimum:

(1) The physical characteristics of the landing area, including size, load-bearing capability and the appropriate ‘D’ and ‘t’ values.

Note 1: ‘D’ is the overall length of the helicopter from the most forward position of the main rotor tip to the most rearward position of the tail rotor tip plane path, or rearmost extension of the fuselage in the case of ‘Fenestron’ or ‘NOTAR’ tails.

Note 2: ‘t’ is the maximum allowable mass in tonnes.

(2) The preservation of obstacle-protected surfaces (an essential safeguard for all flights). These surfaces are:

(i) the minimum 210° obstacle-free surface (OFS) above helideck level;

(ii) the 150° limited-obstacle surface (LOS) above helideck level; and

(iii) the minimum 180° falling ‘5:1’ gradient with respect to significant obstacles below helideck level.

If these sectors/surfaces are infringed, even on a temporary basis, and/or if an adjacent installation or vessel infringes the obstacle-protected surfaces related to the landing area, an assessment should be made to determine whether it is necessary to impose operating limitations and/or restrictions to mitigate any non-compliance with the criteria.

(3) Marking and lighting:

(i) for operations at night, adequate illumination of the perimeter of the landing area, using perimeter lighting that meets national requirements;

(ii) for operations at night, adequate illumination of the location of the touchdown marking by use of a lit touchdown/positioning marking and lit helideck identification marking that meet national requirements;

(iii) status lights (for night and day operations, indicating the status of the helicopter landing area, e.g. a red flashing light indicates 'landing area unsafe: do not land') meeting national requirements;

(iv) dominant-obstacle paint schemes and lighting;

(v) condition of helideck markings; and

(vi) adequacy of general installation and structure lighting.

Any limitations with respect to non-compliance of lighting arrangements may require the HD to be annotated 'daylight only operations'.

(4) Deck surface:

(i) assessment of surface friction;

(ii) adequacy and condition of helideck net (where provided);

(iii) 'fit for purpose' drainage system;

(iv) deck edge safety netting or shelving;

(v) a system of tie-down points that is adequate for the range of helicopters in use; and

(vi) procedures to ensure that the surface is kept clean of all contaminants, e.g. bird guano, sea spray, snow and ice.

(5) Environment:

(i) foreign-object damage;

(ii) an assessment of physical turbulence generators, e.g. structure-induced turbulence due to clad derrick;

(iii) bird control measures;

(iv) air flow degradation due to gas turbine exhaust emissions (turbulence and thermal effects), flares (thermal effects) or cold gas vents (unburned flammable gas); and

(v) adjacent offshore installations may need to be included in the environmental assessment.

To assess for potential adverse environmental effects, as described in (ii), (iv) and (v) above, an offshore location should be subject to appropriate studies, e.g. wind tunnel testing and/or computational fluid dynamics (CFD) analysis.

(6) Rescue and firefighting:

(i) systems for delivery of firefighting media to the landing area, e.g. deck integrated firefighting system (DIFFS);

(ii) delivery of primary media types, assumed critical area, application rate and duration;

(iii) deliveries of complementary agent(s) and media types, capacity and discharge;

(iv) personal protective equipment (PPE); and

(v) rescue equipment and crash box/cabinet.

(7) Communication and navigation (Com/Nav):

(i) aeronautical radio(s);

(ii) radio-telephone (R/T) call sign to match the offshore location name with the side identification that should be simple and unique; and

(iii) radio log.

(8) Fueling facilities: in accordance with the relevant national guidance and legislation.

(9) Additional operational and handling equipment:

(i) windsock;

(ii) meteorological information, including wind, pressure, air temperature, and dew point temperature, and equipment recording and displaying mean wind (10-min wind) and gusts;

(iii) helideck motion recording and reporting system, where applicable;

(iv) passenger briefing system;

(v) chocks;

(vi) tie-down strops/ropes; (vii) weighing scales;

(vii) a suitable power source for starting helicopters (e.g. ground power unit (GPU)), where applicable; and

(viii) equipment for clearing the landing area of snow, ice and other contaminants.

(10) Personnel:

trained helicopter-landing-area staff (e.g. helicopter landing officer/helicopter deck assistant and firefighters, etc.); persons required to assess local weather conditions or communicate with the helicopter by radio-telephony should be appropriately qualified.

(f) The HD entry for each offshore location should be completed and kept up to date, using the template and reflecting the information and details described in (e) above. The template should contain at least the following (GM1 SPA.HOFO.115 below is provided as an example):

(1) details:

(i) name of offshore location;
(ii) R/T call sign;
(iii) helicopter landing area identification marking;
(iv) side panel identification marking;
(v) landing area elevation;
(vi) maximum installation/vessel height;
(vii) helideck size and/or 'D' value;
(viii) type of offshore location:

(A) fixed, permanently manned installation;
(B) fixed, normally unattended installation;
(C) vessel type (e.g. diving support vessel, tanker, etc.);
(D) semi-submersible, mobile, offshore drilling unit:
(E) jack-up, mobile, offshore drilling unit:
(F) floating production, storage and offloading (FPSO);

(ix) name of owner/operator;
(x) geographical position, where appropriate;
(xi) Com/Nav frequencies and identification;
(xii) general drawing of the offshore location that shows the helicopter landing area with annotations indicating location of derrick, masts, cranes, flare stack, turbine and gas exhausts, side identification panels, windsock, etc.;

(xiii) plan view drawing, and chart orientation from the general drawing to show the above; the plan view should also show the 210-degree sector orientation in degrees true;

(xiv) type of fueling:

(A) pressure and gravity;

(B) pressure only;

(C) gravity only; and

(D) none;

(xv) type and nature of firefighting equipment;

(xvi) availability of GPU;

(xvii) deck heading;

(xviii) ‘t’ value ;

(xix) status light system (Yes/No); and

(xx) revision publication date or number; and

(2) one or more diagrams/photographs, and any other suitable guidance to assist pilots.

(g) For offshore locations for which there is incomplete information, ‘restricted’ usage based on the information available may be considered by the operator, subject to risk assessment prior to the first helicopter visit. During subsequent operations, and before any restriction on usage is lifted, information should be gathered and the following should apply:

(1) pictorial (static) representation:

(i) template blanks (GM1 SPA.HOFO.115 is provided as an example) should be available to be filled in during flight preparation on the basis of the information given by the offshore location owner/operator and of flight crew observations;

(ii) where possible, suitably annotated photographs may be used until the HD entry and template have been completed;

(iii) until the HD entry and template have been completed, conservative operational restrictions (e.g. performance, routing, etc.) may be applied;

(iv) any previous inspection reports should be obtained and reviewed by the operator; and

(v) an inspection of the offshore helicopter landing area should be carried out to verify the content of the completed HD entry and template; once found suitable, the landing area may be considered authorized for use by the operator; and

(2) with reference to the above, the HD entry should contain at least the following:

(i) HD revision date or number;
(ii) generic list of helideck motion limitations;
(iii) name of offshore location;
(iv) helideck size and/or 'D' value and 't' value; and
(v) limitations, warnings, instructions and restrictions.

GM1 SPA.HOFO.115 Use of offshore locations

Figure 1 — Example of a helicopter landing area template

Operator		10-1	Revision date	
Installation/vessel name		Position	(N/S XXX)	(E/W XXX)
Deck height	Installation height	Highest obstacle within 5 nm	Deck heading	Deck ident
(XXX ft)	(XXX ft)			
AIMS/ICAO code	Radio	Radio	Deck category	Side ident
			(1/2/3)	
Deck size (m)	T value (XXX kg)	Cleared for (above D or t values)	Installation type	Operator
		(Helicopter type xxx)	(Fixed/semi/etc.)	
Fuel	Ground power	Inspection date	Inspected by	Next due
(Press/gravity/no)	(AC/DC/no)			

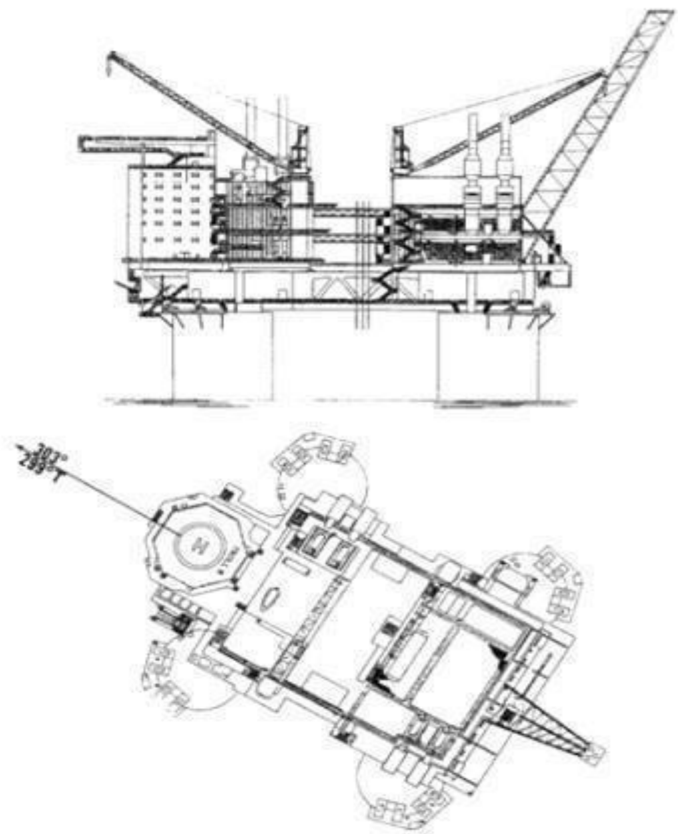


Figure 2 — Example of a helicopter landing area template

Wind direction	Wind speed	Limitations
(All) (000–	(All) (> 30)	(Performance requirements) (Table 2 etc.)
5:1 non-compliant obstacles		
Additional information		

SPA.HOFO.120 Selection of aerodromes and operating sites

(a) Onshore destination alternate aerodrome. the pilot-in command/pilot in command does not need to specify a destination alternate aerodrome in the operational flight plan when conducting flights from an offshore location to a land aerodrome if either:

(1) the destination aerodrome is defined as a costal aerodrome, or

(2) the following criteria are met:

(i) the destination aerodrome has a published instrument approach;

(ii) the flight time is less than 3 hours; and

(iii) the published weather forecast valid from 1 hour prior, and 1 hour subsequent to the expected landing time specifies that:

(A) the cloud base is at least 700 feet above the minima associated with the instrument approach, or 1 000 feet above the destination aerodrome, whichever is the higher; and

(B) visibility is at least 2 500 meters.

(b) Offshore destination alternate helideck. The operator may select an offshore destination alternate helideck when all of the following criteria are met:

(1) An offshore destination alternate helideck shall be used only after the point of no return (PNR) and when an onshore destination alternative aerodrome is not geographically available. Prior to the PNR, an onshore destination alternate aerodrome shall be used.

(2) One engine inoperative (OEI) landing capability shall be attainable at the offshore destination alternate helideck.

(3) To the extent possible, helideck availability shall be guaranteed prior to PNR. The dimensions, configuration and obstacle clearance of individual helidecks or other sites shall be suitable for its use as an alternate helideck by each helicopter type intended to be used.

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

(5) The MEL shall contain specific provisions for this type of operation.

(6) An offshore destination alternate helideck shall only be selected if the operator has established a procedure in the operations manual.

AMC1 SPA.HOFO.120 Selection of aerodromes and operating sites

COASTAL AERODROME

(a) Any alleviation from the requirement to select an alternate aerodrome for a flight to a coastal aerodrome under instrument flight rules (IFR) routing from offshore should be based on an individual safety risk assessment.

(b) The following should be taken into account:

(1) suitability of the weather based on the landing forecast for the destination;

(2) the fuel required to meet the IFR requirements of ANO 6-1 except for the alternate fuel;

(3) where the destination coastal aerodrome is not directly on the coast, it should be:

(i) within a distance that with the fuel specified in (b)(2), the helicopter is able, at any time after crossing the coastline, to return to the coast, descend safely, carry out an approach under visual flight rules (VFR) and land, with the VFR fuel reserves intact;

(ii) within 5 nm of the coastline; and

(iii) geographically sited so that the helicopter is able, within the rules of the air and within the landing forecast:

(A) to proceed inbound from the coast at 500-ft above ground level (AGL), and carry out an approach and landing under VFR; or

(B) to proceed inbound from the coast on an agreed route, and carry out an approach and landing under VFR;

(4) procedures for coastal aerodromes should be based on a landing forecast no worse than:

(i) by day, a cloud base of ≥ 400 ft above descent height (DH)/minimum descent height (MDH), and a visibility of 4 km, or, if descent over the sea is intended, a cloud base of 600 ft and a visibility of 4 km; or

(ii) by night, a cloud base of 1 000 ft and a visibility of 5 km;

(5) the descent to establish visual contact with the surface should take place over the sea or as part of the instrument approach;

(6) routings and procedures for coastal aerodromes nominated as such should be included in the operations manual (OM) (Part C for CAT operators);

(7) the minimum equipment list (MEL) should reflect the requirement for airborne radar and radio altimeter for this type of operation; and

(8) operational limitations for each coastal aerodrome should be specified in the OM.

AMC2 SPA.HOFO.120 Selection of aerodromes and operating sites

OFFSHORE DESTINATION ALTERNATE AERODROME

‘Aerodrome’ is referred to as ‘helideck’ in this AMC.

(a) Offshore destination alternate helideck landing environment

The landing environment at an offshore location proposed for use as an offshore destination alternate helideck should be pre-surveyed, together with the physical characteristics, such as the effect of wind direction and strength, as well as of turbulence established. This information, which should be available to the pilot-in-command/pilot in command both at the planning stage and in-flight, should be published in an appropriate form in the operations manual (OM) (including the orientation of the helideck) so that the suitability of the alternate helideck can be assessed. This helideck should meet the criteria for size and obstacle clearance appropriate to the performance requirements of the type of helicopter concerned.

(b) Performance considerations

The use of an offshore destination alternate helideck should be restricted to helicopters that can achieve one engine inoperative (OEI) in ground effect (IGE) hover at an appropriate power rating above the helideck at the offshore location. Where the surface of the helideck or prevailing conditions (especially wind velocity) precludes an OEI IGE, OEI out-of-ground effect (OGE) hover performance at an appropriate power rating should be used to compute the landing mass. The landing mass should be calculated based on graphs provided in the operations manual (OM) (Part B for CAT operators). When this landing mass is computed, due account should be taken of helicopter configuration, environmental conditions and the operation of systems that have an adverse effect on performance. The planned landing mass of the helicopter, including crew, passengers, baggage, cargo plus 30-min final reserve fuel (FRF), should not exceed the OEI landing mass of the helicopter at the time of approach to the offshore destination alternate.

(c) Weather considerations

(1) Meteorological observations

When the use of an offshore destination alternate helideck is planned, the meteorological observations, both at the offshore destination and the alternate helideck, should be made by an observer acceptable to the authority responsible for the provision of meteorological services. Automatic meteorological-observation stations may be used.

(2) Weather minima

When the use of an offshore destination alternate helideck is planned, the operator should neither select an offshore location as destination nor as alternate helideck unless the weather forecasts for the two offshore locations indicate that during a period commencing 1 h before and ending 1 h after the expected time of arrival at the destination and the alternate helideck, the weather conditions will be at or above the planning minima shown in the following table:

Table 1

Planning minima

Planning minima		
	Day	Night
Cloud base	600 ft	800 ft
Visibility	4 km	5 km

(3) Conditions of fog

To use an offshore destination alternate helideck, it should be ensured that fog is not forecast or present within 60 nm of the destination helideck and alternate helideck during the period commencing 1 h before and ending 1 h after the expected time of arrival at the offshore destination or alternate helideck.

(d) Actions at point of no return

Before passing the point of no return, which should not be more than 30 min from the destination, the following actions should have been completed:

(1) confirmation that navigation to the offshore destination and offshore destination alternate helideck can be assured;

(2) radio contact with the offshore destination and offshore destination alternate helideck (or master station) has been established;

(3) the landing forecast at the offshore destination and offshore destination alternate helideck have been obtained and confirmed to be at or above the required minima;

(4) the requirements for OEI landing (see (b) above) have been checked in the light of the latest reported weather conditions to ensure that they can be met; and

(5) to the extent possible, having regard to information on the current and forecast use of the offshore alternate helideck and on prevailing conditions, the availability of the helideck on the offshore location intended as destination alternate helideck should be guaranteed by the duty holder (the rig operator in the case of fixed installations, and the owner in the case of

mobile ones) until the landing at the destination, or the offshore destination alternate helideck, has been achieved or until offshore shuttling has been completed.

SPA.HOFO.125 Airborne radar approaches (ARAs) to offshore locations — CAT operations

(a) A commercial air transport (CAT) operator shall establish operational procedures and ensure that ARAs are only flown if:

(1) the helicopter is equipped with a radar that is capable of providing information regarding the obstacle environment; and

(2) either:

(i) the minimum descent height (MDH) is determined from a radio altimeter; or

(ii) the minimum descent altitude (MDA) plus an adequate margin is applied.

(b) ARAs to rigs or vessels in transit shall be flown as multi-pilot operations.

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

(d) The approach shall only be continued beyond decision range or below the minimum descent altitude/height (MDA/H) when visual reference to the destination has been established.

(e) For single-pilot CAT operations, appropriate increments shall be added to the MDA/H and decision range.

(f) When an ARA is flown to a non-moving offshore location (i.e. fixed installation or moored vessel) and a reliable GPS position for the location is available in the navigation system, the GPS/area navigation system shall be used to enhance the safety of the ARA.

AMC1 SPA.HOFO.125 Airborne radar approach (ARA) to offshore locations

Note: alternative approach procedures using original equipment manufacturer (OEM)-certified approach systems are not covered by this AMC.

GENERAL

(a) Before commencing the final approach, the pilot-in-command/pilot in command should ensure that a clear path exists on the radar screen for the final and missed approach segments. If lateral clearance from any obstacle will be less than 1 nm, the pilot-in-command/pilot in command should:

   (1) approach to a nearby target structure and thereafter proceed visually to the destination structure; or

   (2) make the approach from another direction leading to a circling manoeuvre.

(b) The cloud ceiling should be sufficiently clear above the helideck to permit a safe landing.

(c) Minimum descent height (MDH) should not be less than 50 ft above the elevation of the helideck:

   (1) the MDH for an airborne radar approach should not be lower than:

      (i) 200 ft by day; or

      (ii) 300 ft by night; and

   (2) the MDH for an approach leading to a circling manoeuvre should not be lower than:

      (i) 300 ft by day; or

      (ii) 500 ft by night.

(d) Minimum descent altitude (MDA) may only be used if the radio altimeter is unserviceable. The MDA should be a minimum of the MDH + 200 ft, and be based on a calibrated barometer at the destination or on the lowest forecast barometric pressure adjusted to sea level (QNH) for the region.

(e) The decision range should not be less than 0.75 nm.

(f) The MDA/MDH for a single-pilot ARA should be 100 ft higher than that calculated in accordance with (c) and (d) above. The decision range should not be less than 1 nm.

(g) For approaches to non-moving offshore locations, the maximum range discrepancy between the global navigation satellite system (GNSS) and the weather radar display should not be greater than 0.3 nm at any point between the final approach fix (FAF) at 4 nm from the offshore location and the offset initiation point (OIP) at 1.5 nm from the offshore location.

(h) For approaches to non-moving offshore locations, the maximum bearing discrepancy between the GNSS and the weather radar display should not be greater than 10° at the FAF at 4 nm from the offshore location.

GM1 SPA.HOFO.125 Airborne radar approach (ARA) to offshore locations

GENERAL

(a) General

(1) The helicopter ARA procedure may have as many as five separate segments: the arrival, initial, intermediate, final approach, and missed approach segment. In addition, the specifications of the circling manoeuvre to a landing under visual conditions should be considered. The individual approach segments can begin and end at designated fixes. However, the segments of an ARA may often begin at specified points where no fixes are available.

(2) The fixes, or points, are named to coincide with the beginning of the associated segment. For example, the intermediate segment begins at the intermediate fix (IF) and ends at the final approach fix (FAF). Where no fix is available or appropriate, the segments begin and end at specified points; for example, at the intermediate point (IP) and final approach point (FAP). The order in which the segments are discussed in this GM is the order in which the pilot would fly them in a complete procedure: that is, from the arrival through the initial and intermediate to the final approach and, if necessary, to the missed approach.

(3) Only those segments that are required by local conditions applying at the time of the approach need to be included in a procedure. In constructing the procedure, the final approach track, which should be orientated so as to be substantially into the wind, should be identified first as it is the least flexible and most critical of all the segments. When the origin and the orientation of the final approach have been determined, the other necessary

segments should be integrated with it to produce an orderly manoeuvring pattern that does not generate an unacceptably high workload for the flight crew.

(4) Where an ARA is conducted to a non-moving offshore location (i.e. fixed installation or moored vessel), and a reliable global navigation satellite system (GNSS) position for the location is available, the GNSS/area navigation system should be used to enhance the safety of the ARA. This is achieved by using the GNSS/area navigation system to navigate the helicopter onto, and maintain, the final approach track, and by using the GNSS range and bearing information to cross-check the position of the offshore location on the weather radar display.

(5) Examples of ARA procedures, as well as vertical profile and missed approach procedures, are contained in Figures 1 and 2 below.

(b) Obstacle environment

(1) Each segment of the ARA is located in an overwater area that has a flat surface at sea level. However, due to the passage of large vessels which are not required to notify their presence, the exact obstacle environment cannot be determined. As the largest vessels and structures are known to reach elevations exceeding 500 ft above mean sea level (AMSL), the uncontrolled offshore obstacle environment applying to the arrival, initial and intermediate approach segments can reasonably be assumed to be capable of reaching to at least 500 ft AMSL. Nevertheless, in the case of the final approach and missed approach segments, specific areas are involved within which no radar returns are allowed. In these areas, the height of wave crests, and the possibility that small obstacles may be present that are not visible on radar, results in an uncontrolled surface environment that extends to an elevation of 50 ft AMSL.

(2) Information about movable obstacles should be requested from the arrival destination or adjacent installations.

(i) Under normal circumstances, the relationship between the approach procedure and the obstacle environment is governed by the concept that vertical separation is very easy to apply during the arrival, initial and intermediate segments, while horizontal separation, which is much more difficult to guarantee in an uncontrolled environment, is applied only in the final and missed approach segments.

(c) Arrival segment

The arrival segment commences at the last en-route navigation fix, where the aircraft leaves the helicopter route, and it ends either at the initial approach fix (IAF) or, if no course reversal or similar manoeuvre is required, it ends at the IF. Standard en-route obstacle clearance criteria should be applied to the arrival segment.

(d) Initial approach segment

The initial approach segment is only required if the intermediate approach track cannot be joined directly. Most approaches will be flown direct to a point close to the IF, and then on to the final approach track, using GNSS/area navigation guidance. The segment commences at the IAF, and on completion of the manoeuvre, it ends at the IP. The minimum obstacle clearance (MOC) assigned to the initial approach segment is 1000 ft.

(e) Intermediate approach segment

The intermediate approach segment commences at the IP, or in the case of straight-in approaches, where there is no initial approach segment, it commences at the IF. The segment ends at the FAP and should not be less than 2 nm in length. The purpose of the intermediate segment is to align the helicopter with the final approach track and prepare it for the final approach. During the intermediate segment, the helicopter should be lined up with the final approach track, the speed should be stabilised, the destination should be identified on the radar, and the final approach and missed approach areas should be identified and verified to be clear of radar returns. The MOC assigned to the intermediate segment is 500 ft. (f) Final approach segment.

(1) The final approach segment commences at the FAP and ends at the missed approach point (MAPt). The final approach area, which should be identified on radar, takes the form of a corridor between the FAP and the radar return of the destination. This corridor should not be less than 2 nm wide so that the projected track of the helicopter does not pass closer than 1 nm to the obstacles lying outside the area.

(2) On passing the FAP, the helicopter will descend below the intermediate approach altitude and follow a descent gradient which should not be steeper than 6.5 %. At this stage, vertical separation from the offshore obstacle environment will be lost. However, within the final approach area, the MDA/MDH will provide separation from the surface environment. Descent from 1 000 ft AMSL to 200 ft AMSL at a constant 6.5 % gradient will involve a horizontal distance of 2 nm. In order to follow the guideline that the procedure should not generate an unacceptably high workload for the flight crew, the required actions of levelling off at MDH, changing heading at the offset initiation point (OIP), and turning away at the MAPt, should not be planned to occur at the same time from the destination.

(3) During the final approach, compensation for drift should be applied, and the heading which, if maintained, would take the helicopter directly to the destination should be identified. It follows that at an OIP located at a range of 1.5 nm, a heading change of 10° is likely to result in a track offset of 15° at 1 nm, and the extended centre line of the new track can be expected to have a mean position approximately 300–400 m to one side of the destination structure. The safety margin built into the 0.75-nm decision range (DR) is dependent upon the rate of closure with the destination. Although the airspeed should be in the range of 60–90 KIAS during the final approach, the ground speed, after due allowance for wind velocity, should not be greater than 70 kt.

(f) Missed approach segment.

(1) The missed approach segment commences at the MAPt and ends when the helicopter reaches the minimum en route altitude. The missed approach manoeuvre is a 'turning missed approach' which should be of not less than 30° and should not, normally, be greater than 45°. A turn away of more than 45° does not reduce the collision risk factor any further nor does it permit a closer DR. However, turns of more than 45° may increase the risk of pilot disorientation, and by inhibiting the rate of climb (especially in the case of an OEI missed approach procedure), may keep the helicopter at an extremely low level for longer than it is desirable.

(2) The missed approach area to be used should be identified and verified as a clear area on the radar screen during the intermediate approach segment. The base of the missed approach area is a sloping surface at 2.5 % gradient starting from MDH at the MAPt. The concept is that a helicopter executing a turning missed approach will be protected by the horizontal boundaries of the missed approach area until vertical separation of more than 130 ft is achieved between the base of the area and the offshore obstacle environment of 500 ft AMSL that prevails outside the area.

(3) A missed approach area, taking the form of a 45° sector orientated left or right of the final approach track, originating from a point 5 nm short of the destination, and terminating on an arc 3 nm beyond the destination, should normally satisfy the specifications of a 30° turning missed approach.

(g) Required visual reference

The visual reference required is that the destination should be in view in order to be able to carry out a safe landing.

(h) Radar equipment

During the ARA procedure, colour mapping radar equipment with a 120° sector scan and a 2.5-nm range scale selected may result in dynamic errors of the following order:

(1) bearing/tracking error of ± 4.5° with 95 % accuracy;

(2) mean ranging error of 250 m; or

(3) random ranging error of ± 250 m with 95 % accuracy.

Figure 1 — Horizontal profile

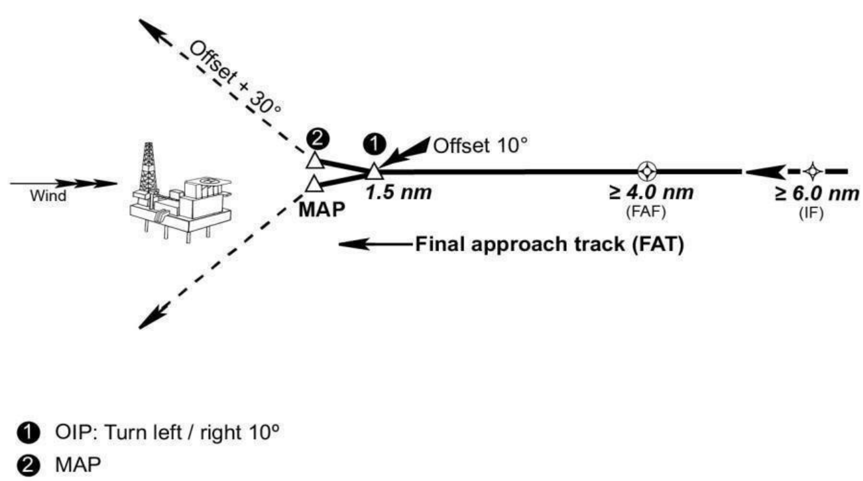
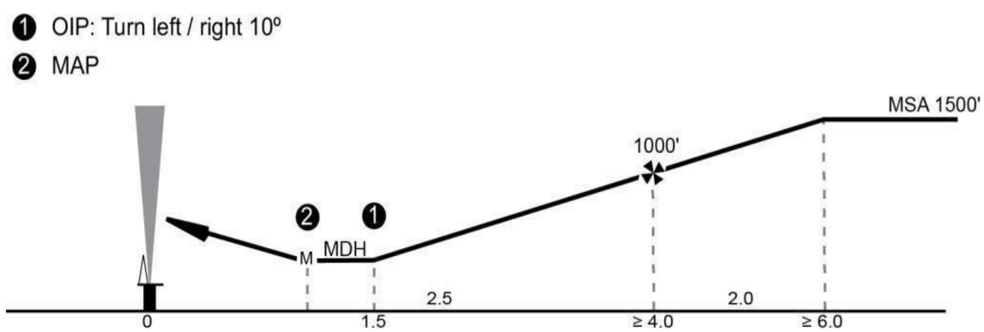


Figure 1 — Vertical profile



GM2 SPA.HOFO.125 Airborne radar approach (ARA) to offshore locations

GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS)/AREA NAVIGATION SYSTEM

Where an ARA is conducted to a non-moving offshore location (i.e. fixed installation or moored vessel), and the GNSS/area navigation system is used to enhance the safety of the ARA, the following procedure or equivalent should be applied:

(a) selection from the area navigation system database or manual entry of the offshore location;

(b) manual entry of the final approach fix (FAF) or intermediate fix (IF), as a range of and bearing from the offshore location;

(c) operation of the GNSS equipment in terminal mode;

(d) comparison of weather radar and GNSS range and bearing data to cross-check the position of the offshore location;

(e) use of GNSS guidance to guide the aircraft onto the final approach track during the initial or intermediate approach segments;

(f) use of GNSS guidance from the FAF towards the offset initiation point (OIP) during the final approach segment to establish the helicopter on the correct approach track and, hence, heading;

(g) transition from GNSS guidance to navigation based on headings once the track is stabilised and before reaching OIP;

(h) use of GNSS range of and bearing to the offshore location during the intermediate and final approach segments to cross-check weather radar information (for correct 'painting' of the destination and, hence, of other obstacles);

(i) use of GNSS range of the offshore location to enhance confidence in the weather radar determination of arrival at the OIP and MAP; and

(j) use of GNSS range of and bearing to the destination to monitor separation from the offshore location.

SPA.HOFO.130 Meteorological conditions

When flying between offshore locations located in class G airspace where the overwater sector is less than 10 NM, VFR flights may be conducted when the limits are at, or better than, the following:

Minima for flying between offshore locations located in class G airspace

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

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

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

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

SPA.HOFO.135 Wind limitations for operations to offshore locations

Operation to an offshore location shall only be performed when the wind speed at the helideck is reported to be not more than 60 knots including gusts.

SPA.HOFO.140 Performance requirements at offshore locations

Helicopters taking off from and landing at offshore locations shall be operated in accordance with the performance requirements of the appropriate Part according to their type of operation.

AMC1 SPA.HOFO.140 Performance requirements — take-off and landing at offshore locations

FACTORS

To ensure that the necessary factors are taken into account, operators not conducting CAT operations should use take-off and landing procedures that are appropriate to the circumstances and have been developed in accordance with ANO 6-1 in order to minimize the risks of collision with obstacles at the individual offshore location under the prevailing conditions.

SPA.HOFO.145 Flight data monitoring (FDM) system

(a) When conducting CAT operations with a helicopter equipped with a flight data recorder, the operator shall establish and maintain a FDM system, as part of its integrated management system, by 1 January 2019.

(b) The FDM system shall be non-punitive and contain adequate safeguards to protect the source(s) of the data.

AMC1 SPA.HOFO.145 Flight data monitoring (FDM) program

FDM PROGRAM

Refer to ANO 6-3

GM1 SPA.HOFO.145 Flight data monitoring (FDM) program

DEFINITION OF AN FDM PROGRAM

ANO 6-3, except for the examples that are specific to aeroplane operation.

GM2 SPA.HOFO.145 Flight data monitoring (FDM) program

FDM

Additional guidance material for the establishment of a FDM program is found in:

(a) International Civil Aviation Organization (ICAO) Doc 10000 — Manual on Flight Data Analysis Programs (FDAP); and

(b) United Kingdom Civil Aviation Authority (UK CAA) CAP 739 — Flight Data Monitoring.

The following table provides examples of FDM events that may be further developed using operator- and helicopter-specific limits. The table is considered illustrative and non-exhaustive.

Table 1 — Examples of FDM events

Event title/description	Parameters required	Comments
Ground		
Outside air temperature (OAT) High - Operating limits	OAT	To identify when the helicopter is operated at the limits of OAT.
Sloping-ground high-pitch attitude	Pitch attitude, ground switch (similar)	To identify when the helicopter is operated at the slope limits.
Sloping-ground high-roll attitude	Roll attitude, ground switch (similar)	To identify when the helicopter is operated at the slope limits.
Rotor brake on at an excessive number of rotations (main rotor speed) (NR)	Rotor brake discreet, NR	To identify when the rotor brake is applied at too high NR.
Ground taxiing speed — max	Ground speed (GS), ground switch (similar)	To identify when the helicopter is ground taxied at high speed (wheeled helicopters only).
Air taxiing speed — max	GS, ground switch (similar), radio altitude (Rad Alt)	To identify when the helicopter is air taxied at high speed.
Excessive power during ground taxiing	Total torque (Tq), ground switch (similar), GS	To identify when excessive power is used during ground taxiing.
Pedal — max left-hand (LH) and right-hand (RH) taxiing	Pedal position, ground switch (similar), GS or NR	To identify when the helicopter flight controls (pedals) are used to excess on the ground. GS or NR to exclude control test prior to rotor start.
Excessive yaw rate on ground during taxiing	Yaw rate, ground switch (similar), or Rad Alt	To identify when the helicopter yaws at a high rate when on the ground.
Yaw rate in hover or on ground	Yaw rate, GS, ground switch (similar)	To identify when the helicopter yaws at a high rate when in a hover.

High lateral acceleration (rapid cornering)	Lateral acceleration, ground switch (similar)	To identify high levels of latera acceleration, when ground taxiing, that indicate high cornering speed.
High longitudinal acceleration (rapid braking)	Longitudinal acceleration, ground switch (similar)	To identify high levels of longitudinal acceleration, when ground taxiing, that indicate excessive braking.
Cyclic-movement limits during taxiing (pitch or roll)	Cyclic stick position, ground switch (similar), Rad Alt, NR or GS	To identify excessive movement of the rotor disc when running on ground. GS or NR to exclude contro test prior to rotor start.
Excessive longitudinal and lateral cyclic rate of movement on ground	Longitudinal cyclic pitch rate, lateral cyclic pitch rate, NR	To detect an excessive rate of movement of cyclic control when on the ground with rotors running
Lateral cyclic movement — closest to LH and RH rollover	Lateral cyclic position, peda position, roll attitude, elapsed time ground switch (similar)	To detect the risk of a helicopter rollover due to an incorrect combination of tail rotor peda position and lateral cyclic contro position when on ground.
Excessive cyclic control with insufficient collective pitch on ground	Collective pitch, longitudinal cyclic pitch, lateral cyclic pitch	To detect an incorrect taxiing technique likely to cause rotor head damage.
Inadvertent lift-off	Ground switch (similar), autopilot discreet	To detect inadvertent lifting into hover.
Flight — Take-off and landing		
Day or night landing or take-off	Latitude and Longitude (Lat & Long), local time or UTC	To provide day/night relevance to detected events.
Specific location of landing or takeoff	Lat & Long, ground switch (similar), Rad Alt, total Tq	To give contextual information concerning departures and destinations.
Gear extension and retraction — airspeed limit	Indicated airspeed (IAS), gear position	To identify when undercarriage airspeed limitations are breached.

Gear extension & retraction — height limit	Gear position, Rad Alt	To identify when undercarriage altitude limitations are breached.
Heavy landing	Normal/vertical acceleration, ground switch (similar)	To identify when hard/heavy landings take place.
Cabin heater on (take-off and landing)	Cabin heater discreet, ground switch (similar)	To identify use of engine bleed air during periods of high power demand.
High GS prior to touchdown (TD)	GS, Rad Alt, ground switch (similar) elapsed time, latitude, longitude	To assist in the identification of 'quick stop' approaches.
Flight — Speed		
High airspeed — with power	IAS, Tq 1, Tq 2, pressure altitude (Palt), OAT	To identify excessive airspeed in flight.
High airspeed — low altitude	IAS, Rad Alt	To identify excessive airspeed in low-level flight.
Low airspeed at altitude	IAS, Rad Alt	To identify a 'hover out of ground' effect.
Airspeed on departure (< 300 ft)	IAS, ground switch (similar), Rad Alt	To identify shallow departure.
High airspeed — power off	IAS, Tq 1, Tq 2 or one engine inoperative (OEI) discreet, Palt, OAT	To identify limitation exceedance of power-off airspeed.
Downwind flight within 60 sec of take-off	IAS, GS, elapsed time	To detect early downwind turn after take-off.
Downwind flight within 60 sec of landing	IAS, GS, elapsed time	To detect late turn to final shortly before landing.

Flight — Height		
Altitude — max	Palt	To detect flight outside of the published flight envelope.
Climb rate — max	Vertical speed (V/S), or Palt, or Rad Alt, Elapsed time	Identification of excessive rates o climb (RoC) can be determined from an indication/rate of change of Palt or Rad Alt.
High rate of descent	V/S	To identify excessive rates of descent (RoD).
High rate of descent (speed or height limit)	V/S, IAS or Rad Alt or elevation	To identify RoD at low level or low speed.
Settling with power (vortex ring)	V/S, IAS, GS, Tq	To detect high-power settling with low speed and with excessive rate of descent.
Minimum altitude in autorotation	NR, total Tq, Rad Alt	To detect late recovery from autorotation.
Low cruising (inertial systems)	GS, V/S, elevation, Lat & Long	To detect an extended low-leve flight. Ground speed is less accurate with more false alarms. Lat & Long used for geographical boundaries.
Low cruising (integrated systems)	Rad Alt, elapsed time, Lat & Long, ground switch (similar)	To detect an extended low-level flight.
Flight — Attitude and controls		
Excessive pitch (height related — turnover (T/O), cruising or landing)	Pitch attitude, Rad Alt elevation, Lat & Long	To identify inappropriate use o excessive pitch attitude durin flight. Height limits may be use (i.e. on take-off and landing or < 500 ft) — Lat & Long required for specific-location-related limits Elevation less accurate than Rad Alt Elevation can be used to identify the landing phase in a specific location.

Excessive pitch (speed related — T/O, cruising or landing)	Pitch attitude, IAS, GS, Lat & Long	To identify inappropriate use o excessive pitch attitude during flight. Speed limits may be used (i.e on take-off and landing or in cruising) — Lat & Long required for specific-location-related limits. GS less accurate than IAS.
Excessive pitch rate	Pitch rate, Rad Alt, IAS, ground switch (similar), Lat & Long	To identify inappropriate use of excessive rate of pitch change during flight. Height limits may be used (i.e. on take-off and landing). IAS only for IAS limit, ground switch (similar) and Lat & Long required for specific- location-related limits.
Excessive roll/bank attitude (speed or height related)	Roll attitude, Rad Alt, IAS/GS	To identify excessive use of rol attitude. Rad Alt may be used fo height limits, IAS/GS may be used for speed limits.
Excessive roll rate	Roll rate, Rad Alt, Lat & Long, Ground switch (similar)	Rad Alt may be used for height limits, Lat & Long and ground switch (similar) required for specific-location-related and air/ground limits.
Excessive yaw rate	Yaw rate	To detect excessive yaw rates in flight.
Excessive lateral cyclic control	Lateral cyclic position, ground switch (similar)	To detect movement of the latera cyclic control to extreme left or right positions. Ground switch (similar) required for pre or post T/O.
Excessive longitudinal cyclic control	Longitudinal cyclic position, ground switch (similar)	To detect movement of the longitudinal cyclic control to extreme forward or aft positions. Ground switch (similar) required for pre or post T/O.
Excessive collective pitch control	Collective position, ground switch (similar)	To detect exceedances of the aircraft flight manual (AFM) collective pitch limit. Ground switch (similar) required for pre or post T/O.

Excessive tail rotor control	Pedal position, ground switch (similar)	To detect movement of the tai rotor pedals to extreme left and right positions. Ground switch (similar) required for pre or post T/O.
Manoeuvre G loading or turbulence	Lat & Long, normal accelerations, ground switch (similar) or Rad Alt	To identify excessive G loading of the rotor disc, both positive an negative. Ground switch (similar required to determine air/ground Rad Alt required if height limi required.
Pilot workload/turbulence	Collective and/or cyclic and/or tai rotor pedal position and change rate (Lat & Long)	To detect high workload and/or turbulence encountered during take-off and landing phases. Lat & Long required for specific landing sites. A specific and complicated algorithm for this event is required. See United Kingdom Civil Aviation Authority (UK CAA) Paper 2002/02.
Cross controlling	Roll rate, yaw rate, pitch rate, GS, accelerations	To detect an 'out of balance' flight. Airspeed could be used instead of GS.
Quick stop	GS (min and max), V/S, pitch	To identify inappropriate flight characteristics. Airspeed could be used instead of GS.
Flight — General		
OEI — Air	OEI discreet, ground switch (similar)	To detect OEI conditions in flight.
Single engine flight	No 1 engine Tq, No 2 engine Tq	To detect single-engine flight.
Torque split	No 1 engine Tq, No 2 engine Tq	To identify engine-related issues.
Pilot event	Pilot event discreet	To identify when flight crews have depressed the pilot event

		button.
Traffic collision avoidance system (TCAS) traffic advisory (TA)	TCAS TA discreet	To identify TCAS alerts.
Training computer active	Training computer mode active or discreet	To identify when helicopter have been on training flights.
High/low rotor speed — power on	NR, Tq (ground switch (similar), IAS, GS)	To identify mishandling of NR Ground switch (similar), IAS or ground speed required to determine whether helicopter is airborne.
High/low rotor speed — power off	NR, Tq (ground switch (similar), IAS, GS)	To identify mishandling of NR Ground switch (similar), IAS or ground speed to determine whether helicopter is airborne.
Fuel content low	Fuel contents	To identify low-fuel alerts.
Helicopter terrain awareness and warning system (HTAWS) alert	HTAWS alerts discreet	To identify when HTAWS alerts have been activated.
Automatic voice alert device (AVAD) alert	AVAD discreet	To identify when AVAD alerts have been activated.
Bleed air system use during take- off (e.g. heating)	Bleed air system discreet, ground switch (similar), IAS	To identify use of engine bleed air during periods of high power demand.
Rotors' running duration	NR, elapsed time	To identify rotors' running time for billing purposes.
Flight — Approach		
Stable approach heading change	Magnetic heading, Rad Alt, ground switch (similar), gear position, elapsed time	To identify unstable approaches.
Stable approach pitch attitude		To identify unstable approaches.

	Pitch attitude, Rad Alt, ground switch (similar), gear position	
Stable approach rod GS	Altitude rate, Rad Alt, ground switch (similar), gear position	To identify unstable approaches.
Stable approach track change	Track, Rad Alt, ground switch (similar), gear position	To identify unstable approaches.
Stable approach angle of bank	Roll attitude, Rad Alt, ground switch (similar), gear position	To identify unstable approaches.
Stable approach — rod at specified height	Altitude rate, Rad Alt, ground switch (similar), gear position	To identify unstable approaches.
Stable approach — IAS at specified height	IAS, Rad Alt, ground switch (similar), gear position	To identify unstable approaches.
Glideslope deviation above or below	Glideslope deviation	To identify inaccurately flown instrument landing system (ILS) approaches.
Localiser deviation left and right	Localiser deviation	To identify inaccurately flown ILS approaches.
Low turn to final	Elevation, GS, V/S, heading change	Airspeed could be used instead of GS.
Premature turn to final	Elevation, GS, V/S, heading change	Airspeed could be used instead of GS.
Stable approach — climb	IAS (min & max), V/S (min & max), elevation	To identify unstable approaches.

Stable approach — descent	IAS (min & max), V/S, elevation	To identify unstable approaches.
Stable approach — bank	IAS (min & max), V/S, elevation, roll	To identify unstable approaches.
Stable approach — late turn	Heading change, elevation, GS	To identify unstable approaches.
Go-around	Gear select (Rad Alt)	To identify missed approaches. Rad Alt for height limit.
Rate of descent on approach	Altitude rate, Rad Alt, Lat & Long, ground switch (similar)	To identify high rates of descent when at low level on approach. Rad Alt if below specified height, Lat & Long for specified location required.
Flight — Autopilot		
Condition of autopilot in flight	Autopilot discreet	To detect flight without autopilot engaged; per channel for multichannel autopilots.
Autopilot engaged within 10 sec after take-off	Autopilot engaged discreet, elapsed time, ground switch (similar), total Tq, Rad Alt	To identify inadvertent lift-off without autopilot engaged.
Autopilot engaged on ground (postflight or preflight)	Autopilot engaged discreet, elapsed time, ground switch (similar), total Tq, Rad Alt	To identify inappropriate use o autopilot when on ground. Elapse time required to allow for permissible short periods.
Excessive pitch attitude with autopilot engaged on ground (offshore)	Pitch attitude, autopilot discreet, ground switch (similar), Lat & Long	To identify potential for low N when helicopter pitches on floatin helideck.
Airspeed hold engaged — airspeed (departure or non-departure)	Autopilot modes discreet, IAS, (ground switch (similar), total Tq,	To detect early engagement of autopilot higher modes. Ground switch (similar), total Tq and Rad Alt to determine if the flight

	Rad Alt)	profile is 'departure'.
Airspeed hold engaged — altitude (departure or non-departure)	Autopilot modes discreet, Rad Alt, (IAS, ground switch (similar), total Tq)	To detect early engagement of autopilot higher modes. IAS, ground switch (similar), total Tq to determine if the flight profile is 'departure'.
Alt mode engaged — altitude (departure or non-departure)	Autopilot modes discreet, Rad Alt, (ground switch (similar), total Tq, IAS)	To detect early engagement of autopilot higher modes. Ground switch (similar), total Tq and Rad Alt to determine if the flight profile is 'departure'.
Alt mode engaged — airspeed (departure or non-departure)	Autopilot modes discreet, IAS, (ground switch (similar), total Tq, Rad Alt)	To detect early engagement of autopilot higher modes. IAS, ground switch (similar), total Tq to determine if the flight profile is 'departure'.
Heading mode engaged — speed	Autopilot modes discreet, IAS	To detect engagement of autopilot higher modes below minimum speed limitations. Ground switch (similar), total Tq and Rad Alt to determine if the flight profile is 'departure'.
V/S mode active — below specified speed	Autopilot modes discreet, IAS	To detect engagement of autopilot higher modes below minimum speed limitations.
VS mode engaged — altitude (departure or non-departure)	Autopilot modes discreet, IAS, (WOW, total Tq, Rad Alt)	To detect early engagement of autopilot higher modes. Ground switch (similar), total Tq and Rad Alt to determine if the flight profile is 'departure'.
Flight director (FD) engaged — speed	FD discreet, IAS	To detect engagement of autopilot higher modes below minimum speed limitations.
FD-coupled approach or take off	FD discreet, IAS, ground switch	To detect engagement of autopilot higher modes below minimum

— airspeed	(similar)	speed limitations.
Go-around mode engaged — airspeed	Autopilot modes discreet, IAS, ground switch (similar), total Tq, Rad Alt	To detect engagement of autopilot higher modes below minimum speed limitations.
Flight without autopilot channels engaged	Autopilot channels	To detect flight without autopilot engaged; per channel for multichannel autopilots.

SPA.HOFO.150 Aircraft tracking system

An operator shall establish and maintain a monitored aircraft tracking system for offshore operations in a hostile environment from the time the helicopter departs until it arrives at its final destination.

AMC1 SPA.HOFO.150 Aircraft tracking system

GENERAL

Flights should be tracked and monitored from take-off to landing. This function may be achieved by the air traffic services (ATS) when the planned route and the planned diversion routes are fully included in airspace blocks where:

(a) ATS surveillance service is normally provided and supported by ATC surveillance systems locating the aircraft at time intervals with adequate duration; and
(b) the operator has given to competent air navigation services (ANS) providers the necessary contact information.

In all other cases, the operator should establish a detailed procedure describing how the aircraft tracking system is to be monitored, and what actions and when are to be taken if a deviation or anomaly has been detected.

GM1 SPA.HOFO.150 Aircraft tracking system

OPERATIONAL PROCEDURE

The procedure should take into account the following aspects:

(a) the outcome of the risk assessment made when the update frequency of the information was defined;

(b) the local environment of the intended operations; and

(c) the relationship with the operator's emergency response plan.

Aircraft tracking data should be recorded on the ground and retained for at least 48 h. Following an accident or a serious incident subject to investigation, the data should be retained for at least 30 days, and the operator should be capable of providing a copy of this data without delay.

SPA.HOFO.155 Vibration health monitoring (VHM) system

(a) All helicopters conducting CAT offshore operations in a hostile environment shall be fitted with a VHM system capable of monitoring the status of critical rotor and rotor drive systems.

(b) The operator shall have a system to:

(1) collect the data including system generated alerts;

(2) analyse and determine component serviceability; and

(3) respond to detected incipient failures.

AMC1 SPA.HOFO.155 Vibration health monitoring (VHM) system

GENERAL

Any VHM system should meet all of the following criteria:

(a) VHM system capability

The VHM system should measure vibration characteristics of rotating critical components during flight, using suitable vibration sensors, techniques, and recording equipment. The frequency and flight phases of data measurement should be established together with the type certificate holder (TCH) during the initial entry into service. In order to appropriately manage the generated data and focus upon significant issues, an alerting system should be established; this is normally automatic. Accordingly, alert generation processes should be developed to reliably advise maintenance personnel of the need to intervene and help determine what type of intervention is required.

(b) Approval of VHM installation

The VHM system, which typically comprises vibration sensors and associated wiring, data acquisition and processing hardware, the means of downloading data from the helicopter, the ground-based system and all associated instructions for operation of the system, should be certified in accordance with CAAB recognized standard.

(c) Operational procedures

The operator should establish procedures to address all necessary VHM subjects.

(d) Training

The operator should determine which staff will require VHM training, determine appropriate syllabi, and incorporate them into the operator’s initial and recurrent training programs.

SPA.HOFO.160 Equipment requirements

(a) The operator shall comply with the following equipment requirements:

(1) Public Address (PA) system in helicopters used for CAT and non-commercial operations with complex motor-powered helicopters (NCC):

(i) Helicopters with a maximum operational passenger seat configuration (MOPSC) of more than 9 shall be equipped with a PA system.

(ii) Helicopters with an MOPSC of 9 or less need not be equipped with a PA system if the operator can demonstrate that the pilot’s voice is understandable at all passengers’ seats in flight.

(2) Radio altimeter

Helicopters shall be equipped with a radio altimeter that is capable of emitting an audio warning below a pre-set height and a visual warning at a height selectable by the pilot.

(b) Emergency exits

All emergency exits, including crew emergency exits, and any door, window or other opening that is suitable for emergency egress, and the means for opening them shall be clearly marked for the guidance of occupants using them in daylight or in the dark. Such markings shall be designed to remain visible if the helicopter is capsized or the cabin is submerged.

(c) Helicopter terrain awareness warning system (HTAWS)

Helicopters used in CAT operations with a maximum certificated take-off mass of more than 3175 kg or a MOPSC of more than 9 and first issued with an individual CofA after 31 December 2018 shall be equipped with an HTAWS that meets the requirements for class A equipment as specified in an acceptable standard.

GM1 SPA.HOFO.160(a)(1) Additional equipment requirements

PUBLIC ADDRESS (PA) SYSTEM

When demonstrating the performance of the PA system or that the pilot's voice is understandable at all passengers' seats during flight, the operator should ensure compatibility with the passengers' use of ear defenders/ear plugs (hearing protection). The operator should only provide hearing protection that is compatible with the intelligibility of the PA system or pilot's voice, as appropriate.

GM1 SPA.HOFO.160(a)(2) Additional equipment requirements

RADIO ALTIMETER

For additional information, please refer to ANO 6-3.

SPA.HOFO.165 Additional procedures and equipment for operations in a hostile environment

(a) Life jackets

Approved life jackets shall be worn at all times by all persons on board unless integrated survival suits that meet the combined requirement of the survival suit and life jacket are worn.

(b) Survival suits

All passengers on board shall wear an approved survival suit:

(1) when the weather report or forecasts available to the pilot in command/pilot-in- command indicate that the sea temperature will be less than plus 10 °C during the flight; or

(2) when the estimated rescue time exceeds the calculated survival time; or

(3) when the flight is planned to be conducted at night.

(c) Emergency breathing system

All persons on board shall carry and be instructed in the use of emergency breathing systems.

(d) Life rafts

(1) All life rafts carried shall be installed so as to be usable in the sea conditions in which the helicopter's ditching, flotation, and trim characteristics were evaluated for certification.

(2) All life rafts carried shall be installed so as to facilitate their ready use in an emergency. (3) The number of life rafts installed:

(i) in the case of a helicopter carrying less than 12 persons, at least one life raft with a rated capacity of not less than the maximum number of persons on board; or

(ii) in the case of a helicopter carrying more than 11 persons, at least two life rafts, sufficient together to accommodate all persons capable of being carried on board and, if one is lost, the remaining life raft(s) having the overload capacity sufficient to accommodate all persons on the helicopter.

(3) Each life raft shall contain at least one survival emergency locator transmitter (ELT(S)); and

(4) Each life raft shall contain life-saving equipment, including means of sustaining life, as appropriate to the flight to be undertaken.

(e) Emergency cabin lighting

The helicopter shall be equipped with an emergency lighting system with an independent power supply to provide a source of general cabin illumination to facilitate the evacuation of the helicopter.

(f) Automatically deployable emergency locator transmitter (ELT(AD))

The helicopter shall be equipped with an ELT(AD) that is capable of transmitting simultaneously on 121,5 MHz and 406 MHz.

(g) Securing of non-jettisonable doors

Non-jettisonable doors that are designated as ditching emergency exits shall have a means of securing them in the open position so that they do not interfere with the occupants' egress in all sea conditions up to the maximum sea conditions required to be evaluated for ditching and flotation.

(h) Emergency exits and escape hatches

All emergency exits, including crew emergency exits, and any door, window or other opening suitable to be used for the purpose of underwater escape shall be equipped so as to be operable in an emergency.

(i) Notwithstanding (a), (b) and (c) above the operator may, based on a risk assessment, allow passengers, medically incapacitated at an offshore location, to partly wear or not wear life jackets, survival suits or emergency breathing systems on return flights or flights between offshore locations.

AMC1 SPA.HOFO.165(c) Additional procedures and equipment for operations in hostile environment

EMERGENCY BREATHING SYSTEM (EBS)

The EBS of SPA.HOFO.165(c) should be an EBS system capable of rapid underwater deployment.

AMC1 SPA.HOFO.165(d) Additional procedures and equipment for operations in hostile environment

INSTALLATION OF THE LIFE RAFT

(a) Projections on the exterior surface of the helicopter that are located in a zone delineated by boundaries that are 1.22 m (4 ft) above and 0.61 m (2 ft) below the established static waterline could cause damage to a deployed life raft. Examples of projections that need to be considered are aerials, overboard vents, unprotected split-pin tails, guttering, and any projection sharper than a three-dimensional right-angled corner.

(b) While the boundaries specified in (a) above are intended as a guide, the total area that should be considered should also take into account the likely behavior of the life raft after deployment in all sea states up to the maximum in which the helicopter is capable of remaining upright.

(c) Wherever a modification or alteration is made to a helicopter within the boundaries specified, the need to prevent the modification or alteration from causing damage to a deployed life raft should be taken into account in the design.

(d) Particular care should also be taken during routine maintenance to ensure that additional hazards are not introduced by, for example, leaving inspection panels with sharp corners proud of the surrounding fuselage surface, or by allowing door sills to deteriorate to a point where their sharp edges may become a hazard.

AMC1 SPA.HOFO.165(h) Additional procedures and equipment for operations in a hostile environment

EMERGENCY EXITS AND ESCAPE HATCHES

In order for all passengers to escape from the helicopter within an expected underwater survival time of 60 sec in the event of capsize, the following provisions should be made:

(a) there should be an easily accessible emergency exit or suitable opening for each passenger;

(b) an opening in the passenger compartment should be considered suitable as an underwater escape facility if the following criteria are met:

(1) the means of opening should be rapid and obvious;

(2) passenger safety briefing material should include instructions on the use of such escape facilities;

(3) for the egress of passengers with shoulder width of 559 mm (22 in.) or smaller, a rectangular opening should be no smaller than 356 mm (14 in.) wide, with a diagonal between corner radii no smaller than 559 mm (22 in.), when operated in accordance with the instructions;

(4) non-rectangular or partially obstructed openings (e.g. by a seat back) should be capable of admitting an ellipse of 559 mm x 356 mm (22 in. x 14 in.); and

(5) for the egress of passengers with shoulder width greater than 559 mm (22 in.), openings should be no smaller than 480 mm x 660 mm (19 in. x 26 in.) or be capable of admitting an ellipse of 480 mm x 660 mm (19 in. x 26 in.);

(c) suitable openings and emergency exits should be used for the underwater escape of no more than two passengers, unless large enough to permit the simultaneous egress of two passengers side by side:

(1) if the exit size provides an unobstructed area that encompasses two ellipses of size 480 mm x 660 m (19 in. x 26 in.) side by side, then it may be used for four passengers; and

(2) if the exit size provides an unobstructed area that encompasses two ellipses of size 356 mm x 559 mm (14 in. x 22 in.) side by side, then it may be used for four passengers with shoulder width no greater than 559 mm (22 in.) each; and

(d) passengers with shoulder width greater than 559 mm (22 in.) should be identified and allocated to seats with easy access to an emergency exit or opening that is suitable for them.

GM1 SPA.HOFO.165(h) Additional procedures and equipment for operations in a hostile environment

SEAT ALLOCATION

The identification and seating of the larger passengers might be achieved through the use of patterned and/or colour-coded armbands and matching seat headrests.

AMC1 SPA.HOFO.165(i) Additional procedures and equipment for operations in a hostile environment

MEDICALLY INCAPACITATED PASSENGER

(a) A 'Medically incapacitated passenger' means a person who is unable to wear the required survival equipment, including life jackets, survival suits and emergency breathing systems (EBSs), as determined by a medical professional. The medical professional's determination should be made available to the pilot-in-command/pilot in command prior to arrival at the offshore installation.

(b) The operator should establish procedures for the cases where the pilot-in- command/pilot in command may accept a medically incapacitated passenger not wearing or partially wearing survival equipment. To ensure proportionate mitigation of the risks associated with an evacuation, the procedures should be based on, but not be limited to, the severity of the incapacitation, sea and air temperature, sea state, and number of passengers on board.

(c) In addition, the operator should establish the following procedures:

(1) under which circumstances one or more dedicated persons are required to assist a medically incapacitated passenger during a possible emergency evacuation, and the skills and qualifications required;

(2) seat allocation for the medically incapacitated passenger and possible assistants in the helicopter types used to ensure optimum use of the emergency exits; and

(3) evacuation procedures related to whether or not the dedicated persons as described in (1) above are present.

SPA.HOFO.170 Crew requirements

(a) The operator shall establish:

(1) criteria for the selection of flight crew members, taking into account the flight crew members' previous experience;

(2) a minimum experience level for a pilot in command/pilot-in-command intending to conduct offshore operations; and

(3) a flight crew training and checking program that each flight crew member shall complete successfully. Such program shall be adapted to the offshore environment and include normal, abnormal and emergency procedures, crew resource management, water entry and sea survival training.

(b) Recency requirements

A pilot shall only operate a helicopter carrying passengers:

(1) at an offshore location, as pilot in command or pilot-in-command, or co-pilot, when he or she has carried out in the preceding 90 days at least 3 take-offs, departures, approaches and landings at an offshore location in a helicopter of the same type or a full flight simulator (FFS) representing that type; or

(2) by night at an offshore location, as pilot in command or pilot-in-command, or co-pilot, when he/she has carried out in the preceding 90 days at least 3 take-offs, departures, approaches and landings at night at an offshore location in a helicopter of the same type or an FFS representing that type.

The 3 take-offs and landings shall be performed in either multi-pilot or single-pilot operations, depending on the operation to be performed.

(c) Specific requirements for CAT:

(1) The 90-day period presented in points (b)(1) and (2) above may be extended to 120 days as long as the pilot undertakes line flying under the supervision of a type rating instructor or examiner.

(2) If the pilot does not comply with the requirements in (1), he/she shall complete a training flight in the helicopter or an FFS of the helicopter type to be used, which shall include at least the requirements described in (b)(1) and (2) before he or she can exercise his or her privileges.

AMC1 SPA.HOFO.170(a) Crew requirements

FLIGHT CREW TRAINING AND CHECKING

(a) Flight crew training programs should:

(1) improve knowledge of the offshore operations environment with particular consideration of visual illusions during approach, introduced by lighting, motion and weather factors;

(2) improve crew cooperation specifically for offshore operations;

(3) provide flight crew members with the necessary skills to appropriately manage the risks associated with normal, abnormal and emergency procedures during flights by day and night;

(4) if night operations are conducted, give particular consideration to approach, go-around, landing, and take-off phases;

(5) include instructions on the optimum use of the helicopter's automatic flight control system (AFCS);

(6) for multi-pilot operation, emphasise the importance of multi-crew procedures, as well as the role of the pilot monitoring during all phases of the flight; and

(7) include standard operating procedures.

(b) Emergency and safety equipment training should focus on the equipment fitted/carried. Water entry and sea survival training, including operation of all associated safety equipment, should be an element of the recurrent training, as described in ANO6-1

(c) The training elements referred to above should be assessed during: operator proficiency checks, line checks, or, as applicable, emergency and safety equipment checks.

(d) Training and checking should make full use of full flight simulators (FFSs) for normal, abnormal, and emergency procedures related to all aspects of helicopter offshore operations (HOFO).

SUBPART L

SINGLE-ENGINED TURBINE AERO PLANE OPERATIONS AT NIGHT OR IN INSTRUMENT METEOROLOGICAL CONDITIONS (SET-IMC)

SPA.SET-IMC.100 SET-IMC operations

In commercial air transport (CAT) operations, single-engined turbine aeroplanes shall only be operated at night or in IMC if the operator has been granted a SET-IMC approval by CAAB.

SPA.SET-IMC.105 SET-IMC operations approval

To obtain a SET-IMC approval by CAAB, the operator shall provide evidence that all the following conditions have been complied with:

(a) an acceptable level of turbine engine reliability is achieved in service by the world fleet for the particular airframe-engine combination;

(b) specific maintenance instructions and procedures to ensure the intended level of continued airworthiness and reliability of the aeroplane and its propulsion system have been established and included in the operator's aircraft maintenance program in accordance with Part-M, including all the following:

(1) an engine trend monitoring program, except for aeroplanes first issued with an individual certificate of airworthiness after 31 December 2004 that shall have an automatic trend monitoring system;

(2) a propulsion and associated systems' reliability program;

(c) flight crew composition and a training/checking program for the flight crew members involved in these operations have been established;

(d) operating procedures have been established specifying all the following:

(1) the equipment to be carried, including its operating limitations and appropriate entries in the MEL;

(2) the flight planning;

(3) the normal procedures;

(4) the contingency procedures, including procedures following a propulsion system failure, as well as forced landing procedures in all weather conditions;

(5) the monitoring and incident reporting.

(e) a safety risk assessment has been performed, including the determination of an acceptable risk period if an operator intends to make use of it.

AMC1 SPA.SET-IMC.105 SET-IMC operations approval

ANNUAL REPORT

After obtaining the initial approval, the operator should make available to CAAB on an annual basis a report related to its SET-IMC operations containing at least the following information:

(a) the number of flights operated;

(b) the number of hours flown; and

(c) the number of occurrences sorted by type.

AMC1 SPA.SET-IMC.105(a) SET-IMC operations approval

TURBINE ENGINE RELIABILITY

(a) The operator should obtain the power plant reliability data from the type certificate (TC) holder and/or supplemental type certificate (STC) holder.

(b) The data for the engine-airframe combination should have demonstrated, or be likely to demonstrate, a power loss rate of less than 10 per million flight hours. Power loss in this context is defined as any loss of power, including in-flight shutdown, the cause of which may be traced to faulty engine or engine component design or installation, including design or installation of the fuel ancillary or engine control systems.

(c) The in-service experience with the intended engine-airframe combination should be at least 100 000 h, demonstrating the required level of reliability. If this experience has not been accumulated, then, based on analysis or test, in-service experience with a similar or related type of airframe and turbine engine might be considered by the TC/STC holder to develop an equivalent safety argument in order to demonstrate that the reliability criteria are achievable.

AMC1 SPA.SET-IMC.105(b) SET-IMC operations approval

MAINTENANCE PROGRAM

The following maintenance aspects should be addressed by the operator:

(a) Engine monitoring program

(1) The operator's maintenance program should include an oil-consumption-monitoring program that should be based on engine manufacturer's recommendations, if available, and track oil consumption trends. The monitoring should be continuous and take account of the oil added. An engine oil analysis program may also be required if recommended by the engine manufacturer. The possibility to perform frequent (recorded) power checks on a calendar basis should be considered.

(2) The engine monitoring program should also provide for engine condition monitoring describing the parameters to be monitored, the method of data collection and a corrective action process, and should be based on the engine manufacturer's instructions. This monitoring will be used to detect propulsion system deterioration at an early stage allowing corrective action to be taken before safe operation is affected.

(b) Propulsion and associated systems' reliability program

(1) A propulsion and associated systems' reliability program should be established or the existing reliability program supplemented for the particular engine-airframe combination. This program should be designed to early identify and prevent problems, which otherwise would affect the ability of the aeroplane to safely perform its intended flight.

(2) Where the fleet of SET-IMC aeroplanes is part of a larger fleet of the same engine-airframe combination, data from the operator's total fleet should be acceptable.

(3) For engines, the program should incorporate reporting procedures for all significant events. This information should be readily available (with the supporting data) for use by the operator, type certificate (TC) holders, and CAAB to help establish that the reliability level set out in AMC1 SPA.SET-IMC.105(a) is achieved. Any adverse trend would require an immediate evaluation to be conducted by the operator in consultation with CAAB. The evaluation may result in taking corrective measures or imposing operational restrictions.

(4) The engine reliability program should include, as a minimum, the engine hours flown in the period, the power loss rate for all causes, and the engine removal rate, both rates on an annual basis, as well as reports with the operational context focusing on critical events. These reports should be communicated to the TC holder and CAAB.

(5) The actual period selected should reflect the global utilization and the relevance of the experience included (e.g. early data may not be relevant due to subsequent mandatory modifications that affected the power loss rate). After the introduction of a new engine variant and whilst global utilization is relatively low, the total available experience may have to be used to try to achieve a statistically meaningful average.

AMC1 SPA.SET-IMC.105(c) SET-IMC operations approval

TRAINING PROGRAM

The operator's flight crew training and checking, established in accordance with ANO (OPS), should incorporate the following elements:

(a) Conversion training

Conversion training should be conducted in accordance with a syllabus devised for SET-IMC operations and include at least the following:

(1) normal procedures:

(i) anti-icing and de-icing systems operation;
(ii) navigation system procedures;
(iii) radar positioning and vectoring, when available;
(iv) use of radio altimeter; and
(v) use of fuel control, displays interpretation;

(2) abnormal procedures:

(i) anti-icing and de-icing systems failures;
(ii) navigation system failures;
(iii) pressurization system failures;
(iv) electrical system failures; and
(v) engine-out descent in simulated IMC; and

(3) emergency procedures:

(i) engine failure shortly after take-off;
(ii) fuel system failures (e.g. fuel starvation);
(iii) engine failure other than the above: recognition of failure, symptoms, type of failure, measures to be taken, and consequences;
(iv) depressurization; and
(v) engine restart procedures:

(A) choice of an aerodrome or landing site; and
(B) use of an area navigation system;

(vi) air traffic controller (ATCO) communications;
(vii) use of radar positioning and vectoring (when available);
(viii) use of radio altimeter; and

(ix) practice of the forced landing procedure until touchdown in simulated IMC, with zero thrust set, and operating with simulated emergency electrical power.

(b) Conversion checking

The following items should be checked following completion of the SET-IMC operations conversion training as part of the operator's proficiency check (OPC):

(1) conduct of the forced landing procedure until touchdown in simulated IMC, with zero thrust set, and operating with simulated emergency electrical power;

(2) engine restart procedures;

(3) depressurization following engine failure; and

(4) engine-out descent in simulated IMC.

(c) Use of simulator (conversion training and checking)

Where a suitable full flight simulator (FFS) or a suitable flight simulation training device (FSTD) is available, it should be used to carry out training on the items under (a) and checking of the items under (b) above for SET-IMC operations conversion training and checking.

(d) Recurrent training

Recurrent training for SET-IMC operations should be included in the recurrent training required by ANO6-1 for pilots carrying out SET-IMC operations. This training should include all items under (a) above.

(e) Recurrent checking

The following items should be included into the list of required items to be checked following completion of SET-IMC operations recurrent training as part of the OPC:

(1) conduct of the forced landing procedure until touchdown in simulated IMC, with zero thrust set, and operating with simulated emergency electrical power;

(2) engine restart procedures;

(3) depressurisation following engine failure; and

(4) emergency descent in simulated IMC.

(f) Use of simulator (recurrent training and checking)

Following conversion training and checking, the next recurrent training session and the next OPCs including SET-IMC operations items should be conducted in a suitable FFS or FSTD, where available.

AMC2 SPA.SET-IMC.105(c) SET-IMC operations approval

CREW COMPOSITION

(a) Unless the pilot-in-command has a minimum experience of 100 flight hours under instrument flight rules (IFR) with the relevant type or class of aeroplane including line flying under supervision (LIFUS), the minimum crew should be composed of two pilots.

(b) A lesser number of flight hours under IFR on the relevant type or class of aeroplane may be acceptable to CAAB when the flight crew member has significant previous IFR experience.

AMC1 SPA.SET-IMC.105(d)(2) SET-IMC operations approval

FLIGHT PLANNING

(a) The operator should establish flight planning procedures to ensure that the routes and cruising altitudes are selected so as to have a landing site within gliding range.

(b) Notwithstanding (a) above, whenever a landing site is not within gliding range, one or more risk periods may be used for the following operations:

(1) over water;

(2) over hostile environment; or

(3) over congested areas.

(i) Except for the take-off and landing phase, the operator should ensure that when a risk period is planned, there is a possibility to glide to a non-congested area.

(ii) The total duration of the risk period per flight should not exceed 15 min unless the operator has established, based on a risk assessment carried out for the route concerned, that the cumulative risk of fatal accident due to an engine failure for this flight remains at an acceptable level (see GM2 SPA.SET-IMC.105(d)(2)).

(c) The operator should establish criteria for the assessment of each new route. These criteria should address the following:

(1) the selection of aerodromes along the route;

(2) the identification and assessment, at least on an annual basis, of the continued suitability of landing sites (obstacles, dimensions of the landing area, type of the surface, slope, etc.) along the route when no aerodrome is available; the assessment may be performed using publicly available information or by conducting on-site surveys;

(3) assessment of en route specific weather conditions that could affect the capability of the aeroplane to reach the selected forced landing area following loss of power (icing conditions including gliding descent through clouds in freezing conditions, headwinds, etc.);

(4) consideration of landing sites' prevailing weather conditions to the extent that such information is available from local or other sources; expected weather conditions at landing sites for which no weather information is available should be assessed and evaluated taking into account a combination of the following information:

(i) local observations;

(ii) regional weather information (e.g. significant weather charts); and

(iii) terminal area forecast (TAF)/meteorological aerodrome report (METAR) of the nearest aerodromes; and

(5) protection of the aeroplane occupants after landing in case of adverse weather.

(d) At the flight planning phase, any selected landing site should have been assessed by the operator as acceptable for carrying out a safe forced landing with a reasonable expectation of no injuries to persons in the aeroplane or on the ground. All information reasonably practical to acquire should be used by the operator to establish the characteristics of landing sites.

(e) Landing sites suitable for a diversion or forced landing should be programd into the navigation system so that track and distance to the landing sites are immediately and continuously available. None of these preprogramd positions should be altered in-flight.

AMC2 SPA.SET-IMC.105(d)(2) SET-IMC operations approval

ROUTE AND INSTRUMENT PROCEDURE SELECTION

The following should be considered by the operator, as appropriate, depending on the use of a risk period:

(a) Departure

The operator should ensure, to the extent possible, that the instrument departure procedures to be followed are those guaranteeing that the flight path allows, in the event of power loss, the aeroplane to land on a landing site.

(b) Arrival

The operator should ensure, to the extent possible, that the arrival procedures to be followed are those guaranteeing that the flight path allows, in the event of power loss, the aeroplane to land on a landing site.

(c) En route

The operator should ensure that any planned or diversionary route should be selected and be flown at an altitude such that, in the event of power loss, the pilot is able to make a safe landing on a landing site.

AMC3 SPA.SET-IMC.105(d)(2) SET-IMC operations approval

LANDING SITE

A landing site is an aerodrome or an area where a safe forced landing can be performed by day or by night, taking into account the expected weather conditions at the time of the foreseen landing.

(a) The landing site should allow the aeroplane to completely stop within the available area, taking into account the slope and the type of the surface.

(b) The slope of the landing site should be assessed by the operator in order to determine its acceptability and possible landing directions.

(c) Both ends of the landing area, or only the zone in front of the landing area for one-way landing areas, should be clear of any obstacle which may be a hazard during the landing phase.

GM1 SPA.SET-IMC.105(d)(2) SET-IMC operations approval

LANDING SITE

(a) When selecting landing sites along a route to be operated, it is recommended to prioritize the different types of landing sites as follows:

(1) aerodromes with available runway lighting;

(2) aerodromes without available runway lighting;

(3) non-populated fields with short grass/vegetation or sandy areas.

(b) When assessing the suitability of a landing site which is not an aerodrome, it is recommended to consider the following landing site criteria:

(1) size and shape of the landing area:

(i) landing sites with a circular shape providing multiple approach paths depending on the wind; and

(ii) for other cases, landing sites with a minimum width of 45 m; and

(2) type of surface:

the surface of the landing area should allow a safe forced landing to be conducted.

GM2 SPA.SET-IMC.105(d)(2) SET-IMC operations approval

SAFETY RISK ASSESSMENT FOR A SPECIFIC ROUTE

(a) Introduction

The risk assessment methodology should aim at estimating for a specific route the likelihood of having fatalities due to emergency landing caused by engine failure. Based on the outcome of this risk assessment, the operator may extend the duration of the risk period beyond the maximum allowed duration if no landing site is available within gliding range.

(b) The safety target

(1) The overall concept of SET-IMC operations is based on an engine reliability rate for all causes of 10 per million flight hours, which permits in compliance with SET-IMC requirements an overall fatal accident rate for all causes of 4 per million flight hours.

(2) Based on accident databases, it is considered that the engine failure event does not contribute by more than 33 % to the overall fatal accident rate. Therefore, the purpose of

the risk assessment is to ensure that the probability of a fatal accident for a specific flight following engine failure remains below the target fatal accident rate of 1.3 × 10-6.

(c) Methodology

(1) The methodology aims at estimating the likelihood of failing to achieve a safe forced landing in case of engine failure, a safe forced landing being defined as a landing on an area for which it is reasonably expected that no serious injury or fatalities will occur due to the landing even though the aeroplane may suffer extensive damage.

(2) This methodology consists of creating a risk profile for a specific route, including departure, en route and arrival airfield and runway, by splitting the proposed flight into appropriate segments (based on the flight phase or the landing site selected), and by estimating the risk for each segment should the engine fail in one of these segments. This risk profile is considered to be an estimation of the probability of an unsuccessful forced landing if the engine fails during one of the identified segments.

(3) When assessing the risk for each segment, the height of the aeroplane at which the engine failure occurs, the position relative to the departure or destination airfield or to an emergency landing site en route, and the likely ambient conditions (ceiling, visibility, wind and light) should be taken into account, as well as the standard procedures of the operator (e.g. U-turn procedures after take-off, use of synthetic vision, descent path angle for standard descent from cruising altitude, etc.).

(4) The duration of each segment determines the exposure time to the estimated risk. The risk is estimated based on the following calculation:

(5) Segment risk factor = segment exposure time (in s)/3 600 × probability of unsuccessful forced landing in this segment x assumed engine failure rate per flight hour (FH).

(6) By summing up the risks for all individual segments, the cumulative risk for the flight due to engine

(7) failure is calculated and converted to risk on a ‘per flight hour’ basis.

(8) This total risk must remain below the target fatal accident rate of 1.3 × 10-6 as under (b) above.

(d) Example of a risk assessment

(1) An example of such a risk assessment is provided below. In any case, this risk assessment is an example designed for a specific flight with specific departure and arrival aerodrome characteristics. It is an example of how to implement this methodology, and all the estimated probabilities used in the table below may not directly apply to any other flight.

(2) The meaning of the different parameters used is further detailed below:

(i) AD/Other: 'AD' is ticked whenever only aerodromes are selected as landing sites in the segment concerned. 'Other' is ticked if the selected landing sites in the segment concerned are not aerodromes. When a risk period is used by the operator, none of the two boxes (neither 'AD' nor 'Other') are ticked.

(ii) Segment exposure time: this parameter represents the duration of each segment in seconds (s).

(iii) Estimated probability of an unsuccessful forced landing if engine fails in the segment: probability of performing in the segment a safe forced landing following engine power loss.

(iv) Segment risk factor: risk of an unsuccessful forced landing (because of power loss) per segment (see formula above).

		LANDING SITE				Assumed engine failure rate per FH			$1{,}00 \times 10^{-5}$
Segments of flight	**Assumed height or height band above ground level (AGL) in ft**	**AD**	**Other**	**Segment exposure time (in s)**	**Cumulative flight time from start of take-off to end of segment (in s)**	**Estimated probability of unsuccessful forced landing if engine fails in this segment**	**Segment risk factor**	**Cumulative risk per flight**	**Comment on estimation of unsuccessful outcome**
Take-off (T-O) ground roll	0 ft	X		20	20	0.01 %	5.56×10^{-12}	5.56×10^{-12}	T-O aborted before being airborne.Runway long enough to stop the aircraft.
Climb-out	0-50 ft	X		8	28	0.10 %	2.22×10^{-11}	2.78×10^{-11}	Aircraft aborts T-O and lands ahead within runway length available.
	50-200 ft	X		10	38	1.00 %	2.78×10^{-10}	3.06×10^{-10}	
	200-1 100 ft	X		36	74	100.00 %	1.00×10^{-7}	1.00×10^{-7}	Aircraft has to land ahead outside airfield with little height for manoeuvring
	1 100-2 000 ft	X		36	110	50.00 %	5.00×10^{-8}	1.50×10^{-7}	U-turn and landing at opposite q-code for magnetic

									heading of a runway (QFU) possible.
	2 000-4 000 ft	X		80	190	25.00 %	5.56 x 10^{-8}	2.06 x 10^{-7}	
Climbing to en route height	4 000-10 000ft	X	X	240	430	5.00 %	3.33 x 10^{-8}	2.39 x 10^{-7}	Aircraft able to operate a glide-in approach.
Cruising: emergency area available	≤ 10 000 ft	X		5 400	5 830	5.00 %	7.50 x 10^{-7}	9.89 x 10^{-7}	En route cruising time with available landing sites along the route within gliding range.
Cruising: emergency area NOT available	≤ 10 000 ft			300	6 130	100.00 %	8.33 x 10^{-7}	1.82 x 10^{-6}	En route cruising time without available landing sites within gliding range.
Descent to initial approach fix for instrument flight rules (IFR) approach	10 000-4 000 ft on a 4° slope (1 200 ft/min)	X		300	6 430	5.00 %	4.17 x 10^{-8}	1.86 x 10^{-6}	Descent with available landing sites within gliding range, and destination not reachable.
Aircraft has to descend below the glide approach capability to set up for a normal powered landing from	4 000-1 000 ft on the		X	150	6 580	50.00 %	2.08 x 10^{-7}	2.07 x 10^{-6}	Aircraft descends below the height needed to maintain a glide approach for reaching the airfield. Therefore, it may land short of airfield if engine fails.

1000 ft on a 3° approach path	approach								
Aircraft descends on a 3° approach path	1 000 - 50 ft on approach at 120 kt (600 ft/min)			95	6 675	100.00 %	2.64×10^{-7}	2.34×10^{-6}	Aircraft assumes 3° glideslope, regained to ensure normal landing. Therefore, it may undershoot the landing field if engine fails at this late stage.
Landing	50 ft above threshold until touchdown	X		10	6 685	5.00 %	1.39×10^{-9}	2.34×10^{-6}	Aircraft over runway. Engine is to be idled anyway, but failure, while airborne, may surprise pilot and result in hard landing.
Landing ground run	Touchdown to stop	X		15	6 700	0.01 %	4.17×10^{-12}	2.34×10^{-6}	Aircraft on ground. Risk negligible, if engine stops on the example runway (very long) providing that all services are retained.
								1.26×10^{-6}	Risk per flight

The following likelihood scale may be used to determine the estimated probability of an unsuccessful forced landing:

Probability in %	Description
0	Impossible
0-1	Negligible likelihood/remote possibility
1-10	Possible but not likely
10-35	Moderately likely
35-65	Possible
65-90	Likely
90-99	Almost certain
99-100	Certain

AMC1 SPA.SET-IMC.105(d)(4) SET-IMC operations approval

CONTINGENCY PROCEDURES

When a risk period is used during the take-off or landing phase, the contingency procedures should include appropriate information for the crew on the path to be followed after an engine failure in order to minimize to the greatest extent possible the risk to people on the ground.

SPA.SET-IMC.110 Equipment requirements for SET-IMC operations

Aeroplane used for SET-IMC operations shall be equipped with all the following equipment:

(a) tow separate electrical generating systems, each one capable of supplying adequate power to all essential flight instruments, navigation systems and aeroplane systems required for continued flight to the destination or alternate aerodrome;

(b) two attitude indicators, powered from independent sources;

(c) for passenger operations, a shoulder harness or a safety belt with a diagonal shoulder strap for each passenger seat;

(d) airborne weather-detecting equipment;

(e) in a pressurized aeroplane, sufficient supplemental oxygen for all occupants to allow descent, following engine failure at the maximum certificated cruising altitude, at the best range gliding speed and in the best gliding configuration, assuming the maximum cabin leak rate, until sustained cabin altitudes below 13000 ft are reached

(f) an area navigation system capable of being programd with the positions of landing sites and providing lateral guidance to the flight crew to reach those sites;

(g) a radio altimeter;

(h) a landing light, capable of illuminating the touchdown point on the power-off glide path from 200 ft away.

(i) an emergency electrical supply system of sufficient capacity and endurance capable of providing power, following the failure of all generated power, to additional loads necessary for all of the following:

(1) the essential flight and area navigation instruments during descent from maximum operating altitude after engine failure;

(2) the means to provide for one attempt to restart the engine;

(3) if appropriate, the extension of landing gear and flaps;

(4) the use of the radio altimeter throughout the landing approach;

(5) the landing light;

(6) one pitot heater;

(7) if installed, the electrical means to give sufficient protection against impairment of the pilot's vision for landing;

(j) an ignition system that activates automatically, or is capable of being operated manually, for take-off, landing, and during flight, in visible moisture;

(k) a means of continuously monitoring the power train lubrication system to detect the presence of debris associated with the imminent failure of a drivetrain component, including a flight crew compartment caution indication;

(l) an emergency engine power control device that permits continuing operation of the engine at a sufficient power range to safely complete the flight the flight in the event of any reasonably probable failure of the fuel control unit.

AMC1 SPA.SET-IMC.110(b) Equipment requirements for SET-IMC operations

ATTITUDE INDICATORS

A backup or standby attitude indicator built in the glass cockpit installations is an acceptable means of compliance for the second attitude indicator.

AMC1 SPA.SET-IMC.110(d) Equipment requirements for SET-IMC operations

AIRBORNE WEATHER-DETECTING EQUIPMENT

The airborne weather-detecting equipment should be an airborne weather radar, as defined in the applicable Certification Specification — European Technical Standard Order (CS-ETSO) issued by the EASA or equivalent standard acceptable by CAAB.

AMC1 SPA.SET-IMC.110(f) Equipment requirements for SET-IMC operations

AREA NAVIGATION SYSTEM

The area navigation system should be based on a global navigation satellite system (GNSS) stand-alone receiver or multi-sensor system, including at least one GNSS sensor, to enable at least required navigation performance approach (RNP APCH) operations without vertical guidance.

GM1 SPA.SET-IMC.110(f) Equipment requirements for SET-IMC operations

AREA NAVIGATION SYSTEM

Acceptable standards for the area navigation system are ETSO-145/146c, ETSO-C129a, ETSO-C196a or ETSO-C115 issued by the EASA or equivalent standard acceptable by CAAB.

GM1 SPA.SET-IMC.110(h) Equipment requirements for SET-IMC operations

LANDING LIGHTS

In order to demonstrate the compliance of its Aeroplan's landing lights with the 200-ft illumination capability requirement, and in the absence of relevant data available in the aircraft flight manual (AFM), the operator should liaise with the type certificate (TC) holder or supplemental type certificate (STC) holder, as applicable, to obtain a statement of compliance.

GM1 SPA.SET-IMC.110(i)(7) Equipment requirements for SET-IMC operations

ELEMENTS AFFECTING PILOT'S VISION FOR LANDING

Examples of elements affecting pilot's vision for landing are rain, ice and window fogging.

AMC1 SPA.SET-IMC.110(l) Equipment requirements for SET-IMC operations

EMERGENCY ENGINE POWER CONTROL DEVICE

The means that allows continuing operation of the engine within a sufficient power range for the flight to be safely completed in the event of any reasonably probable failure/malfunction of the fuel control unit should enable the fuel flow modulation.