Chapter 3
Operational Approval Criteria

3.1 General

3.1.1 In considering an application from an operator to conduct ETOPS operations, an assessment shall be made of the operator's overall safety record, past performance, flight crew training, maintenance training and maintenance reliability programs. The data provided with the request shall substantiate the operator's ability to safely conduct and support these operations and shall include the means used to satisfy the criteria outlined in this section and in Chapter 4 (ETOPS Maintenance and Reliability Requirements).

3.2 Operational Approval Considerations

3.2.1 **Benign Area of Operation**

a) Consideration will be given to operators requesting approval to conduct extended range operations within a benign area of operation with minimal or no inservice experience with the airframe/engine combination. Although an ETOPS type design approval is not necessarily required, the airframe-engine combination will be reviewed to determine if there are any factors that would effect the safe conduct of operations. Furthermore, flights shall be operated at a weight that permits the flight, at the approved single engine cruise speed and power setting, to maintain flight altitude at or above the Minimum Enroute Altitude.

b) These approvals shall be limited to a maximum diversion time of 75 minutes.

3.2.2 **Demanding area of operations**

Each operator requesting approval to conduct extended range operations within demanding areas of operation shall have, prior to commencement of ER operations, an ETOPS approved airframe-engine combination and approved Operation and Maintenance systems which follow standards presented in this document. Furthermore, each operator shall satisfy the following minimum requirements:

1. <u>75 minute approval</u>

   i) Minimal or no inservice experience required;

ii) Approved CMP

2. 90 minute approval

i) 6 months of operating experience;
ii) Approved CMP

3. 120 minute approval

i) 12 months of operating experience;
ii) Approved CMP

4. 138 minute approval

i) 3 months of 120 minute ETOPS operating experience ;
ii) ETOPS type design approval configuration may be to the 120 minute criteria, but any specific limitations may not be exceeded.

5. Greater than 138 minute approval

i) 12 months of 120 minute ETOPS, or above, operating experience;
ii) ETOPS type design approval for the intended operation (e.g. 180 minute CMP if only 120 and 180 configurations are specified). Specific limitations to reflect operational approval (e.g. propulsion system reliability, cargo fire protection) not to be exceeded.

3.2.3 The initial inservice experience may be reduced in accordance with an Accelerated ETOPS Operational Approval (see Appendix C) in situations where an operator can successfully demonstrate its ability and competence to achieve the necessary reliability required for ETOPS operations.

3.2.4 The Department may require an increase in prerequisite inservice experience in cases where an abnormally low number of flights and/or ER segments have occurred.

3.3 Accelerated ETOPS Approval

3.3.1 The accelerated ETOPS Approval concept is based on a structured program of compensating factors and a step-by-step approach as outlined in Appendix C. This is the same philosophy as the technical transfer analysis used to accelerate the aircraft ETOPS Type Design Approval. The content of the appendix is applicable only in consideration of granting an Operational

Approval for an operator intending to operate an airframe/engine combination which has been awarded Type Design Approval including ETOPS.

3.4 Flight Preparation and In-Flight Considerations

3.4.1 General

The flight dispatch criteria specified herein are in addition to, or to amplify, the requirements contained in applicable operational rules and specifically apply to extended range operations. Although many of the criteria in this document are currently incorporated into approved programs for other aeroplanes or route structures, the nature of ETOPS necessitates that compliance with these criteria be re-examined in view of the operations to ensure that the approved programs are adequate for this purpose.

3.4.2 Minimum equipment list (MEL)

a) System redundancy levels appropriate to the intended extended range operations 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 extended range operation proposed and equipment and service problems unique to the operator. For aeroplanes already in operational service, the existing MEL shall be re-evaluated and adjusted appropriately to reflect system redundancy level requirements for ETOPS.

b) The ETOPS MEL criteria need not be applied for benign area ETOPS operational approval (75 min.).

c) For other ETOPS operations the operator MEL shall be based upon the information contained within the aircraft MMEL, ETOPS CMP document, and the TCA supplement.

Note: The MEL criteria defined for 120 minute operations is appropriate for ETOPS up to and including 138 minute approvals. The MEL criteria defined for 180 minute operations is appropriate for ETOPS greater than 138 minutes.

3.4.3 System failure action during flight

a) The carrier shall develop a list of items that are considered ETOPS sensitive. This list shall be published in an appropriate document (e.g. Quick Reference Handbook QRH) readily accessible to the flight crew. This list shall contain applicable CMP standards, limitations and procedures in addition to information stating requirements prior to entering

the ETOPS segment of the flight. Furthermore, this list should contain direction to the flight crew for their action if any of the specified items fail during any phase of flight.

b) This document shall give specific direction for action required for both ETOPS and non-ETOPS phases of flight, and shall include, but not limited to:

1. electrics;
2. hydraulics;
3. pneumatics;
4. auto pilot;
5. fuel;
6. ice protection;
7. navigation and communications;
8. auxiliary power unit;
9. air conditioning and pressurisation;
10. fire protection; and
11. enroute alternate weather limits.

c) The identified items and relevant procedures shall be acceptable to Transport Canada. A statement will be included to ensure that the Pilot in Command has the final authority in all phases of flight.

3.4.4 **Communication and navigation facilities**

An aeroplane shall not be dispatched on an ETOPS unless:

1. communication facilities are available to provide, under normal conditions of propagation at the normal one-engine inoperative cruise altitudes, reliable two-way communications between the aeroplane and the appropriate ground communication facility over the planned route of flight and the routes to any suitable alternate to be used in the event of diversion. It shall be shown that current weather information, adequate status monitoring information and crew procedures for all critical systems are available to enable the flight crew to make go/no go and diversion decisions;

2. non-visual ground aids are available and located so as to provide, taking account of the navigation equipment installed in the aeroplane, the navigation accuracy required over the planned route and altitude of flight, and the routes to any alternate and altitudes to be used in the event of an engine shutdown; and

3. visual and non-visual aids are available at the specified alternates as required for the authorized types of approaches and operating minima.

3.4.5 **Fuel and Oil Supply**

a) **General**

1. Unlike the area of operation which is determined in still air and ISA conditions, the fuel planning must consider the expected meterological conditions along the considered route. Prior to dispatching an aircraft on an ETOPS flight, the operator shall determine, for the considered route, both a standard and ETOPS fuel requirement. The fuel quantity required for dispatch is the greater of the two resulting fuel requirements.

2. An aeroplane shall not be dispatched on an ER operation unless it carries sufficient fuel and oil to meet regulatory requirements including additional contingency fuel reserves that may be determined in accordance with 3.4.5b) Critical fuel reserves). In computing fuel and oil requirements, at least the following shall be considered:

   i) current forecast winds and meteorological conditions along the expected flight path at one engine inoperative cruising altitude and throughout the approach and landing;

   ii) any requirement for operation of ice protection systems and performance loss due to ice accretion on the unprotected surfaces of the aeroplane;

   Note: Icing encounters shall be conservatively factored to account for the likelihood of an encounter, threat severity, encounter duration and anticipated flight crew action.

   iii) any required operation of auxiliary power unit (APU);

   iv) loss of aeroplane pressurization and air conditioning; consideration shall be given to flying at an altitude meeting oxygen requirements in the event of loss of pressurization;

   v) an approach followed by a missed approach and a subsequent approach and landing;

   vi) navigational accuracy required; and

   vii) any known Air Traffic Control (ATC) constraints.

   Note: APU oil consumption and servicing shall be considered in accordance with CMP document requirements.

b) **Critical fuel reserves**

In establishing the critical fuel reserves, the operator is to determine the fuel necessary to fly from the most critical point to a suitable alternate under the conditions outlined in 3.4.5c. These critical fuel reserves should be compared to the fuel that will be on board at the most critical point based on a departure with the normal fuel required by regulations for the proposed trip. If it is determined by this comparison that the fuel that would be on board at the most critical point is less that the critical fuel reserves, then additional fuel shall be loaded to ensure that the fuel on board at the most critical point is equal to or greater than the critical fuel reserves.

In consideration of the items listed in 3.4.5a), the critical fuel scenario shall allow for:

1. a contingency figure of 5 percent added to the calculated fuel burn from the critical point to allow for errors in wind forecasts and fuel mileage;

2. any Configuration Deviation List items;

3. both airframe and engine anti-icing;

4. ice accretion on unprotected surfaces if icing conditions are likely to be encountered during the diversion; and

5. any required operation of an auxiliary power unit and/or Ram Air Turbine (RAT).

c) Critical fuel scenario

1. Calculation of the critical fuel reserve requires the operator to determine the failure scenario that is the most operationally critical, considering time and aircraft configuration. Any failure or combination of failures not shown to be extremely improbable must be considered. The critical fuel reserve is the fuel required, taking into account the items listed in paragraph 3.4.5b:

   i) to proceed from the most critical point to a suitable alternate following the occurrence of the most operationally critical event (s), plus
   ii) upon reaching the suitable alternate, to descend to 1500 feet above destination, hold for 15 minutes, initiate an approach followed by a missed approach and then execute a normal approach and landing.

2. For example, if the critical scenario was determined to be the simultaneous failure of one propulsion system and the pressurization system, then the critical fuel reserves would be the fuel required to:

   i) at the most critical point, immediate descent to and continued cruise at 10000 feet at the approved single engine cruise speed (fuel consumption may be based on continued cruise above 10000 feet if the aircraft has sufficient supplemental oxygen in accordance with applicable regulations); and

   ii) upon reaching the suitable alternate, to descend to 1500 feet above destination, hold for 15 minutes, initiate an approach followed by a missed approach and then execute a normal approach and landing.

3.4.6 **Alternate Airports**

a) An aeroplane shall not be released on an extended range operation unless the required take-off, destination and alternate airports, including en route alternate airports to be used in the event of a system failure which requires a diversion, are listed in the operational flight plan, (e.g. on board computer flight plan).

b) Suitable en route alternates are also required to be identified and listed in the dispatch release for all cases where the planned route of flight contains a point more than 60 minutes flying time at the designated single engine cruise speed from an adequate airport. Since these en route alternates serve a different purpose than the destination airport and would normally be used only in the event of an engine failure or the loss of a primary airframe system, an airport may not be listed as an en route alternate unless:

   1. the landing distances required as specified in the Aircraft Flight Manual for the altitude of the airport, 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 airport authorities and computed in accordance with applicable regulations;

   2. the airport services and facilities are available and adequate for the operator's approved approach procedure(s) and operating minima for the runway expected to be used;

   3. the latest available forecast weather conditions for a period commencing one hour before the established earliest time of landing and ending one hour after the established latest time of landing at that airport, are equal to or exceed the authorized weather minima for en route alternate airports in appendix B; and

4. for the same period, the forecast crosswind component for the intended landing runway, including gusts, is less than the maximum permitted crosswind for a single engine landing. Where no demonstrated crosswind value exists, 80% of the all engine demonstrated value will be used.

5. during the course of the flight, the flight crews remain informed of any significant changes at designated en route alternates. Prior to proceeding beyond the extended range entry point, the forecast weather for the applicable time periods, aeroplane status, fuel remaining, runway surface conditions, landing distances, airport services and facilities shall be evaluated. If any conditions are identified which would preclude safe approach and landing then the pilot shall be notified and an acceptable alternate(s) selected where safe approach and landing can be made.

c) Once the flight has entered the extended range segment, if the forecast for the en route alternate is revised to below the designated limits, the flight may continue at the Captain's discretion.

d) In addition, the operator's program should provide flight crews with information on adequate airports appropriate to the route to be flown which are not forecast to meet Appendix B en route alternate weather minima. Airport facility information and other appropriate planning data concerning these airports should be provided to flight crews for use when executing a diversion.

Note: The alternate airports should be chosen in order to make it possible for the aeroplane to reach the alternate, especially with regard to performance (flight over obstacles) and/or oxygen requirements. A list of en route alternates and the en route alternate weather limits will be published in the air carrier's Operations Manual.

3.4.7 **Aeroplane Performance Data**

No aeroplane shall be released on an extended range flight unless the operator's Operations Manual contains sufficient data to support the critical fuel reserve and area of operations calculation. The following data shall be based on information provided or referenced in the TCA approved Aeroplane Flight Manual (AFM):

1. detailed single engine 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) driftdown (includes net performance);

ii) cruise altitude coverage including 10 000 feet;

iii) holding;

iv) altitude capability (includes net performance); and

v) missed approach.

2. 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:

i) cruise (altitude coverage including 10 000 feet); and

ii) holding.

3. details of any other conditions relevant to extended range operations which can cause significant deterioration of performance, such as ice accretion on the unprotected surfaces of the aeroplanes, Ram Air Turbine, thrust reverser deployment, etc.; and

4. the altitudes, airspeeds, thrust settings, and fuel flow used in establishing the ER area of operations for each airframe/engine combination must be used in showing the corresponding terrain and obstruction clearances in accordance with applicable regulations.

3.5 Flight Crew Training and Evaluation Program

3.5.1 The operator's training program in respect to extended range operations shall provide training for flight crew members followed by subsequent evaluations and proficiency checks as well as recurrent training in the following areas:

a) introduction to ETOPS regulations/ operational approvals;

b) routes and airports intended to be used in the ER area of operations;

c) performance:

1. flight planning, and plotting, including all contingencies;

2. flight performance progress monitoring; and

d) procedures:

1. diversion procedures and diversion "decision making". Special initial and recurrent training to prepare flight crews to evaluate probable propulsion and airframe failures should be conducted. The goal of this training should be to establish crew competency in dealing with the most probable operating contingencies;

2. use of appropriate navigation and communication systems including appropriate flight management devices;

3. flight crews should be provided with detailed initial and recurrent training that 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 equipment failures in flight that would precipitate go/no-go and diversion decisions. If standby sources of electrical power significantly degrade cockpit instrumentation, then approved training that simulates approaches with the standby generator as the sole power source should be conducted during initial and recurrent training;

   ii) operational restrictions associated with these failures including any applicable MEL considerations;

   iii) procedures for in-flight restart of the propulsion systems, including APU, if required; and

   iv) crew incapacitation.

4. use of emergency equipment including protective breathing and ditching equipment;

5. procedures to be followed in the event that there is a change in conditions at designated en route alternates that would preclude a safe approach and landing;

6. understanding and effective use of approved additional or modified equipment required for ETOPS;

7. fuel requirements and management:

   Flight crews shall be trained on the fuel requirements and management procedures to be followed during the en route portion of the flight. These procedures should provide for an independent cross-check of fuel quantity indicators. (e.g. fuel flows could be used to calculate fuel burned and compared to indicated fuel remaining.

8. dispatch considerations (MEL, CDL, weather minima, and flight crew performed maintenance service checks); and

9. flight crew documentation.

3.5.2 Operators shall standardize flight crew practices and procedures for ETOPS operations. Furthermore, only pilots with a demonstrated understanding of ETOPS operations shall be designated as training and/or check pilots for ETOPS operations.

3.6 Operational Limitations

3.6.1 **Areas of operation**

Following satisfactory compliance with these criteria, an operator may be authorized to conduct ETOPS with a particular airframe-engine combination within a particular area of operation. The area of operation will be limited by the maximum approved diversion time to an adequate airport at the approved single engine speed (standard conditions, still air) from any point along the proposed route of flight. The area of operation approved shall be specified in an Operations Specification.

3.6.2 **Flight dispatch limitation**

Flight dispatch limitation shall specify the maximum diversion time from a suitable airport for which an operator can conduct a particular ETOPS operation. The maximum diversion time at the approved single engine speed shall not be any greater than the value specified in the Operations Specification.

3.6.3 **Use of standard maximum diversion time**

The procedures established by the operator should ensure that extended range operation is limited to flight plan routes where the approved maximum diversion time to suitable airports can be met under standard conditions in still air. Operators shall ensure that:

1. Company procedures require that upon occurrence of an in-flight shutdown of an engine, the pilot shall, subject to *PIC's Authority*, promptly initiate diversion and fly to and land at the nearest suitable airport in terms of flying time, at which a safe landing can be made; and

2. A procedure shall be established such that in the event of a single or multiple critical system failure, the pilot shall, subject to *PIC's Authority*, initiate the diversion procedure and fly to and land at the nearest suitable airport, unless it can be

established that no substantial degradation of safety results from continuation of the planned flight.

3.6.4 **Pilot-in-command authority**

Contingency procedures or plans should not be interpreted in any way which prejudice the final authority and responsibility of the Pilot-In-Command for safe operation of the aeroplane

3.7 Operations Manual

3.7.1 An operator's Flight Operations manual/training manuals shall outline the training and standard operating procedures applicable to ETOPS operations in addition to, but not limited to, the following:

a) minimum altitudes to be flown along planned and diversionary routes as applicable;

b) airports authorized for use, including alternates and associated instrument approaches and operating minima; and

c) the information used in determining the critical fuel scenario.

3.8 Operations Specifications

3.8.1 An operator's aeroplanes shall not be operated on ETOPS operations unless the provisions of this document are complied with and the flight is authorized by an Operations Specification.

3.8.2 An Operations Specification for ETOPS operations shall specifically include provisions covering at least the following:

a) approved area of operation,(flights may be planned to operate through sectors outside of the delimiting arcs, provided the sector crossing is less than 30 miles); and

b) for each ETOPS approved airframe-engine combination, the maximum diversion time, at the designated single engine cruise speed, that any point on the route may be from a suitable airport for landing.