

Chapter 4

ETOPS Maintenance and Reliability Requirements

4.1 General

- 4.1.1 The maintenance program shall contain the standards, guidance and direction necessary to support the intended operation. Maintenance and personnel involved must be made aware of the special nature of ETOPS and have the knowledge, skills and ability to accomplish the requirements of the program.
- 4.1.2 The Regional Director of Airworthiness having jurisdiction over the Air Operator must assess the operator's maintenance program as being suitable to support the proposed ETOPS operation before the operational approval for ETOPS can be granted.

4.2 ETOPS Maintenance Program

- 4.2.1 The basic maintenance program for the aircraft being considered for ETOPS is the continuous airworthiness maintenance program currently approved for that operator, for the make and model airframe/engine combination. The maintenance program must be reviewed to ensure that it provides an adequate basis for development and inclusion of specific ETOPS maintenance requirements as defined in the CMP document for the airframe/engine combination. These include maintenance procedures to preclude identical action being applied to multiple similar elements in any ETOPS critical system (e.g. fuel control change on both engines).
- a) ETOPS related tasks must be identified on the operator's routine work forms and related instructions.
 - b) ETOPS related procedures, such as involvement of centralised maintenance control or technical dispatch, must be clearly defined in the operator's maintenance program.
 - c) An ETOPS service check must be developed to verify that the status of the aeroplane and certain critical items are acceptable. This check will be accomplished by an ETOPS qualified maintenance person prior to an ETOPS flight.

- d) Log books will be reviewed and documented, as appropriate, to ensure proper MEL procedures, deferred items and maintenance checks, and that system verification procedures have been properly performed.

4.3 ETOPS Manual

- 4.3.1 The operator shall develop a manual, or submit suitable amendments to existing manuals, for use by personnel involved in ETOPS. This manual need not include, but should at least reference, the maintenance program and other requirements described by this Chapter, and clearly indicate where they are located in the operator's manual system.
- 4.3.2 All ETOPS requirements, including supportive program procedures, duties and responsibilities, must be identified as being ETOPS sensitive and be subject to revision control. This manual should be submitted to Transport Canada for approval with sufficient lead time prior to the scheduled commencement of ETOPS flights

4.4 Oil Consumption Program

- 4.4.1 The operator's oil consumption program should reflect the manufacturer's recommendations and be sensitive to oil consumption trends. It should consider the amount of oil added at the departing ETOPS stations with reference to the running average consumption; i.e. the monitoring must be continuous up to, and including, oil added at the ETOPS departure station. If oil analysis is meaningful to this make and model, it should be included in the program. If the APU is required for ETOPS operation, it must be added to the oil consumption program.

4.5 Engine Condition Monitoring

- 4.5.1 This program will 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 is affected. The program must ensure that engine limit margins are maintained so that a prolonged single-engine diversion may be conducted without exceeding approved engine limits (i.e. rotor speeds, exhaust gas temperature) at all approved power levels and expected environmental conditions. Engine margins preserved through this program must also account for the effects of additional engine loading demands (e.g. anti-icing, electrical, etc.) which may be required during the single-engine flight phase associated with the diversion.

4.6 Verification Program after Maintenance

- 4.6.1 The operator will develop a verification program that includes procedures to ensure appropriate corrective action following an engine shutdown, primary system failure or adverse trend(s) for any prescribed event(s) which require a verification flight, or other action, and establish means to assure their accomplishment. A clear description of who must initiate verification actions and the section or group responsible for the determination of what action is necessary must be identified in the program. Primary systems or conditions requiring verification actions must be described in the operator's ETOPS manual.

4.7 Reliability Program

- 4.7.1 An ETOPS reliability program will be developed or the existing reliability program supplemented as applicable. This program should be designed with early identification and prevention of ETOPS related problems as the primary goal as well as ensuring that the minimum ETOPS reliability levels are maintained. The program should be event-oriented and incorporate reporting procedures for significant events detrimental to ETOPS flights. This information will be readily available for use by the operator and Transport Canada to help establish that the reliability level is adequate, and to assess the operator's competence and capability to safely continue ETOPS. An ETOPS reporting program will be established by the operator to ensure that Transport Canada is notified at least monthly, or more often if events reportable through this program are identified.
- 4.7.2 The operator must also ensure that procedures are established and implemented that will roll back the approved ETOPS diversion time should the engine in flight shutdown rate exceed the limits specified in Appendix A. The appropriate maintenance management level must be authorized to initiate roll back of the approved ETOPS diversion time.
- 4.7.3 Where reliability data indicates that the "target criteria" per Appendix A, Figure 1, is no longer being met, the operator must notify Transport Canada with corrective action measures. Where the "minimum criteria" is no longer being met, the operator must roll back the ETOPS diversion time to that specified in the appendix for the particular IFSD rate noted.
- 4.7.4 Failure for an operator to roll back the maximum diversion time when required will constitute grounds for removal of ETOPS authority.
- 4.7.5 In addition to the requirements of Chapter 591 of the Airworthiness Manual, the following items will be included in the reporting program:
- a) in-flight shutdowns or flameouts;
 - b) diversion or turnback;
 - c) uncommanded power changes or surges;
 - d) inability to control the engine or obtain desired power;

- e) problems with systems critical to ETOPS (engine bleed air, pressurization, electrical power, etc.).

4.7.6 The report will also identify the following:

- a) aircraft identification;
- b) engine identification (make and serial number);
- c) total time, cycles and time since last shop visit;
- d) for systems, time since overhaul or last inspection of the defective unit;
- e) phase of flight; and
- f) corrective action.

4.8 Contracted Maintenance and Reliability

4.8.1 Operators who contract any part of their maintenance and/or reliability programs, necessary to support their ETOPS approval, to any other organization, remain responsible for ensuring that all elements of this program are addressed and continue to meet the applicable requirements.

4.8.2 For those operators whose ETOPS approval is based on reliability levels established by other organizations, Transport Canada will not consider ETOPS approval beyond that issued to these organizations by their respective airworthiness authority.

4.9 Propulsion System Monitoring

4.9.1 The operator's assessment of propulsion systems reliability for the extended range fleet should be made available to Transport Canada (with supporting data) on at least a monthly basis, to ensure that the approved maintenance program continues to maintain a level of reliability necessary for extended range operation.

4.9.2 The assessment will include, as a minimum, engine hours flown in the period, in flight shut-down rate for all causes and engine removal rate, both on a 12 month moving average basis. Where the combined extended range fleet is part of a larger fleet of the same aircraft/engine combination, data from the operator's total fleet will be acceptable. However, the reporting requirements of paragraph 4.7 of this Chapter must still be observed for the extended range fleet.

4.9.3 Any adverse sustained trend would require an immediate evaluation to be accomplished by the operator in consultation with Transport Canada. The evaluation may result in corrective action or operational restrictions being applied.

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

4.10 Maintenance Training

4.10.1 Maintenance training will focus on the special nature of ETOPS. This training should be included as an integral part of the operator's maintenance training program. The goal of this element of the program is to ensure that all personnel who are assigned ETOPS responsibilities (including dispatch, parts control and any other ETOPS related area) are provided with the necessary training so that ETOPS maintenance tasks are properly accomplished. Qualified maintenance personnel are those that have completed the operator's extended range training program and have satisfactorily performed extended range tasks under supervision, within the framework of the operator's approved procedures for Personnel Authorization.

4.11 ETOPS Parts Control

4.11.1 The operator will develop a parts control program, with support from the manufacturer, that ensures that proper parts and configuration are maintained for ETOPS. The program includes verification that parts placed on ETOPS aircraft during parts borrowing or pooling arrangements, as well as those parts used after repair or overhaul, maintain the necessary ETOPS configuration for that aircraft.