



**CIVIL AVIATION AUTHORITY OF SRI LANKA**

# **EXTENDED DIVERSION TIME OPERATIONS**

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## FOREWORD

The reason to introduce this second Revision to Edition 01 (2017) of SLCAP 4525 is that based on the location of Sri Lanka, the Aviation industry has a vast potential available. The CAASL has done extensive studies by consulting the SARPs, ICAO & EASA documentation and based on these regulations and the technological advances which have enhanced aircraft reliability, Sri Lanka has decided to extend its EDTO Threshold. Whilst keeping Safety as the prime concern of the Authority, timely developments and decisions are vital for the growth of the industry. Therefore this new revision will grant our AOC holders the ability to utilize their compatible fleets to their fullest capability.

The purpose of this EDTO Manual is to provide guidance and interpretative material of the EDTO elements introduced through Implementing Standard 13 Section 7 – 7.1 & 7.2 (Amendment 36 in Annex 6 Part 1 Section 4.7 and Attachment D to Annex 6 Part 1.)


In short, the new EDTO standards:

- Allow longer EDTO operations for twins, based on propulsion reliability and overall operational safety of current ETOPS Twins. The related criteria have been evolved from the ETOPS standards previously existing in ICAO Annex 6.
- Introduce similar precaution to EDTO operations of aero planes with more than 2 engines, through few additional operational requirements (consideration of Time Limited System / policy for selection and monitoring of En-route alternates). There are no additional maintenance requirements for EDTO operations of aero planes with more than 2 engines, nor any additional certification requirements. It means that for EDTO with more than 2 engines, neither the basic Type Certification nor the maintenance program need to be reviewed as both remain valid for EDTO operations. Accordingly, this EDTO Manual details the standard, policy, procedures and guidelines for operations by transport category aero planes with turbine engines conducted beyond 60 minutes, from a point on a route to an En-route alternate aerodrome, and for obtaining Type Design and/or EDTO Operational Approval for these aero planes to operate farther than the applicable EDTO threshold time.

This EDTO Manual is intended to be used by:

- “Oversight Inspectors” from the CAASL, in the frame of granting EDTO operational approvals and exercising oversight of EDTO operations
- Concerned airline staff (from both Flight Operations and Maintenance/Engineering organizations), in the frame of getting ready for starting new or revised EDTO operations, or when assessing compliance of existing EDTO organization and procedures versus the new EDTO standards.

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#### Note concerning the use of the terms EDTO vs. ETOPS

It was ICAO decision, through Amendment 36, to replace the previously used term of ETOPS (for extended range operations by twin-engine aero planes) with the new term EDTO (for Extended Diversion Time Operations). The main reason of this change in the terminology was to better reflect the scope and applicability of these new standards. Nevertheless, this name change is not intended to mandate a similar name change in the concerned State regulations or aircraft documentation.

This is in line with the note introduced in EDTO standards of Annex 6, which clarifies that the term “ETOPS” may still be used instead of “EDTO” as long as the concepts are correctly embodied in the concerned regulation or documentation.

CAASL staff will adhere to the policy and procedures contained in this Handbook when authorizing EDTO operations. Because of the wide scope of operations involved and the many variables that can be encountered in aircraft equipment, it is impossible to anticipate all situations, therefore CAASL personnel must exercise common sense and good judgement in the application of these policies and procedures.


All personnel assigned by the CAASL to perform tasks that are addressed in this manual shall comply with these policies and procedures in the performance of their duties. All other relevant working documents relating to these specific tasks and responsibilities will also be considered. If there is any conflicting guidance, the employee should advise management in writing. It is a goal of the CAASL to provide guidance that empowers personnel to conduct their tasks in a standardized manner.




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01/06/2021


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## ABBREVIATIONS

ACARS	Airborne Communication Addressing and Reporting System
AEC	Aeroplane/Engine Combination
AFM	Aircraft Flight Manual
APU	Auxiliary Power Unit
ATC	Air Traffic Control
BECMG	Becoming (Weather)
CDL	Configuration Deviation List
CMPM	Configuration, Maintenance and Procedures Manual
CP	Critical Point
EEP	Extended Range Entry/Exit Point
ER	Extended Range
ETP	Equal Time Point
EXP	Extended Range Exit Point
HAT	Height above Threshold
HAA	Height above Airport
IFSD	In-flight Shut Down
IPC	Illustrated Parts Catalogue
MCTOW	Maximum Certified Take-off Weight
MEL	Minimum Equipment List
MMEL	Master Minimum Equipment List
PMI	Principal Maintenance Inspector
POI	Principal Operations Inspector
PROB	Probability (Weather)
PSRA	Propulsion System Reliability Assessment
RAT	Ram Air Turbine
STC	Supplemental Type Certificate
TC	Type Certificate
TEMPO	Temporary weather

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## DEFINITIONS

### **Airworthiness Inspector (AWI):**

Representative of the Civil Aviation Authority in charge of initial approval And/or continued oversight of the Operator's Maintenance and Engineering organization and processes. The assessment performed by the AWI may include (but may not be limited to):

- the adequacy of maintenance facilities, equipment and procedures
- the adequacy of the training programs and competence of employees
- the adequacy of the program or schedule for periodic maintenance and overhauls
- the airworthiness of the aircraft

### **Aircraft Flight Manual:**

The term Aircraft Flight Manual is defined in IS 015 and is used in lieu of the terms "Airplane Flight Manual" and/or "Approved Flight Manual".

### **Adequate Airport:**

For the purpose of ETOPS, an adequate airport means one at which the landing performance requirements at the expected landing weight can be met and which is expected to be available, if required, and which has the necessary facilities and services, such as air traffic services, lighting, communications, meteorological services, navigation aids, aeroplane rescue and fire-fighting services and at least one suitable instrument approach procedure which is usable by the aeroplane

### **Alternate aerodrome:**

An aerodrome to which an aircraft may proceed when it becomes either impossible or inadvisable to proceed to or to land at the aerodrome of intended landing where the necessary services and facilities are available, where aircraft performance requirements can be met and which is operational at the expected time of use. Alternate aerodromes include the following:

#### **Take-off alternate:**

An alternate aerodrome at which an aircraft would be able to land should this become necessary shortly after take-off and it is not possible to use the aerodrome of departure.

#### **En-route alternate:**

An alternate aerodrome at which an aircraft would be able to land in the event that a diversion becomes necessary while En route.

#### **Destination alternate:**


An alternate aerodrome at which an aircraft would be able to land should it become either impossible or inadvisable to land at the aerodrome of intended landing.

### **CAA:**

Civil Aviation Authority

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**Configuration, maintenance and procedures (CMP) standards:** A document containing the minimum requirements for the aircraft configuration including any special inspections, maintenance tasks, hardware life limits and Master Minimum Equipment List (MMEL) constraints necessary to establish and maintain the suitability of an airframe-engine combination for ETOPS operations

**DT:** Diversion Time

**EDTO:** Extended Diversion Time Operations

**EDTO alternate:**

An En-route alternate aerodrome that is designated in a dispatch or flight release for use in the event of a diversion during an EDTO flight, and which meets the applicable dispatch minima (weather and field conditions). This definition applies to flight planning and does not in any way limit the authority of the pilot-in-command during flight.

*Note. — En-route alternate aerodromes may also be the take-off and/or destination aerodromes.*

**EDTO - configuration, maintenance and procedures (CMP) document:**

The document approved by the Primary Certifying Authority and which contains the particular aeroplane configuration minimum requirements, including any special inspection, hardware life limits, master minimum equipment list (MMEL) constraints and maintenance practices found necessary to establish the suitability of an airframe-engine combination for extended diversion time operation.

**EDTO — configuration, maintenance and procedures (CMP) requirements:**

The particular aeroplane configuration minimum requirements including any special inspection, hardware life limits, master minimum equipment list (MMEL) constraints and Maintenance practices found necessary to establish the suitability of an airframe-engine combination for extended diversion time operation.

**EDTO critical fuel:**

The fuel quantity necessary to fly to an En-route alternate aerodrome considering, at the most critical point on the route, the most limiting system failure.

**EDTO-significant system:**

An aeroplane system whose failure or degradation could adversely affect the safety particular to an EDTO flight, or whose continued functioning is specifically important to the safe flight and landing of an aeroplane during an EDTO diversion.

**ETOPS:**


Extended Range Operations by aeroplanes with two Turbine Engines

**Extended diversion time operations (EDTO):**

Any operation by an aeroplane with two or more turbine engines where the diversion time to an En-route alternate aerodrome is greater than the threshold time established by the State of the Operator

**Flight Operations Inspector (FOI):**

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Representative of the Civil Aviation Authority in charge of initial approval and/or continued oversight of the Operator's Flight Operations organization and processes. The assessment performed by the FOI may include (but may not be limited to):

- the adequacy of flight operations facilities, equipment and procedures
- the adequacy of the training programs and competence of employees
- the adequacy of the program to ensure safe

#### **Mandatory Continuing Airworthiness Information (MCAI):**

The mandatory requirements for the modification, replacement of parts, or inspection of aircraft and amendment of operating limitations and procedures for the safe operation of the aircraft. Among such information is that issued by Contracting States in the form of airworthiness directives. (Definition from ICAO doc.9760 Airworthiness Manual)

#### **Maximum diversion time:**

Maximum allowable range, expressed in time, from a point on a route to an En-route alternate aerodrome. This will be specified for each Aircraft in its Operations Specification Certificate (See Chapter 2). It should be understood that the maximum diversion time approved in accordance with this SLCAP should take into consideration the most limiting EDTO *significant system time limitation*, if any, indicated in the aeroplane flight manual (directly or by reference) for a particular aeroplane type and the operator's operational and EDTO experience, if any, with the aeroplane type or, if relevant, with another aeroplane type or model. (See Chapter 4)

#### **MSN:**

Manufacturer Serial Number i.e. serial number of the concerned airplane.

#### **Threshold time:**


The range, expressed in time, established by the State of the Operator to an En-route alternate aerodrome, whereby any time beyond requires an EDTO approval from the State of the Operator. Threshold time is established in accordance with Chapter 4 and is not an operating limit. This will be specified for each Aircraft in its Operations Specification Certificate (See Chapter 2). It is a flight time to an en-route alternate aerodrome, which is established by the DGCA as being the EDTO threshold beyond which particular consideration should be given to the aeroplane capability as well as the operator's relevant operational experience, before granting an EDTO approval.

#### **ETOPS alternate airport:**

For the purpose of ETOPS, an ETOPS alternate airport means an adequate airport that is listed in the air operator's company operations manual and that meets the applicable requirements of Section 3.4.6 of this manual.

#### **Benign area of operation:**

An area that provides numerous adequate airports, a high level of reliability and availability of communication, navigation and ATC services and facilities, and where prevailing weather conditions are stable and generally do not approach extremes in temperature, wind, ceiling, and visibility. (The Caribbean Sea meets this criteria).

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### **Configuration, maintenance and procedures (CMP) standards:**

A document containing the minimum requirements for the aircraft configuration including any special inspections, maintenance tasks, hardware life limits and Master Minimum Equipment List (MMEL) constraints necessary to establish and maintain the suitability of an airframe-engine combination for ETOPS operations.

### **Critical point (CP):**

A “critical point” is the point along a route which is most critical from a fuel requirement point of view, from which an aeroplane can proceed toward the destination or initiate a diversion to another airport. (The CP is usually, but not always, the last ETP).

### **Demanding area of operation:**

An area that has one or more of the following characteristics:

1. Prevailing weather conditions can approach extremes in winds, temperature, ceiling, and visibility for prolonged period of time;
2. Few alternate airports;
3. Due to remote or overwater area, a high level of reliability and availability of communications, navigation, and ATC services may not exist

### **Engine:**

The basic engine assembly plus its essential accessories as supplied by the engine manufacturers

### **Engineering judgment:**

A subjective decision required due to the complexity of an issue based upon a qualitative analysis of relevant data.

### **Equal time point (ETP):**

An Equal Time Point is a point along the route which is located at the same flight time from two airports.

### **ETOPS significant system:**


ETOPS Significant Systems means the aeroplane propulsion system and any other aeroplane systems whose failure could adversely affect the safety of an ETOPS flight, or whose functioning is important to continued safe flight and landing during an aeroplane extended diversion

***Information Note: Each ETOPS significant system is either a Group 1 or Group 2 system***

#### **ETOPS Group 1 System:**

- (1) A system for which the fail-safe redundancy characteristics are directly linked to the number of engines;
- (2) A system that may affect the proper functioning of the engines to the extent that it could result in an in-flight shutdown or uncommanded loss of thrust;
- (3) A system which contributes significantly to the safety of an engine inoperative ETOPS diversion and is intended to provide additional redundancy to accommodate the system(s) lost by the inoperative engine. These include back-up systems such as an emergency generator or APU; or

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- (4) Any system essential to prolonged operation at engine inoperative altitudes including anti-icing systems for a twin engine aeroplane if single engine performance results in the aeroplane operating in the icing envelope.

### **ETOPS Group 2 System:**

Group 2 System is an ETOPS significant system that is not a Group 1 system

### **ETOPS operations:**

For the purpose of this document, ETOPS operations are those operations conducted with a twin-engine aeroplane over a specified route that contain a point further than 90 minutes flying time at the approved one-engine-inoperative cruise speed (under standard conditions in still air) from an adequate airport.

### **ETOPS area of operation:**

The area in which an air operator is authorized to conduct a flight under ETOPS regulations. It is defined by circles centered on the adequate airports, the radius of which is the allowed maximum diversion distance (maximum diversion distance equals approved maximum diversion time multiplied by the approved one-engine-inoperative cruise speed).

### **ETOPS entry point (EEP):**

The EEP is the first point on the aeroplane's outbound route beyond which the aeroplane is no longer continuously within 90 minutes flying time at the approved one-engine-inoperative cruise speed (under standard conditions in still air) from an adequate airport.

### **ETOPS exit point (EXP):**

The EXP is the first point on the aeroplane's inbound route where the aeroplane is continuously within 90 minutes flying time at the approved one-engine-inoperative cruise speed (under standard conditions in still air) from an adequate airport.

### **ETOPS segment:**

The ETOPS segment starts at the EEP and ends at the EXP.

### **ETOPS significant event:**

An ETOPS significant event is any system malfunction, degradation or other in-flight event, which requires that the crew make a decision whether to turn back, divert or to continue under an increased level of alertness.

### **Fail-safe:**

Fail-safe is the design methodology upon which Airworthiness Standards for Transport Category Aeroplanes are based. It requires that the effect of failures and combinations of failures to be considered in defining a safe design.


### **Fuel consumption monitoring program:**

Is a program established by the air operator to monitor the aeroplane's in-service deterioration in cruise fuel burn performance.

### **In-flight shutdown (IFSD):**

When an engine ceases to function in-flight and is shut down, for any reason (Ex: a flameout, internal failure, crew-initiated shut-off, foreign object ingestion, icing, etc.) or power reduction which results in an unacceptable thrust loss.

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### **Power plant:**

A system consisting of an engine and all ancillary components installed on the engine prior to installation on the aeroplane to provide and control power/thrust and for the extraction of energy.

### **Process:**

A process is a series of steps or activities that are accomplished, in a consistent manner, to assure that a desired result is attained on an ongoing basis.

### **Proven process:**

A process is considered to be proven when the following elements are developed and implemented:

- (1) Definition and documentation of process elements.
- (2) Definition of process related roles and responsibilities.
- (3) Procedure for validation of process or process elements:
  - (i) Indications of process stability/reliability;
  - (ii) Parameters to validate process and monitor (measure) success;
  - (iii) Duration of necessary evaluation to validate process.
- (4) Procedure for follow-up in-service monitoring to assure process remains Reliable/stable

### **Single engine cruise speed (or one-engine-inoperative cruise speed):**

1. The approved one-engine-inoperative cruise speed for the intended area of operation must be a speed, within the certified limits of the aeroplane, selected by the air operator and approved by Civil Aviation Authority, Sri Lanka (CAASL)
2. This speed must be used for:
  - i) Establishing the area of ETOPS operations and any dispatch limitations;
  - ii) Calculation of one-engine-inoperative fuel requirements under paragraph 3.4.5 (Fuel and Oil Supply) of this document; and
  - iii) Establishing the level off altitude (net performance) data. This level off altitude (net performance) must clear any obstacles En route by margins as specified in applicable operating rules.

### **System:**


A system includes all elements of equipment necessary for the control and performance of a particular major function. It includes both the equipment specifically provided for the function in question and other basic equipment such as that required to supply power for the equipment operation.

1. **Airframe System –**  
Any system on the aeroplane that is not a propulsion system.
2. **Propulsion System –**  
The aeroplane power plant installation including each component that: is necessary for propulsion, affects the control of the major propulsion units or affects the safety of the major propulsion units


### **Unacceptable thrust loss:**

Total thrust loss or loss of thrust to an extent that would preclude continued controlled flight with the affected engine to an adequate airport, should the other engine fail.

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# CHAPTER 1

## CHAPTER 1 – POLICY AND GENERAL INFORMATION

### 1.1 GENERAL

**1.1.1** This manual provides the standard, policy, procedures and guidelines for operations by aeroplanes with turbine engines conducted beyond 90 minutes, from a point on a route to an Enroute alternate aerodrome, and for obtaining Type Design and/or EDTO Operational Approval for:

1. Two- engine transport category aeroplanes to operate over a specified route containing a point farther than applicable threshold time at the approved one-engine-inoperative cruise speed (under standard conditions in still air) from an adequate aerodrome. The threshold is a point on the route beyond which the provisions of this publication apply. Specific criteria are included for diversion time of beyond 90mins for specific aircraft types and engine combinations on a case-by-case basis.

**2. State Threshold Time for Two-Engine aircraft not certified for EDTO: 60 minutes**

In establishing the EDTO threshold time for two-engine transport category the State should consider that the maximum diversion time capability of two-engine transport category aeroplanes not certified for EDTO is usually limited to 60 minutes. This limitation will be specified in the Operations Specification Certificate of each aircraft that does not meet the criteria set in this manual.

**3. State Threshold Time for EDTO Certified Aircraft: 90 minutes**

The CAASL recognises the minimum threshold time for such operations as 90mins provided that the manufacturer of the aircraft has certified an equal or higher diversion time. In any other case, where the manufacturer has specified a maximum approved diversion time less than 90mins, the applicable threshold time will be that time threshold set by the manufacturer. This will be specified in each Aircraft Operations Specifications Certificate which shall stipulate the applicable Threshold and Maximum Diversion Time.


Therefore for extension beyond 90 minutes as it may be required by an Operator, the following limits shall apply:

- the Maximum Approved Diversion Time (given by manufacturer) or,
- the time-limited system capability minus 15 minutes.

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.

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Consideration may be given to the approval of ETOPS up to 90 minutes for operators with minimal or no in-service experience with an airframe/engine combination which has already been certified by the manufacturer for endurance greater than 90 minutes.

This determination by the CAASL 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 programmes, and adherence to the manufacturer's maintenance schedules and procedures for EDTO certified airframe/engine combinations. If any of these are not satisfied, the airplane is limited to 60 minute Operations and can only extend beyond by further trial as set out in this manual.

Minimum Equipment List (MEL) restrictions for 120 minutes ETOPS should be used unless there are specific restrictions for 90 minutes or less.

***Note: Previously issued approvals for ETOPS programs continue to be valid; requests for new EDTO authorizations or changes to existing programs will be assessed under the criteria outlined in this manual.***

4. Transport category aeroplanes with more than two engines to operate over a specified route containing a point farther than applicable threshold time at the approved all-engine-operative cruise speed (under standard conditions in still air) from an adequate aerodrome. The threshold is a point on the route beyond which the provisions of this publication apply.

The threshold time for such operations has to be established by the State. In doing so, the State should consider the specificities (if any) of such operations. Considering that the vast majority of long range operations over the last 50 years have been conducted within 180 min maximum diversion time, and were not subject to any specific criteria, the threshold time for such EDTO operations should normally be set at 180 minutes. It is possible to select another threshold time value further to a thorough assessment of the impact of such value on existing operations and on the time limitations (if any) of transport category aeroplanes with more than two engines operated beyond the threshold time.

## 1.2 APPLICABILITY


- 1.2.1 This manual applies to transport category aeroplanes with two or more turbine engines where the diversion time to an Enroute alternate aerodrome is greater than 60 minutes and/or where the DGCA has recognized an aeroplane certified by the manufacturer for more than 90 minutes ETOPS and an Operator who is a Sri Lankan AOC holder who maintains such aeroplanes without degrading its ETOPS capability, whereby upon application the threshold time may be approved as 90 minutes by the DGCA.

## 1.3 REFERENCE REGULATIONS

- 1.3.1 This document is enabled by Annex 6 Part 1 Section 4.7 and Attachment C to Annex 6 Part 1. This document can also be used in conjunction with other guidance materials such as the Flight Planning and Fuel Monitoring Manual (FPFMM), the Airworthiness Manual

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(Doc 9760), ICAO Doc 8335 (Manual of Procedures for Operations Inspections, Certification and Continued Surveillance).

## **1.4 APPROVAL PROCEDURES**

### **1.4.1 Application for EDTO operational approval**

Requests for approval of EDTO operations with aeroplanes having two or more engine should be submitted by the EDTO candidate operator, with the necessary elements to the CAASL office. These elements are those necessary for the CAA to determine the applicable approval process (i.e. “In-service” or “Accelerated” EDTO operational approval – Refer to Subsection 1.4.2) and launch the assessment of the operator’s readiness for EDTO.

These necessary elements are typically:

- i. The targeted date of start of EDTO
- ii. The contemplated Maximum Diversion Time authority
- iii. The concerned airplane model and fleet (MSNs)
- iv. The intended EDTO route(s)

Other elements may be provided if deemed relevant by the EDTO candidate operator to support its application.

The request for approval of EDTO operations should be submitted as an advance notice, so that the Authority can plan and launch the necessary oversight actions.

The required duration of this advance notice prior to the proposed start of EDTO operations should be specified by the CAA. It should be typically:

- i. From 60 up to 90 days for In-Service EDTO operational approval
- ii. Up to 180 days for Accelerated EDTO operation approval.


The Appendix C of this manual provides typical workflows (one for “In-service” and one for “Accelerated” EDTO operational approval).

### **1.4.2 EDTO operation approval requirements – Aeroplanes with 2 turbine engines**

For operations with transport category aeroplanes with 2 turbine engines, the EDTO operational approval requires:

- i. Validation or acceptance by the operator’s CAA of the EDTO certification (also called EDTO Type Design and Reliability Approval) of the aeroplane granted by the Primary Certification Authority of the aircraft manufacturer. The Aeroplane type design should meet the requirements for EDTO design features and criteria specified in the Regulations unless another Standard is available.

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- ii. Conformity of the "candidate" aircraft (MSN), including APU and engines, to the applicable EDTO configuration requirements (listed in the EDTO CMP document)
- iii. To have a system to maintain and dispatch an EDTO aeroplane in accordance with an approved maintenance, reliability and training program that includes EDTO requirements specified in Chapter 4 (EDTO Maintenance and Reliability Requirements) of this manual;
- iv. Demonstration that the maintenance checks, servicing, and programs called for in Chapter 4 (EDTO Maintenance and Reliability Requirements) of this manual are properly conducted;
- v. Demonstration that the operational limitations, flight preparation and in-flight procedures called for in Chapter 3 (EDTO Flight Operations Requirements) of this manual are properly conducted;
- vi. Approval of the operator based on his application package: routes, desired diversion time, fleet, area of operations, planned date for the start of EDTO flights, experience records, manuals, training, etc...

The airframe-engine combination and the general scope of the operation will be reviewed by the Flight Operations Inspector (FOI) and the Airworthiness Inspector (AWI) to determine if there are any factors that could affect the safe conduct of operations before an Operations Specification (Ops Spec) is issued. The Operations Specification will clearly state the applicable Threshold (90 minutes or less) and the Maximum Diversion time allowed for each Aircraft (MSN specific).

To sum up, an operator who wants to operate EDTO flights with transport category aeroplanes with 2 turbine engines has to demonstrate that its aircraft is configured for EDTO and that its organization, means and processes comply with applicable EDTO regulation and, for transport category aeroplanes with two turbine engines only, the EDTO CMP requirements.

The complexity of this demonstration is basically linked to:

- i. The airline Operators ability to demonstrate that it has the capability of maintaining the airworthiness of a specific aircraft in conformity with its manufacturers certified EDTO maintenance schedule thereby proving to the CAASL that the Operator, the Aircraft (with current systems) and maintenance program is capable of operations beyond the basic 60 minute radius.
- ii. The contemplated degree of direct in-service experience reduction;
- iii. The type of contemplated EDTO operations (area of operations, frequency of EDTO flights, diversion time requested)

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There are two types of EDTO operational approval (i.e. approval of the operator): it can be either an “in-service” EDTO approval or an “accelerated” EDTO approval.

These approval methods are described hereafter, and related compliance demonstrations are detailed in this manual.

The specificity of an “accelerated” EDTO approval is that the operator has to build a program of process validation for the lack of direct experience (with EDTO and/or with the candidate aircraft).

This process validation may involve transfer of experience and use of proven processes, simulated EDTO flights, assistance from an operator with EDTO experience, assistance from the manufacturer, etc... The main objective of this program is the transfer of EDTO experience into the candidate operator's organization and operations. The required amount of process validation is directly linked to the airline's background and EDTO objectives.

#### **1.4.2.1 “In-service” EDTO approval for operations with transport category aeroplanes with two turbine engines**

An “in-service” EDTO approval is when the operator has accumulated over one year of direct in-service experience with the aircraft (in that case, the operator may apply for a diversion time of 120 min maximum), or when the operator has accumulated over one year of EDTO experience (at up to 120 minute Maximum Diversion Time) with the aircraft (in that case, the operator may apply for a diversion time of 180 min maximum).

The required amount of prior in-service experience listed above may be reduced (or increased) at the discretion of the CAA.

***Note: approval for EDTO operations beyond 180-min diversion time requires prior approval for 180-min EDTO operations. Approval for EDTO operations beyond 240-min diversion time requires a minimum of 2 years of experience with 180-min or higher EDTO operations.***


#### **1.4.2.2 “Accelerated” EDTO approval for operations with transport category aeroplanes with two turbine engines**

An “accelerated” EDTO approval is either when the operator plan to start EDTO with less than one year of direct in-service experience with the aircraft, or when the operator has accumulated direct in-service experience with the aircraft but plan to conduct EDTO beyond 120 minutes with less than one year of 120-min Diversion Time EDTO experience with the aircraft. The operator may apply for any diversion time up to 180 min, and may start EDTO at entry into service.

***Note: approval for EDTO operations beyond 180 min diversion time requires prior experience with 180 min EDTO operations.***

#### **1.4.3 EDTO operation approval requirements – Aeroplanes with more than 2 turbine engines**

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For operations with transport category aeroplanes with more than 2 turbine engines, the EDTO operational approval requires:

- i. The EDTO certification is not required for aeroplane with more than two engines. However, a review of the time capabilities of the relevant time limited systems should be performed, in order to adequately consider them during EDTO operations. On most airplanes with more than 2 engines, the only relevant time limited system is the cargo fire protection system.
- ii. Approval of the operator based on his application package: routes, desired diversion time, fleet, area of operations, planned date for the start of EDTO flights, experience records, manuals, training, etc...

The airframe-engine combination and the general scope of the operation will be reviewed by the Flight Operations Inspector (FOI) and the Airworthiness Inspector (AWI) to determine if there are any factors that could affect the safe conduct of operations before an Operations Specification (Ops Spec) is issued.

To sum up, an operator who wants to operate EDTO flights with transport category aeroplane with more than two turbine engines has to demonstrate that its organization, means and processes comply with applicable EDTO regulation and, for transport category aeroplanes with two turbine engines only, the EDTO CMP requirements. The complexity of this demonstration is basically linked to:


- i. The airline's experience with EDTO, with long-range operations, with the area of operation, with the aircraft, with the engines...
- ii. The contemplated degree of direct in-service experience reduction;
- iii. The type of contemplated EDTO operations (area of operations, frequency of EDTO flights, diversion time requested)

There are no specific categories for EDTO approval for operations with transport category aeroplanes with more than two turbine engines, i.e. there are no specific diversion time categories nor specific methods of approval.

**1.4.4** In addition, the following criteria should be met prior to conducting EDTO operations:

- a) Satisfy the operational approval considerations (Operational Approval Criteria) specified in Chapter 3 (EDTO Flight Operations Requirements) of this manual; and
- b) Demonstrate that EDTO flight release practices, policies, and procedures are established; and
- c) Conduct operational validation flight(s). Such validation flight(s) should be performed on proposed route(s) that the operator intends to operate, as detailed in its EDTO approval request. The intent of the validation flight is to ensure that the required EDTO flight operations and maintenance (as

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applicable) processes and procedures are capable of supporting those operations.

***Note: depending on the scope of EDTO operational approval (i.e. operator experience with the area of operations and aircraft model, contemplated diversion time ...) the validation flight in the aeroplane may be replaced by a flight on an approved simulator.***

When the foregoing has been reviewed and found acceptable, a recommendation from the Flight Operations Inspector (FOI) and the Airworthiness Inspector (AWI) will be forwarded to the responsible Manager, for approval and the applicant will be issued an Operations Specification to conduct EDTO operations within specified limitations.


## **1.5 CONTINUITY OF EDTO CERTIFICATION - Aeroplanes with two turbine engines (Not applicable to aeroplanes with more than 2 engines)**

- 1.5.1,** The EDTO certification is not granted forever: it is submitted to a continued surveillance by the Primary Certification Authority of the in-service reliability of the worldwide fleet of the concerned aircraft model/type.
- 1.5.2** The certified EDTO capability of the aircraft may therefore be reduced, suspended or even revoked if no solution exists to a major problem. This revisited EDTO capability should be reflected as applicable in relevant aircraft documentation.
- 1.5.3** Existing ETOPS certifications granted prior to the implementation of the new EDTO standards in the State regulations remain valid and do not require re-certification for EDTO. Refer to Chapter 2.2 (Airworthiness Consideration for aeroplanes with two turbine engines) for further information and guidelines on EDTO certification of aeroplanes with two turbine engines.

## **1.6 CONTINUITY OF EDTO OPERATIONAL APPROVAL**


- 1.6.1** The EDTO Operational Approval is not granted forever: it is submitted to a continued surveillance by the CAA of the operator of its in-service reliability (concerned EDTO fleet of aircraft).
- 1.6.2** The Operator's Procedures and training for EDTO are required to be maintained once EDTO approval is issued.
- 1.6.3** Subject to the Subsection 1.6.4, where an air operator ceases actual EDTO operations for a period exceeding a time determined by the CAA (e.g. 13 months), application for re-instatement should be submitted in accordance with section 1.4 of this document
- 1.6.4** Where an air operator cease actual EDTO operation for a period exceeding the time defined in Subsection 1.6.3 but maintains simulated EDTO processes, procedures and training as prescribed in this manual, the EDTO approval may be maintained until actual EDTO operation is resumed. However, when actual EDTO operation resumes following a period of actual EDTO inactivity that exceeds the time defined in Subsection 1.6.3, recurrent training should be completed by each flight crew member as per the requirements stipulated by the CAA and an EDTO recurrent training should be completed

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by each flight dispatcher and relevant Maintenance and Engineering staff as per those requirements.

- 1.6.5** Existing ETOPS operational approvals granted prior to the implementation of the new EDTO standards in the State regulations remain valid and do not require re-approval for EDTO.
- 1.6.6** For minor revisions to EDTO/ETOPS approvals, the approval exercise should be focused on the requested changes to the program. The intent is not to re-evaluate the entire approved program unless warranted by reliability or operational concerns.

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## CHAPTER 2

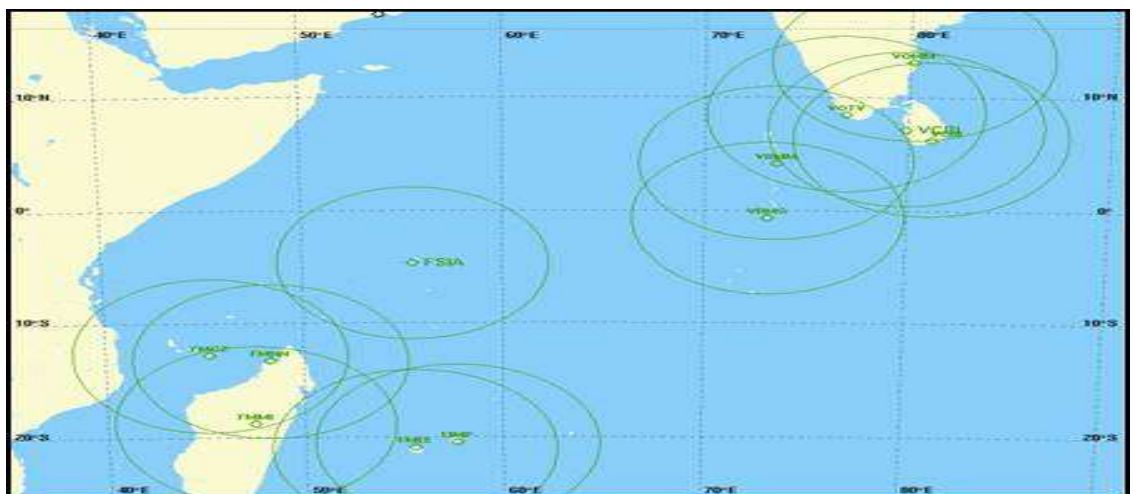
### CHAPTER 2 – AIRCRAFT AIRWORTHINESS CONSIDERATIONS FOR EDTO

#### 2.1 BACKGROUND


**2.1.1** In the context of this Manual, the term “Aircraft Airworthiness Considerations for EDTO” refers to the assessment for EDTO of the type design, reliability and maintenance program of the concerned aircraft model (i.e. a given airframe-engine combination) for EDTO beyond 60 minutes. The State of Sri Lanka recognizes the EDTO threshold as 90 minutes, however each aircraft must meet the airworthiness criteria for EDTO to operate up to the State Threshold and beyond. The aim of this assessment is to ensure that:

- The design features are suitable for the intended EDTO operations. Equipment required for EDTO should be properly identified.
- The reliability of relevant aircraft systems is suitable for the intended EDTO operations. Modifications to systems that may be necessary to achieve the desired level of reliability should be properly identified.
- The aircraft maintenance and reliability programme can contribute to maintain the desired level of reliability of relevant aircraft systems for EDTO. Special maintenance programme requirements for EDTO should be properly identified.

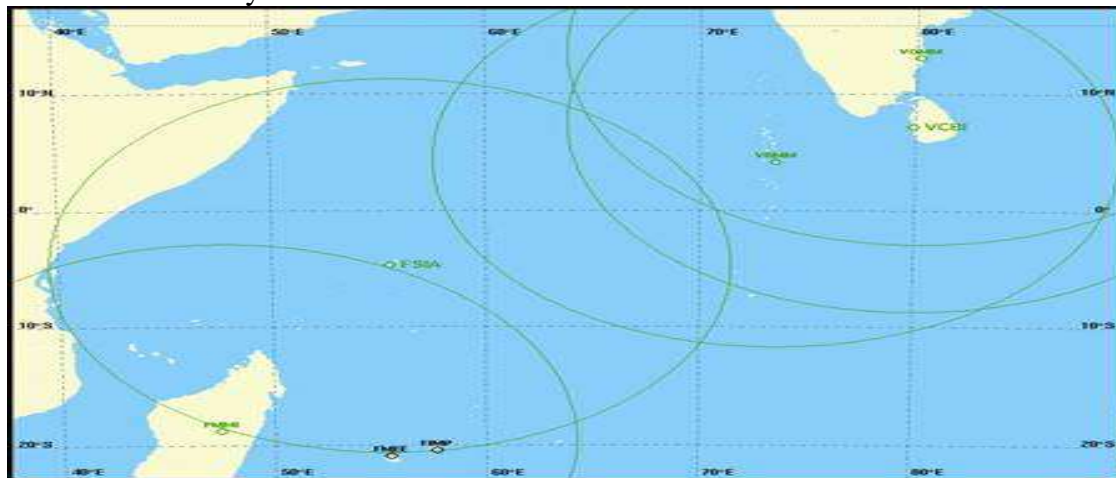
**2.1.2** When ETOPS was initially introduced in 1985, the intent was to ensure that the level of safety of operations on extended diversion time routes (i.e. routes beyond 60 min from an alternate aerodrome) with twin-engine aeroplanes was consistent with the level of safety achieved with aeroplanes with more than two engines operated on the same routes. This was achieved through the implementation of the initial ETOPS requirements, which addressed both the operational approval of the operator and the certification of the aeroplane.





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**2.1.3** **EDTO is an evolution of ETOPS** based on industry best practices and lessons learned from over 25 years of ETOPS operations. In consideration of the reliability demonstrated by several aircraft & engine combinations, states are now able to extend the EDTO Threshold beyond the earlier 60 minutes consideration.



**2.1.4** **The airworthiness considerations for aeroplanes with two turbine engines**, which include the identification of the time limitation of relevant time limited systems, are therefore an evolution of the ETOPS criteria introduced in 1985, and are further detailed in § 2.2 of this Manual.

**2.1.5** **The airworthiness considerations for aeroplanes with more than two turbine engines** were discussed during the development of the EDTO criteria. In this context, a review was performed of the reliability of operations on extended diversion time routes with aeroplanes with more than two engines, and it was concluded that both the basic Type Certification standard and maintenance program provided the required level of safety for EDTO, and remained suitable for EDTO operations.

Accordingly, the EDTO standards do not introduce additional maintenance requirements or any additional certification requirements for aeroplanes with more than two engines. It means that for EDTO with Tris/Quads, neither the need to be reviewed (i.e. both remain acceptable for EDTO operations).


Nevertheless, it was also concluded that a review of the time limitation of relevant time limited systems (if any) was necessary for aeroplanes with more than two engines engaged in EDTO. This specific airworthiness consideration for aeroplanes with more than two turbine engines is further detailed in § 2.3 of this Manual.

## **2.2 AIRWORTHINESS CONSIDERATIONS FOR AEROPLANES WITH TWO TURBINE ENGINES**

### **2.2.1 GENERAL**

**2.2.1.1** The EDTO certification of the aircraft has to be granted by the Primary Certification Authority of the aircraft manufacturer. This EDTO certification may also be called EDTO Type Design and Reliability approval of the aircraft.

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**2.2.1.2** The EDTO certification of the aircraft is a prerequisite to the start of EDTO operations (see Chapter 3 - EDTO Flight Operations Requirements). This EDTO certification has therefore to be validated or accepted by the CAA of the operator before the intended start of EDTO.

**2.2.1.3** The EDTO certification is always granted to a given airframe-engine combination. It is not granted indefinitely: it is submitted to a continued surveillance by the Primary Certification Authority of the in-service reliability of the worldwide fleet of the concerned airframe-engine combination.

**Note 1.** *ETOPS Certifications granted before issuance or implementation of the new EDTO criteria remain valid.*

**Note 2.** *The EDTO certification may be called ETOPS certification in some documents, as the term “ETOPS” may still be used instead of “EDTO” (see Foreword - Note concerning the use of the terms EDTO vs. ETOPS).*

**2.2.1.4** Annex 6, Part I, 4.7, provides for the basic requirements for the approval of EDTO operations. Attachment D of the Annex contains guidance on the setting of a threshold time, maximum diversion time and the means of achieving the required level of safety.

The Para 2.2.2 of this manual provides some further information on the EDTO certification requirements. Nevertheless, the EDTO certification criteria are detailed in Chapter 5 of ICAO Airworthiness Manual Doc 9760, which contains the airworthiness requirements for EDTO, and in particular the guidance on the continuing airworthiness and airworthiness approval for aeroplanes with two turbine engines (except § 5.2 which is dedicated to the considerations for aeroplanes with more than two turbine engines). They are therefore not repeated in this Manual.


**2.2.1.5** The certified EDTO capability of the aeroplane is reflected in the TCDS, the AFM (or AFM EDTO supplement, as applicable) and the EDTO CMP document.

**2.2.1.6** The EDTO certification of the aircraft granted by the Primary Certification Authority should then be validated or accepted by the CAA of the operator prior to intended start of EDTO operations by this operator.

## **2.2.2 THE EDTO CERTIFICATION OF AEROPLANES WITH TWO TURBINE ENGINES**

**2.2.2.1** The basic concept of the EDTO certification, as for the EDTO Operational approval, is to prevent the diversion to occur, and to protect the diversion should it occur. Accordingly, the main intent of the EDTO certification requirements is to:

- Introduce reliability objectives, to minimize the occurrence of failures that could lead to a diversion.
- Introduce design features to retain a high level of systems performance

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- 2.2.2.2** The EDTO certification of an aircraft is an assessment of compliance of the candidate aircraft with all the design provisions and reliability objectives of the applicable EDTO certification criteria (e.g.: EASA CS25.1535 or FAA 14CFR 25.1535, etc...).

A determination should be made that the design features for a new transport category type design aeroplane with two turbine engines intended to be used in EDTO are suitable for such operations. In the event that an existing aeroplane's operation is expanded to include EDTO operations, dedicated evaluation of some design features may be necessary.

Modifications to some systems may be required to achieve the desired reliability or system performance. In particular, the EDTO significant systems for the particular airframe engine combination should be shown to be designed to fail safe criteria and to have achieved a level of reliability suitable for the intended operation of the aeroplane (see §2.2.3 – EDTO Significant Systems).

### **2.2.2.3 EDTO CMP Document**

- 2.2.2.3.1** The EDTO certification is reflected by the issuance of an EDTO CMP (CMP stands for Configuration, Maintenance and Procedures) document. The EDTO CMP document gathers the required configuration, maintenance, procedures and dispatch standards. For EDTO operations, the aircraft should be configured, maintained and operated according to the EDTO CMP document requirements.

- 2.2.2.3.2** The EDTO CMP document is approved by the Primary Certification Authority. It is issued for the initial EDTO certification. It may be revised to reflect the conclusions of the in-service experience review (reliability surveillance performed by the Primary Certification Authority). Refer to §2.2.5 of this manual for further information on continuity of EDTO certification


- 2.2.2.4** Many airworthiness considerations for flight dispatch may already be incorporated into approved programmes for other aeroplanes or non-EDTO, the nature of EDTO necessitates a re-examination of these programmes to ensure that they are adequate for this purpose. System redundancy levels appropriate to EDTO should be reflected in the master minimum equipment list (MMEL). An air operator's MEL may be more restrictive than the MMEL considering the kind of EDTO proposed and equipment and service problems unique to the operator.

### **2.2.2.5 Aircraft maintenance program for EDTO**

- 2.2.2.5.1** In the frame of the EDTO certification, a review of the aircraft maintenance program should be performed to confirm that it adequately supports the targeted EDTO operations. This review should address the scheduled and unscheduled maintenance tasks, as well as the Pre-departure Service checks (pre-flight, transit, daily and weekly checks, as applicable).

- 2.2.2.5.2** The maintenance tasks related to EDTO should be identified, in order to clarify when a given task has to be performed and/or released by an EDTO qualified technician. These tasks should be related to the EDTO Significant Systems identified for the applicable

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airplane engine configuration (see Chapter 4 EDTO Maintenance and Reliability Requirements of this manual).

**2.2.2.5.3** The maintenance tasks related to EDTO are tasks impacting EDTO Significant System(s). In other words, tasks which are not impacting any EDTO significant system(s) should not be considered as EDTO related tasks.

**2.2.2.5.4** If needed, the EDTO related tasks may be further categorized as follows:

1. EDTO Specific task: It is any task that is uniquely required when the aircraft is operated on EDTO and identified in the associated CMP document.

These tasks may originate from either:

- o A specific aircraft configuration mandatory for EDTO, e.g. cargo fire protection system with increased protection time.
- o A specific constraint related to the EDTO mission profile, e.g. increased flight duration, maximum EDTO diversion time (up to 180 min, beyond 180 min, etc....).
- o A specific MMEL constraint for EDTO (e.g. SATCOM no-go for EDTO beyond 180 min)

These tasks and the related interval (defined through above relevant maintenance and/or safety analyses) should be listed in the EDTO CMP document.


The Operator should ensure that these tasks are revised in to their approved maintenance program and scheduled and performed in accordance with the applicable interval. In case of mixed EDTO/non-EDTO operations, compliance with the EDTO interval is required.

***Note 1. In the context above, “mixed EDTO/non-EDTO operations” is when the same aircraft (or fleet of aircraft) is continuously operated on both EDTO and non-EDTO flights.***

***Note 2. In case of “mixed EDTO/non-EDTO operations”, any tasks to be performed prior to an EDTO flight (e.g. tasks from the EDTO Pre-Departure Service Check) are not required to be performed before the non-EDTO flights.***

2. EDTO Relevant task: It is any task (other than EDTO specific task) impacting an EDTO Significant System and addressing:

- ☐ An EDTO significant functional failure; or
- ☐ A reliability constraint with system/component design and requiring a different interval than the one quoted in the basic (non EDTO) MPD for the task to support EDTO operations.

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These tasks may be identified as EDTO relevant task to restore and/or maintain the reliability levels required for EDTO. These tasks may be listed in the EDTO CMP document


**2.2.2.5.5** The Operator should ensure that dual maintenance (scheduled or unscheduled) on identical (or substantially similar) EDTO Significant Systems during the same maintenance visit is to be specifically managed by the operator approved EDTO/ETOPS program (see Chapter 4 (EDTO Maintenance and Reliability Requirements) of this manual).

This is to preclude common cause human failure modes.

**2.2.2.6** Upon satisfactory completion of an engineering type design review and test program, which may include Certification. Flight Test evaluation or other dedicated bench test and analyses, an EDTO certification (type design and reliability approval) is issued. The Aircraft Flight Manual (AFM) (or AFM EDTO supplement, as applicable), the EDTO CMP document and TCDS, or any other relevant manufacturer documentation or tools should contain the following pertinent information as applicable:

- a) Special limitations, including any limitations associated with operation of the aeroplane up to the maximum EDTO capability being approved;
- b) The airborne equipment, installation, and flight crew procedures required for EDTO operations;
- c) EDTO performance information including fuel consumption rates;
- d) Markings or placards;
- e) The maximum diversion time capability of the aeroplane for EDTO as well as the time capability of the Time Limited Systems i.e. the most limiting fire suppression system for Class C cargo or baggage compartments, and the most limiting EDTO significant system other than fire suppression systems (see Section 2.2.4 – Time Limited Systems).
- f) The following or similar statement: “The type design, reliability and performance of this airframe-engine combination has been evaluated in accordance with the “state applicable EDTO certification Criteria” and found suitable for “state maximum approved diversion time” EDTO operations when the configuration, maintenance, and procedures standards contained in the following CMP Documents are met.
  - LRE – EASA: AMC 20-6-C – ALK – 0010
  - SA – EASA: AMC 20-6-C – ALK – 0016
  - SA – EASA: AMC 20.6.C – MLA – 0011

The actual maximum approved diversion time for this airplane may be less based on its most limiting system time capability or other applicable limitation. . This finding does not constitute operational approval to conduct EDTO.”

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### 2.2.3 EDTO SIGNIFICANT SYSTEMS

An EDTO-significant system is a system whose failure or degradation could adversely affect the safety of an EDTO flight or whose continued functioning is important to the safe flight and landing of an aeroplane during an EDTO diversion. Such systems may include, but are not limited to:

- Electrical systems, including battery (if relevant);
- Hydraulics;
- Pneumatic systems;
- Flight instrumentation;
- Fuel systems;
- Flight controls;
- Ice protection systems;
- Engine start and ignition;
- Propulsion system instruments;
- Navigation and communications;
- Propulsion;
- Auxiliary power units;
- Air conditioning and pressurization;
- Cargo fire suppression;
- Engine fire protection;
- Emergency equipment; and
- Any other equipment required for EDTO.

EDTO/ETOPS Significant Systems are identified to support EDTO/ETOPS design standards as well as supporting maintenance and operational procedure approval.

Each EDTO significant system may be further classified into either a Group 1 or a Group 2 system as follows:


- o An EDTO significant system is classified in the Group 1 when its importance for EDTO relates to the number of engines of the airplane. Under this principle, this category contains the EDTO significant systems that are specifically more important for the safety of EDTO operations of two engine aircraft.
- o An EDTO significant system is classified in the Group 2 when its importance for EDTO is the same for two, three and four engine aircraft.

As explained above, the identification of EDTO Group 1 systems is done through the assessment of the consequence of an engine failure. Therefore these Group 1 systems are typically more relevant to twin-engine airplanes compared to four-engine airplanes.

Group 2 systems, which are typically common to two, three and four engine aircraft, are not concerned by these additional requirements related to reliability demonstration because it is considered that the basic type certification exercise adequately cover the need. Nevertheless, the consequence of the failure of such system would still require to be addressed in the frame of the reliability (and maturity) demonstration for EDTO, and any required corrective action could be mandated further to an assessment of the impact of the concerned system failure on the safety of the flight.

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This classification is only necessary for the aircraft manufacturer when conducting the EDTO reliability demonstration under the Early EDTO certification method, i.e. in the frame of aircraft certification activities, as additional requirements are applying to Group 1 systems. The objective of the Early EDTO demonstration is to validate the reliability of the airplane at entry into service, in accordance with the early EDTO certification process. This demonstration of reliability is required only for the EDTO Group 1 systems.

It is important to note that the Group 1 and Group 2 EDTO Significant Systems should be equally considered by the EDTO operator. In other words, this distinction is not needed in the frame of EDTO operations, and should not lead to a different consideration and treatment of Group 1 and Group 2 systems by the EDTO operator.

## 2.2.4 TIME LIMITED SYSTEMS

**2.2.4.1** As per the EDTO certification criteria, the time capability of the cargo fire suppression system (for Class C cargo or baggage compartments) and of the other most time limiting EDTO significant system must be demonstrated.

*Note 1. For airplanes with no time limited EDTO Significant System (other than the cargo fire suppression system), the value of "the other most limiting EDTO significant system" corresponds to the maximum diversion time assumptions taken in the safety analyses. In other words, there is not an identified system, and this limitation therefore applies to all systems other than the cargo fire protection system.*

*Note 2. The requirement to determine the time capability of "the other most limiting EDTO significant system" has been introduced by the new EDTO criteria. As explained in Section 2.2.1, the ETOPS Certifications granted before issuance or implementation of the new EDTO criteria remain valid. Therefore, for these ETOPS Certifications, the time capability of "the other most limiting EDTO significant system" is not provided, and it is considered to be no less than the approved ETOPS (or EDTO) maximum diversion time capability of the concerned aircraft.*


**2.2.4.2** The time capability of these Time Limited Systems (i.e. the most limiting fire suppression system and the most limiting EDTO significant system other than fire suppression systems) are introduced in the AFM (or AFM EDTO supplement, as applicable), the EDTO CMP document and TCDS, or in any other relevant manufacturer documentation or tools (see Section 2.2.2.4 – EDTO Certification of the aircraft).

**2.2.4.3** The time capability of these Time Limited Systems has to be adequately considered in the operational dispatch of the aircraft. Please refer to Chapter 3 (EDTO Flight Operations Requirements) for detailed guidelines on the consideration of the Time Limited Systems versus the maximum diversion time, for the dispatch of the aircraft on EDTO routes.

## 2.2.5 CONTINUED VALIDITY OF EDTO CERTIFICATION (AIRWORTHINESS MONITORING)

**2.2.5.1,** As explained in §1.5 (Continuity of EDTO Certification of aeroplanes with two turbine engines) of this Manual, the EDTO certification is not granted forever: it is submitted to

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a continued surveillance by the Primary Certification Authority of the in-service reliability of the worldwide fleet of the concerned aircraft model/type.

This reliability surveillance may result in changes to the EDTO standards for the airframe or engines (Service Bulletins, maintenance or procedures mandated to restore the reliability).

***Note: Existing ETOPS certifications granted prior to the implementation of the new EDTO standards in the State regulations remain valid and do not require re-certification for EDTO.***

**2.2.5.2** These Modifications/Service Bulletins, maintenance tasks or procedures necessary to restore the reliability may therefore be mandated through a new issue of the EDTO CMP document and/or dedicated Mandatory Continuing Airworthiness Information (MCAI)

**2.2.5.4** The certified EDTO capability of the aircraft may therefore be reduced, suspended or even revoked if no solution exists to a major problem. This revisited EDTO capability should be reflected as applicable in dedicated revision of the TCDS, Aircraft Flight Manual (AFM) (or AFM EDTO supplement, as applicable) and EDTO CMP document (and/or through dedicated Mandatory Continuing Airworthiness Information (MCAI)). EDTO operations of the concerned aircraft should not be performed beyond the revisited EDTO capability.

## **2.3 AIRWORTHINESS CONSIDERATIONS FOR AEROPLANES WITH MORE THAN TWO TURBINE ENGINES**

### **2.3.1 GENERAL**

**2.3.1.1** As explained in Section 2.1 of this manual, the EDTO certification is not required for aeroplane with more than two engines. It means that the configuration and maintenance standards defined through the basic Type Certification of an aeroplane with more than two engines are considered as adequate for EDTO operations.

**2.3.1.2** Nevertheless, a review of the time limited systems (if any) fitted on aeroplanes with more than two engines should be performed by the aircraft manufacturer. The objective of this review is to confirm whether these time limitations (if any) have to be considered for the dispatch of EDTO flights and corresponding time limitation (if any) should be provided in relevant aircraft documentation.


**2.3.1.3** As explained in Section 2.1.5 of this manual, there are no additional EDTO certification, maintenance procedures or maintenance programme requirements for aeroplanes with more than two engines.

***Note: Notwithstanding that ICAO Standards do not require EDTO certification for aeroplanes with more than two engines, a State may have implemented standards for EDTO (or ETOPS) certification of these aeroplanes. In this case:***

- a. Existing ETOPS certifications granted prior to the implementation of the new EDTO standards in the State regulations remain valid and do not require re-certification for EDTO.

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- b. The EDTO certification is reflected by the issuance of an EDTO CMP (CMP stands for Configuration, Maintenance and Procedures) document. The EDTO CMP document gathers the required configuration standards and maintenance tasks, and as applicable the flight crew procedures and dispatch standards. For EDTO operations, the aircraft should be configured, maintained and operated according to the EDTO CMP document requirements.
- c. The EDTO CMP document is approved by the Primary Certification Authority. It is issued for the initial EDTO certification. It may be revised to reflect the conclusions of the in-service experience review (reliability surveillance performed by the Primary Certification Authority) through the Airworthiness Directive process. Refer to Section 2.2.5 of this manual for further information on continuity of EDTO certification.


### 2.3.2 EDTO CERTIFICATION OF AEROPLANES WITH MORE THAN TWO TURBINE ENGINES

Not applicable.

As explained in Section 2.1.5 of this manual, there are no additional EDTO airworthiness certification, maintenance procedures or maintenance programme requirements for aeroplanes with more than two engines.

***Note: Notwithstanding that ICAO Standards do not require EDTO certification for aeroplanes with more than two engines, a State may have implemented standards for EDTO (or ETOPS) certification of these aeroplanes. In this case:***

- a. Existing ETOPS certifications granted prior to the implementation of the new EDTO standards in the State regulations remain valid and do not require re-certification for EDTO.
- b. The EDTO certification is reflected by the issuance of an EDTO CMP (CMP stands for Configuration, Maintenance and Procedures) document. The EDTO CMP document gathers the required configuration standards and maintenance tasks, and as applicable the flight crew procedures and dispatch standards. For EDTO operations, the aircraft should be configured, maintained and operated according to the EDTO CMP document requirements.
- c. The EDTO CMP document is approved by the Primary Certification Authority. It is issued for the initial EDTO certification. It may be revised to reflect the conclusions of the in-service experience review (reliability surveillance performed by the Primary Certification Authority) through the Airworthiness Directive process. Refer to Section 2.2.5 of this manual for further information on continuity of EDTO certification.

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### 2.3.3 EDTO SIGNIFICANT SYSTEMS

An EDTO-significant system is a system whose failure or degradation could adversely affect the safety of an EDTO flight or whose continued functioning is important to the safe flight and landing of an aeroplane during an EDTO diversion. Such systems may include, but are not limited to:

- electrical systems, including battery (if relevant);
- hydraulics;
- pneumatic systems;
- flight instrumentation;
- fuel systems;
- flight controls;
- ice protection systems;
- engine start and ignition;
- propulsion system instruments;
- navigation and communications;
- propulsion;
- auxiliary power units;
- air conditioning and pressurization;
- cargo fire suppression;
- engine fire protection;
- emergency equipment; and
- any other equipment required for EDTO.


EDTO/ETOPS Significant Systems are identified to support EDTO/ETOPS design standards as well as supporting maintenance and operational procedure approval.

Each EDTO significant system may be further classified into either a Group 1 or a Group 2 system as follows:

- o An EDTO significant system is classified in the Group 1 when its importance for EDTO relates to the number of engines of the airplane. Under this principle, this category contains the EDTO significant systems that are specifically more important for the safety of EDTO operations of two engine aircraft.
- o An EDTO significant system is classified in the Group 2 when its importance for EDTO is the same for two, three and four engine aircraft.

As explained above, the identification of EDTO Group 1 systems is done through the assessment of the consequence of an engine failure. Therefore these Group 1 systems are typically more relevant to twin-engine airplanes compared to four-engine airplanes.

Group 2 systems, which are typically common to two, three and four engine aircraft, are not concerned by these additional requirements related to reliability demonstration because it is considered that the basic type certification exercise adequately cover the need. Nevertheless, the consequence of the failure of such system would still require to be addressed in the frame of the reliability (and maturity) demonstration for EDTO, and

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any required corrective action could be mandated further to an assessment of the impact of the concerned system failure on the safety of the flight.

This classification is only necessary for the aircraft manufacturer when conducting the EDTO reliability demonstration under the early EDTO method, i.e. in the frame of aircraft certification activities, as additional requirements are applying to Group 1 systems. The objective of the early EDTO demonstration is to validate the reliability of the airplane at entry into service, in accordance with the early EDTO certification process. This demonstration of reliability is required only for the EDTO Group 1 systems.

It is important to note that the Group 1 and Group 2 EDTO Significant Systems should be equally considered by the EDTO operator. In other words, this distinction is not needed in the frame of EDTO operations, and should not lead to a different consideration and treatment of Group 1 and Group 2 systems by the EDTO operator.

As there are typically no additional EDTO airworthiness certification, maintenance procedures or maintenance programme requirements for aeroplanes with more than two engines, the consideration of the EDTO-significant system is necessary for the identification of the time capability of the most time limiting EDTO significant system (see Section 2.3.4 of this manual).


***Note: Notwithstanding that ICAO Standards do not require EDTO certification for aeroplanes with more than two engines, a State may have implemented standards for EDTO (or ETOPS) certification of these aeroplanes. In this case:***

- a. Existing ETOPS certifications granted prior to the implementation of the new EDTO standards in the State regulations remain valid and do not require re-certification for EDTO.
- b. The EDTO certification is reflected by the issuance of an EDTO CMP (CMP stands for Configuration, Maintenance and Procedures) document. The EDTO CMP document gathers the required configuration standards and maintenance tasks, and as applicable the flight crew procedures and dispatch standards. For EDTO operations, the aircraft should be configured, maintained and operated according to the EDTO CMP document requirements.
- c. The EDTO CMP document is approved by the Primary Certification Authority. It is issued for the initial EDTO certification. It may be revised to reflect the conclusions of the in-service experience review (reliability surveillance performed by the Primary Certification Authority) through the Airworthiness Directive process. Refer to §2.3.5 of this manual for further information on continuity of EDTO Certification

## 2.3.4 TIME LIMITED SYSTEMS

**2.3.4.1** As explained in §2.3.1 of this manual, the time capability of the most time limiting EDTO significant system must be identified. In most cases, this most time limiting EDTO significant system is the cargo fire suppression system (for Class C cargo or baggage compartments).

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**2.3.4.2** The time capability of this most time limiting EDTO significant system should be reflected in the relevant manufacturer documentation or tools.


**2.3.4.3** The time capability of this most time limiting EDTO significant system has to be adequately considered in the operational dispatch of the aircraft. Please refer to Chapter 3 (EDTO Flight Operations Requirements) for detailed guidelines on the consideration of this Time Limited System versus the maximum diversion time, for the dispatch of the aircraft on EDTO routes.

## **2.3.5 CONTINUED VALIDITY OF EDTO CERTIFICATION (AIRWORTHINESS MONITORING)**

As explained in §2.1.5 of this manual, there are typically no additional EDTO airworthiness certification, maintenance procedures or maintenance programme requirements for aeroplanes with more than two engines.


***Note: Notwithstanding that ICAO Standards do not require EDTO certification for aeroplanes with more than two engines, a State may have implemented standards for EDTO (or ETOPS) certification of these aeroplanes. In this case:***

- a. Existing ETOPS certifications granted prior to the implementation of the new EDTO standards in the State regulations remain valid and do not require re-certification for EDTO.
- b. The EDTO certification is reflected by the issuance of an EDTO CMP (CMP stands for Configuration, Maintenance and Procedures) document. The EDTO CMP document gathers the required configuration standards and maintenance tasks, and as applicable the flight crew procedures and dispatch standards. For EDTO operations, the aircraft should be configured, maintained and operated according to the EDTO CMP document requirements.
- c. The EDTO CMP document is approved by the Primary Certification Authority. It is issued for the initial EDTO certification. It may be revised to reflect the conclusions of the in-service experience review (reliability surveillance performed by the Primary Certification Authority) through the Airworthiness Directive process.

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## CHAPTER 3

### CHAPTER 3 – EDTO FLIGHT OPERATIONS REQUIREMENTS

#### 3.1 GENERAL

**3.1.1** As explained in Chapter 1.4 (Approval Procedures) of this Manual, in considering an application from an air operator to conduct EDTO operations, an assessment should be made of the air operator's overall safety record, past performance, flight crew training, flight dispatcher training, maintenance training and maintenance reliability programs. The data provided with the request should substantiate the air operator's ability to safely conduct and support these operations and should include the means used to satisfy the criteria outlined in this section and in Chapter 4 (EDTO Maintenance and Reliability Requirements) of this manual.

**3.1.2** As detailed in Chapter 1.1 (General) of this Manual, the Operator should obtain from its CAA an EDTO Operational approval before starting commercial operations of transport category aeroplanes over a specified route containing a point beyond the applicable EDTO threshold time.

***Note: Previously issued approvals for ETOPS programs continue to be valid; requests for new EDTO authorizations or changes to existing programs will be assessed under the criteria outlined in this manual.***

**3.1.3** The applicable EDTO threshold time has to be established by the State. It may not be the same for two-engine transport category aeroplanes and for transport category aeroplanes with more than two engines, as explained below:

**3.1.3.1** In establishing the EDTO threshold time for two-engine transport category the State should consider that the maximum diversion time capability of two-engine transport category aeroplanes not certified for EDTO is usually limited to 60 minutes.

Therefore the threshold time for such EDTO operations should normally be set at 60 minutes.


It is possible to select a greater threshold time value further to a thorough assessment of the impact of such value on non-EDTO operations of non-EDTO certified two-engine transport category aeroplanes.

**3.1.3.2** In establishing the EDTO threshold time for transport category aeroplanes with more than two engines the State should consider the specificities (if any) of such operations.

Considering that the vast majority of long range operations over the last 50 years have been conducted successfully within 180 min maximum diversion time, and were not subject to any specific criteria, the threshold time for such EDTO operations should normally be set at 180 minutes.

It is possible to select another threshold time value further to a thorough assessment of the impact of such value on existing operations and on the time limitations (if any) of

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transport category aeroplanes with more than two engines operated beyond the threshold time.

### **3.2 CONVERSION OF THRESHOLD AND MAXIMUM DIVERSION TIME INTO DISTANCE**

#### **3.2.1 GENERAL**

**3.2.1.1** In order to relate threshold and maximum diversion times to an area of geographic applicability, the time value of interest must be converted into an equivalent distance value which is typically expressed as a still-air (zero wind) range in nautical miles based on an assumed diversion speed schedule.

**3.2.1.2** This distance value is then used to construct diversion radius arcs around en-route alternate aerodromes to establish the non-EDTO and EDTO areas of operation.

**3.2.1.3** Guidance on performing the time-to-distance conversion is provided in Annex 6, Part I, Attachment C (Aeroplane Performance Operating Limitations). The conversion calculation itself is typically performed using aeroplane manufacturer data derived from operational documents and software tools or from basic aerodynamic speed relationships, as appropriate.

**3.2.1.4** It should be noted that the 60-minute (non-EDTO) and EDTO areas of operation are defined in international standard atmosphere (ISA) and still-air (zero wind) conditions. Therefore, actual diversion times may be higher than the diversion times used to establish the corresponding area of operation. This is expected and does not constitute an area of operation Exceedence as long as the planned route of flight remains within the applicable still-air range from an en-route alternate aerodrome.


**3.2.1.5** The basic concepts of still-air diversion distance and area of operation are common to two-engine aeroplanes and to aeroplanes with more than two engines; however, the assumed flight conditions under which these assessments are performed differ as described in the following sections. It should also be noted that the diversion speed/distance assessment is typically applied to a particular geographic area and AEC, and may vary for different fleets and regions. Also, the speed used to calculate the EDTO threshold distances for a particular operation may be different than the speed used to determine the EDTO maximum diversion distance.

#### **3.2.2 DETERMINING THE APPLICABLE THRESHOLD/DIVERSION DISTANCES (AEROPLANES WITH TWO ENGINES)**

**3.2.2.1** The time-to-distance conversion for two-engine aeroplanes is performed using an operator-selected one-engine-inoperative (OEI) speed which must be within the certified operational envelope of the candidate aeroplane. This calculation is by convention typically based on a still-air standard day thrust limited drift-down profile starting from normal cruise altitude at an assumed reference mass with maximum continuous thrust set on the remaining operating engine after the point of engine failure.

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- 3.2.2.2** The OEI speed schedule is normally represented as a Mach/IAS (indicated airspeed) combination with constant Mach targeted during the initial portion of the driftdown profile followed by constant IAS after the aeroplane passes through the Mach/IAS transition altitude as illustrated in Figure 3.2-1.
- 3.2.2.3** Operators applying for EDTO authorization should include justification for their selected OEI speed schedule and diversion distance calculation with their EDTO authorization application.
- 3.2.2.4** Typical justification would consist of supporting manufacturer data derived from operational documents and/or software tools. Additional justification may include relevant operator performance calculations and flight planning system implementation. The manufacturer's diversion distance information for operational planning and justification is found in the type specific manuals.
- 3.2.2.5** The time-to-distance conversion for two-engine aeroplanes is sometimes, but not normally, based on a constant true airspeed (TAS) assumption instead of the more typical Mach/IAS OEI speed schedule described above, due to local regulation variations or limitations in operator flight planning systems.
- 3.2.2.6** While the constant TAS method may have been used in some legacy EDTO programmes, industry standards have evolved to the more typical drift-down calculation based on Mach/IAS speed parameters which can actually be targeted by the flight crew. The relationship between time and distance is non-linear with this calculation approach due to the variation in altitude with time during the thrust limited drift-down portion of the engine failure profile.

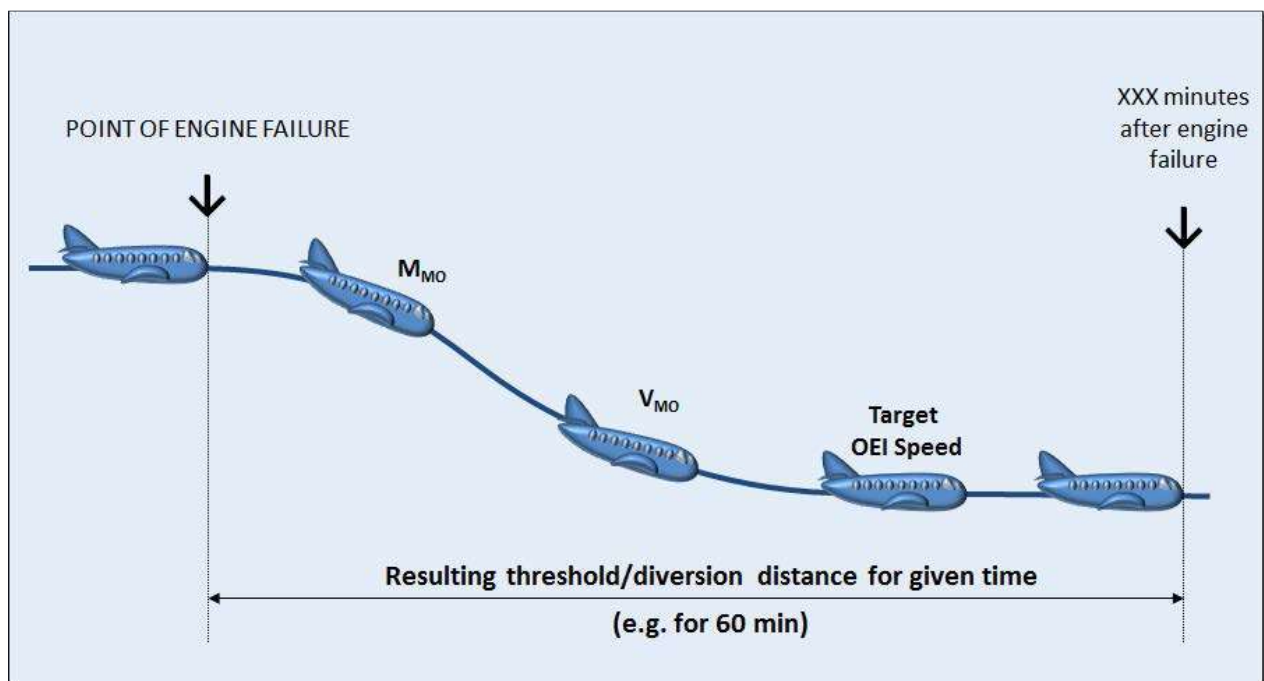



Figure 3.2-1. Drift-down profile example: Max OEI speed / Max continuous thrust (MCT)



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### 3.2.2.7 Sixty-Minute Threshold

The 60-minute threshold distance calculation is used to determine whether the Standards for two-engine aeroplanes set forth in Section 4.7.1 of Annex 6, Part I, are applicable. The calculation is normally based on a high engine inoperative speed up to the maximum permissible operating speed or Mach number (VMO/MMO) in order to maximize the 60-minute area of operation.

### 3.2.2.8 EDTO Threshold

The EDTO threshold distance calculation is used to determine whether the Standards set forth in Section 4.7.2 of Annex 6, Part I, are applicable. This calculation is also used to determine the EDTO entry and exit points in an EDTO operational area. Typically, the calculation is based on a 60-minute diversion time as in 3.2.2.7; however, a different time value may be used if a State has chosen to set its EDTO threshold time to something other than 60 minutes. In the case of Sri Lanka, this Threshold is 90 minutes.

*Note.— The EDTO threshold distance calculation will be common to the 60-minute threshold distance calculation for a given region and aeroplane type if a State has chosen to set 60 minutes as the EDTO threshold for two-engine aeroplanes. However, as in the case of Sri Lanka, this calculation will have to be done based on the 90 minute state threshold.*

### 3.2.2.9 EDTO Maximum Diversion Distance

**3.2.2.9.1** The EDTO maximum diversion distance calculation for two-engine aeroplanes is required if an operation has been determined to have a need to exceed the geographic area constraints defined by the EDTO threshold distance.


**3.2.2.9.2** The time-to-distance conversion is performed at the operator's approved or proposed OEI cruise speed and maximum EDTO diversion time for a particular aeroplane type (AEC) and operational area. This defines the maximum still-air radius that a flight can be from an en-route alternate aerodrome. These computations are typically performed considering a relatively high OEI speed to maximize the EDTO area of operations; however, other considerations such as diversion fuel requirements may dictate a lower speed selection. The selected EDTO OEI speed schedule also has implications on EDTO diversion fuel planning which is discussed in Section 3.5.3.

**3.2.2.9.3** For EDTO operations, the threshold and maximum diversion distance calculations should normally be based on the same OEI speed schedule.

## 3.2.3 DETERMINING THE APPLICABLE THRESHOLD/DIVERSION DISTANCES (AEROPLANES WITH MORE THAN TWO ENGINES)

**3.2.3.1** For aeroplanes with more than two engines, the speed used to convert the EDTO thresholds and EDTO maximum diversion times to corresponding diversion distance values is not an OEI speed as for two-engine aeroplanes, but rather an assumed all-engine cruise speed which is selected by the operator based on the performance characteristics of the particular AEC. As with two-engine aeroplanes, the selected

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speed must be within the aeroplane's certified operational flight envelope, and thus, must be less than or equal to the maximum operational speed (MMO and/or VMO) defined in the AFM or other relevant documentation or tool(s) from the aeroplane manufacturer.

**3.2.3.2** The selected all-engine cruise speed used to calculate the applicable distances for aeroplanes with more than two engines does not have any fuel planning implications, so typically the highest possible speed may be used to maximize the corresponding operational area. EDTO diversion fuel planning is discussed in Section 3.5.3.

**3.2.3.3** Further, the most favourable cruise altitude may be used in the calculation since altitude capability constraints are not a factor. For a given selected all-engine cruise speed and altitude, the time-to-distance relationship for aeroplanes with more than two engines is essentially a TAS conversion based on standard aerodynamic relationships and therefore the aeroplane/engine specific manufacturer diversion distance information is not required.

**3.2.3.4** Operators applying for EDTO authorization should include justification for their selected all-engine cruise speed with their EDTO authorization application. Typical justification would consist of supporting performance calculations and manufacturer data derived from operational documents or software tools. Additional justification may include details on flight planning system implementation.

***Note: Some national regulations may specify an OEI cruise speed as opposed to an all-engine cruise speed for establishing the applicable distances for aeroplanes with more than two engines. In this case, the time-to-distance conversion is comparable to the two-engine aeroplane methodology described in Section 3.2.2 except that the thrust limited altitude profile after the point of engine failure will typically be much higher than for a two-engine aeroplane.***

**3.2.3.5 Sixty-minute threshold**


The 60-minute threshold distance calculation is used to determine whether the Standards for aeroplanes with more than two engines set forth in Section 4.7.1 of Annex 6, Part I, are applicable. The calculation is normally based on a high all-engine cruise speed up to MMO/VMO in order to maximize the 60-minute area of operation.

**3.2.3.6 EDTO threshold**

The EDTO threshold distance calculation is used to determine whether the Standards set forth in Section 4.7.2 of Annex 6, Part I, are applicable. This calculation is also used to determine the EDTO entry and exit points in an EDTO operational area. Typically, the calculation is based on a 180-minute diversion time unless the individual State has elected to specify a different EDTO threshold time for aeroplanes with more than two engines.

**3.2.3.7 EDTO maximum diversion distance**

**3.2.3.7.1** The EDTO maximum diversion distance calculation for aeroplanes with more than two engines is required if an operation has been determined to have a need to exceed the geographic area constraints defined by the EDTO threshold distance (normally

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the distance associated with 180 minutes). The time-to-distance conversion is performed at the operator's approved or proposed all-engine cruise speed and maximum EDTO diversion time for a particular aeroplane type (AEC) and operational area, and defines the maximum still-air radius that a flight can be from an enroute alternate aerodrome. As with the 60-minute and EDTO threshold distance calculations, the highest available all-engine cruise speed and most favourable altitude are generally used for this calculation to maximize the operational area, although some operators may choose to use different speed and altitude assumptions.

- 3.2.3.7.2** For EDTO operations, the threshold and maximum diversion distance calculations should normally be based on the same AEO speed schedule.

### **3.3 OPERATIONS BEYOND 60 MINUTES**

- 3.3.1** Operations beyond 60 minutes from an en-route alternate aerodrome should incorporate the Standards set forth in Section 4.7.1 of Annex 6, Part I. These operations may involve an EDTO authorization, depending upon:


- a) the applicable EDTO threshold times that have been established by the State of the Operator; and
- b) the maximum diversion time used by the operator for the operations.

*Note: The EDTO Threshold for Sri Lanka is 90 Minutes or as specified (limited) for each Aircraft in its Operations Specifications Certificate.*

- 3.3.2** For two-engine aeroplanes, many States have established a 60-minute EDTO threshold, therefore operations beyond 60 minutes would also constitute an EDTO operation. For aeroplanes with more than two engines, EDTO diversion time thresholds established by States are typically much higher than 60 minutes (e.g. 180 minutes) and therefore an operation beyond 60 minutes would not involve EDTO authorization, unless that operation is conducted beyond the State established EDTO threshold time, which in the case of Sri Lanka is 90 minutes.

- 3.3.2.1** Regardless of whether EDTO is involved, all operations beyond 60 minutes from an en-route alternate aerodrome should incorporate suitable operational control and flight dispatch procedures, operating procedures and training programmes to support the operation. A specific approval is not required for these operations if they are not conducted beyond the applicable EDTO threshold; however, approved operating manuals and procedures should include the appropriate considerations as outlined in this section. Additional guidance on beyond 60-minute operations may also be found in Annex 6, Part I, Attachment C.

*Note.— The determination of whether an operation is beyond 60 minutes from an en-route alternate aerodrome is based on the time-to-distance conversion methodology outlined in Section 3.2.2 for two-engine aeroplanes and Section 3.2.3 for aeroplanes with more than two engines.*

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### 3.3.3 Approval levels — EDTO operations with two-engine aeroplanes

**3.3.3.1** The EDTO operational approval level granted to an applicant should be consistent with the operational need (route requirements), the aeroplane EDTO capability, relevant operational experience and robustness of the operator's EDTO programme compliance. All EDTO authorizations require the operator to implement supporting flight operations and maintenance programmes as discussed in this chapter and in Chapter 4, respectively. These programmes should address continuing airworthiness, release considerations including weather and MEL, flight planning, training, en-route alternate aerodromes and communication capability.

#### 3.3.3.1.1 Up to 90-minute authorization

EDTO authorizations up to 90 minutes are generally associated with benign operational areas where higher diversion times are not required to support direct routing. In this case, some relaxation in the operational programme requirements relative to higher EDTO times may be implemented in local regulations.

For instance, if the AEC does not have an EDTO certification for at least 90 minutes diversion time, the aircraft design features and reliability should be assessed versus the relevant EDTO design requirements. This assessment should confirm the suitability of the aircraft for such operations without requiring a formal EDTO certification.

Consideration may be given to the authorization of EDTO up to 90 minutes for operators with minimal or no in-service experience with the AEC. 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 programmes.

***Minimum equipment list (MEL) restrictions for 120 minutes EDTO should be used if available, unless there are specific restrictions for 90 minutes or less.***

#### 3.3.3.1.1.1 Beyond 90-minute and up to 180-minute authorization


EDTO authorizations up to 180 minutes support most EDTO operational areas and reflect the vast majority of worldwide EDTO operations. It may therefore be expected that the vast majority of operator approval applications will fall into this category.

The AEC must be approved for EDTO in the type certification up to at least the maximum diversion time being requested (e.g. 120, 180 minutes). The operator must comply with the MEL requirements appropriate to the approved maximum diversion time (e.g. 120 minute EDTO and beyond). The operator's MEL cannot be less restrictive than the MMEL appropriate to the approved maximum diversion time.

#### 3.3.3.1.2 For 120 minute approval

- i) A minimum of 6 months of EDTO operating experience with the aeroplane-engine combination for which approval is requested;

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- ii) An EDTO type design approved for a minimum 120 minutes EDTO criteria;
- iii) An approved CMP; and
- iv) A Minimum Equipment List requirement for 120 minutes “ER”.

#### **3.3.3.1.3. For 138 minute approval**

- a) Extension of EDTO 120 minute approval;
  - i) A minimum of 3 months of 120 minute EDTO operating experience with the aeroplane-engine combination for which approval is requested;
  - ii) Approved on a case by case basis;
  - iii) An EDTO type design approved for a minimum 120 minute EDTO criteria;
  - iv) An approved CMP;
  - v) An aeroplane time limited system capability not be less than the authorized 138 minute diversion time in still air conditions at the approved one engine inoperative cruise speed plus 15 minutes to allow for a hold, an approach and a landing;
  - vi) A Minimum Equipment List requirement modified to satisfy the MMEL policy for system component/relief for EDTO operation beyond 120 minutes; and
  - vii) Flight crew, flight dispatcher and maintenance personnel training provided to address the differences between 120 minute and 138 minute approval.
- b) Use of 180 minutes EDTO approval;
  - i) A minimum of 3 months of 120 minute EDTO operating experience with the aeroplane-engine combination for which approval is requested;
  - ii) Exercised on an unlimited basis;
  - iii) An EDTO type design approved for a minimum 180 minutes EDTO criteria;
  - iv) An approved CMP;
  - v) A Minimum Equipment List requirement beyond 120 minutes “ER”; and
  - vi) Flight crew, flight dispatcher and maintenance personnel training provided to address the differences between 138 minute and the 180 minute approval.


#### **3.3.3.1.4. For 180 minute approval**

- i) A minimum of 12 months of 120 minute EDTO operating experience with the aeroplane-engine combination for which approval is requested;
- ii) An EDTO type design approved for a minimum 180 minute EDTO criteria;
- iii) An approved CMP; and
- iv) A Minimum Equipment List requirement beyond 120 minutes “ER”.

#### **3.3.3.1.5. For greater than 180 minutes approval**

- i) Hold a current 180 minutes EDTO approval with the aeroplane-engine combination for which approval is requested;
- ii) During flight planning, attempt to minimize the potential diversion time along the preferred track and plan the EDTO flight at a maximum diversion distance of 180 minutes of less;

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- iii) If conditions prevent the use of adequate aerodromes within 180 minutes, as EDTO alternates, the route may be flown beyond 180 minutes subject the requirements of the applicable specific area of operation specified in this Section;
- iv) The airframe-engine combination reviewed as per Chapter 2 of this manual to determine if they are any factors which would affect the safe conduct of the flight to be operated; and
- v) A Minimum Equipment List requirement for 180 minutes, including the following systems operational for dispatch;
  - A) Fuel Quantity Indicating System (FQIS);
  - B) APU Including electrical and pneumatic supply to its design capability;
  - C) Auto throttle system;
  - D) The communication system required by Subsection 3.4.4 of this manual; and
  - E) One engine inoperative auto land capability (if flight planning is predicted on its use)

### **For specific area of operations beyond 180 minute approval**

For flights operating in the North Pacific area, which for the purpose of this manual, is defined as the area covering the Pacific Ocean areas north of 40°N latitudes including NOPAC ATS routes and published PACOT track system between Japan and North America;


- i) To be operated only a case by case basis based on criteria set in the air operator's company operation manual when an EDTO alternate aerodrome is not available within 180 minutes in the North Pacific Area of operation;
- ii) The nearest available EDTO alternate aerodrome should be specified within 207 minutes maximum diversion time;
- iii) Air Traffic Services preferred tracking, if available, should be given first consideration;
- iv) Application of this approval should be limited to circumstances such as political or military concern, volcanic activity, aerodrome weather below dispatch requirements, temporary aerodrome condition and other weather related events;
- v) EDTO type design should be approved for a minimum 180 minutes EDTO criteria;
- vi) Approved CMP; and
- vii) The time required to fly the distance to the planned EDTO alternate or the alternate, at the approved one engine inoperative cruise speed, in still air and standard day temperature, should not exceed the time specified in the Airplane Flight Manual for the airplane's most time limiting system time minus 15 minutes.

#### **3.3.3.1.6 For 240 minutes approval**

- i) EDTO type design should be approved for minimum 240 minutes EDTO criteria;
- ii) Approved CMP;
- iii) Applicable to EDTO operation with a maximum diversion time of 240 minutes on routes in the Pacific oceanic areas between the Canadian and United States west coast

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and Australia, New Zealand and Polynesia; South Atlantic oceanic areas; Indian Oceanic areas; oceanic areas between Australia and South America; and

- iv) Nearest available EDTO alternates aerodromes along the planned route of flight should be designated.

### **3.3.3.1.7 For greater than 240 minutes approval**

- i) Minimum of 24 consecutive months of 180 minute EDTO operating experience of which at least 12 consecutive month has been operated at 240 minutes on the airframe-engine combination for which the approval is requested;
- ii) Specific to operation between specific city pairs on routes in the Pacific Oceanic areas between the west coast of North America, Australia, New Zealand and Polynesia; South Atlantic oceanic areas; Indian Oceanic areas; oceanic areas between Australia and South America and South Pole areas;
- iii) Nearest available EDTO alternates aerodromes along the planned route of flight should be designated;
- iv) EDTO type design should be approved for beyond 240 minutes EDTO criteria; and
- v) Approved CMP

**3.3.3.2** The initial in-service experience may be reduced in accordance with an Accelerated EDTO Operational Approval (see Appendix C of this manual) in situations where an air operator can successfully demonstrate its ability and competence to achieve the necessary reliability required for EDTO operations.

### **3.3.3.4 ACCELERATED EDTO APPROVAL**

**3.3.3.4.1** The accelerated EDTO Approval concept is based on a structured program of compensating factors and a step-by-step approach as outlined in Appendix C of this manual. This is the same philosophy as the technical transfer analysis used to accelerate the aeroplane EDTO Type Design Approval.


**3.3.3.4.2.** The program is intended for an air operator to be able to demonstrate that the EDTO process specified in Appendix C, Section 2.1 applicable to a specific airframe-engine combination, can be proven prior to actually operating under a specific EDTO approval. The content of Appendix C is applicable only in consideration of granting an Operational Approval for an air operator intending to operate an airframe-engine combination, which has been awarded Type Design Approval including EDTO.

## **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 EDTO operations. Although many of the criteria in this document are currently incorporated into approved programs for other aeroplanes or route structures, the nature of EDTO

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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.

### **3.4.1.1 TIME LIMITED SYSTEM PLANNING**

- a) For an EDTO flight operating up to and including 180 minutes, the time required to fly the distance to the planned EDTO alternate or alternates, at the approved one engine inoperative cruise speed in still air and standard day temperature, should not exceed the time specified in the Aircraft Flight Manual for the airplanes most time limited system time minus 15 minutes;
- b) Except for the condition set out in Subparagraph 3.4.1.1.c), for an EDTO flight operating beyond 180 minutes, the time required to fly the distance to the planned EDTO alternate or alternates, at all engine operating cruise speed correcting for wind and temperature, should not exceed the time specified in the Aircraft Flight Manual for the airplane's cargo fire suppression system minus 15 minutes; or
- c) Except for the condition set out in Subparagraph 3.4.1.1.b), for an EDTO flight operating beyond 180 minutes, the time required to fly the distance to the planned EDTO alternate or alternates, at the approved one engine inoperative cruise speed correcting for wind and temperature, should not exceed the time specified in the Aircraft Flight Manual for the airplanes most time limited system time (except for cargo fire suppression) minus 15 minutes;

### **3.4.2 MINIMUM EQUIPMENT LIST (MEL)**


- a) The specific EDTO MEL criteria need not be applied for EDTO operational approval in Benign Area of Operation (75 min.). For all EDTO operations, the MEL should be based on the information contained within the aeroplane MMEL, the Type Certificate (TC) Supplement and the CMP document;
- b) System redundancy levels appropriate to the intended EDTO Operations should be reflected in the Master Minimum Equipment List (MMEL) and/or TC Supplement. An air operator's MEL may be more restrictive than the MMEL considering the kind of EDTO Operation being considered, and equipment and service problems unique to the air operator. For aeroplanes already in operational service, the existing MEL should be re-evaluated and adjusted to reflect system redundancy level requirements for EDTO; and
- c) For the purpose of EDTO, a flight is deemed to be "Dispatched" from the moment the airplane starts its takeoff roll (Ref TP 9155 Section 3.15). It is only from this point that the Minimum Equipment List requirements do not apply.

### **3.4.3 EDTO SIGNIFICANT EVENT DURING FLIGHT**

- a) A list of systems that are considered EDTO significant systems to the type and/or area of operation may be developed. If developed, it should be published in an appropriate document readily accessible to the flight crew, flight dispatchers and maintenance personnel. This list should contain applicable CMP standards,

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limitations and procedures in addition to information stating requirements and also reflect the type certificate holder's recommendations for any segments of the flight;


- b) This document should, based on available options at the time of the failure, give specific direction, for action required during any phases of flight. It is not intended to mandate MEL requirements for in-flight system failures, but to enhance the guidance to be provided to the flight crew after the completion of the applicable check list(s) (i.e. QRH, ECAM, ICAS, etc....) This list should consider all ATA Chapters. For items fully addressed by the check list (i.e. QRH, ECAM, ICAS, etc....) the list should contain a statement to that effect;
- c) In the occurrence of any EDTO significant event in-flight prior to the EDTO entry point, all available means of communication should be used by the flight crew to ensure assistance from the flight dispatcher to update and/or revise, if applicable, the flight plan as a result of re-evaluating the aeroplane's system capability to ensure that the flight can safely continue into the EDTO area of operation; and
- d) A statement should 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 should not be dispatched on an EDTO flight unless the requirements of the applicable regulations of the appropriate Subpart of the CARs have been met, and:

- 1) For all EDTO operations where voice communication facilities are available, voice communication should be provided. While planning an EDTO flight, an air operator should consider potential route and altitudes necessary for diversion to EDTO alternate aerodromes in determining whether voice communications facilities are available. Where voice communication facilities are not available or is of poor quality and voice communication is not possible, communications using alternative system should be substituted;
- 2) For EDTO operation beyond 180 minutes, the aeroplane should be equipped with an additional communication system that is capable of providing immediate satellite based voice communication (SATCOM). The system should provide communication capability between the flight crew and air traffic control and the flight crew and the air operator's operational control center. While planning an EDTO flight beyond 180 minutes, an air operator should consider potential route and altitudes necessary for diversion to EDTO alternate aerodromes in determining whether immediate, satellite based voice communications are available. Where immediate, satellite based voice communications are not available or are of poor quality, communications using alternative system should be substituted;
- 3) 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

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EDTO alternate aerodrome to be used in the event of diversion. It should be shown that current weather information, adequate status monitoring information and crew procedures for all aeroplane and ground facilities' critical systems are available to enable the flight crew to make go/no-go and diversion decisions;


- 4) 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;
- 5) Visual and non-visual aids are available at the specified EDTO alternate aerodromes as required for the authorized types of approaches and operating minima; and
- 6) Flights that are planned to be operated in an area of known or expected area of solar flare activity, cosmic radiation or radio blackout, that may affect the operation of the aeroplane should be planned to avoid these areas based on criteria established in the air operator's company operation manual.

### 3.4.5 FUEL AND OIL SUPPLY

#### a) General

- 1) Unlike the area of operation, which is determined under standard conditions in still air, the fuel planning should consider the expected meteorological conditions along the planned route. Prior to dispatching an aeroplane on an EDTO flight, both a standard and EDTO fuel requirement, for the planned route, should be determined. The fuel quantity required for dispatch is the greater of the two resulting fuel requirements.
- 2) An aeroplane should not be dispatched on an EDTO flight unless it carries sufficient fuel and oil to meet regulatory requirements of trip fuel and alternate fuel including additional contingency fuel reserves that may be determined in accordance with Paragraph 3.4.5 b) (Critical fuel reserves). In computing fuel and oil requirements, at least the following should 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;
  - iii) Icing encounters should be conservatively factored to account for the likelihood of an encounter, threat severity, encounter duration and anticipated flight crew action;
  - iv) Any required operation of auxiliary power unit (APU);
  - v) Loss of aeroplane pressurization and air conditioning, with consideration should be given to flying at an altitude meeting oxygen requirements in the event of loss of pressurization;

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- vi) Upon reaching any of the EDTO alternate aerodromes, holding at 1500 feet above field elevation for 15 minutes and then initiating an instrument approach and landing;
- vii) Navigational accuracy required;
- viii) Any known Air Traffic Control (ATC) constraints; and
- ix) APU oil consumption and servicing should be considered in accordance with CMP document requirements.

**b) Critical fuel reserves**

In establishing the critical fuel reserves, the fuel necessary to fly from the most critical point to an EDTO alternate aerodrome under the conditions outlined in Paragraph 3.4.5 c), (Critical fuel scenario) should be determined. 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 will be on board at the most critical point\* is less than the critical fuel reserves, then additional fuel should be loaded to ensure that the fuel on board at the most critical point is equal to or greater than the critical fuel reserves.

***Note: In some rare cases, the minimum fuel to go from the second to last Equal Time Point (ETP) to the applicable EDTO alternate aerodrome is the same as the minimum fuel to go from the last ETP to the another EDTO alternate aerodrome. In those case each ETP constitute a critical point. The first critical point is the most critical until such time that the aeroplane has past the first critical point En route to the second critical point, at which time the second critical point becomes the most critical point. In consideration of the items listed in Paragraph 3.4.5 a), for an air operator with an approved fuel consumption monitoring program, the critical fuel scenario should allow for:***

- 1) A contingency figure of 5 percent added to the calculated fuel burn from the critical point to a EDTO alternate, to allow for errors in wind forecasts and fuel mileage, except when the air operator can demonstrate and justify with an assessment tool and supporting data specific for that route of flight, that each element which has an impact on safety has been identified and appropriate mitigating factors have been applied, use a contingency figure of 5 percent wind speed factor based on the actual forecast wind used to calculate fuel for the most critical fuel scenario in order to account for any potential errors in wind forecasting;
- 2) Any Configuration Deviation List (CDL) and/or Minimum Equipment List (MEL) items;
- 3) Fuel for engine anti-icing, and if applicable wing anti-ice, for the entire time during which icing is forecasted except when the air operator can demonstrate and justify with an assessment tool and supporting data specific to the aeroplane type for that route of flight, that each element which has an impact on safety has been identified and appropriate mitigating factors have been applied, fuel for the effect of 10 percent of the time during which icing is forecast including the fuel used by engine and wing anti-ice during this period;


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- 3) Ice accretion on unprotected surfaces if icing conditions are likely to be encountered during the diversion except when the air operator can demonstrate and justify with an assessment tool and supporting data specific to the aeroplane type for that route of flight, that each element which has an impact on safety has been identified and appropriate mitigating factors have been applied, fuel for the effect of 10 percent of the time during which icing is forecast including the fuel used by engine and wing anti-ice during this period; and
- 5) Any required operation of an auxiliary power unit and/or Ram Air Turbine (RAT).

For an air operator that does not have an approved fuel consumption monitoring program to monitor the aeroplane in-service deterioration of cruise fuel burn performances and includes fuel supply calculations sufficient to compensate for such deterioration, increase the fuel supply by 5 percent.

**c) Critical fuel scenario**

1. Calculation of the critical fuel reserve requires the determination of the failure scenario that is the most operationally critical, considering time and aeroplane configuration. Any failure or combination of failures not shown to be extremely improbable should be considered. The critical fuel reserve is the fuel required taking into account the items listed in paragraph 3.4.5 b) and:
  - i) To proceed from the most critical point to an EDTO alternate aerodrome following the occurrence of the most operationally critical event(s); and
  - ii) Upon reaching the EDTO alternate aerodrome, to descend to 1,500 feet above the aerodrome, hold for 15 minutes, initiate an instrument approach and land.
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:

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- i) At the most critical point, cruise at 10,000 feet at the approved one-engine-inoperative cruise speed (fuel consumption may be based on continued cruise above 10,000 feet if the aeroplane has sufficient supplemental oxygen in accordance with applicable regulations); and
- ii) Upon reaching the EDTO alternate aerodrome, to descend to 1,500 feet above destination, hold for 15 minutes, initiate an instrument approach and land.

### 3.4.6 EDTO ALTERNATE AERODROMES

- a) EDTO alternate aerodrome should be chosen in order to make it possible for the aeroplane to reach the EDTO alternate aerodrome, especially with regard to performance (flight over obstacles) and/or oxygen requirements. A list of EDTO alternate aerodromes and the EDTO alternate aerodrome pre and post-dispatch weather limits should be published in the air operator's Operations Manual.

An aeroplane should not be released on an EDTO flight unless the required take off, destination and alternate aerodromes, including EDTO alternate aerodromes 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 copy of computer flight plan). All adequate aerodromes that are located within the authorized diversion limits, should be considered when determining the EDTO alternate aerodromes and the choice and number of EDTO alternate aerodromes should be made so as to minimize the duration of the diversion;

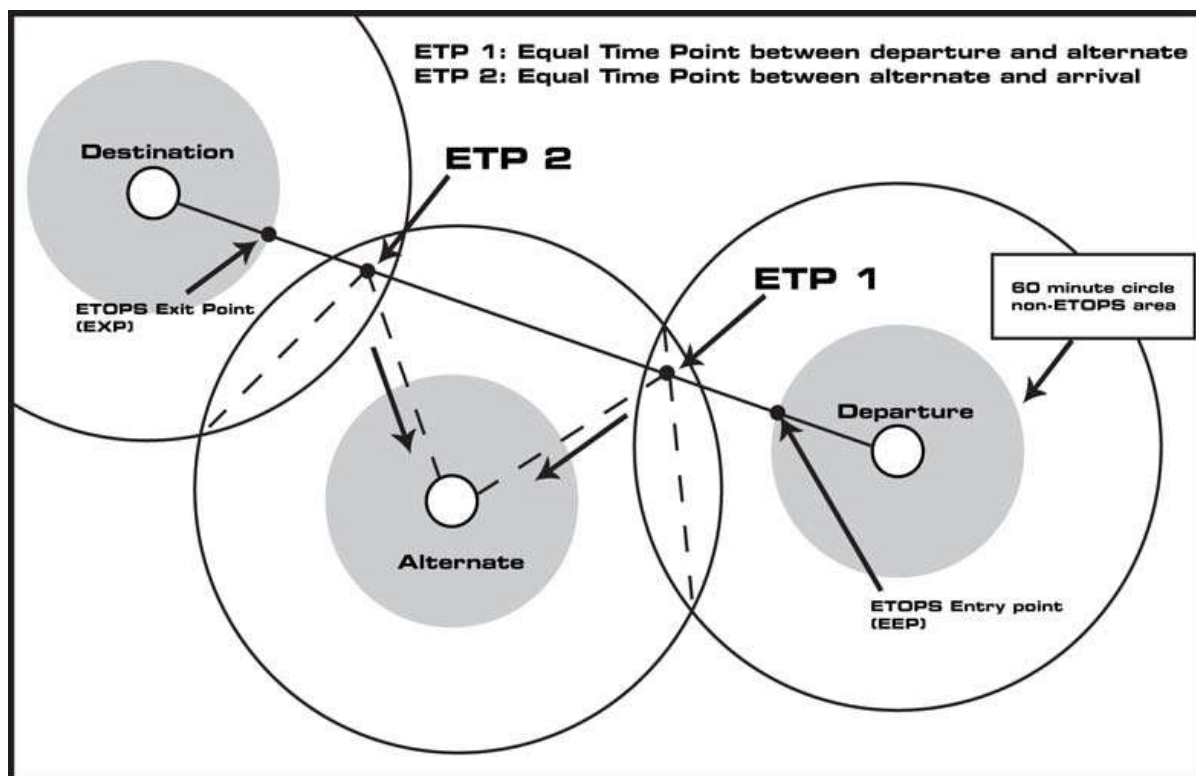
- b) EDTO alternates aerodromes are required to be identified, listed and provided to the flight crew with the most up to date information (e.g. aerodrome data, facilities, weather, etc.) as part of the dispatch release for all cases where the planned route of flight contains a point more than 90 minutes flying time at the approved one-engine-inoperative cruise speed from an adequate aerodrome. Since these EDTO alternates aerodrome serve a different purpose than the destination aerodrome and would normally be used only in the event of an engine failure or the failure of a EDTO significant system, an aerodrome should not, prior to dispatch, be designated as an EDTO alternate aerodrome unless the following conditions are met:
  - 1) The landing distances required as specified in the Aircraft Flight Manual 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 regulations;
  - 2) The aerodrome services and facilities are available and adequate for the air operator's approved instrument approach procedure(s) and operating minima for the runway expected to be used;

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- 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 aerodrome, (Figure 1) are equal to or exceed the authorized weather minima for EDTO alternate aerodromes as specified in Appendix B of this manual and that the periods between which the forecast should be equal to or exceed the authorized weather minima are identified on the operational flight plan;
- 4) For the same period, the forecast cross wind component for the intended landing runway, including gusts, is less than the maximum permitted cross wind for a single engine landing. Where no single engine demonstrated cross wind value exists, 80% of the all engine demonstrated value is used;
- 5)
  - i) Subject to Clause 3.4.6.a) 5) ii), for EDTO operation up to 180 minutes, each designated EDTO alternate aerodrome should meet a minimum Aircraft Rescue and Fire Fighting (ARFF) capability equivalent to that specified by ICAO category 4, or higher and for EDTO operation beyond 180 minutes, each designated EDTO alternate aerodrome should meet a minimum Aircraft Rescue and Fire Fighting (ARFF) capability equivalent to that specified by ICAO category 4, or higher provided that the aeroplane remains within the EDTO authorized diversion time from an adequate aerodrome that meets the minimum capability equivalent to that specified by ICAO category 7, or higher;
  - ii) If the equipment and personnel are not immediately available at the aerodrome, the aerodrome may still be listed on the operational flight plan, provided that the ARFF capability is available upon the arrival of the diverting aeroplane and remains at the aerodrome as long as the diverting aeroplane requires their services. A 30-minute response time is adequate provided that the initial notification to respond can be initiated while the diverting aeroplane is En route and the above conditions are met;



**FIGURE 1**



**Established earliest time of landing: High speed cruise (2 engine operating and high altitude) from ETP 1 to alternate.**

**Established latest time of landing: Low speed cruise (one engine operating and low altitude) from ETP 2 to alternate.**

- iii) Once the flight is dispatched, the flight crew and the flight dispatcher should remain informed of any significant changes at the EDTO alternates aerodromes and should be updated with the latest weather and aerodrome information of potential adequate aerodrome along the route of flight, that are not listed on the operational flight plan but could be used in case a diversion was initiated; and
  - a) Prior to proceeding beyond the EDTO Entry Point, the pilot in command and the flight dispatcher should complete a review of the forecast weather of all the EDTO alternate aerodromes identified on the operational flight plan and should ensure that the forecasted weather is equal to or exceeds the published landing minima for the time period established in subparagraph 3.4.6 b) 3 for the runway and type of instrument approach expected in order to ensure a safe landing at the expected time of use. If the weather forecast does not meet the landing minima, the pilot in command and the flight dispatcher are advised and the flight plan should be amended to add any other EDTO alternate aerodrome located within the maximum authorized diversion time, that meet the landing minima in order to allow the flight to proceed into the EDTO area of operation. If unable, the flight should not enter the EDTO area of operation; and

- b) Prior to proceeding beyond the EDTO Entry Point, the pilot in command and the flight dispatcher should complete a review of the conditions established in Paragraph 3.4.6 b) (excluding Subparagraph 3.4.6 b) 3) of the EDTO alternate aerodrome and ensure that no changes have occurred since the flight has been dispatched. If any conditions are identified which would preclude safe approach and landing, then the pilot in command should be notified and an acceptable EDTO alternate(s) aerodrome selected where safe approach and landing can be made. If any of the EDTO alternate aerodromes identified on the operational flight plan is not considered to be adequate at the expected time of use, the operational flight plan should be amended to add another EDTO alternate aerodrome located within the maximum authorized diversion time, in order to allow the flight to proceed into the EDTO area of operation. If unable, the flight should not enter the EDTO area of operation.
- iv) Once the flight has entered the EDTO area of operation, if the forecast for the EDTO alternate aerodrome is revised to below the landing limits, or that the EDTO alternate aerodrome becomes inadequate, the flight may continue at the Pilot in Command's discretion.
6. Flight dispatchers and flight crews should take into consideration the effects of solar flare, cosmic radiation and radio blackout activity that may affect the performance of the flight, when planning or approving the choice of EDTO alternates aerodromes


**FIGURE 2**

EDTO alternate airport	Prior to dispatch	After dispatch and prior to EDTO entry point	Once enter the EDTO area of operation
WX	Appendix B	Landing Minima	PIC's discretion
MEL	Applicable	Not applicable	Not applicable
Airport Adequacy	Applicable	Applicable	PIC's discretion

### 3.4.7 AEROPLANE PERFORMANCE DATA

An aeroplane should not be released on an EDTO flight unless the air operator's Operations Manual contains sufficient performance data to support all phases of any applicable EDTO operation. The following data should be based on information provided or referenced in the approved Aircraft Flight Manual (AFM):



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- 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) Drift down (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 EDTO 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 EDTO area of operations for each airframe-engine combination should be used in showing the corresponding terrain and obstruction clearances in accordance with applicable regulations.

### **3.4.8 NAVIGATION DOCUMENTATION**

The necessary navigation documentation including a mean to determine the location of each Equal Time Point and the Critical Point should be provided to the flight crew.

## **3.5 TRAINING AND EVALUATION PROGRAM**


Flight crew member's initial and recurrent EDTO training requirements are specified in the Regulations and associated standards for Extended Twin-Engine Operations (EDTO) for Flight Crew Members. Flight dispatcher's initial and recurrent EDTO requirements are specified in the Regulations and associated standards for

## **3.6 OPERATIONAL LIMITATIONS**

### **3.6.1 AREAS OF OPERATION**

### **3.6.2 FLIGHT DISPATCH LIMITATION**

Flight dispatch limitation should specify the maximum diversion time from an EDTO alternate aerodrome for which an air operator can conduct a particular EDTO operation. The maximum diversion time at the approved one-engine-inoperative cruise speed should not be any greater than the value specified in the Operations Specification.

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### 3.6.3 USE OF STANDARD MAXIMUM DIVERSION TIME

The procedures established should ensure that EDTO operation is limited to flight plan routes where the approved maximum diversion time to EDTO alternate aerodromes can be met under standard conditions in still air. Air operators should ensure that:

- 1) A procedure should be established that upon occurrence of an in-flight shutdown (IFSD) of an engine, the pilot in command should, subject to the PIC's authority, promptly initiate a diversion and fly to and land the aeroplane at the nearest dis\* aerodrome, at which a safe landing can be made; and,
- 2) A procedure should be established such that in the event of a single or multiple EDTO significant system failure, the pilot in command should, subject to the PIC's authority, promptly initiate a diversion procedure and fly to and land at the nearest suitable\* aerodrome, at which a safe landing can be made, unless it can be established that no substantial degradation of safety results from continuation of the planned flight.

*\* Suitable means right or appropriate for the particular situation*

### 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** The Company Operations Manual should outline the standard operating procedures applicable to EDTO operations including, but not limited to, the following:

- a) Minimum altitudes to be flown along planned and diversionary routes as applicable;
- b) Aerodromes authorized for use, including alternates and associated instrument approaches and operating minima;
- c) The information used in determining the critical fuel scenario; and
- d) The minimum equipment list (MEL)

## 3.8 OPERATIONS SPECIFICATIONS

**3.8.1** Aeroplanes should not be operated on EDTO Operations unless the air operator has complied with all the provisions of this document and the flight is authorized by an Operations Specification.

**3.8.2** An Operations Specification for EDTO Operations should specifically include provisions covering at least the following:

- a) Approved area of operation; and

*Note: Flights may be planned to operate through sectors outside of the delimiting arcs, provided the sector crossing is less than 30 track miles;*

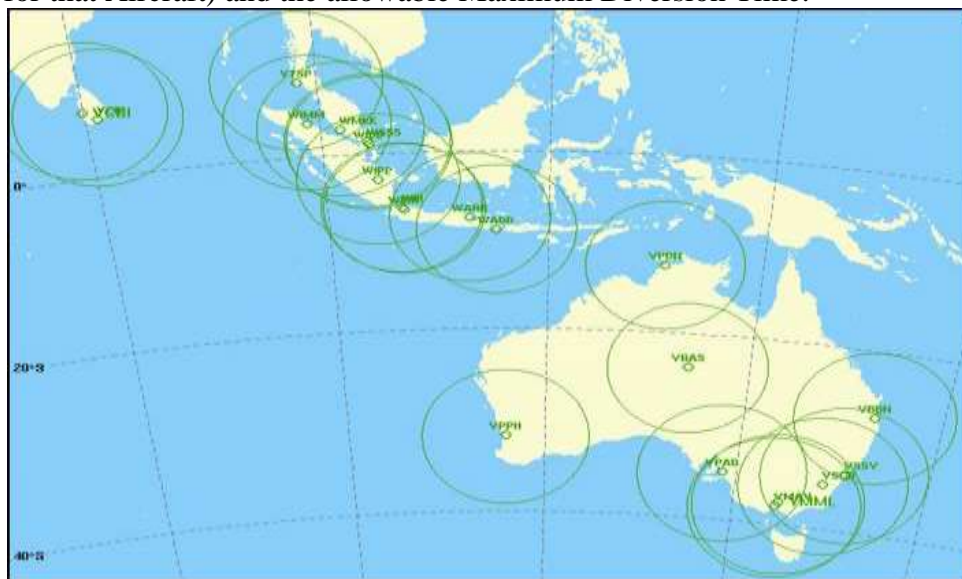
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- b) For each EDTO approved airframe-engine combination, the maximum diversion time, at the approved one-engine-inoperative cruise speed, that any point on the route may be from an EDTO alternate aerodrome.

### 3.8.3

The Operations Specification of each Aircraft will specify if that Aircraft has been approved for ETOPS Operations only if it has met the criteria set out in this manual which must be fulfilled by the Operator & the Aircraft.


- The Operator satisfies that the CAASL that it is capable of maintaining the aircraft to meet the manufacturer's maintenance schedule for ETOPS capability.
- The Manufacturer has certified that particular Engine & Airframe combination for Operations greater than 60minutes.
- The CAASL will determine the applicable EDTO Threshold (if less than 90mins for that Aircraft) and the allowable Maximum Diversion Time.




Example of Area of Operations for Aircraft that the Operations Specifications specified a Threshold Time of 60 Minutes (due to limitations set by the CAASL)



Example of Area of Operations for Aircraft that the Operations Specifications specified a Threshold Time of 90 Minutes (for Aircraft that satisfy the EDTO Capability to the CAASL)

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## CHAPTER 4

### CHAPTER 4 – EDTO MAINTENANCE AND RELIABILITY REQUIREMENTS

#### 4.1 GENERAL

**4.1.1** All personnel involved should be made aware of the special nature of EDTO and have the knowledge, skills and ability to accomplish the requirements of the program. Therefore, the maintenance control system should contain the standards, guidance and direction necessary to support the intended operation of EDTO aeroplane.


**4.1.2** The Airworthiness Inspector (AWI) having jurisdiction over the air operator should assess over a period of not less than 3 months the maintenance control system as being suitable to support the proposed EDTO operation before the Operational approval for EDTO can be granted.

#### 4.2 MAINTENANCE CONTROL SYSTEM

**4.2.1** The maintenance control system required by Regulation that is being considered for EDTO approval, should be reviewed in conjunction with the aeroplane maintenance schedule, to ensure that it provides an adequate basis for development and inclusion of specific EDTO maintenance requirements as defined in the Configuration, Maintenance and Procedures (CMP) document for the airframe-engine combination and any applicable Supplemental Instructions for Continued Airworthiness (ICA) that affects EDTO requirements. The maintenance control system should include procedures to ensure that an aeroplane is not dispatched for an EDTO flight following maintenance actions that affect multiple similar elements in any system determined to be an EDTO significant system (e.g. fuel control change on both engines) and ensure that:

- a) The EDTO related tasks should be identified on the routine work forms and related instructions;
- b) The EDTO related procedures, such as involvement of centralized maintenance control or technical dispatch, should be clearly defined in the maintenance control system, including identification of the management position that is responsible for those procedures;
- c) An EDTO service check should be developed and used to verify that the status of the aeroplane and certain significant items are acceptable. Prior to every EDTO flight (actual or simulated, as applicable), an EDTO authorized person, accomplishes this check. Authorization may be provided to suitably trained persons to perform this check under the “elementary work” provision of Regulations, provided the check is not incorporated into the aeroplane maintenance schedule, and does not include any item that requires a maintenance release; and
- d) The Quality Assurance program should encompass the review of the aeroplane technical record. This review is to ensure proper MEL procedures, defect rectification and control procedures, deferred items, maintenance checks have been performed properly and system verification procedures are effective.

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### **4.3 MCM REQUIREMENTS FOR EDTO**

**4.3.1** The Maintenance Control Manual (MCM) should be amended to address EDTO operations. The manual should include, either directly or by reference to incorporated documents, the requirements described in Chapter 4 of this manual.

**4.3.2** All EDTO requirements, including supportive program procedures, duties and responsibilities, should be identified as being related to EDTO. The amended manual should be submitted to the AWI for approval with sufficient lead-time prior to the scheduled commencement of EDTO Operations of the particular aeroplane type, model and /or variant. (Airframe-engine combination).

### **4.4 OIL CONSUMPTION**

**4.4.1** The oil consumption program should reflect the type certificate holder's recommendations and be sensitive to oil consumption trends. The dispatch procedures for EDTO segments are to take into account peak consumption and Current running average consumption, including consumption on the immediately preceding segments. If oil analysis is meaningful to this make and model, it should be included in the program. If the APU is required for EDTO operation, it should be included in the oil consumption program.

### **4.5 ENGINE CONDITION AND TREND MONITORING (ECTM)**


**4.5.1** This program should describe the parameters to be monitored, method of data collection and corrective action process. The program should reflect the type certificate holder's instructions and industry practice. This monitoring is used to detect deterioration at an early stage to allow for corrective action before safe operation is affected. The program should 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 temperatures) at all approved power levels and expected environmental conditions. Engine margins preserved through this program should 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. Monitoring should be on a continual basis. It is necessary to demonstrate that the achieved reliability and performance is sufficiently high.

### **4.6 VERIFICATION PROGRAM**

**4.6.1** The MCM should describe verification procedures to ensure that the corrective action following an engine in-flight shutdown, an EDTO significant system failure or adverse trend(s) for any prescribed event(s) is appropriate and effective. This may include a verification flight, or other methods. The description is to include a list of the affected systems and actions, together with the appropriate verification methods. The program should include but is not limited to the type certificate holder's instruction. A clear description of who should initiate verification actions and the section or group responsible for the determination of what action is necessary should be identified in the program. EDTO significant systems or conditions requiring verification actions should be described in the MCM.

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**4.6.2** The MCM should also describe verification procedures to be applied following maintenance actions that affect multiple similar elements in any system determined to be an EDTO significant system.

## **4.7 RELIABILITY PROGRAM**

**4.7.1** A reliability program that focuses on EDTO significant systems should be established. If a reliability program already exists, it should be supplemented as applicable to take account of EDTO. The program should be designed with early Identification and prevention of EDTO related significant event when operating EDTO as the primary goal as well as ensuring that the minimum EDTO reliability levels are maintained. The program should be event-oriented and incorporate reporting procedures for significant events and trends detrimental to EDTO flights. This information should be readily available for use by the air operator and the AWI to help establish that the reliability level is adequate, and to assess the air operator's competence and capability to safely continue EDTO Operations. An EDTO reporting program should be established which ensures that the AWI is notified at least monthly, on the previous month's activities or more often if adverse trends reportable through this program are identified.

**4.7.2** Procedures for the roll back of the EDTO diversion time should be established and implemented if;

- a) A significant event is identified on any flight, including non EDTO flights, of the air operator's EDTO approved aeroplane type affected; or
- b) An adverse trend is identified through the reliability program. The Maintenance Manager should have the authority to initiate roll back of the approved EDTO diversion time.


**4.7.3** Where reliability data indicate that the propulsion system "target criteria" per Appendix A of this document, Figure 1, are no longer being met, the AWI should be notified of the corrective measures taken. Where the "minimum criteria" are no longer being met, the air operator should roll back the EDTO diversion time to that specified in Appendix A for the particular IFSD rate noted. An IFSD could be discounted pursuant to conditions such as:

- a) The IFSD is not the result of any action or inaction from the part of the air operator;
- b) The IFSD is not the result of any action or inaction from the part of the maintenance provider; or
- c) The IFSD is the result of an operational incident such as a bird strike at low altitude.

When discounting of IFSD, the air operator, AWI and FOI should have consensus. If required, the AWI is to consult with the Aircraft Certification Engineering Division for interpretation and/or guidance on a case-by-case basis.

**4.7.4** Failure of an air operator to roll back the maximum diversion time when required constitutes grounds for removal of EDTO authority.

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**4.7.5** The following events should be included in the reporting program:

- a) In-flight shutdowns or flameouts;
- b) Diversion or turn-back;
- c) Uncommanded power changes or surges;
- d) Inability to control the engine or obtain desired power; and
- e) Significant events or adverse trends with EDTO significant systems

**4.7.6 THE REPORT SHOULD ALSO IDENTIFY THE FOLLOWING:**

- a) Aeroplane 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** Air operators who contract any part of their maintenance control system and/or reliability programs, necessary to support their EDTO 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 air operators whose EDTO approval is based on reliability levels established by other organizations, Civil Aviation Authority of Sri Lanka does not consider EDTO approval privileges beyond those granted by the other organization's CAA.

## **4.9 PROPULSION SYSTEM MONITORING**

**4.9.1** The assessment of propulsion systems reliability for the EDTO fleet should be made available to the AWI (with supporting data) in accordance with an agreed upon frequency, to ensure that the approved maintenance control system continues to maintain a level of reliability necessary for EDTO operation.


**4.9.2** The assessment should 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 EDTO fleet is part of a larger fleet of the same aircraft/engine combination, data from the air operator's total fleet is acceptable. However, the reporting requirements of Section 4.7 of this Chapter should still be observed for the EDTO fleet.

**4.9.3** Any adverse trend requires an immediate evaluation to be accomplished. The CAASL should be advised of the result of the evaluation. 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 air operator's performance is reviewed on a case-by-case basis. The review includes such items as actual data populating the air operator's reliability program and being compared, where possible, to global fleet data on the power plants*

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*and related EDTO maintenance significant systems, as well as air operator events, including IFSD's and loss of thrust, with the results of investigation into the cause(s) of the events.*

#### **4.10 TECHNICAL TRAINING**


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

#### **4.11 EDTO PARTS CONTROL**

**4.11.1** The parts control program should include procedures to ensure that appropriate parts are installed on EDTO aircraft. The program should include means to verify that parts obtained through borrowing or pooling arrangements, conform to the applicable EDTO configuration for the aeroplane concerned.

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## APPENDIX A

### PROPULSION SYSTEM RELIABILITY ASSESSMENT

#### A.1 GENERAL

##### A.1.1 TYPE DESIGN APPROVAL

To establish if a particular airframe engine combination has satisfied the propulsion system reliability criteria for EDTO, a thorough assessment should be conducted by specialists of the responsible Primary Certification Authority for airframe propulsion system design utilizing all the pertinent engine and airframe propulsion system data and information available (includes the APU, if required).

The CAA reviews these findings as part of the aeroplane type design approval activity.

##### A.1.2 OPERATIONAL APPROVAL

The intent of the operational approval is to establish if an air operator has demonstrated the capability of ensuring propulsion system reliability targets have been met and continue to be met.

#### A.2 CONCEPTS AND CRITERIA

No single parameter by itself, without other data/information, can adequately qualify reliability. There are a number of variables, maintenance and operating statistics and general information about the operational experience of a particular power unit, which characterize propulsion system reliability. Engineering judgment should then be utilized to determine the adequacy and applicability of this data and information to EDTO and to determine the suitability of the aeroplane for EDTO. As an aid in making this judgment, statistical analysis is used to help determine that the desired level of reliability is obtained. The evidence should be such that it can be shown with high confidence that the risk of total thrust loss or loss to an extent that precludes continued safe flight, is acceptably low, i.e., at an appropriate level less than between 10 to the minus 8 and 10 to the minus 10 per hour during the relevant portion of the cruise.

#### A.3 ASSESSMENT


To assess adequately the propulsion system reliability for EDTO type design and operational approval, certain world fleet data and information are required. The Regulatory specialists maximize the use of existing sources and kinds of data generally available but additional data may be required in certain cases.

##### A.3.1 DATA REQUIREMENTS

**A3.1.1 Type Design Approval** – World fleet data and information are necessary to adequately assess propulsion system reliability for EDTO. This data should include:

- 1) A list of all engine shutdown events both ground and in-flight for all causes (excluding normal training events) including flameout. The list should provide the following for each event: data, airline, aeroplane and engine identification (model and serial number), power unit configuration and modification history, engine

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position, symptoms leading up to the event, phase of flight or ground operation, weather/environmental conditions and reason for shutdown;

- 2) A list of all occurrences where achieved thrust was below the intended level, for whatever reason: The list should provide the above detailed information;
- 3) Data concerning total engine hours and aeroplane cycles (if known, include engine hour distribution, e.g., percent of world fleet of engines at 1,000 hours, 2,000 hours, etc.);
- 4) Data listing mean time between failure of the propulsion system and associated components that affect reliability (unscheduled removals);
- 5) The amount and frequency of using reduced/de-rated thrust (if detailed data is not available, a representative sampling may be sufficient); and
- 6) Additional data as specified by the specialist group.

**A.3.1.2 Operational Approval** – Data requirements for EDTO Type Design Approval Paragraph A.3.1.1) limited to air operator fleet experience and any experience claimed as compensatory experience (see Engineering Assessment Subsection A.3.3).

## **A.3.2 EXPERIENCE**


**A.3.2.1 Type Design** – In support of applications for EDTO type approval, data should be provided from various sources to ensure completeness, i.e., engine manufacturer, air operator and aeroplane manufacturer.

To provide a reasonable indication of reliability trends and significant problem areas, an accumulation of at least 150,000 engine hours is normally required in the world fleet before the assessment process can produce meaningful results. This number of hours may be reduced if adequate compensating factors are established which give a reasonable equivalent data base.

Once an assessment has been completed and the specialist groups have documented their findings, the Director, Airworthiness, declares whether or not the current propulsion system reliability of a particular airframe engine combination satisfies the relevant criteria of this document. The CAASL specifies items required to qualify the propulsion system suitable for EDTO, such as the recommended propulsion system type design configuration, operating conditions, maintenance requirements and limitations.

**A.3.2.2 Air operator** – Operational experience is required to ensure the air operator continues to maintain and operate the particular airframe-engine combination at an acceptable level of reliability. The assessment of an air operator's suitability to be granted an EDTO approval is routinely made after a minimum amount of operating experience. Operational experience requirements may be reduced if adequate compensatory experience factors exist (see Appendix C of this document). The accepted basic experience requirement is defined in Chapter 3 of this document.

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### A.3.3 ENGINEERING ASSESSMENT

**A.3.3.1** An analysis, on a case by case basis, of all significant failures, defects and malfunctions experienced in service (or during testing) for the airframe engine combination should be addressed. Significant failures are principally those causing or resulting in in-flight shutdown or flameout of an engine but may also include unusual ground failures and/or unscheduled removal of engines from the aeroplane. In making the assessment, consideration is given to the following:


- a) The type of power unit, previous experience, whether the power unit is new or a derivative of an existing model and the engine operating rating limit to be used with one engine shutdown;
- b) The trends in cumulative and six and twelve months rolling average, updated quarterly, of in-flight shutdown rates versus propulsion system flight hours and cycles;
- c) The effect of corrective modifications, maintenance, etc., on future reliability of the propulsion system;
- d) Maintenance actions recommended and performed and its effect on engine and APU failure rates;
- e) The accumulation of operational experience which covers the range of environmental conditions likely to be encountered; and
- f) Intended maximum flight duration, maximum diversion and mean diversion time used in EDTO.

**A.3.3.2 Type Design** – An assessment of the corrective actions planned or taken for each problem identified with the objective of verifying that the action is sufficient to correct the deficiency.

When each identified significant deficiency has a corresponding CAASL accepted corrective action and when all corrective actions are satisfactorily incorporated and verified, CAASL determines that an acceptable level of reliability can be achieved. Statistical corroboration is also utilized.

Any certification inspections and tests that may be necessary to approve these corrective actions is the responsibility of the appropriate Primary Certification Authority. The required corrective action and modifications are included in the type design standard necessary for final type approval of the aeroplane for EDTO.

**A.3.3.3 Operations** – The CAA recognizes that a number of potential countable events (e.g. IFSDs, flameouts, un commanded thrust reductions, etc.) are not EDTO relevant or action has been taken to preclude further occurrences. An air operator may request, through the AWI, FOI Aircraft Certification Engineering Division, that such an event be discounted so that the propulsion system reliability objective is not affected. Any configuration, maintenance or procedural change to satisfy the event discounting becomes part of the

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EDTO CMP criteria. (Credit for optional equipment, e.g. ACARS, should be reviewed against MEL criteria)

Refer to Subsection 4.7.3 for additional information on discounting of IFSDs.

## **A.4 PROPULSION SYSTEM RELIABILITY OBJECTIVE**

### **A.4.1 TYPE DESIGN**

A determination is made that the type design of the propulsion system achieves the desired level of reliability. The CAA determines if the probability of total/unacceptable thrust loss due to design related and/or independent causes meet the criteria of this section.

### **A.4.2 OPERATIONS**

**A.4.2.1** A determination is made of the propulsion system's ability to achieve the desired level of operational reliability in EDTO. The CAA determines if the probability of total/unacceptable thrust loss for all independent causes meets the criteria of this section.

**A.4.2.2** The propulsion system reliability objective ensures that the propulsion system achieves at least the minimum reliability criteria required of other critical aeroplane systems, i.e., navigation, flight control, communications, etc.

Considering the complexity of the entire power plant system, the approach to determine the reliability has been to use in service data. This data therefore, not only considers design related failures, but also includes maintenance and operational effects on the failure rates.

The events to be considered are to include those occurring from the beginning of the take-off roll to the end of the landing phase, though items confirmed as not EDTO significant are discounted. Failures considered are engine in-flight shutdowns (IFSD) and any other significant power loss or loss of engine control. The reliability objective used by the CAA relates diversion time to the probability of a loss of thrust which precludes continued safe flight.

The target is expressed by the following formula:

$$(10^9) (Pe^2) (t) \leq 1$$

Where

Pe = probability of an engine failure (per hour)

t = diversion time (hours)

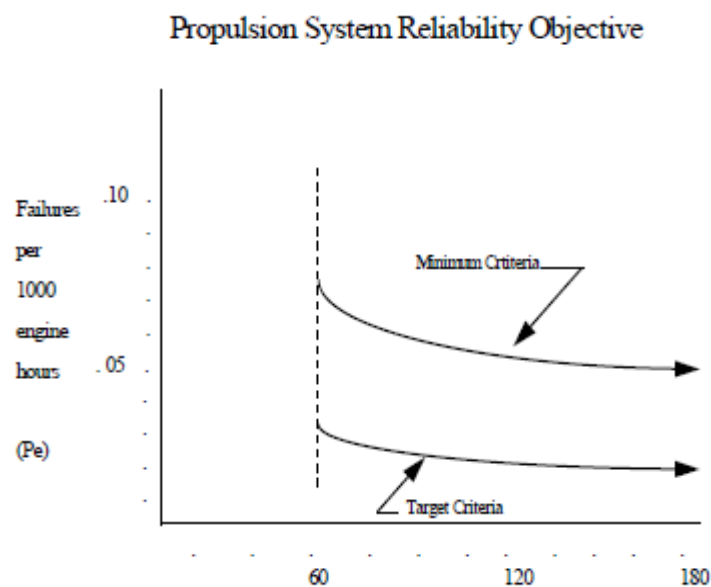
(10<sup>9</sup>) represents the life of an entire aeroplane fleet (hours)

The CAA believes some tolerance is required to account for verified corrective actions and precautionary shutdowns and also to provide for the expected variance over time in propulsion system reliability statistics. Reported occurrences beyond the tolerance are grounds for withdrawal of EDTO approval, or reduction in allowed diversion time. The maximum criterion is defined by the following formula:

$$(.25) (10^9) (Pe^2) (t) \leq 1$$

**FIGURE 1**

### Propulsion System Reliability Objective




### DIVERSION TIME (MINUTES) (T)


### RELIABILITY TABLE (ENGINE FAILURES PER 1000 HOURS)

Diversion Time (t)	Target Criteria	Minimum Criteria
60 minutes	.032	.063
75 minutes	.028	.056
90 minutes	.026	.052
120 minutes	.022	.044
138 minutes	.021	.042
180 minutes	.018	.036



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## **APPENDIX B**

### **EDTO ALTERNATE AERODROME**

#### **B.1 GENERAL**

One of the distinguishing features of EDTO is the concept of an EDTO alternate aerodrome being available to which an aeroplane can divert after a single or combination of failures which require a diversion. Whereas most two-engine aeroplanes operate in an environment where there is usually a choice of diversion aerodromes available, the EDTO aeroplane may have only one alternate within a range dictated by the endurance of a particular airframe system (e.g. cargo fire suppressant), or by the approved maximum diversion time for that route. It is, therefore, important that any aerodromes designated as an EDTO alternate aerodrome have the capabilities, services and facilities to safely support that particular aeroplane and that the weather conditions at the time of arrival provide a high assurance that adequate visual references are available upon arrival at decision height (DH) or minimum descent altitude (MDA) and that the surface conditions are within acceptable limits to permit the approach and landing to be safely completed with an engine and/or systems inoperative.

#### **B.2 ADEQUATE AERODROME**

As with all other operations, an air operator desiring any route approval is required to show that it is able to satisfactorily conduct operations between each required aerodrome over that route or route segment. Air operators are required to show that the facilities and services specified are available for their use and adequate for the proposed operation. For the purpose of this manual, in addition to meeting these criteria, those aerodromes, which meet the CAA standards or ICAO Annex 14 and are determined to be useable by that particular aeroplane, are to be accepted as adequate aerodromes.


#### **B.3 EDTO ALTERNATE AERODROME**

For the purposes of this document in order for an aerodrome to be considered as an EDTO alternate aerodrome, it should have the capabilities, services and facilities necessary to be designated as an adequate aerodrome and have weather conditions and field conditions at the time of the particular operation which provide a high assurance that an approach and landing can be safely completed with an engine and/or systems inoperative, in the event that a diversion to an EDTO alternate aerodrome becomes necessary. For planning purposes only, the EDTO alternate aerodrome weather minima are higher than the weather minima required to initiate an instrument approach.

#### **B.4 EDTO ALTERNATE AERODROME WEATHER MINIMA**

The following are established for flight planning and training purposes in EDTO operations:

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<b>FACILITIES AVAILABLE AT SUITABLE ALTERNATE</b>	<b>CEILING</b>	<b>VISIBILITY</b>
<b>Two or more separate precision Approach equipped runways</b> (Note- One runway and its reciprocal does not satisfy this requirement,)	A cloud base that is the higher of; a). 400 feet, or b). 200 feet above the lowest authorized aerodrome landing minima.	Visibility that is the greater of; a). 1500 meters or b). 800 meters above the lowest authorized aerodrome landing minima.
<b>A single precision approach</b>	A cloud base that is the higher of; a). 600 feet or b). 300 feet above the lowest authorized aerodrome landing minima.	Visibility that is the greater of; a). 3 000 meters or b). 1 500 meters above the lowest authorized aerodrome landing minima.
<b>Non-precision Approach.</b>	A cloud base that is the higher of; a). 800 feet or b). 300 feet Above the lowest Authorized aerodrome landing minima.	Visibility that is the greater of; a). 4 000 meters or b). 1 500 meters above the lowest authorized aerodrome landing minima.

A particular aerodrome may be considered an EDTO alternate aerodrome for flight planning and dispatch purposes for EDTO operations if it meets the criteria of Section B.3 of this Appendix and has one of the following combinations of instrument approach capabilities and EDTO alternate aerodrome weather minima at the time of the particular operation:

***Note: Weather forecasts that contain the term BECMG, TEMPO or PROB may be used to determine the weather suitability of an aerodrome as an EDTO alternate provided that.***


- a) Where the conditions are forecast to improve, the forecast BECMG condition should be considered to be applicable as of the end of the BECMG time period, and these conditions should not be below the published alternate minima requirements for that aerodrome;
- b) Where the conditions are forecast to deteriorate, the forecast BECMG condition should be considered to be applicable as of the start of the BECMG time period, and these conditions should not be below the published alternate minima requirements for that aerodrome;
- c) The forecast TEMPO condition should not be below the published alternate minima requirements for that aerodrome; and

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- d) The forecast PROB condition should not be below the appropriate landing minima for that aerodrome. Where a condition is forecast as “PROB”, provided the probability per cent factor is less than 40 per cent, it is not limiting. However the Pilot-In-Command and flight dispatcher are to exercise good aviation judgment in assessing the overall “PROB” conditions.

For the purpose of EDTO, a flight is deemed to be commenced/dispatched after brake release for take-off. Thus, during the planning stage and prior to the aeroplane being dispatched, the EDTO alternate aerodrome should meet the criteria of Section B.4 of this Appendix. Once the flight is dispatched, and prior to the EDTO entry point, the EDTO alternate aerodrome should meet the published landing minimum for the intended runway and instrument approach to be used in the event of a diversion. Once the flight has entered the EDTO area of operation, if the forecast for the EDTO alternate aerodrome is revised to below the landing limits, or that the EDTO alternate aerodrome becomes inadequate, the flight may continue at the Pilot in Command’s discretion.

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## **APPENDIX C**

### **ACCELERATED EDTO OPERATIONAL APPROVAL**

#### **C.1 GENERAL**

This Appendix is a means to identify factors, which the CAA may consider to allow a reduction or substitution of in-service experience requirements on a case by case basis, prior to granting accelerated EDTO Operational Approval for a specific Airframe-engine combination up to and including 180 minutes EDTO.

In addition to the requirements of this Appendix, an air operator wishing to be considered for an accelerated EDTO approval up to and including 180 minutes for a specific airframe-engine combination, should either conduct actual EDTO operation at 120 minutes for a minimum period of at least 3 months or comply with the condition of a simulated EDTO program as defined in Appendix D. On a case-by-case basis, an air operator already operating at 180 minutes with a different airframe-engine combination may obtain 180 minutes approval in less than 3 months provided that all the conditions of this Appendix are met.

An excellent propulsion related service safety record for two-engine aeroplanes has been maintained since the introduction of EDTO. Current data indicates that the EDTO process benefits are achievable without extensive in-service experience. Therefore, reduction or elimination of in-service experience requirements may be possible when the air operator demonstrates that adequate and validated EDTO processes are in place.

The Accelerated EDTO Operational Approval Program with reduced in-service experience does not imply that a reduction of existing levels of safety are tolerated but rather acknowledges that an air operator may satisfy the objectives of this document by an equivalent means when considering demonstrated operational capability.

An air operator may be permitted to start EDTO operations under the conditions of this Appendix when it has established and demonstrated that those processes necessary for successful EDTO operations are in place and are considered to be reliable. It should be emphasized that failure to meet the established criteria, milestones or reliability levels may result in the loss of the Accelerated EDTO Operational Approval.


#### **C.2 POLICY**

##### **C.2.1 EDTO PROCESS**

The airframe-engine combination for which the air operator is seeking Accelerated EDTO Operational Approval should be EDTO Type Design approved. It should be demonstrated that there is a program in place to address the process elements identified in this section.


The following are the required EDTO process elements:

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- a) Airframe-engine compliance to Type Design Build Standard (CMP)
- b) Compliance with the EDTO Maintenance and reliability requirements as described in Chapter 4 of this manual, requiring the following proven EDTO programs to be in place:
  - 1) Fully developed Maintenance Control System, as required by Section 4.2 of this manual;
  - 2) Amended Maintenance Control Manual (MCM) as required by Section 4.3 of this manual;
  - 3) Oil consumption monitoring as required in Section 4.4 of this manual;
  - 4) Engine condition and trend monitoring (ECTM) as required in Section 4.5 of this manual;
  - 5) Verification as required by Section 4.6 of this manual;
  - 6) Reliability Program as required by Section 4.7 of this manual;
  - 7) An established propulsion system monitoring program, that results in a high degree of confidence that the propulsion system reliability appropriate to the EDTO diversion time is maintained as per Section 4.9 of this manual;
  - 8) Initial, update and additional training as well as authorization for all personnel involved in EDTO operations;
  - 9) EDTO parts control as per Section 4.11 of this manual; and
  - 10) Aeroplane defect control system.
- c) Compliance with the Flight Operations Program for EDTO as described in Chapter 3 of this manual, which should address:
  - 1) Flight planning and dispatch programs, including initial and annual recurrent EDTO training for flight dispatcher;
  - 2) Availability of meteorological information;
  - 3) Minimum Equipment List (MEL) considering EDTO operation; and
  - 4) EDTO initial and recurrent training and checking program for each flight crew member.
- d) Documentation of the following elements:



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- 1) Technology new to the air operator and significant differences in EDTO significant systems between the aeroplane currently operated and the aeroplane for which the air operator is seeking Accelerated EDTO Operational Approval;
- 2) The plan to train each flight crew member, flight dispatcher and maintenance personnel to the differences identified in Paragraph C.2.1 d) 1.above;
- 3) The plan to use proven or manufacturer validated Training, Maintenance & Operations Manual procedures relevant to EDTO for the aeroplane for which the air operator is seeking accelerated EDTO approval;
- 4) Changes to any previously proven or manufacturer validated Training, Maintenance or Operations Manual procedures described above. Depending on the nature of the changes, a plan for validating such changes may be required;
- 5) Details of any EDTO program support from the aeroplane type certificate holder, engine type certificate holder, other air operators or any other outside agency; and
- 6) The control procedures when maintenance or flight dispatch support is provided by an outside party as described above.

## **C.2.2 APPLICATION**

An “Accelerated EDTO Operational Approval Plan” should be submitted to CAA a minimum of 6 months before the proposed start of operations. This period gives an opportunity to incorporate any refinements that may be required to achieve an Accelerated EDTO Operational Approval.

The application for Accelerated EDTO Operational Approval should:

- a) Define proposed routes and necessary diversion times required to support the applicable routes;
- b) Define processes and resources allocated to initiate and sustain EDTO;
- c) Identify the plan for establishing and maintaining EDTO build standard compliance;
- d) Document plan for compliance with items outlined in Section C.2.1; and
- e) Define Review Gates (a Review Gate is a milestone tracking plan to allow to define the tasks and timing for the necessary tasks to be accomplished); items for which CAA approval is sought should be included in the Review Gates. These milestone tasks should be completed during the approval process although the timing may vary.

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### C.2.3 OPERATIONAL APPROVALS

Operational approvals are to be considered on individual merit and capability (case-by-case basis). Accelerated EDTO Operational Approval is not guaranteed and air operators are encouraged to await approval prior to planning revenue EDTO operations.

Accelerated EDTO Operational approvals which are granted with reduced in-service experience are to be limited to those areas agreed by CAA contained within the Accelerated EDTO Operational Approval Plan. Concurrence from CAA is required if the air operator wishes to add or expand the request.

Air operators may be eligible for Accelerated EDTO Operational Approval up to the Type Design Approval limit.

### C.2.4 PROCESS VALIDATION

All the process elements identified in Section C.2.1 should be proven prior to an Accelerated EDTO Operational Approval. In order for a process to be considered proven, it first should be defined. Thus, the various elements of the process should be clearly demonstrated. Role and responsibilities of the personnel who are managing this process should be defined including the training requirements.

It should be demonstrated that the established process is in place and functions as intended. This may be accomplished by thorough documentation and analysis, or by demonstration on an aeroplane (simulation) to confirm that the process works and consistently provides the intended results. There should also be a system in place to ensure that there is proper feedback in the event there is a need to revise the process.


Any simulation flights should not be initiated prior to:

- a) The completion of the applicable training of flight crews, maintenance personnel, dispatch personnel;
- b) The approval of the EDTO maintenance control systems;
- c) The reliability program being in place and operating; and
- d) The aeroplane being configured for EDTO.

Simulation is a coordinated operation between flight operation and maintenance of all the elements of an air operator's EDTO process in a non-EDTO environment.

An air operator who is currently operating EDTO on different airframe and/or engine combination may be able to demonstrate that it has a proven process in place and may only require minimal validation. However, it may be necessary to demonstrate that there are means in place to assure an equivalent results on the aeroplane for which an accelerated EDTO approval is requested.

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Given that air operator's accelerated EDTO approval is considered for its individual merit and capability on a case-by-case basis at the time of the application, it is important to note that the following elements, although beneficial in justifying a reduction in the validation requirements of the EDTO process, do not automatically justify that the process identified in Section C.2.1 is a proven one:

- a) The air operator's experience with other similar airframes and/or engines;
- b) The air operator's previous EDTO experience;
- c) The air operator's long range, over-water operational experience; and
- d) The air operator's flight crew, maintenance and flight dispatch personnel experience with EDTO.

A process may be validated initially by demonstration on a different type than the airframe-engine combination intended to be used in the Accelerated EDTO operation. It is then necessary to demonstrate that means are in place to assure equivalent results occur on the aeroplane being proposed for Accelerated EDTO Operational Approval.

Any validation program should address the following:

- a) Assurance that the validation program does not adversely impact actual safety of operations especially during periods of abnormal, emergency, or high cockpit workload operations. It should be emphasized that during these abnormal situations the validation exercise may be terminated;
- b) A means to monitor and report performance with respect to accomplishment of tasks associated with EDTO process elements. Any changes to EDTO maintenance and operational process elements should be defined;
- c) Assurance that the validation program provides sufficient frequency and operational exposure to validate maintenance and operational support systems;
- d) Prior to the start of the process validation program, the following information is submitted to the Flight Operations Inspector (FOI):
  - i) Validation period, including start dates and proposed completion dates;
  - ii) Definition of the aeroplane, manufacturer and serial number and model of the airframe and engine;
  - iii) Description of the area of operation proposed for the validation and actual EDTO operation; and
  - iv) Definition for the designated EDTO routes that should be of a duration necessary to ensure process validation; and

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- e) Compilations of the result of the EDTO process validation that:
  - i) Documents how each element of the EDTO process was utilized during the validation;
  - ii) Documents any short comings with the process elements and measures in place to correct short comings;
  - iii) Documents any changes to the EDTO processes that were required after an in-flight shutdown (IFSD), unscheduled engine removals, or any other significant operational events; and
  - iv) Provides periodic process validation reports to their FOI. This may be addressed during the review gates.

### **C.2.5 ACCELERATED EDTO SURVEILLANCE**


Deficiencies associated with engineering and maintenance control systems, flight dispatch or flight crew performance may result in the rejection of or amendment to, the claimed credit for reduced in-service experience.

Therefore, an accelerated program leading to an EDTO Operational Approval is considered feasible so long as the air operators retain commitment to the standards which are contained in their EDTO Operational Approval Plan and associated programs. During the first year of operation close monitoring should be exercised


### **C.2.6 MINIMUM REQUIREMENTS**

- 1) The Accelerated EDTO Operational Approval allows for a reduction of in- service experience, based on the degree of compliance with the existing air operator's EDTO program, which can be validated with supporting documentation. The typical operational experience requirements for a given airframe-engine combination is:
  - a) Minimal or no in service experience for 90 minutes approval;
  - b) Minimal or no in service experience for 120 minutes approval; and
  - c) 3 months 120 minutes EDTO experience for 180 minutes approval. On a case-by-case basis, the in-service experience requirements for an accelerated EDTO approval specified in this paragraph may be further reduced provided that the air operator can successfully demonstrate to the satisfaction of the Flight Operations Inspector (FOI) and Airworthiness Inspector (AWI) that all of the elements of their EDTO process for the applicable airframe-engine combination are proven and function as intended. This may either be accomplished via:
    - a) The air operator conducting a simulated EDTO program as per the requirements of Appendix D of this document; or


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- b) Supporting documentation and demonstration that the elements of a EDTO process that has been validated for another airframe-engine combination and could be applicable to the new airframe-engine combination would function to an equivalent level of safety on the new airframe-engine combination; and
  - c) Those elements of the EDTO process that are unable to be proven until the new airframe-engine combination enters service, should be validated prior to the approval of the requested authority.
- 2) All in-service experience requirements noted above assume acceptable performance. Air operator EDTO program difficulties may require additional in-service experience and/or removal of the eligibility for Accelerated EDTO Operational Approval.

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## **APPENDIX D**

### **SIMULATED EDTO PROGRAM**

#### **D.1 GENERAL**

This Appendix provides the guidance for an air operator to substitute the actual in-service experience at 120 minutes EDTO operation required to obtain 180 minutes EDTO approval. It establishes the conditions under which CAA may authorize an air operator to gain in-service experience through a simulation/demonstration program as a pre-requisite for applying for 180 minutes EDTO authority. The intent is to permit an air operator who does not have the capability to demonstrate EDTO operation due to route structure to develop and validate an EDTO program leading to 180-minutes approval.

The objective of the EDTO simulation/demonstration is to provide the air operator with an acceptable level of experience to demonstrate its capability to safely operate with a maximum diversion time of 180 minutes.

#### **D.2 IN SERVICE EXPERIENCE REQUIREMENTS**

An air operator who wishes to obtain 180 minutes authority through a simulation/demonstration program is to have at least 12 consecutive months of operational in-service experience with the specified airframe-engine combination before the start of a simulated EDTO flight.


#### **D.3 APPLICATION**

A request to the CAA should be submitted for approval to conduct a simulated and demonstrated EDTO program, at least 60 days prior to the intended start of the simulated EDTO flights. The request should address the criteria contained in this manual for 180 minutes EDTO programs. The application should also contain information on the proposed simulated operation, the proposed demonstration flights and the proposed actual operation. There may be certain items related to 180 minutes and actual operations, which the air operator will not be prepared to address initially. If applicable, these items should be identified to the FOI and AWI and addressed during the final application for 180 minutes authority. The application to conduct simulated or demonstrated EDTO should include:

- a) The proposed simulation and demonstration periods (start and end dates);
- b) A list of aeroplanes to be used in the simulation and demonstration, including aeroplane registration, manufacturer and serial number and model of the airframes and engines;
- c) A description of the areas of operation proposed for simulated, demonstrated and actual operations;

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- d) A list of designated EDTO simulation routes, of sufficient duration to provide adequate simulation and usually the air operator's longest routes, and demonstration routes required to be the proposed routes;
- e) A description of the air operator's relevant EDTO in-service experience with other airframe-engine combinations and/or relevant non EDTO in-service experience with the airframe-engine combination to be used in the simulation, including records of in-flight shutdowns, unscheduled engine removals, and any events that could be considered as EDTO significant events;
- f) A description of aeroplane configuration with respect to the applicable CMP document at the start of simulation, including a schedule of compliance for items not yet incorporated or a statement of the date that full compliance is expected;

*Note: items requiring incorporation are discussed in Subsection D.7. c)*

- g) A minimum number of EDTO simulation and demonstration segments performed;
- h) A supplemental EDTO maintenance and reliability requirements of Chapter 4 of this manual;
- i) A plan to ensure that maintenance personnel, at proposed departure and destination aerodromes in the actual area of operation, are qualified in accordance with Chapter 4 and the ANRs;
- j) Policy guidance to personnel involved in the program in regards to flight safety as stated in Section D.5 of this appendix;
- k) Operations requirements that meet the criteria of this manual and the appendices;
- l) A Gate and Milestone tracking plan to allow for the orderly tracking and documentation of specific requirements of the EDTO; and
- m) Any other items relevant to the applicant's EDTO program requested by the FOI and/or AWI;


#### **D.4 AUTHORITY**

Authority to conduct 180 minutes EDTO through a simulated program is granted via an Operation Specification and is initially limited to the areas of operation in which the air operator has already demonstrated capability. New areas of operation are authorized once the air operator's 180 minutes EDTO and overall in-service experience record is proven.

#### **D.5 FLIGHT SAFETY**

While operating in a simulated EDTO program, it should be clearly demonstrated that the impact of such a program, on flight safety in actual operation, has been considered. When applying to conduct a simulated EDTO program, it should be clearly stated that

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the EDTO simulation should be terminated immediately during any abnormal or emergency situation.

## **D.6 SIMULATION/DEMONSTRATION PROGRAM REQUIREMENTS**

The following is a list of basic elements which should be considered for a simulation/demonstration program. These elements should be addressed both in the initial request and during operations conducted under the program. The elements are:


- a) A fully developed and approved Maintenance Control System;
- b) An approved airframe, system and engine reliability monitoring and reporting systems;
- c) An approved flight planning and dispatch program;
- d) An approved initial and recurrent training and checking program for flight crew and flight dispatchers;
- e) An approved initial training, qualifications and authorization program for EDTO maintenance personnel;
- f) A simulation scenario of sufficient frequency and operational exposure to demonstrate the application and response of maintenance and operational support systems;
- g) A means to monitor and report ongoing EDTO performance results during the period of the simulation to provide validation or, as necessary, recommended changes to EDTO maintenance and operational support systems; and
- h) Resource allocation and decision making process which demonstrates commitment by management and all personnel involved in EDTO maintenance and operational systems support.

## **D.7 CONCEPT FOR SIMULATION**

The simulation is intended to provide for accumulation of in-service experience, which is equivalent to the actual conduct of EDTO operation. The following should be addressed:

- a) Identification of simulated areas of operation and alternates that are proposed to be used to meet the dispatch limitations for an EDTO alternate aerodrome;
- b) A plan to conduct simulated EDTO with the specified airframe engine for at least 12 consecutive months. The sample size should consist of approximately 1000 separate flights. These operations should be conducted on flights, which contain approximately 3 hours of cruise flight. The number of operations and months of in-service experience may be increased or decreased following a review by the FOI on a case-by-case basis considering:

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- 1) Experience with similar technology airframe-engine combinations in conducting EDTO; (i.e., 757/767, A 310 or A330);
- 2) Experience with the specified airframe engine combination;
- 3) Experience with non-EDTO aeroplane in international over water operations;
- 4) The record of the airframe engine combination in EDTO with other air operators; and
- 5) Other scenarios.

c) Airframe Engine Combination Build Standards.


- 1) Engine/APU Items. This statement applies equally to Engine manufacturer items, Engine Build up Systems and Auxiliary Power Units on aeroplanes proposed to be used to conduct simulated EDTO flights. Normally, the configuration, maintenance, and operating items identified in the current approved Configuration, Maintenance, and Procedures (CMP) document are implemented prior to the start of simulated EDTO flights. However, items identified in the CMP document by an asterisk may be accomplished per the manufacturer's recommended schedule.
- 2) Airframe Items. It is recommended that aeroplane proposed to be used in the simulated EDTO program be configured to the CMP Build Standard for airframe items at the start of simulated EDTO flights. Further, if certain equipment significantly impacts maintenance and/or operational procedures then the CAA may require that it may be installed early in the simulation period. Airframe items which the applicant intends to incorporate at a later date are to be identified in the application along with a schedule for compliance. During the final three months of the simulation period, all aeroplanes used to conduct simulated EDTO flights are to fully comply with the CMP document.
- 3) Equipment required by the Regulations for extended overwater flight. Any equipment required by the SLACARs for extended overwater flight, which is not installed at the start of simulated EDTO operations, should be identified. They should present the AWI with a schedule for the installation of such equipment. If certain equipment significantly impacts maintenance and/or operational procedures then the FOI and/or AWI, may require that equipment be installed early in the simulation period.

- d) Maintenance Control Systems. The simulation program should be designed to aid air operators in the development of decision-making processes through implementation of supplemental EDTO maintenance and reliability requirements as specified in Chapter 4 of this manual. It is not within the scope of this Appendix to restate each

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required program element, but to outline the extent of their application in simulated programs. These are:

- 1) Dispatch Considerations. All dispatch actions real or simulated including documentation of discrepancies should be completed prior to actual dispatch of the aeroplane. Air operators conducting EDTO simulations have the same dispatch options as would be exercised in actual EDTO operations. These considerations are:
  - i) Minimum Equipment List (MEL). In instances in which the aeroplane does not meet the operator's EDTO MEL requirements (but does meet non EDTO requirements), dispatch options are to include:
    - A) Taking appropriate action to clear MEL and operate as an EDTO segment;
    - B) Substitute an EDTO capable aeroplane and operate as an EDTO segment; or
    - C) Operate the flight as a non-EDTO segment; and
  - ii) Domestic Verification Flights. Instances in which the air operator's program prescribes a domestic verification flight prior to EDTO, dispatch options could include:
    - A) Substitute an EDTO capable aeroplane and operate as an EDTO segment.
    - B) Operate the flight as a non-EDTO segment; or.
    - C) Perform the verification flight in accordance with the approved CAA procedure and operate as an EDTO segment.
- 2) EDTO Destination Reliability Requirements. The excessive use of the option to operate as a non EDTO segment is not desirable in that it indicates a lack of commitment to the EDTO program. Therefore, during the period of simulation, it is recommended that EDTO destination reliability remain at 98% or higher. The following details the ground rules for destination reliability requirements.
  - i) An EDTO flight is considered reliable if it arrives at its planned destination within 6 hours of its planned arrival time;
  - ii) If an EDTO flight does not arrive at its intended destination within 6 hours of planned due to factors unrelated to the air operator's maintenance or operations programs, then the flight may be counted as reliable. Passenger medical emergencies, air traffic flow control and flights rescheduled for passenger load considerations are examples of

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flights that would not be counted against the EDTO destination reliability requirements;

- iii) Flights which are conducted under the non EDTO MEL are not considered as reliable for the destination reliability calculation;
- iv) Any EDTO designated flight which is unreliable under the criteria specified above should be reported to the Airworthiness Inspector (AWI) within 72 hours of the event. The report should include:
  - A) If maintenance related, a description of the discrepancy or malfunction that caused the flight to be unreliable including operating under a non EDTO MEL;
  - B) If operations-related, a description of the operational problem which caused the flight to be unreliable;
  - C) Chronology of the problem beginning with the first notification to maintenance or operations personnel up to the time of flight termination or cancellation;
  - D) The actions which followed initial notification of the problem;
  - E) Logistical aspects surrounding the availability of repair parts and/or required maintenance equipment at the station where the problem occurred; and
  - F) Any other information that may be deemed pertinent to the factors, which caused the flight to be unreliable; and
- v) Destination reliability data should be compiled and reported to the AWI each month starting from commencement of EDTO simulation. This report should include
  - A) The number of flights scheduled during the period and total number scheduled since start of EDTO simulation;
  - B) The number of flights considered reliable and unreliable during the period and since start of EDTO simulation;
  - C) The percentage of flights considered reliable during the period and since the start of EDTO simulation; and
  - D) In-service experience data to include inflight shutdown (IFSD) rates, (3 month, 6 month, 12 month rolling average, as agreed with the AWI), unscheduled engine removals and rates, delays and cancellations, airframe-engine hours and cycles, record of APU start and run reliability, and any other significant operator events required

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to be reported under the maintenance reliability program identified in Chapter 4. Data such as IFSD rates and events for portions of the applicant's airplane engine combination fleet which are not intended to be utilized in the EDTO simulation also be reported.

e) Operations Programs.


- 1) Training. Flight crew and dispatchers who participate in the simulation should have received EDTO training prior to participation in the simulation; and
- 2) Operations. Flights should be planned, dispatched and flown in accordance with this manual. All dispatch actions real or simulated including documentation of discrepancies should be completed prior to actual dispatch of the aeroplane. The following elements should be evaluated:
  - i) Critical fuel reserves and critical fuel requirements during EDTO simulated flights;
  - ii) EDTO alternate aerodromes;
  - iii) Operational flight plans including diversion data such as Equal Time Points, critical fuel requirements, heading information;
  - iv) Minimum Equipment List (MEL) items;
  - v) Plotting charts, annotated during flight planning as they would for an actual flight.
  - vi) Communications capabilities in order to familiarize themselves with operational characteristics of HF communication and SATCOM; and
  - vii) Technical assistance, where exercises are conducted on selected flights to evaluate the availability and quality of assistance from maintenance technical centers.
- f) Number of operations are to be observed by the CAA maintenance and operations inspectors. Simulated malfunctions and contingencies should be given to determine the capability to respond correctly and expeditiously

## D.8 CONCEPT FOR DEMONSTRATION

The purpose of the demonstration phase is to gain experience and to validate effectiveness consistent with the highest level of safety over actual 180 minute routes. Flights conducted during the demonstration phase should be conducted utilizing applicable Regulations and this manual's criteria for airframe engine configuration, maintenance, dispatch, and flight crew programs. The following should be addressed:

- a) Area of operation: The demonstration flights should be conducted over intended routes. Exact tracks, points of entry, diversion aerodromes, and support facilities at


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origins and destinations should be established as if 180 minute authority were actually being exercised in regularly scheduled service;

- b) Sample size and timing: A minimum of twelve (one way) demonstration flights should be flown in the planned actual area of operations. The number of demonstration flights may be increased or decreased by the FOI, on a case-by-case basis based on the factors identified in Paragraphs D.7 (b) (1) through (4). The initial flight should be flown approximately 90 days prior to the date of anticipated 180 minute approval. The purpose of these flights is to demonstrate proof of concept in the exercise of all operational and maintenance factors. Results of these flights are used to modify the EDTO program elements to assure that subsequent flights fully conform to desired profiles. So that the experience base built, repeatable, operations;
- c) EDTO Maintenance and reliability requirements: The maintenance control system for the EDTO demonstration flights should be fully developed and conform to the requirements of Chapter 4 of this Manual;
- d) Configuration compliance: All aeroplanes flying in the demonstration flights should comply with configuration requirements as established in the CMP Document and applicable SLCARs. Similarly, all training, dispatch, maintenance, and maintainability/reliability standards criteria should be in full conformance with this manual;
- e) Configuration delays. Should a delay occur in the configuration of the aeroplanes (for example, due to part availability) the simulation program should be continued until ready to conduct demonstration flights;
- f) Flight profiles: Demonstration flight segments should be integrated into the operational schedule and submitted in advance to the FOI. All flights should conform to the operations specifications and 180 minute EDTO criteria;
- g) Diversion exercises. During the course of the demonstration flights, EDTO diversion exercises should be conducted in accordance with the established ground rules, at a frequency and extent to be determined by CAA. The demonstration diversions should be consistent with the guidelines established by CAA for 180 minute EDTO validation flights. Diversion exercises should not impact the applicant's destination reliability record or required number of simulation/demonstration flights; and
- h) Validation flight credit. At the discretion of the CAA, the final flight or flights conducted during the demonstration phase may be planned and conducted as the CAA required EDTO validation flight(s). This flight or flights should be coordinated between the CAA and the air operator well in advance. This provision does not alter the requirement to conduct simulation/demonstration for 12 consecutive months and approximately 1,000 flights.



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## **D.9 CONCEPTS FOR PAPER AIRLINE EVALUATION**

To validate the accuracy and repeatability of data sources, flight planning methodology and algorithms, and operational decision processes, a “paper airline” data assimilation and analysis should be conducted in parallel to both the simulation and demonstration phases and should address the following:


- a) Area of operation: The “paper airline” should be “flown” over the exact route(s) intended for the regularly scheduled EDTO flights.
- b) Sample size and timing: A minimum of one flight per business day, per intended segment, should be planned. “Business day” is described as the period in which normal duties permit data retrieval and analysis. Where the frequency is less than daily, the “paper” scenario should still maintain a minimum analysis volume of at least 5 flights per week.
- c) Maintenance program. Although maintenance activity simulation cannot be accommodated in a quantitative analysis scenario of this type, it is recommended that maintenance alert and MEL notification mechanisms be regularly exercised and displayed in conjunction with flight planning releases.
- d) Configuration compliance. Not applicable, but it should be assumed that the “paper” airplane in the planning data base for the daily analyses is fully conformed to CMP and EDTO MEL requirements.
- e) Paper flight analysis. For each paper flight, planned versus actual weather and facility status should be analyzed. Items to be analyzed include:
  - 1) crosswind component, icing, runway);
  - 2) Actual versus forecast En route weather;
  - 3) Actual versus forecast condition of navigation, communication and aerodrome facilities for En route, alternate, and terminal phase of flight; and
  - 4) Analysis of planned versus actual En route wind and the resultant variation in planned fuel burn off to determine impact on the critical fuel scenario.
- f) Presentation of data. During the course of the domestic simulation phase, results from the ongoing daily “paper airline” analyses should be made available for the FOI and AWI to review and comment.

## **D.10 EDTO VALIDATION FLIGHT**

EDTO validation flight or flights should be conducted under the supervision of a CAA Inspector in accordance with the requirements Paragraph 1.4.2 of this manual. The flight(s) may be scheduled approval of the air operator’s 180 minute EDTO application (see Subsection D.8 g) for guidance on conducting validation flight or flights during the demonstration phase).

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## APPENDIX E


### E.1 INTRODUCTION


This Job Aid was developed to provide operators and inspectors with guidance on the process to be followed in order to obtain Extended Diversion Time Operations (EDTO) approval. It should be used as an aid for the approval process but frequent reference to CAASL EDTO Handbook would be required.

### E.2 EDTO AIRWORTHINESS/OPERATIONAL APPROVAL JOB AID

<b>Operator:</b>	<b>Aircraft:</b>
<b>Max. Diversion time applied:</b>	<b>Engine:</b>

Sl, No;	Items	Operators Document	Remarks (S/NS/A) Remarks Legend: S – Satisfactory NS – Not Satisfactory A – Additional information required
<b>1. General requirements</b>			
<b>1.1</b>	Calculation of distance covered during approved extended diversion time period is reasonable and is based on Airplane Flight Manual (AFM) data and drift down procedures and established single-engine level flight procedures are published in the Operations Manual.		
<b>2. Operations Manual</b>			
<b>2.1</b>	Specifies nominated single-engine cruise speed, drift-down speeds, and distance covered during requested maximum diversion time		
<b>2.2</b>	Procedures for drift-down and establishment of single-engine cruise are included in the manual		
<b>2.3</b>	EDTO weather minima is explained in the manual		
<b>2.4</b>	Information on alternate aerodromes		
<b>2.5</b>	EDTO flight planning <ul style="list-style-type: none"> <li>Fuel and oil policy</li> <li>Minimum altitudes applicable to the routes</li> </ul>		
<b>2.6</b>	Policy on diversion in event of engine or other major system failure		
<b>2.7</b>	Operational procedures <ul style="list-style-type: none"> <li>EDTO aerodrome selection</li> </ul>		
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	<ul style="list-style-type: none"> <li>• Pre-flight crew procedures</li> <li>• Enroute procedures (cross checking procedures to identify navigation errors, selection of other navigation aids in case of loss of RNAV capability, contingency procedures, minimum equipment at EDTO entry point, alternate routings, position check before entering EDTO airspace, alternate airports, performance data, APU etc.</li> <li>• Passenger and crew recovery plans for diversion to enroute alternates if applicable.</li> <li>• Post-flight crew procedures</li> </ul>		
<b>3. MEL</b>			
<b>3.1</b>	Appropriate EDTO MEL has been approved		
<b>4. Performance data</b>			
	Data on single-engine performance giving fuel flow and TAS under various atmospheric conditions and power settings are available for the following phases of flight;		
<b>4.1</b>	Drift-down		
<b>4.2</b>	Cruise altitude, including 10,000 feet		
<b>4.3</b>	Altitude capability		
<b>4.4</b>	Holding		
<b>4.5</b>	Missed approach		
<b>5. Operational Control</b>			
<b>5.1</b>	Operator can provide operational control including flight following of EDTO flights and communications with aircraft		
<b>6. Flight Planning</b>			
<b>6.1</b>	System provided for additional pre-flight information for EDTO flights		
<b>6.2</b>	System considers weather minima requirements for alternate aerodromes		
<b>6.3</b>	Fuel planning allows for diversion from the most critical point with the most critical failure		
<b>7. Alternate Aerodromes</b>			
<b>7.1</b>	System in place for selection of alternate aerodromes <ul style="list-style-type: none"> <li>• Fire protection/medical facilities</li> </ul>		
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	<ul style="list-style-type: none"> <li>Fuel and oil servicing (if applicable)</li> <li>Aerodrome lighting</li> <li>Approach facilities</li> <li>Aerodrome facilities</li> <li>Ground communication</li> <li>Maintenance facilities (if applicable)</li> </ul>		
7.2	System in place for surveillance of alternate aerodromes		
7.3	System to ensure DGCA approval of alternate aerodromes for EDTO		
<b>8. Crew Training and Checking</b>			
8.1	Concept of engineering reliability		
8.2	Flight crew qualification requirements		
8.3	Initial and recurrent training <ul style="list-style-type: none"> <li>Alternate aerodrome standards</li> <li>EDTO flight planning and meteorological requirements</li> <li>MEL requirements for EDTO</li> <li>Diversion decision making</li> <li>Non-normal flight procedures</li> </ul>		
8.4	Flight Dispatcher training		
<b>9. EDTO 75/90 Minutes Approval (additional items)</b>			
9.1	Airworthiness approval (see airworthiness checklist)		
9.2	Mature operator (experience) (mark yes/no)		
9.3	Benign area of operations of aircraft does not hold EDTO/EDTO Type Design Approval (mark yes/no)		
<b>10. EDTO More than 75/90 Minutes - 120 Minutes Approval</b>			
10.1	12 month experience in operating specified engine/airframe combination		
10.2	Proving flight planned		
10.3	Airworthiness approval (see airworthiness checklist)		
<b>11. EDTO More than 120 Minutes – 180 Minutes Approval</b>			
11.1	12 month experience in operating specified engine/airframe combination		
11.2	Proving flight planned		
11.3	Weather forecast reliability monitored by operator		
11.4	“Flight Following” cell established to monitor weather forecasts and NOTAM for nominated alternate aerodromes		
11.5	Additional crew training covering		

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	operation under system failure conditions, contingency procedures and diversion decision making		
<b>11.6</b>	Airworthiness approval (see airworthiness checklist)		
<b>12. Draft Operations Specification</b>			
<b>12.1</b>	Specifies maximum diversion time		
<b>12.2</b>	Specifies area of operation		
<b>12.3</b>	Specifies approved engine/airframe combination and aircraft model		
<b>Remarks:</b>			
<b>Signature of Flight Operations Inspector:</b>		<b>Signature of Airworthiness Inspector:</b>	
<b>Name of Flight Operations Inspector:</b>		<b>Name of Airworthiness Inspector:</b>	
<b>Date:</b>		<b>Date:</b>	

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## APPENDIX F

### EDTO DEMONSTRATION CHECKLIST

#### F.1 Step 1

Proving flight readiness check (table-top exercise) as per SLCAP 4525 Appendix D Para D-9 on Concepts for Paper Airline Evaluation.

#### F.2 Step 2

Simulator validation conducted on EDTO sector

**Legend:**


S – Satisfactory

NS – Not Satisfactory

Sl. No;	Items	S/NS	Comment if NS
1	Pre-flight documentation review <ul style="list-style-type: none"> <li>• Technical Log</li> <li>• NOTAMs</li> <li>• Met briefing</li> <li>• CFP</li> <li>• Route map with threshold and max diversion time circles</li> </ul>		
2	Take off, climb cruise, entry into EDTO segment, weather minima requirements for alternate aerodrome		
3	Normal in-flight procedures <ul style="list-style-type: none"> <li>• Fuel management</li> <li>• Communication</li> <li>• Navigation</li> </ul>		
4	Non-normal scenarios <ul style="list-style-type: none"> <li>• Cabin safety event</li> <li>• In-flight shutdown of engine/s</li> <li>• Decompression, emergency descent to MEA/FL 100</li> <li>• Loss of electrical power</li> <li>• Incapacitation</li> <li>• Diversion to enroute alternate</li> </ul>		
5	Engine inoperative approach and Landing		

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<b>6</b>	Post-flight procedure <ul style="list-style-type: none"> <li>• Technical log</li> <li>• Communications</li> <li>• Passenger and crew recovery plan</li> </ul>		
<b>Remarks:</b>			
<b>Signature of Flight Operations Inspector:</b>			
<b>Name of Flight Operations Inspector:</b>			
<b>Date:</b>			

### F.3 Step 3


#### EDTO PROVING FLIGHT CHECKLIST

**Legend: S – Satisfactory**  
**NS – Not Satisfactory**


<b>Operator:</b>		<b>Aircraft model/engine:</b>	
<b>Registration:</b>		<b>Sector:</b>	
<b>PIC:</b>		<b>Co-pilot:</b>	
<b>Maximum diversion time:</b> 90-120 mins/120-180 mins			
SI No	Items	S/NS	Comments if NS
<b>1. Pre-flight EDTO documentation</b>			
1.1	CMP available and current		
1.2	CMP Supplement available and current		
1.3	AFM EDTO Coverage		
1.4	Configuration compliance letter (manufacturer)		
1.5	FCOM/QRH available and current		
1.6	MMEL/DDG available and current		
1.7	Company Operations manuals and checklists updated for EDTO (Diversion Distances, Alternate Airports, EDTO Performance)		
1.8	Company MEL available and includes EDTO provisions		

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Sl No	Items	S/NS	Comments if NS
<b>2. Training and Qualification</b>			
2.1	EDTO Flight Crew Training program reviewed		
2.2	EDTO dispatcher training program reviewed		
2.3	EDTO maintenance training program reviewed		
2.4	Flight crew qualified for EDTO		
2.5	Dispatcher support qualified for EDTO		
2.6	Maintenance personnel qualified for EDTO		
2.7	<b><i>Potential Scenario: Training currency expired, re-qualification requirements</i></b>		
<b>3. EDTO Flight Release</b>			
3.1	EDTO technical log complete and signed off		
3.2	Company EDTO CFP produced and reviewed		
3.3	EDTO diversion time identified on flight plan		
3.4	EDTO entry, exit and equi-time points identified on flight plan		
3.5	EDTO Alternates and validity period identified on flight plan		
3.6	EDTO area of operation confirmed		
3.7	Flight plan shows most limiting critical fuel scenario (Engine inoperative speed, icing)		
3.8	NOTAMs and approach plates for designated EDTO alternates		
3.9	EDTO weather minima check (enroute and destination)		
3.10	EDTO plotting chart available for flight		
3.11	Dispatch briefing observed and complete		
3.12	<b><i>Potential Scenario: Simulated 120 Minute MEL dispatch condition</i></b>		
<b>4. Flight Deck preparation</b>			
4.1	EDTO critical systems checks (Nav/Comm)		
4.2	FMS Preparation (EDTO Fixes, Alternate Airports)		
4.3	EDTO briefing complete		
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Sl No	Items	S/NS	Comments if NS
4.4	Fuel load confirmed against critical fuel scenario		
<b>5. Enroute</b>			
5.1	Enroute alternate airport weather checks		
5.2	EDTO alternate status confirmed prior to EDTO entry point		
5.3	Enroute communication procedures/oceanic control		
5.4	Fuel progress monitoring		
5.5	Navigation procedures and use of plotting chart		
5.6	FMC functionality and usage		
5.7	Company communications/flight following procedures		
5.8	EDTO area confirmation for potential reroutes		
5.9	APU cold soak start procedures and maintenance program interface		
5.10	<b><i>Potential Scenario: EDTO Alternate below minimums prior to EEP, Simulated EDTO verification flight</i></b>		
<b>6. Simulated Diversion Scenarios</b>			
6.1	Flight crew coordination, CRM		
6.2	Diversion Aerodrome Selection		
6.3	Use of QRH procedures (as applicable)		
6.4	Diversion strategy considerations (speed, thrust selection)		
6.5	Dispatch/Operations Control Centre Coordination		
6.6	Maintenance Control Centre Coordination		
6.7	Ground handling coordination		
6.8	<b><i>Potential Scenarios: Engine shutdown, decompression, cargo fire, passenger medical, weather diversion</i></b>		
<b>Remarks:</b>			
<b>Signature of FOI:</b>		<b>Signature of AWE:</b>	
<b>Name of FOI:</b>		<b>Name of AWE:</b>	
<b>Date:</b>		<b>Date:</b>	

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## APPENDIX G




### APPLICATION FOR EXTENDED DIVERSION TIME (EDTO) OPERATIONAL/AIRWORTHINESS APPROVAL

Applicants are strongly advised to read the EDTO/ETOPS notes before completing the form.

Please complete the form in BLOCK CAPITALS using black or dark blue ink.


This form is designed to elicit all the required information from those operators requiring EDTO/ETOPS operations approvals. The completed form and supporting documentation should be submitted to the Operations Section of the CAA SL at the address listed in the 'Notes for Completion'.

Section	Content	Instruction
<b>Section I</b>	Operator/Airframe Details	Completion mandatory
<b>Section II</b>	EDTO/ETOPS Notes For Completion	
<b>Section III</b>	Signature Block	Completion mandatory
<b>Section IV</b>	Operator's EDTO/ETOPS Operations Manual Matrix	Completion mandatory

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## Section I – Operator/Airframe Details

<b>1. Applicant Details - required for all Approval requests</b>		
<p>Please give the official name and business or trading name(s), address, mailing address, e-mail address and contact telephone/fax numbers of the applicant. Note: For AOC holders - company name, AOC number and e-mail address will suffice.</p>		
<b>2. Aircraft Details - required for all Approval requests Aeroplane type(s), series and registration mark(s).</b>		
Aeroplane Type	Aeroplane Series	Registration


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## Section II – ETOPS Notes for Completion

Section II – ETOPS Notes for Completion		
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Section II – ETOPS Notes for Completion		
Section II – ETOPS Notes for Completion		
Section II – ETOPS Notes for Completion	<b>Contact details for enquiries about EDTO/ ETOPS:</b>	<b>Contact details for enquiries about charges:</b>
Section II – ETOPS Notes for Completion	Tel: 011 2358914 Email: <a href="mailto:dops@caa.lk">dops@caa.lk</a>	Tel: 0112358922 Email: <a href="mailto:caiafo@caa.lk">caiafo@caa.lk</a>

## Section III – Signature Block

Signature: .....  Name (BLOCK LETTERS): .....  Designation: .....  Date: .....
Please note that a minimum of 120 working days will normally be required to process and issue an ETOPS approval - if data is missing or omitted the process may take considerably longer.


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## Section IV - Applicant's EDTO/ETOPS Submissions Matrix

Please complete your review of your Operations Manual. The EDTO/ETOPS flight operations minimum requirements are given in the table below.


Enter the Operations Manual references in the last column and return the matrix, together with photocopies of the relevant pages of the Operations Manual, to the address given in paragraph 4 of Section II.

OPERATIONS MANUAL	SUBJECTS	REQUIREMENTS	OPERATIONS MANUAL REF. OR DOC. REF.
<b>Part A General</b>	Documents/regulations used in compiling ETOPS Manual/Procedures.	EU-OPS EASA AMC 20-6 FAA AC 120-42B	
	Brief description of EDTO/ETOPS.		
	Definitions.	Extended Operations. Adequate aerodrome. Approved one-engine inoperative cruise speed. Threshold distance/time. Adequate ETOPS En route alternate. Equal time points. Rule distance/time. ETOPS segment. ETOPS significant system. Maximum approved diversion time. Dispatch.	
	Criteria.	Company AOC defined operating area. List of certified aircraft types/engine combinations.	


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<b>Part A General (Contd.)</b>	Approval.	Approved diversion time.	
	Qualifications.	Crew qualifications. ETOPS qualified dispatcher personnel. ETOPS qualified operations staff. ETOPS qualified maintenance personnel.	
	Training (Initial and Recurrent) and Checking.	Flight crew training and Operations Manuals. Flight crew currency requirements.	
	ETOPS Authorization.	Commander's responsibilities. Statement to show when ETOPS are allowed.	
	ETOPS Flight Preparation and Planning.	Aircraft serviceability and MEL. Communication and navigation facilities. Critical fuel scenario. Critical fuel reserve. ETOPS alternate aerodrome selection. ETOPS alternate planning minima. Pre-dispatch and post-dispatch weather minima. Computerised flight plan. Delayed dispatch. Maintenance check (pre-departure service check). Verification flights.	
	Flight Crew Procedures.	Crew responsibilities. Flight documentation/chart handling. Fuel management. Weather monitoring. Change of routing. Diversion decision-making.	




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		Icing. Crew workload management.	
<b>Part B Type Specific</b>	Type-related ETOPS Operations.	Identification of EDTO/ETOPS aeroplanes. Types of EDTO/ETOPS operations that are approved. Placards and limitations. One-engine inoperative speed.	
	Type-specific Planning Requirements.		
	ETOPS Fuel Planning.	Including critical fuel scenario.	
	MEL/CDL.	EDTO/ETOPS-specific MEL/CDL items.	
	Aeroplane Systems.	Performance data. Aerodrome technical differences, navigation fit, communications fit.	
	Non-normal Procedures.	Navigation failures. Action to be taken on EDTO/ETOPS-significant system failure. Low fuel scenario. Crew incapacitation.	
<b>Part C Route and Aerodrome Instructions</b>	ETOPS Areas and Routes.	Approved area of operation. EDTO/ETOPS En-route alternates. Performance restrictions and weather minima for En route alternates. Meteorological facilities/information. Low altitude cruise information. Route minimum diversion altitudes. MSA restrictions. Route-specific oxygen requirements.	

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<b>Part D Training</b>	Ground Training with Simulator and/or Line Training.	<p>General:</p> <ul style="list-style-type: none"> <li>• EDTO/ETOPS overview.</li> <li>• EDTO/ETOPS regulations.</li> <li>• EDTO/ETOPS type design approval.</li> <li>• Definitions.</li> <li>• Approved one-engine inoperative speed.</li> <li>• Maximum approved diversion time.</li> <li>• Operator's approved diversion time.</li> <li>• EDTO/ETOPS area of operation.</li> <li>• EDTO/ETOPS routes.</li> <li>• EDTO/ETOPS alternate aerodromes and weather minima.</li> <li>• Navigation systems accuracy, limitations and operating procedures.</li> <li>• Meteorological facilities and information.</li> <li>• In-flight monitoring and procedures.</li> <li>• Computerised flight plan.</li> <li>• Charts and position plotting.</li> <li>• Equal time point.</li> <li>• Critical fuel. Normal procedures:</li> <li>• Flight planning and dispatch.</li> <li>• ETOPS fuel requirements.</li> <li>• Route alternate selection - weather minima.</li> <li>• MEL - equipment-specific.</li> <li>• ETOPS service check and technical log.</li> <li>• Pre-flight FMS set-up.</li> <li>• Flight performance progress monitoring.</li> <li>• Flight management, navigation and communication systems.</li> </ul>	
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<b>PART D TRAINING (Contd.)</b>		<ul style="list-style-type: none"> <li>• Aeroplane system monitoring.</li> <li>• Weather monitoring.</li> <li>• In-flight fuel management (to include independent cross-checking of fuel quantity).</li> </ul> <p>Non-normal procedures:</p> <ul style="list-style-type: none"> <li>• Diversion procedures and diversion 'decision making'.</li> <li>• Navigation and communication systems, including appropriate flight management devices in degraded modes.</li> <li>• Fuel management with degraded systems.</li> <li>• Procedures for single and multiple failures in flight affecting EDTO/ETOPS sector entry and diversion decisions.</li> <li>• Operating on standby power.</li> <li>• Operational restrictions associated with system failures including any applicable MEL considerations.</li> </ul>	
	ETOPS Line Refresher Check and/or Simulator Check	<p>Annual refresher course.</p> <p>Pilot's conversion course.</p>	
	Flight Operations Staff and Dispatchers.	<p>Outline of training syllabus to include:</p> <ul style="list-style-type: none"> <li>• EDTO/ETOPS regulations.</li> <li>• Operational approval.</li> <li>• Aeroplane performance.</li> <li>• Diversion procedures.</li> <li>• Area of operation.</li> <li>• Fuel requirements.</li> <li>• Dispatch considerations: MEL, CDL, weather minima and alternate airports.</li> <li>• Delayed dispatch.</li> </ul>	

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<b>PART D TRAINING (Contd.)</b>		• Documentation.	
<b>Any Further Comments to Support Your Application:</b>			

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## APPENDIX H

### GUIDANCE FOR OPERATIONS BY TURBINE-ENGINED AEROPLANES BEYOND 90 MINUTES TO AN EN-ROUTE ALTERNATE AERODROME INCLUDING EXTENDED DIVERSION TIME OPERATIONS (EDTO)

#### 1. INTRODUCTION

1.1 The purpose of this Attachment is to provide guidance on the general provisions relating to operations by turbine- engined aeroplanes beyond 90 minutes' flying time to an en-route alternate aerodrome and extended diversion time operations contained in Chapter 4, 4.7. The guidance will also assist DGCA in establishing a threshold time and approving the maximum diversion time for a given operator with a specific aeroplane type. The provisions in Chapter 4, 4.7, are divided into:

- a) The basic provisions that apply to all aeroplanes operating beyond 90 minutes to an en-route alternate aerodrome; and
- b) Provisions to fly beyond a threshold time, and up to a maximum diversion time, approved by the DGCA, that may be different for each operator/aeroplane type combination.

This Attachment provides guidance on the means of achieving the required level of safety envisaged.

1.2 Similar to the threshold time, the maximum diversion time is the range (expressed in time) from a point on a route to an en-route alternate aerodrome up to which the DGCA will grant approval. When approving the operator's maximum diversion time, DGCA will need to consider not only the capable range of the aircraft, taking into consideration any limitation of the aeroplane's type certificate, but also the operator's previous experience on similar aircraft types and routes.

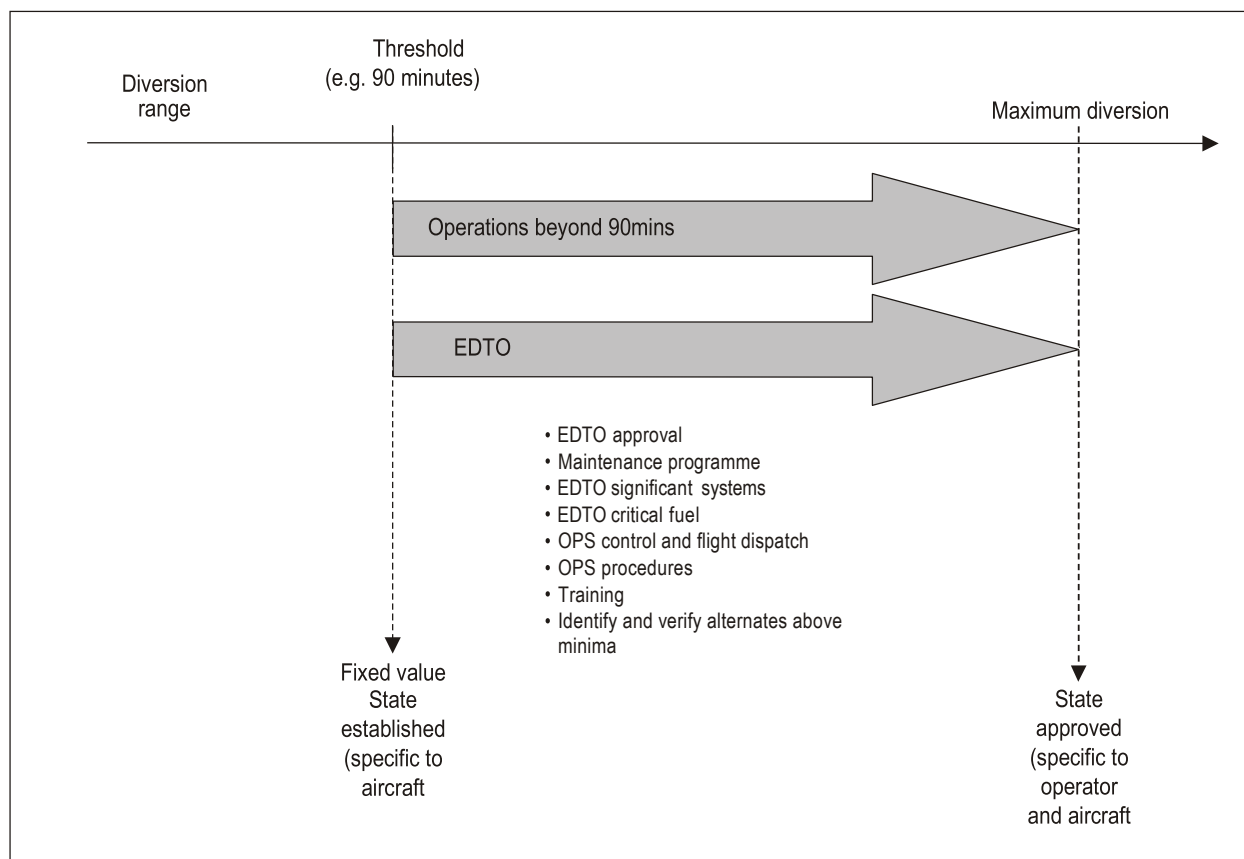
1.3 The material in this Attachment is organized to address guidance on operations beyond 90 minutes to an en-route alternate aerodrome for all aeroplanes with turbine engines (Section 2) and guidance for extended diversion time operations (Section 3). The EDTO section is further divided into general provisions (Section 3.1), provisions that apply to aeroplanes with more than two engines (Section 3.2) and provisions that apply to aeroplanes with two engines (Section 3.3). The sections on aeroplanes with two engines and more than two engines are organized in exactly the same way. It should be noted that these sections may appear to be similar and thus repetitive; however there are requirement differences based on the aeroplane type. The reader should see Sections 2 and 3.1 and then either 3.2 for aeroplanes with more than two engines or 3.3 for aeroplanes with two engines.

#### 2. OPERATIONS BY AEROPLANES WITH TURBINE ENGINES BEYOND 90 MINUTES TO AN EN-ROUTE ALTERNATE AERODROME

##### 2.1 General

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2.1.1 All provisions for operations by aeroplanes with turbine engines beyond 90 minutes to an en-route alternate aerodrome also apply to extended diversion time operations (EDTO). Figure C-1 illustrates generically the integration of operations beyond 90 minutes to an en-route alternate aerodrome and EDTO.



**Figure C-1. Generic EDTO graphical representation**

2.1.2 In applying the requirements for aeroplanes with turbine engines in Chapter 4, 4.7, it should be understood that:

- Operational control refers to the exercise, by the operator, of responsibility for the initiation, continuation, termination or diversion of a flight;
- Flight dispatch procedures refer to the method of control and supervision of flight operations. This does not imply a specific requirement for licensed flight dispatchers or a full flight following system;
- Operating procedures refer to the specification of organization and methods established to exercise operational control and flight dispatch procedures in the appropriate manual(s) and should cover at least a description of responsibilities concerning the initiation, continuation, termination or diversion of each flight as well as the method of control and supervision of flight operations; and

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d) Training programme refers to the training for pilots and flight operations officers/flight dispatchers in operations covered by this and following sections.

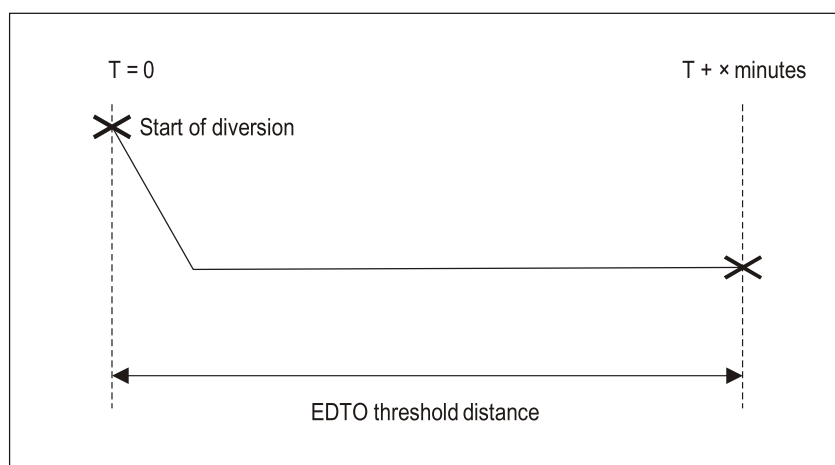
2.1.3 Aeroplanes with turbine engines operating beyond 90 minutes to an en-route alternate aerodrome are not required to have specific additional approval by the DGCA except if they engage in extended diversion time operations.

2.2 Conditions to be used when converting diversion times to distances

2.2.1 For the purpose of this guidance, an approved one-engine-inoperative (OEI) speed or approved all-engines- operative (AEO) speed is any speed within the certified flight envelope of the aeroplane.

2.2.2 Determination of the 90-minute distance — aeroplanes with two turbine engines

2.2.2.1 For determining whether a point on the route is beyond 90 minutes to an en-route alternate, the operator should select an approved OEI speed. The distance is calculated from the point of the diversion followed by cruise for 90 minutes, in ISA and still-air conditions, as shown in Figure C-2. For the purposes of computing distances, credit for drift-down may be taken.



**Figure C-2. Ninety-minute distance — aeroplanes with two turbine engines**

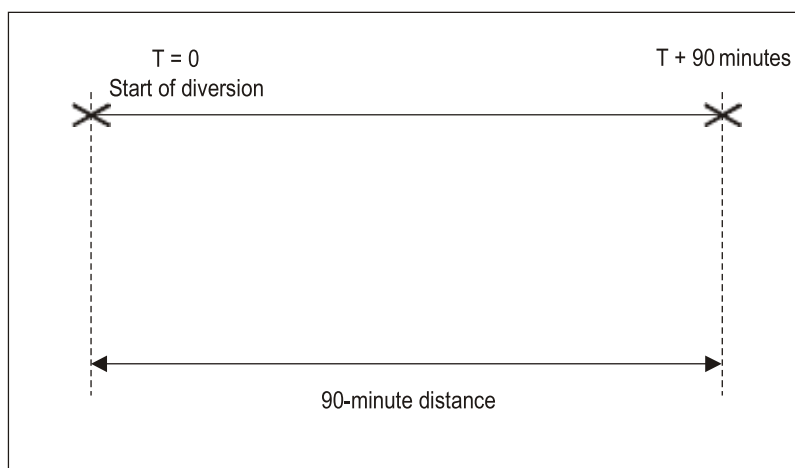
2.2.3 Determination of the 90-minute distance — aeroplanes with more than two turbine engines

2.2.3.1 For determining whether a point on the route is beyond 90 minutes to an en-route alternate, the operator should select an approved AEO speed. The distance is calculated from the point of the diversion followed by cruise for 90 minutes, in ISA and still-air conditions, as shown in Figure C-3.

2.3 Training

2.3.1 Training programmes should ensure that the requirements of Chapter 9, 9.4.3.2, are complied with such as, but not limited to, route qualification, flight preparation, concept of extended diversion time operations and criteria for diversions.

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**Figure C-3. Ninety-minute distance — aeroplanes with more than two turbine engines**

## 2.4 Flight dispatch and operational requirements

2.4.1 In applying the general flight dispatch requirements of Chapter 4 particular attention should be paid to the conditions which might prevail any time that the operation is beyond 90 minutes to an en-route alternate aerodrome, e.g. systems degradation and reduced flight altitude. For compliance with the requirement of Chapter 4, 4.7, at least the following aspects should be considered:

- a) Identify en-route alternate aerodromes;
- b) ensure that, prior to departure, the flight crew is provided with the most up-to-date information on the identified en- route alternate aerodromes, including operational status and meteorological conditions and, in flight, make available means for the flight crew to obtain the most up-to-date weather information;
- c) Methods to enable two-way communications between the aeroplane and the operator's operational control centre;
- d) Ensure that the operator has a means to monitor conditions along the planned route including the identified alternate aerodromes and ensure that procedures are in place so that the flight crew are advised of any situation that may affect the safety of flight;
- e) Ensure that the intended route does not exceed the established aeroplane threshold time unless the operator is approved for EDTO operations;
- f) Pre-flight system serviceability including the status of items in the minimum equipment list;
- g) Communication and navigation facilities and capabilities;
- h) Fuel requirements; and



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- i) Availability of relevant performance information for the identified en-route alternate aerodrome(s).

2.4.2 In addition, operations conducted by aeroplanes with two turbine engines require that, prior to departure and in flight, the meteorological conditions at identified en-route alternate aerodromes will be at or above the aerodrome operating minima required for the operation during the estimated time of use.

## 2.5 En-route alternate aerodromes

2.5.1 Aerodrome(s) to which an aircraft may proceed in the event that a diversion becomes necessary while en route, where the necessary services and facilities are available, where aircraft performance requirements can be met, and which are expected to be operational if required, need to be identified any time that the operation is beyond 90 minutes to an en-route alternate aerodrome.

*Note.* — En-route alternate aerodromes may also be the take-off and/or destination aerodromes.

## 3. EXTENDED DIVERSION TIME OPERATIONS (EDTO) REQUIREMENTS

### 3.1 Basic concept

3.1.1 In addition to the provisions in Section 2, this section addresses the provisions that apply to operations by aeroplanes with two or more turbine engines where the diversion time to an en-route alternate aerodrome is greater than the threshold time established by the DGCA (extended diversion time operations).

#### 3.1.2 EDTO significant systems


3.1.2.1 EDTO significant systems may be the aeroplane propulsion system and any other aeroplane systems whose failure or malfunctioning could adversely affect safety particular to an EDTO flight, or whose functioning is specifically important to continued safe flight and landing during an aeroplane EDTO diversion.

3.1.2.2 Many of the aeroplane systems that are essential for non-extended diversion time operations may need to be reconsidered to ensure that the redundancy level and/or reliability will be adequate to support the conduct of safe extended diversion time operations.

3.1.2.3 The maximum diversion time should not exceed the value of the EDTO significant system limitation(s), if any, for extended diversion time operations identified in the aeroplane flight manual, directly or by reference, reduced by an operational safety margin, commonly 15 minutes, specified by the DGCA.


3.1.2.4 The specific safety risk assessment to approve operations beyond the time limits of an EDTO significant time- limited system per the provisions in Chapter 4, 4.7.2.3.1, should be based on the safety risk management guidance contained in the Safety Management Manual (SMM) (Doc 9859).

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Hazards should be identified and safety risks assessed according to predicted probability and the severity of the consequences based on the worst foreseeable situation. When addressing the following components of the specific safety risk assessment it should be understood that:

- a) Capabilities of the operator refer to the operator's quantifiable in-service experience, compliance record, aeroplane capability and overall operational reliability that:
  - 1) Are sufficient to support operations beyond the time limits of an EDTO significant time-limited system;
  - 2) Demonstrate the ability of the operator to monitor and respond to changes in a timely manner; and
  - 3) There is an expectation that the operator's established processes, necessary for successful and reliable extended diversion time operations, can be successfully applied to such operations;
- b) Overall reliability of the aeroplane refers to:
  - 1) quantifiable standards of reliability taking into account the number of engines, aircraft EDTO significant systems and any other factors that may affect operations beyond the time limits of a particular EDTO significant time-limited system; and
  - 2) Relevant data from the aeroplane manufacturer and data from the operator reliability programme used as a basis to determine overall reliability of the aeroplane and its EDTO significant systems;
- c) Reliability of each time-limited system refers to quantifiable standards of design, testing and monitoring that ensure the reliability of each particular EDTO significant time-limited system;
- d) Relevant information from the aeroplane manufacturer refers to technical data and characteristics of the aeroplane and worldwide fleet operational data provided by the manufacturer and used as a basis to determine overall reliability of the aeroplane and its EDTO significant systems; and
- e) Specific mitigation measures refer to the safety risk management mitigation strategies, which have manufacturer concurrence, that ensure an equivalent level of safety is maintained. These specific mitigations shall be based on:
  - 1) Technical expertise (e.g. data, evidence) proving the operator's eligibility for an approval of operations beyond the time limit of the relevant EDTO significant system; and
  - 2) An assessment of relevant hazards, their probability and the severity of the consequences that may adversely impact the safety of the operation of an

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aeroplane operated beyond the limit of a particular EDTO significant time-limited system.

### 3.1.3 Threshold time

3.1.3.1 It should be understood that the threshold time established in accordance with Chapter 4, 4.7, is not an operating limit. It is a flight time to an en-route alternate aerodrome, which is established by the DGCA as being the EDTO threshold beyond which particular consideration should be given to the aeroplane capability as well as the operator's relevant operational experience, before granting an EDTO approval.

### 3.1.4 Maximum diversion time

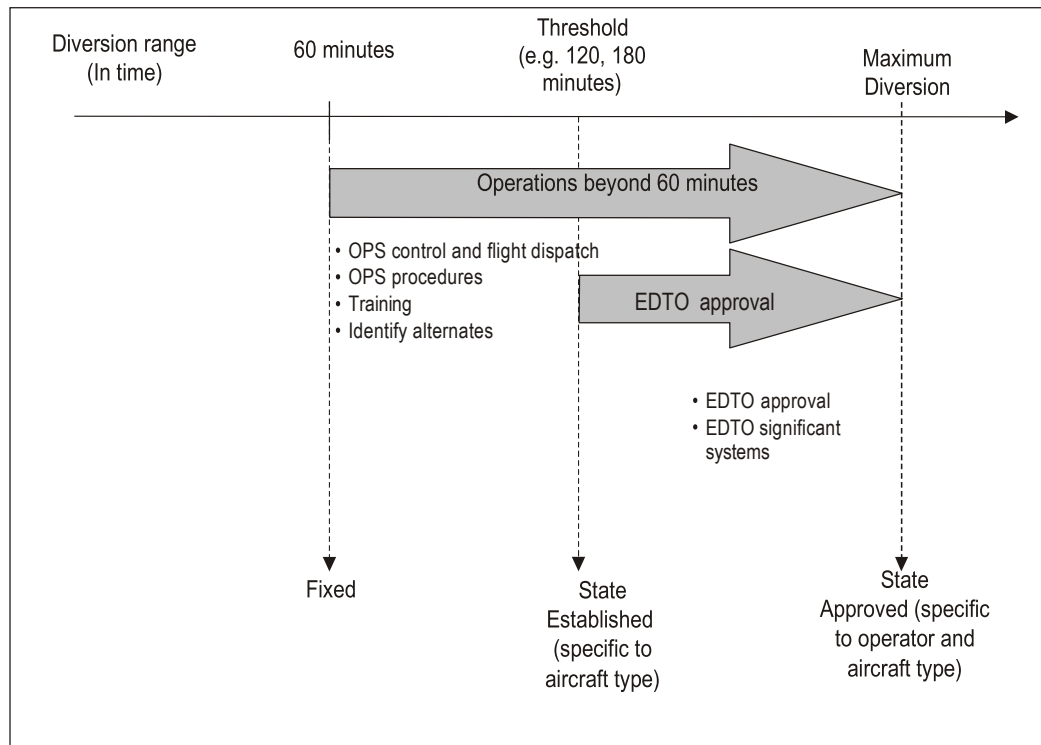
3.1.4.1 It should be understood that the maximum diversion time approved in accordance with Chapter 4, 4.7, should take into consideration the most limiting EDTO significant system time limitation, if any, indicated in the aeroplane flight manual (directly or by reference) for a particular aeroplane type and the operator's operational and EDTO experience, if any, with the aeroplane type or, if relevant, with another aeroplane type or model.

## 3.2 EDTO for aeroplanes with more than two turbine engines

### 3.2.1 General

3.2.1.1 In addition to the provisions in Sections 2 and 3.1 of this Attachment, this section addresses the provisions that apply in particular to aeroplanes with more than two turbine engines (see Figure C-4).

**Note.** — *EDTO may be referred to as ETOPS in some documents.*



**Figure C-4. Generic EDTO graphical representation for aeroplanes with more than two turbine engines**


### 3.2.2 Operational and diversion planning principles

3.2.2.1 When planning or conducting extended diversion time operations, the operator and pilot-in-command should ensure that:

- the minimum equipment list, the communications and navigation facilities, fuel and oil supply, en-route alternate aerodromes and aeroplane performance are appropriately considered;
- if no more than one engine is shut down, the pilot-in-command may elect to continue beyond the nearest en-route alternate aerodrome (in terms of time) if the pilot-in-command determines that it is safe to do so. In making this decision the pilot-in-command should consider all relevant factors; and
- in the event of a single or multiple failure of an EDTO significant system or systems (excluding engine failure), the aircraft can proceed to and land at the nearest available en-route alternate aerodrome where a safe landing can be made unless it has been determined that no substantial degradation of safety will result from any decision made to continue the planned flight.

#### 3.2.2.2 EDTO critical fuel

3.2.2.2.1 An aeroplane with more than two engines engaged in EDTO operations should carry enough fuel to fly to an en-route alternate aerodrome as described in 3.2.6. This EDTO

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critical fuel corresponds to the additional fuel that may be required to comply with Chapter 4, 4.3.6.3 f) 2).

3.2.2.2.2 The following should be considered, using the anticipated mass of the aeroplane, in determining the corresponding EDTO critical fuel:

- a) fuel sufficient to fly to an en-route alternate aerodrome, considering at the most critical point of the route, simultaneous engine failure and depressurization or depressurization alone, whichever is more limiting;
- 1) the speed selected for the diversions (i.e. depressurization, combined or not with an engine failure) may be different from the approved AEO speed used to determine the EDTO threshold and maximum diversion distance (see 3.2.8);
- b) Fuel to account for icing;
- c) Fuel to account for errors in wind forecasting;
- d) Fuel to account for holding an instrument approach and landing at the en-route alternate aerodrome;
- e) Fuel to account for deterioration in cruise fuel-burn performance; and
- f) Fuel to account for APU use (if required).


**Note.** — *Guidance on EDTO critical fuel planning can be found in the Flight Planning and Fuel Management Manual (Doc 9976).*

3.2.2.3 The following factors may be considered in determining if a landing at a given aerodrome is the more appropriate course of action:

- a) Aeroplane configuration, mass, systems status and fuel remaining;
- b) Wind and weather conditions en route at the diversion altitude, minimum altitudes en route and fuel consumption to the en-route alternate aerodrome;
- c) Runways available, runway surface condition and weather, wind and terrain in the proximity of the en-route alternate aerodrome;
- d) Instrument approaches and approach/runway lighting available and rescue and firefighting services (RFFS) at the en-route alternate aerodrome;
- e) The pilot's familiarity with that aerodrome and information about that aerodrome provided to the pilot by the operator; and
- f) Facilities for passenger and crew disembarkation and accommodation.

3.2.3 Threshold time

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3.2.3.1 In establishing the appropriate threshold time and to maintain the required level of safety, it is necessary for DGCA to consider that:

- a) The airworthiness certification of the aeroplane type does not restrict operations beyond the threshold time, taking into account the aeroplane system design and reliability aspects;
- b) Specific flight dispatch requirements are met;
- c) Necessary in-flight operational procedures are established; and
- d) The operator's previous experience on similar aircraft types and routes is satisfactory.

3.2.3.2 For determining whether a point on a route is beyond the EDTO threshold to an en-route alternate aerodrome, the operator should use the approved speed as described in 3.2.8.

#### 3.2.4 Maximum diversion time

3.2.4.1 In approving the maximum diversion time, the DGCA should take into consideration the aeroplane's EDTO significant systems (e.g. limiting time limitation, if any, and relevant to that particular operation) for a particular aeroplane type and the operator's operational and EDTO experience with the aeroplane type or, if relevant, with another aeroplane type or model.

3.2.4.2 For determining the maximum diversion distance to an en-route alternate, the operator should use the approved speed as described in 3.2.8.

3.2.4.3 The operator's approved maximum diversion time should not exceed the most limiting EDTO significant system time limitation identified in the aeroplane flight manual, reduced by an operational safety margin, commonly 15 minutes, specified by the DCGA.


#### 3.2.5 EDTO significant systems

3.2.5.1 In addition to the provisions in 3.1.1, this section addresses particular provisions for aeroplanes with more than two turbine engines.

##### 3.2.5.2 Consideration of time limitations

3.2.5.2.1 For all operations beyond the EDTO threshold as determined by the DGCA should consider, at time of dispatch and as outlined below, the most limiting EDTO significant system time limitation, if any, indicated in the aeroplane flight manual (directly or by reference) and relevant to that particular operation.

3.2.5.2.2 The operator should check that from any point on the route, the maximum diversion time does not exceed the most limiting EDTO significant system time limitation, reduced by an operational safety margin, commonly 15 minutes, specified by the DGCA.

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3.2.5.2.3 The maximum diversion time subject to cargo fire suppression time limitations are considered part of the most limiting EDTO significant time limitations in 3.3.5.2.2.

3.2.5.2.4 For that purpose, the operator should consider the approved speed as described in 3.2.8.2 or consider adjusting that speed with forecast wind and temperature conditions for operations with longer threshold times (e.g. beyond 180 minutes) as determined by the DGCA.

### 3.2.6 En-route alternate aerodromes

3.2.6.1 In addition to the en-route alternate aerodrome provisions described in 2.5 the following apply:

- a) For route planning purposes, identified en-route alternate aerodromes, which could be used if necessary, need to be located at a distance within the maximum diversion time from the route; and
- b) In extended diversion time operations, before an aeroplane crosses its threshold time during flight, there should always be an en-route alternate aerodrome within the approved maximum diversion time whose conditions will be at or above the operator's established aerodrome operating minima for the operation during the estimated time of use.

If any conditions, such as weather below landing minima, are identified that would preclude a safe approach and landing at that aerodrome during the estimated time of use, an alternative course of action should be determined such as selecting another en-route alternate aerodrome within the operator's approved maximum diversion time.


**Note.** — *En route alternate aerodromes may also be the take-off and/or destination aerodromes.*

### 3.2.7 Operational approval procedure

3.2.7.1 In approving the operator with a particular aeroplane type for extended diversion time operations, the DGCA should establish an appropriate threshold time and maximum diversion time and, in addition to the requirements previously set forth in this Attachment, ensure that:

- a) Specific operational approval is granted (by the DGCA);
- b) The operator's past experience and compliance record is satisfactory and the operator has established the processes necessary for successful and reliable extended diversion time operations and shown that such processes can be successfully applied throughout such operations;
- c) The operator's procedures are acceptable based on certified aeroplane capability and adequate to address continued safe operation in the event of degraded aeroplane systems;

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- d) The operator's crew training programme is adequate for the proposed operation;
- e) Documentation accompanying the authorization covers all relevant aspects; and
- f) It has been shown (e.g. during the EDTO certification of the aeroplane) that the flight can continue to a safe landing under the anticipated degraded operating conditions which would arise from:
  - 1) The most limiting EDTO significant system time limitation, if any, for extended diversion time operations identified in the aeroplane flight manual, directly or by reference; or
  - 2) Any other condition which the DGCA considers to be equivalent in airworthiness and performance risk.

3.2.8 Conditions to be used when converting diversion times to distances for the determination of the geographical area beyond threshold and within maximum diversion distances

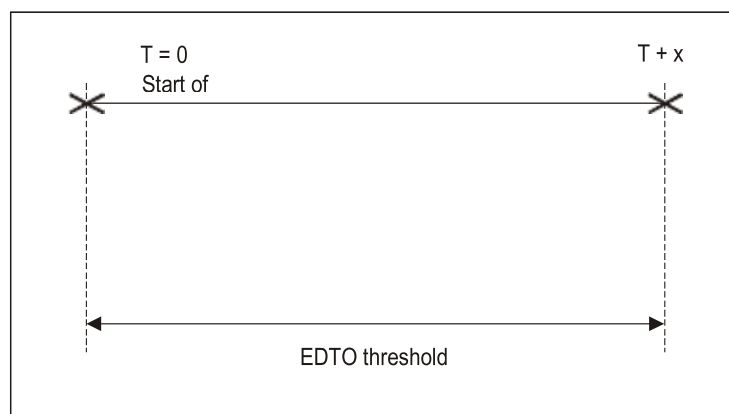
3.2.8.1 For the purpose of this guidance, an approved AEO speed is any all-engines-operative speed within the certified flight envelope of the aeroplane.

*Note.* — See 3.2.5.2.2 for operational considerations.

3.2.8.2 When applying for EDTO the operator should identify, and the DGCA should approve, the AEO speed(s), considering ISA and still-air conditions, that will be used to calculate the threshold and maximum diversion distances. The speed that will be used to calculate the maximum diversion distance may be different from the speed used to determine the 90-minute and EDTO thresholds.


3.2.8.3 Determination of the EDTO threshold

3.2.8.3.1 For determining whether a point on the route is beyond the EDTO threshold to an en-route alternate, the operator should use the approved speed (see 3.2.8.1 and 3.2.8.2). The



distance is calculated from the point of the diversion followed by cruise for the threshold time as determined by the DGCA and shown in Figure C-5.



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**Figure C-5. Threshold distance — aeroplanes with more than two turbine engines**

#### 3.2.8.4 Determination of the maximum diversion time distance

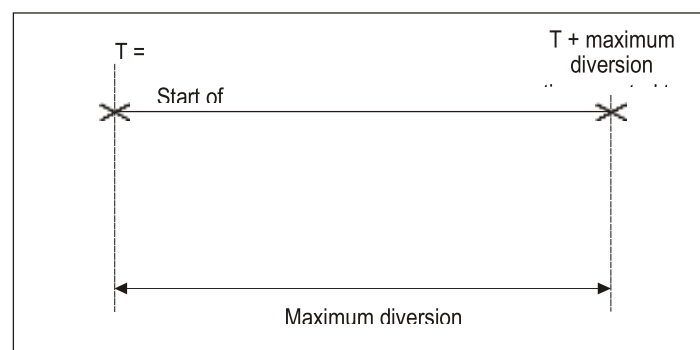
3.2.8.4.1 For determining the maximum diversion time distance to an en-route alternate, the operator should use the approved speed (see 3.2.8.1 and 3.2.8.2). The distance is calculated from the point of the diversion followed by cruise for the maximum diversion time as approved by the DGCA and shown in Figure C-6.

3.2.9 Airworthiness certification requirements for extended diversion time operations beyond the threshold time

3.2.9.1 There are no additional EDTO airworthiness certification requirements for aeroplanes with more than two engines.

3.2.10 maintaining operational approval

3.2.10.1 In order to maintain the required level of safety on routes where these aeroplanes are permitted to operate beyond the established threshold time, it is necessary that:



**Figure C-6. Maximum diversion distance — aeroplanes with more than two turbine engines**

- Specific flight dispatch requirements are met;
- The necessary in-flight operational procedures are established; and
- Specific operational approval is granted by the DGCA.


3.2.11 Airworthiness modifications and maintenance programme requirements

3.2.11.1 There are no additional EDTO airworthiness or maintenance requirements for aeroplanes with more than two engines.

3.2.12 Examples

3.2.12.1 In establishing the appropriate threshold and approved maximum diversion time for the operator with a particular aeroplane type, the DGCA should consider, but not be limited to, the following: the airworthiness certification of the aeroplane, the operator's experience in conducting operations beyond the 90-minute threshold, flight deck crew experience in conducting such operations, the maturity of that operator's flight dispatch system, the communication capability with the operator's operational control centre (ACARS,

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SATCOM, HF, etc.), the robustness of both the operator's standard operating procedures and the familiarity of the crews with those procedures, the maturity of the operator's safety management system, the crew training programme and the reliability of the propulsion system. The following examples are based on these considerations and are taken from actual State requirements:

- a) State A: State A has established the threshold time at 180 minutes based on the capability of the operator and the aeroplane type for an aeroplane with more than two engines and has approved a maximum diversion time of 240 minutes. That operator will need to have specific approval to be further than 180 minutes to an en-route alternate aerodrome (AEO speed in ISA and still-air conditions), remain within 240 minutes to an en-route alternate aerodrome and meet the requirements in Chapter 4, 4.7.1 to 4.7.2.4.

If that operator, with the particular aeroplane type, plans a route within the threshold time established by the DGCA (in the above example this is 180 minutes) to an en-route alternate aerodrome, that operator would not require any additional approval from the DGCA and would only need to comply with the requirements in Chapter 4, 4.7.1, if the operation is conducted beyond 90 minutes from an en-route alternate aerodrome.

- b) State B: The CAA is approached by the operator who is in the process of expansion, having acquired aeroplanes with more than two engines capable of EDTO. The operator submits an application to amend its AOC to include this new aeroplane type on newly granted routes. These routes take the flight beyond 90 minutes to an en-route alternate, thus requiring the establishment of a threshold time and approval of a maximum diversion time. Taking into account:
- 1) That the operator has not had previous experience with the routes and area of operation;
  - 2) The new aeroplane type;
  - 3) The inexperience of the company and its flight operations/operations control department at planning and dispatching such flights; and
  - 4) The new operating procedures to be established,

State B determines that the threshold time for the operator should be limited to 120 minutes and approves a maximum diversion time of 180 minutes.

As the operator gains experience with the operation and the procedures over time, the DGCA may amend the initially established threshold time and approved maximum diversion time.


### 3.3 EDTO for aeroplanes with two turbine engines

#### 3.3.1 General

3.3.1.1 In addition to the provisions in Sections 2 and 3.1, this section addresses the provisions that apply in particular to aeroplanes with two turbine engines (see Figure C-7).

3.3.1.2 EDTO provisions for aeroplanes with two turbine engines do not differ from the previous provisions for extended range operations by aeroplanes with two turbine engines (ETOPS). Therefore, EDTO may be referred to as ETOPS in some documents.

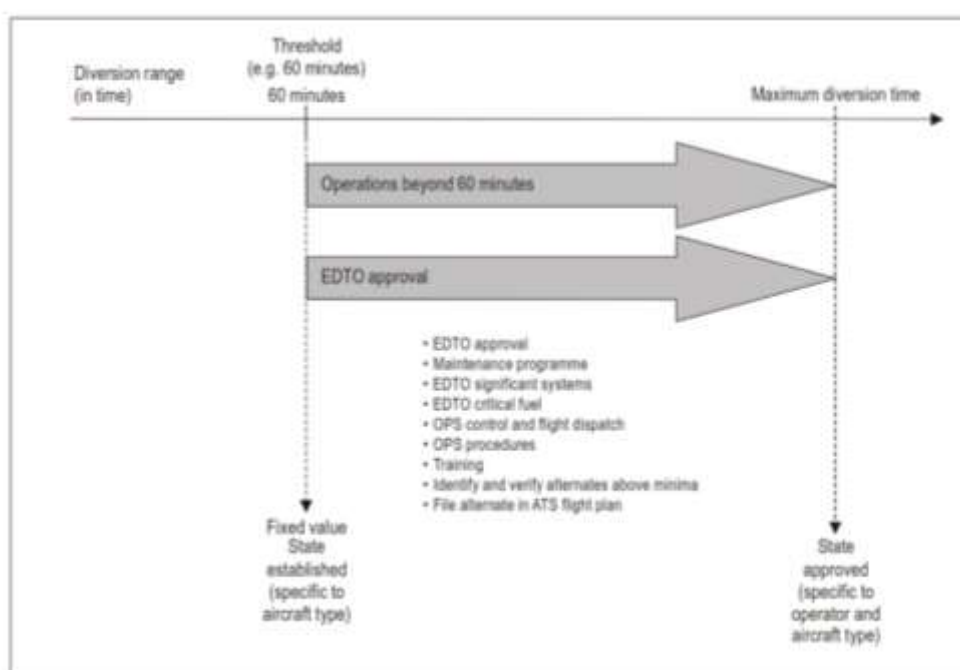
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### 3.3.2 Operational and diversion planning principles

3.3.2.1 When planning or conducting extended diversion time operations, the operator and pilot-in-command should normally ensure that:

- a) The minimum equipment list, the communications and navigation facilities, fuel and oil supply, en-route alternate aerodromes or aeroplane performance are appropriately considered;
- b) In the event of an aeroplane engine shutdown, the aircraft can proceed to and land at the nearest (in terms of the least flying time) en-route alternate aerodrome where a safe landing can be made; and




**Figure C-7. Generic EDTO graphical representation for aeroplanes with two turbine engines (example with 60 minute threshold)**

- c) In the event of a single or multiple failure of an EDTO significant system or systems (excluding engine failure), the aircraft can proceed to and land at the nearest available en-route alternate aerodrome where a safe landing can be made unless it has been determined that no substantial degradation of safety will result from any decision made to continue the planned flight.

#### 3.3.2.2 EDTO critical fuel

3.3.2.2.1 An aeroplane with two engines engaged in EDTO operations should carry enough fuel to fly to an en-route alternate aerodrome as described in 3.3.6. This EDTO critical fuel corresponds to the additional fuel that may be required to comply with Chapter 4, 4.3.6.3 f) 2).

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3.3.2.2.2 The following should be considered, using the anticipated mass of the aeroplane, in determining the corresponding EDTO critical fuel:

- a) fuel sufficient to fly to an en-route alternate aerodrome, considering at the most critical point of the route, failure of one engine or simultaneous engine failure and depressurization or depressurization alone, whichever is more limiting;
  - 1) The speed selected for the all-engines-operative diversion (i.e. depressurization alone) may be different from the approved OEI speed used to determine the EDTO threshold and maximum diversion distance (see 3.3.8);
  - 2) The speed selected for the OEI diversions (i.e. engine failure alone and combined engine failure and depressurization) should be the approved OEI speed used to determine the EDTO threshold and maximum diversion distance (see 3.3.8);
- b) Fuel to account for icing;
- c) Fuel to account for errors in wind forecasting;
- d) Fuel to account for holding an instrument approach and landing at the en-route alternate aerodrome;
- e) Fuel to account for deterioration in cruise fuel-burn performance; and
- f) Fuel to account for APU use (if required).

*Note. — Guidance on EDTO critical fuel planning can be found in the Flight Planning and Fuel Management Manual (Doc 9976).*

3.3.2.3 The following factors may be considered in determining if a landing at a given aerodrome is the more appropriate course of action:

- a) Aeroplane configuration, mass, systems status and fuel remaining;
- b) Wind and weather conditions en route at the diversion altitude, minimum altitudes en route and fuel consumption to the en-route alternate aerodrome;
- c) Runways available, runway surface condition and weather, wind and terrain in the proximity of the en-route alternate aerodrome;
- d) Instrument approaches and approach/runway lighting available and rescue and firefighting services (RFFS) at the en-route alternate aerodrome;
- e) The pilot's familiarity with that aerodrome and information about that aerodrome provided to the pilot by the operator; and

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- f) Facilities for passenger and crew disembarkation and accommodation.

### 3.3.3 Threshold time

3.3.3.1 In establishing the appropriate threshold time and to maintain the required level of safety, it is necessary for DGCA to consider that:

- a) The airworthiness certification of the aeroplane type specifically permits operations beyond the threshold time, taking into account the aeroplane system design and reliability aspects;
- b) The reliability of the propulsion system is such that the risk of double engine failure from independent causes is extremely remote;
- c) Any necessary special maintenance requirements are fulfilled;
- d) Specific flight dispatch requirements are met;
- e) Necessary in-flight operational procedures are established; and
- f) The operator's previous experience on similar aircraft types and routes is satisfactory.

3.3.3.2 For determining whether a point on a route is beyond the EDTO threshold to an en-route alternate aerodrome, the operator should use the approved speed as described in 3.3.8.

### 3.3.4 Maximum diversion time

3.3.4.1 In approving the maximum diversion time, the DGCA should take into consideration the EDTO certified capability of the aeroplane, the aeroplane's EDTO significant systems (e.g. limiting time limitation, if any, and relevant to that particular operation) for a particular aeroplane type and the operator's operational and EDTO experience with the aeroplane type or, if relevant, with another aeroplane type or model.

3.3.4.2 For determining the maximum diversion distance to an en-route alternate, the operator should use the approved speed as described in 3.3.8.


3.3.4.3 The operator's approved maximum diversion time should not exceed the EDTO certified capability of the aeroplane or the most limiting EDTO significant system time limitation identified in the aeroplane flight manual, reduced by an operational safety margin, commonly 15 minutes, specified by the DGCA.

### 3.3.5 EDTO significant systems

3.3.5.1 In addition to the provisions in 3.1.1, this section addresses particular provisions for aeroplanes with two turbine engines.

3.3.5.1.1 The reliability of the propulsion system for the aeroplane/engine combination being certified is such that the risk of double engine failure from independent causes is assessed as

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provided for in the Airworthiness Manual (Doc 9760) and found acceptable to support the diversion time being approved.

**Note.** — *EDTO may be referred to as ETOPS in some documents.*

### 3.3.5.2 Consideration of time limitations

3.3.5.2.1 For all operations beyond the EDTO threshold, as determined by the DGCA, the operator should consider, at time of dispatch and as outlined below, the EDTO certified capability of the aeroplane and the most limiting EDTO significant system time limitation, if any, indicated in the aeroplane flight manual (directly or by reference) and relevant to that particular operation.

3.3.5.2.2 The operator should check that from any point on the route, the maximum diversion time at the approved speed as described in 3.3.5.2 does not exceed the most limiting EDTO significant system time limitation, other than the cargo fire suppression system, reduced by an operational safety margin, commonly 15 minutes, specified by the DGCA.

3.3.5.2.3 The operator should check that from any point on the route, the maximum diversion time at all-engines operating cruise speed, considering ISA and still-air conditions, does not exceed the cargo fire suppression system time limitation, reduced by an operational safety margin, commonly 15 minutes, specified by the DGCA.

3.3.5.2.4 The operator should consider the approved speed as described in 3.3.5.2.2 and 3.3.5.2.3 or consider adjusting that speed with forecast wind and temperature conditions for operations with longer threshold times (e.g. beyond 180 minutes) as determined by the DGCA.


### 3.3.6 En-route alternate aerodromes

3.3.6.1 In addition to the en-route alternate aerodrome provisions described in 2.5, the following apply:

- a) For route planning purposes, identified en-route alternate aerodromes, which could be used if necessary, need to be located at a distance within the maximum diversion time from the route; and
- b) In extended diversion time operations, before an aeroplane crosses its threshold time during flight, there should always be an en-route alternate aerodrome within the approved maximum diversion time whose conditions will be at or above the operator's established aerodrome operating minima for the operation during the estimated time of use.

If any conditions, such as weather below landing minima, are identified that would preclude a safe approach and landing at that aerodrome during the estimated time of use, an alternative course of action should be determined such as selecting another en-route alternate aerodrome within the operator's approved maximum diversion time.

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3.3.6.2 During flight preparation and throughout the flight the most up-to-date information on the identified en-route alternate aerodromes, including operational status and meteorological conditions, should be provided to the flight crew.

*Note.* — *En route alternate aerodromes may also be the take-off and/or destination aerodromes.*


### 3.3.7 Operational approval procedure

3.3.7.1 In approving the operator with a particular aeroplane type for extended diversion time operations, the DGCA should establish an appropriate threshold time and approve a maximum diversion time and, in addition to the requirements previously set forth in this Attachment, ensure that:

- a) Specific operational approval is granted (by the DGCA);
- b) The operator's past experience and compliance record is satisfactory and the operator has established the processes necessary for successful and reliable extended diversion time operations and shown that such processes can be successfully applied throughout such operations;
- c) The operator's procedures are acceptable based on certified aeroplane capability and adequate to address continued safe operation in the event of degraded aeroplane systems;
- d) The operator's crew training programme is adequate for the proposed operation;
- e) Documentation accompanying the authorization covers all relevant aspects; and
- f) It has been shown (e.g. during the EDTO certification of the aeroplane) that the flight can continue to a safe landing under the anticipated degraded operating conditions which would arise from:
  - 1) The most limiting EDTO significant system time limitation, if any, for extended diversion time operations identified in the aeroplane flight manual, directly or by reference; or
  - 2) Total loss of engine-generated electric power; or
  - 3) Total loss of thrust from one engine; or
  - 4) Any other condition which the DGCA considers to be equivalent in airworthiness and performance risk.

3.3.8 Conditions to be used when converting diversion times to distances for the determination of the geographical area beyond threshold and within maximum diversion distances



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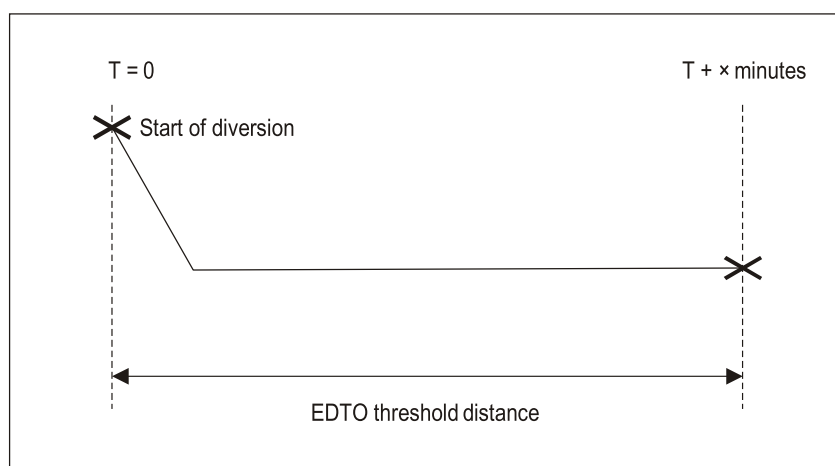
3.3.8.1 For the purpose of this guidance, an approved OEI speed is any one-engine-inoperative speed within the certified flight envelope of the aeroplane.

Note. — See 3.3.5.2.2 for operational considerations.

3.3.8.2 When applying for EDTO the operator should identify, and the DGCA should approve, the OEI speed(s), considering ISA and still-air conditions, that will be used to calculate the threshold and maximum diversion distances. The identified speed that will be used to calculate the maximum diversion distance should be the same one used to determine fuel reserves for OEI diversions. This speed may be different from the speed used to determine the 90-minute and EDTO thresholds.

### 3.3.8.3 Determination of the EDTO threshold

3.3.8.3.1 For determining whether a point on the route is beyond the EDTO threshold to an en-route alternate, the operator should use the approved speed (see 3.3.8.1 and 3.3.8.2). The distance is calculated from the point of the diversion followed by cruise for the threshold time as determined by the DGCA and shown in Figure C-8. For the purposes of computing distances, credit for drift down may be taken.




**Figure C-8. Threshold distance — aeroplanes with two turbine engines**

### 3.3.8.4 Determination of the maximum diversion time distance

3.3.8.4.1 For determining the maximum diversion time distance to an en-route alternate, the operator should use the approved speed (see 3.3.8.1 and 3.3.8.2). The distance is calculated from the point of the diversion followed by cruise for the maximum diversion time as approved by the DGCA and shown in Figure C-9. For the purposes of computing distances, credit for drift down may be taken.

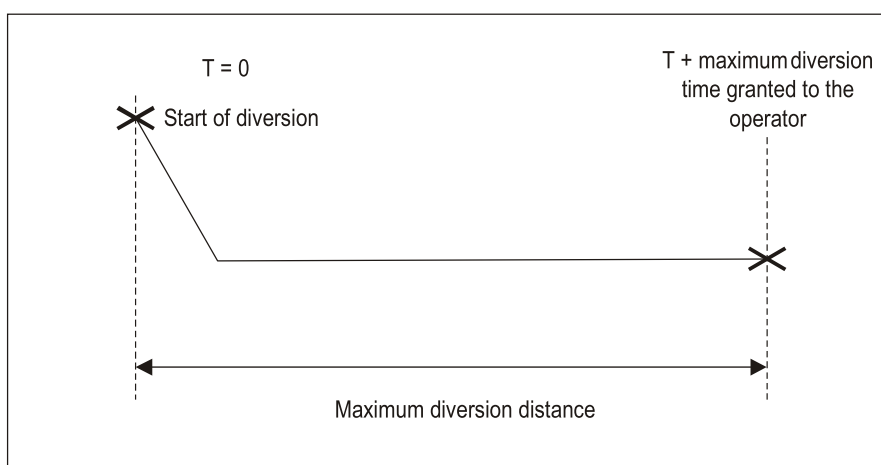
## 3.3.9 Airworthiness certification requirements for extended diversion time operations beyond the threshold time



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3.3.9.1 During the airworthiness certification procedure for an aeroplane type intended for extended diversion time operations, special attention should be paid to ensure that the required level of safety will be maintained under conditions which may be encountered during such operations, e.g. flight for extended periods following failure of an engine and/or the aeroplane's EDTO significant systems.

Information or procedures specifically related to extended diversion time operations should be incorporated into the aeroplane flight manual, the maintenance manual, the EDTO configuration, maintenance and procedure (CMP) document or other appropriate document.



**Figure C-9. Maximum diversion distance — aeroplanes with two turbine engines**

3.3.9.2 Aeroplane manufacturers should supply data specifying the aeroplane's EDTO significant systems and, where appropriate, any time-limiting factors associated with those systems.

**Note 1.** — *Criteria on aeroplane system performance and reliability for extended diversion time operations are contained in the Airworthiness Manual (Doc 9760).*


**Note 2.** — *EDTO may be referred to as ETOPS in some documents.*

### 3.3.10 Maintaining operational approval

3.3.10.1 In order to maintain the required level of safety on routes where these aeroplanes are permitted to operate beyond the established threshold time, it is necessary that:

- The airworthiness certification of the aeroplane type specifically permits operations beyond the threshold time, taking into account the aeroplane's system design and reliability aspects;
- The reliability of the propulsion system is such that the risk of double engine failure from independent causes is extremely remote, assessed as provided for in the Airworthiness Manual (Doc 9760) and found acceptable to support the diversion time being approved;
- Any special maintenance requirements are fulfilled;

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- d) Specific flight dispatch requirements are met;
- e) The necessary in-flight operational procedures are established; and
- f) Specific operational approval is granted by the DGCA.

**Note 1.**— *The airworthiness considerations applicable to extended diversion time operations are provided in the Airworthiness Manual (Doc 9760), Part IV, Chapter 5.*


**Note 2.** — *EDTO may be referred to as ETOPS in some documents.*

### 3.3.11 Airworthiness modifications and maintenance programme requirements

#### 3.3.11.1 Each operator's maintenance programme should ensure that:

- a) The titles and numbers of all airworthiness modifications, additions and changes which were made to qualify aeroplane systems for extended diversion time operations are provided to the DGCA and, where applicable, to the DGCA;
- b) Any changes to maintenance and training procedures, practices or limitations established in the qualification for extended diversion time operations are submitted to the DGCA and, where applicable, to the State of Registry before such changes are adopted;
- c) A reliability monitoring and reporting programme is developed and implemented prior to approval and continued after approval;
- d) Prompt implementation of required modifications and inspections which could affect propulsion system reliability is undertaken;
- e) Procedures are established which prevent an aeroplane from being dispatched for an extended diversion time operation after engine shutdown or EDTO significant system failure on a previous flight until the cause of such failure has been positively identified and the necessary corrective action has been completed. Confirmation that such corrective action has been effective may, in some cases, require the successful completion of a subsequent flight prior to dispatch on an extended diversion time operation;
- f) a procedure is established to ensure that the airborne equipment will continue to be maintained at the level of performance and reliability required for extended diversion time operations; and
- g) a procedure is established to minimize scheduled or unscheduled maintenance during the same maintenance visit on more than one parallel or similar EDTO significant system. Minimization can be accomplished by staggering maintenance tasks, performing and/or supervising maintenance by a different technician, or verifying maintenance correction actions prior to the aeroplane entering an EDTO threshold.

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*Note.— The maintenance considerations applicable to extended diversion time operations are provided in the Airworthiness Manual (Doc 9760).*

### 3.3.12 Examples

3.3.12.1 In establishing the appropriate threshold and approved maximum diversion time for the operator with a particular aeroplane type, the DGCA should consider, but not be limited to, the following: the airworthiness certification of the aeroplane, the operator's experience in conducting operations beyond the 90-minute threshold, flight deck crew experience in conducting such operations, the maturity of that operator's flight dispatch system, the communication capability with the operator's operational control centre (ACARS, SATCOM, HF, etc.), the robustness of both the operator's standard operating procedures and the familiarity of the crews with those procedures, the maturity of the operator's safety management system, the crew training programme and the reliability of the propulsion system. The following examples are based on these considerations and are taken from actual State requirements:


- a) State A: State A has established the threshold time at 60 minutes based on the capability of the operator and the aeroplane type for a twin-engined aeroplane and has approved a maximum diversion time of 180 minutes. That operator will need to have specific approval to be further than 60 minutes to an en-route alternate aerodrome (calculated in ISA and still-air conditions at the one-engine-inoperative cruise speed), remain within 180 minutes to an en-route alternate aerodrome and meet the requirements in Chapter 4, 4.7.1 to 4.7.2.6.

If that operator, with the particular aeroplane type, plans a route within the threshold time established by the DGCA (in the above example this is 60 minutes) to an en-route alternate aerodrome, that operator, by definition, would not be conducting an extended diversion time operation and thus would not need to meet any of the provisions in Chapter 4, 4.7.

- b) State B: State B has established the threshold time at 90 minutes based on the capability of the operator and the aeroplane type for a twin-engined aeroplane and has approved a maximum diversion time of 180 minutes. That operator will need to have specific approval to be further than 90 minutes to an en-route alternate aerodrome (calculated in ISA and still-air conditions at the one-engine-inoperative cruise speed), remain within 180 minutes to an en-route alternate aerodrome and meet the requirements in Chapter 4, 4.7.1 to 4.7.2.6.

If that operator, with the particular aeroplane type, plans a route within the threshold time established by the DGCA (in the above example this is 90 minutes) to an en-route alternate aerodrome, that operator would not require any additional approval from the DGCA and would need only to comply with the requirements in Chapter 4, 4.7.1, and in particular 4.7.1.1 b).

- c) The same State B: The same State B is approached by the operator who is in the process of expansion, having acquired twin-engined aeroplanes capable of EDTO.

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The operator submits an application to amend its AOC to include this new aeroplane type on newly granted routes. These routes take the flight beyond 60 minutes to an en-route alternate, thus requiring the establishment of a threshold time and approval of a maximum diversion time. Taking into account:

- 1) That the operator has not had previous experience with the routes and area of operation;
- 2) The new aeroplane type;
- 3) The inexperience of the company and its flight operations/operations control department at planning and dispatching such flights; and
- 4) The new operating procedures to be established,

State B determines that the threshold time for this operator should be limited to 90 minutes and approves a maximum diversion time of 120 minutes.

As this operator gains experience with the operation and the procedures over time, the DGCA amend the initially established threshold time and approved maximum diversion time.

***Note: The CAASL recognizes the EDTO threshold time of 90mins unless the aircraft is limited by the manufacturer or other conditions to less than 90mins.***