



CHAPTER 27

EXTENDED DIVERSION TIME OPERATIONS CERTIFICATION (EDTO)

1.0 PURPOSE

The purpose of this chapter on EDTO is to provide guidance and interpretative material of the EDTO elements introduced through Amendment 36 in Annex 6 Part 1 §4.7 and Attachment D to Annex 6 Part 1.

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-engined aeroplanes) 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.

1.1 APPLICABILITY

This chapter applies to transport category aeroplanes with two or more turbine engines where the diversion time to an en-route alternate aerodrome is greater than 60 minutes and/or than the threshold time established by the State of the Operator operated by an air operator in an international air transport service.

1.2 REFERENCE REGULATIONS

This document is enabled by Annex 6 Part 1 §4.7 and Attachment D to Annex 6 Part 1. This document can also be used in conjunction with other guidance materials such as the FPFMM (Flight Planning & Fuel Management Manual), the Airworthiness Manual (Doc 9760), ICAO Doc 8335 (Manual of Procedures for Operations Inspections, Certification and Continued Surveillance).

Nig. CARs 8.6.2.10, 8.6.2.11, 8.6.2.12.

1.3 APPROVAL PROCEDURES

1.3.1 APPLICATION FOR EDTO OPERATIONAL APPROVAL

Requests for approval of EDTO operations with aeroplanes having two or more engines should be submitted by the EDTO candidate operator, with the necessary elements to the applicable NCAA office. These elements are those necessary for the NCAA to determine the applicable approval process (i.e. “In-service” or “Accelerated” EDTO operational approval – Refer to Subparagraph 1.3.2) and launch the assessment of the operator’s readiness for EDTO.

These necessary elements are typically:

- The targeted date of start of EDTO
- The contemplated Maximum Diversion Time authority
- The concerned airplane model and fleet (MSNs)
- 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 is:

90 days for In-Service EDTO operational approval; and
180 days for Accelerated EDTO operation approval.

1.3.2 EDTO operation approval requirements – Aeroplanes with 2 turbine engines

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

- Validation or acceptance by the NCAA 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.
- Conformity of the "candidate" aircraft (MSN), including APU and engines, to the applicable EDTO configuration requirements (listed in the EDTO CMP document). CMP refers to Configuration, Maintenance and Procedures
- 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 TGM Vol. 4 (EDTO Maintenance and Reliability Requirements);
- Demonstration that the maintenance checks, servicing, and programs called for in TGM Vol. 4 (EDTO Maintenance and Reliability Requirements) are properly conducted;
- Demonstration that the operational limitations, flight preparation and in-flight procedures called for in paragraph 3 - EDTO Flight Operations Requirements are properly conducted;
- 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. [Coordination with Airworthiness]

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:

- The airline's experience with EDTO, with long-range operations, with the area of operation, with the aircraft, with the engines...
- The contemplated degree of direct in-service experience reduction;



- The type of contemplated EDTO operations (area of operations, frequency of EDTO flights, diversion time requested)

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 chapter.

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.

1.3.2.1 “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 NCAA.

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.

1.3.2.2 “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.

1.3.3 EDTO Operation Approval Requirements – Aeroplanes with more than 2 turbine engines

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

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.



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:

- The airline's experience with EDTO, with long-range operations, with the area of operation, with the aircraft, with the engines...
- The contemplated degree of direct in-service experience reduction;
- 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.

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

- a) Satisfy the operational approval considerations (Operational Approval Criteria) specified in (EDTO Flight Operations Requirements) of this chapter; 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 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 to the Project Manager, for approval and the applicant will be issued an Operations Specification to conduct EDTO operations within specified limitations. [Coordination with Airworthiness]

1.4 CONTINUITY OF EDTO CERTIFICATION - Aeroplanes with two turbine engines

1.4.1 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.



1.4.2 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.

1.4.3 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 TGM Vol. 4 (Airworthiness Consideration for aeroplanes with two turbine engines) for further information and guidelines on EDTO certification of aeroplanes with two turbine engines.

1.5 CONTINUITY OF EDTO OPERATIONAL APPROVAL

1.5.1 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).

1.5.2 The Operator's Procedures and training for EDTO are required to be maintained once EDTO approval is issued.

1.5.3 Subject to the Subsection 1.5.4, where an air operator ceases actual EDTO operations for a period exceeding a time determined by the NCAA (e.g. 13 months), application for re-instatement should be submitted in accordance with paragraph 1.3.

1.5.4 Where an air operator ceases actual EDTO operation for a period exceeding the time defined in Subparagraph 1.5.3 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 Subparagraph 1.5.3, recurrent training should be completed by each flight crew member as per the requirements stipulated by the NCAA and an EDTO recurrent training should be completed by each flight dispatcher and relevant Maintenance and Engineering staff as per those requirements.

1.5.5 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.

1.5.6 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.

2.0 EDTO FLIGHT OPERATIONS REQUIREMENTS

2.1 As explained in paragraph 1.3 (Approval Procedures), 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 paragraph and in the EDTO Maintenance and Reliability Requirements.

It is required that the operator conducts a specific safety risk assessment which demonstrates how an equivalent level of safety will be maintained, taking into account the following:

- capabilities of the operator;
- overall reliability of the aeroplane;
- reliability of each time limited system;
- relevant information from the aeroplane manufacturer; and



- specific mitigation measures.

2.2 ELIGIBILITY

1. For 90 minute approval

- A minimum of 3 months of domestic operating experience with the aeroplane-engine combination for which approval is requested;
- An EDTO type design approved for a minimum 120 minutes EDTO criteria;
- An approved CMP; and
- A Minimum Equipment List requirement for 120 minutes “ER”.

2. For 120 minute approval

- A minimum of 6 months of EDTO operating experience with the aeroplane-engine combination for which approval is requested;
- An EDTO type design approved for a minimum 120 minutes EDTO criteria;
- An approved CMP; and
- A Minimum Equipment List requirement for 120 minutes “ER”.

3. For 138 minute approval

- Extension of EDTO 120 minute approval;
 - A minimum of 3 months of 120 minute EDTO operating experience with the aeroplane-engine combination for which approval is requested;
 - Approved on a case by case basis;
 - An EDTO type design approved for a minimum 120 minute EDTO criteria;
 - An approved CMP;
 - 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;
 - A Minimum Equipment List requirement modified to satisfy the MMEL policy for system component/relief for EDTO operation beyond 120 minutes; and
 - Flight crew, flight dispatcher and maintenance personnel training provided to address the differences between 120 minute and 138 minute approval.
- Use of 180 minutes EDTO approval;
 - A minimum of 3 months of 120 minute EDTO operating experience with the aeroplane-engine combination for which approval is requested;
 - Exercised on an unlimited basis;
 - An EDTO type design approved for a minimum 180 minutes EDTO criteria;
 - An approved CMP;
 - A Minimum Equipment List requirement beyond 120 minutes “ER”; and
 - Flight crew, flight dispatcher and maintenance personnel training provided to address the differences between 138 minute and the 180 minute approval.



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".

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 or less;
- iii) If conditions prevent the use of adequate aerodromes within 180 minutes, as EDTO alternates, the route may be flown beyond 180 minutes subject to 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 there 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. of this chapter; 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 chapter, 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 on 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.

**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 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.

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

3.0 FLIGHT PREPARATION AND IN-FLIGHT CONSIDERATIONS**3.1 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 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.

3.1.1 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 3.1.1.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 3.1.1.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;



3.2 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. It is only from this point that the Minimum Equipment List requirements do not apply.

3.3 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, 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 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 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.

3.5 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 Nig.CARs 8.6.2.11 and 8.6.2.15, including additional contingency fuel reserves that may be determined in accordance with Paragraph 3.5 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;



- 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 3.5 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 enroute 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 3.5 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;
- 4) 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 3.5 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:
 - 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.

3.6 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).

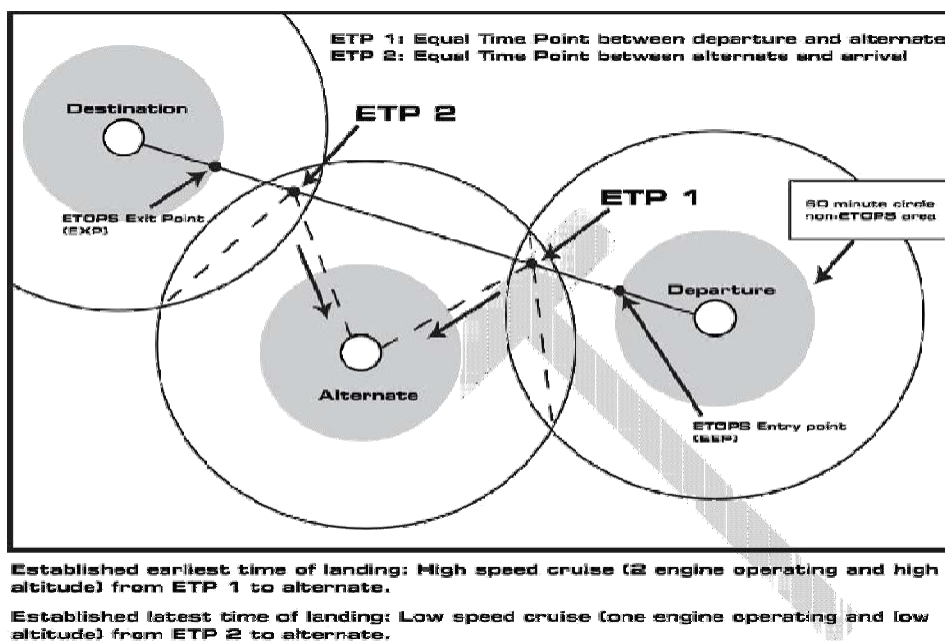
All adequate aerodromes that are located within the authorized diversion limits, should be considered when determining the EDTO alternate aerodromes and the choice and number of EDTO alternate aerodromes should be made so as to minimize the duration of the diversion;

- 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 60 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;
 - 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 A 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 3.6.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 enroute and the above conditions are met;

FIGURE 1





- iii) Once the flight is dispatched, the flight crew and the flight dispatcher should remain informed of any significant changes at the EDTO alternate 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 3.6 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 3.6 b) (excluding Subparagraph 3.6 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 alternate 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 A	Landing Minima	PIC's discretion
MEL	Applicable	Not applicable	Not applicable
Airport Adequacy	Applicable	Applicable	PIC's discretion



Approval of EDTO alternate aerodromes will be based on the results of a specific safety risk assessment demonstrated by the operator, which contains the following:

- capabilities of the operator;
- overall capability of the aeroplane and its systems;
- available aerodrome technologies, capabilities and infrastructure;
- quality and reliability of meteorological information;
- identified hazards and safety risks associated with each alternate aerodrome variation; and
- specific mitigation measures.

3.7 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):

- 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.

3.8 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.

4.0 TRAINING AND EVALUATION PROGRAM

Flight crew member's initial and recurrent EDTO training requirements shall be completed. See example in Appendix B.

Flight dispatcher's initial and recurrent EDTO requirements shall be completed. See Appendix B.5

Maintenance personnel's initial, update and additional EDTO training requirements shall be completed.

See TGM Vol. 4



5.0 OPERATIONAL LIMITATIONS

5.1 AREAS OF OPERATION

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

5.2 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.

5.3 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 suitable* 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*

5.4 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.

6.0 OPERATIONS MANUAL

6.1 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)

7.0 OPERATIONS SPECIFICATIONS

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

7.2 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;

- 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.



APPENDIX A – EDTO ALTERNATE AERODROME

A.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.

A.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.

A.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.



A.4 EDTO ALTERNATE AERODROME WEATHER MINIMA

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

FACILITIES AVAILABLE AT EDTO ALTERNATE AIRPORT	CEILING	VISIBILITY
2 or more useable precision approaches each providing straight-in minima to separate suitable runways. (Two separate landing surfaces)	400 feet, or 200 feet above the lowest useable HAT, whichever is higher.	1 s.m., or 1/2 s.m. more than the lowest useable visibility limit, whichever is greater.
1 useable precision approach.	600 feet, or 300 feet above the lowest authorized HAT/HAA, whichever is higher.	2 s.m., or 1 s.m. more than the lowest published landing visibility, whichever is greater.
1 useable non-precision approach.	800 feet, or 300 feet above the lowest authorized HAT/HAA, whichever is higher.	2 s.m., or 1 s.m. more than the lowest published landing visibility, whichever is greater.

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 paragraph 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
- 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.



APPENDIX B: EDTO TRAINING

The following is an example of a generic EDTO training syllabus. The syllabus should provide for initial and recurrent training for flight crew and be tailored to the operator's particular operations.

1. Introduction to EDTO regulations

- Brief overview of the history of EDTO
- EDTO regulations
- Definitions
- Approved one engine inoperative cruise speed
- Approved all engine operating cruise speed is applicable
- EDTO type design approval - a brief synopsis
- Maximum approved diversion times and time limited system capability
- Cargo fire suppression system capabilities and time limit if applicable
- Routes and aerodrome intended to be used in the EDTO area of operations
- EDTO operations approval
- EDTO area of operations
- EDTO en-route alternate aerodromes including all available approach aids
- Navigation systems accuracy, limitations and operating procedures
- Meteorological facilities and available information
- In-flight monitoring procedures
- Computerised flight plan
- Orientation charts (including low level planning charts and flight progress charts usage including position plotting)
- Equal time point
- Critical fuel scenario.

2. Normal operations

Flight planning and dispatch:

- EDTO fuel requirements
- Route alternate selection - weather minima
- MEL - EDTO specific
- EDTO service check and tech log
- Pre-flight flight management system set up.

Flight performance progress monitoring:

- Flight management, navigation and communication systems
- Aeroplane system monitoring
- Weather monitoring
- In-flight fuel management (to include independent pilot cross checking of fuel quantity).

3. Abnormal and contingency procedures

Diversion procedures and diversion "decision making":

- Initial and recurrent training to prepare flight crew to evaluate potential significant system failures. The goal of this training should be to establish crew competency in dealing with the most probable contingencies. The decision should include the factors that may require medical, passenger related or non-technical diversions.



Navigation and communication systems (including appropriate flight management devices in degraded modes).

Fuel management with degraded systems.

Initial and recurrent training which emphasises abnormal and emergency procedure to be followed in the event of foreseeable failure for each area of operation, including:

- procedures for single and multiple failures in flight affecting EDTO entry and diversion decisions. If standby sources of electrical power significantly degrade the cockpit instrumentation to the pilots, then training for approaches with the standby generator as the sole power source should be conducted during initial and recurrent training
- operational restrictions associated with these system failures (including any applicable MEL considerations).

4. EDTO line flying under supervision

During the introduction into service of a new EDTO type, or conversion of flight crew not previously EDTO qualified, a minimum of two EDTO sectors should be completed including a line check.

EDTO subjects should also be included in annual refresher training.

5. Flight operations personnel other than flight crew

The operator's training program in respect of EDTO should provide training (where applicable) for operations personnel other than flight crew (e.g. dispatchers) in addition to recurrent training in the following areas:

- EDTO regulations/operations approvals
- aeroplane performance/diversion procedures
- area of operation
- fuel requirements
- dispatch considerations MEL, configuration deviation list, weather minima, and alternate airports
- documentation.



APPENDIX C – SIMULATED EDTO PROGRAM

C.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 NCAA 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.

C.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.

C.3 APPLICATION

A request to the NCAA 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 chapter 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;
- 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 C.7. c)



- g) A minimum number of EDTO simulation and demonstration segments performed;
- h) A supplemental EDTO maintenance and reliability requirements of TGM Vol. 4;
- 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 TGM Vol. 4 and the Nig. CARs;
- j) Policy guidance to personnel involved in the program in regards to flight safety as stated in Section C.5 of this appendix;
- k) Operations requirements that meet the criteria of this chapter 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;

C.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.

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

C.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.



C.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:
 - 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 CARs 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 TGM Vol. 4b. It is not within the scope of this Appendix to restate each 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 NCAA 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 operators 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 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 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 in-flight 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 to be reported under the maintenance reliability program identified in TGM Vol. 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.

C.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 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 CARs. 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 aeroplane (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 TC. The demonstration diversions should be



consistent with the guidelines established by TC 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.

C.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) Actual versus forecast enroute EDTO alternate, destination, and terminal alternate weather (ceiling, visibility, crosswind component, icing, runway);
 - 2) Actual versus forecast enroute weather;
 - 3) Actual versus forecast condition of navigation, communication and aerodrome facilities for enroute, alternate, and terminal phase of flight; and
 - 4) Analysis of planned versus actual enroute wind and the resultant variation in planned fuel burnoff 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.

C.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 1.4.3 e) 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.