Advisory Circular

CAA-AC-GEN026
December 2022

EXTENDED DIVERSION TIME OPERATIONS (EDTO)

1. POLICY & GENERAL INFORMATION

1. PURPOSE

This Advisory Circular (AC) provides information and guidance material that should be used by air operator certificate (AOC) holders to ensure compliance with EDTO regulatory requirements

The AC also provides information for operators to assist them in ensuring they meet continuing airworthiness requirements for EDTO approved aircraft and operations requirements for EDTO Operations, as such it has operational and airworthiness information within it.

It should be noted that dependent on the exact route structure, as well as EDTO other approvals would also be required (RVSM, RNP4, RNP10[1]) and approval to operate in North Atlantic High-Level Airspace (NAT/HLA) or other minimum navigation performance specifications (MNPS) airspace would be required. Therefore it is important to consult CAA Advisory Circulars and other guidance fully as well as the reference documents (including ICAO NAT Doc 007) listed in this Advisory Circular.

An additional consideration is the concepts of Required Communications Performance (RCP) and Required Surveillance Performance (RSP). These concepts relate to PBCS operational approval and are relevant as certain airspace has or is proposed to have Reduced Lateral Separation Minima and Reduced Longitudal Separation Minima predicted upon RCP and RSP.

ADS-B, ADS-C, CPDLC (ATS Surveilance/Communication/Datalink) are also relevant and therefore need to be fully considered. Certain airspace is now subject to a Datalink Mandate for example.

It is important always that Organisations and the CAA assigned oversight team consult Regional Supplementary Procedures (ICAO Doc 7030) and Aeronautical Information Publications (AIP) or equivalent so they are aware of specific airspace operating requirements so they may comply with Regional/State specific Airspace requirements.

2. REFERENCE

Notes: The user should always check the latest validity of all relevant reference documents and the technical standards therein.

[1] Exact determination depends on specific application & airspace requirements

EDTO may be referred to as ETOPS in some documents (Ref ICAO Annex 6 Part I 4.7.2.3)

The following Uganda Civil Aviation Regulations (UCARs) are applicable to the EDTO requirements:

1. Regulations 3 of the Civil Aviation (Aircraft Instrument and Equipment) Regulations, 2022
2. Particularly Regulations 68, 76 (3)(f)(ii), 104, 105, 106,&178(10) of the Civil Aviation (Operation of Aircraft-Commercial Air Transport- Aeroplanes) Regulations, 2022 and more generally regulations 3.
3. Civil Aviation (Air Operator Certification and Administration) Regulations, 2022
4. Civil Aviation (Airworthiness of Aircraft) Regulations 2022

The following CAA guidance documents are applicable to EDTO application and operations:

5. Checklist : CL-GEN026- EDTO Assessment Worksheet (AW/OPS)
6. FORM: AC-GEN026- EDTO Operations Application Form
7. CAA-O-GEN026- Extended Diversion Time Operations (EDTO) Approval.

Other relevant EDTO publications:

8. ICAO Annex 2: Rules of the Air
9. ICAO Annex 6, Operation of Aircraft, Part I International Commercial Air Transport-Aeroplanes and Part II – International General Aviation – Aeroplanes
10. ICAO Annex 8, Airworthiness of Aircraft.
11. ICAO Document 10085 (the EDTO Manual)
12. EASA Document AMC 20-6B (Extended Range Operation with Two-Engine Aeroplanes ETOPS Certification and Operation)
13. ICAO Document 8335 – The Surveillance Manual
14. ICAO Document 10037 (Global Operational Data Link GOLD Manual)
15. FAA Advisory Circular AC No 120-42B Extended Operations
16. The ICAO Airworthiness Manual (Doc 9760) contains guidance on the level of performance and reliability of aircraft systems and on overall continuing airworthiness aspects
17. EASA AMC & GM to Annex V, SPA.ETOPS of Regulation (EU) No 965/2012
18. ICAO Doc 7030, Regional Supplementary Procedures
19. NAT Doc 007 – North Atlantic Operations and Airspace Manual
20. State AIP Information, Regional & Airspace Bulletins
21. See also the following websites for additional relevant information:

    ICAO ESAF website www.icao.int/ESAF (Eastern & Southern Africa ICAO office)

1. INTRODUCTION

Regulations 68, 71, 76 (3), 104,105 & 106 of the The Civil Aviation (Operation of Aircraft-Commercial Air Transport -Aeroplanes) Regulations, 2022 relate to or deal specifically with the requirements pertaining to the granting of an EDTO approval by the Authority.

These requirements (expanded upon in this Advisory Circular) include the following: Type Design Considerations, and Operational Approval Considerations with significant detail under these two primary considerations, including aircraft equipment, flight dispatch, operating procedures, training requirements as well as continuing airworthiness & maintenance requirements. Note this Advisory

Circular is structured to have core detail arranged in the Appendices to it on airworthiness and operational matters.

2. TERMINOLOGY (Abbreviations & Definitions)

1. Abbreviations

AEC Aeroplane/engine combination
AEO All engines operative
AFM Aircraft flight manual
APU Auxiliary power unit
ATA Air Transport Association
AWI Airworthiness inspector
CAA Civil aviation authority
CASS Continuing analysis and surveillance
CBT Computer-based training
CDL Configuration deviation list
CFR Critical fuel required
CMP Configuration, maintenance and procedures
CMR Certification maintenance requirements
CP Critical point
DA Decision altitude
DH Decision height
ECM Engine condition monitoring
EDTO Extended diversion time operations
EEP EDTO entry point
EFOM EDTO flight operations manual
EGT Exhaust gas temperature
EMPM EDTO maintenance procedures manual
ETA Estimated time of arrival
ETOPS Extended range operations by aeroplanes with two turbine engines
ETP Equal time point
EXC Excess fuel
EXP Exit point
FL Flight level
FMS Flight management system
FOB Fuel on board
FOI Flight operations inspector
FOM Flight operations manual
GVI General visual inspection
HF High frequency
IAS Indicated airspeed
ICA Instruction for continuing airworthiness
IFSD In-flight shut down
IPC Illustrated parts catalogue
IPD Illustrated parts data
ISA International standard atmosphere
L/D Lift over drag ratio
LOFT Line-oriented flight training
LRC Long-range cruise
MCAI Mandatory continuing airworthiness information
MCT Maximum continuous thrust
MDA Minimum descent altitude
MDH Minimum descent height
MEL Minimum equipment list

MIN Minute(s)
MMEL Master minimum equipment list
MNPS Minimum navigation performance specification
MPD Maintenance planning document
MPM Maintenance procedures manual
MRBR Maintenance review board report
MRC Maximum range cruise
MSN Manufacturer serial number (i.e. serial number of the concerned aeroplane)
NOTAM Notice to airmen
OEI One-engine-inoperative
OFP Operational flight plan
PBN Peformance-based navigation
P/Ns Part numbers
QRH Quick reference handbook
RFFS Rescue and firefighting service
RNP Required navigation performance
RVR Runway visual range
RVSM Reduced vertical separation minimum
RWY Runway
TAS True air speed
TCDS Type certificate data sheet
TLS Time-limited system
VFG Variable frequency generator
VMO/MMO Maximum permissible operating speed or Mach number

2. Definitions

Where the following terms are used in this AC, they have the meaning indicated:

Adequate EDTO en-route alternate aerodrome. An adequate alternate aerodrome is one at the expected time of use, the aerodrome is available and equipped with necessary ancillary services such as air traffic services (ATS), sufficient lighting, communications, weather reporting, navigation aids and emergency services and has at least one instrument approach procedure available.

Aeroplane/engine combination (AEC). A combination of aeroplane model and engine model which has been identified for the purpose of EDTO certification (also called type design and reliability approval) or authorized for EDTO.

EDTO — configuration, maintenance and procedures (CMP) document. The document approved by the State of Design 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 aeroplane/engine combination (AEC) 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, MMEL constraints and maintenance practices found necessary to establish the suitability of an aeroplane/engine combination (AEC) 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.

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 authority.

Maximum Diversion Time. Maximum allowable range, expressed in time, from a point on a route to an en-route alternate aerodrome.

Threshold time. The range, expressed in time, established by the authority, to an en-route alternate aerodrome, whereby any time beyond requires an EDTO approval from the authority.

Type Certification Standards. The data that are defined and approved by the State of Design in the frame of the Type Certification of the concerned aeroplane, e.g. baseline configuration, airworthiness limitations, flight crew procedures.

22. REQUIREMENTS

1. Introduction

The Civil Aviation (Operation of Aircraft-Commercial Air Transport -Aeroplanes) Regulations, 2022 are where the core rules pertaining to EDTO operations are promulgated.

See the Regulation for the full detail but baseline summary information is as below:

Requirements for extended diversion time operations (EDTO):

Unless the operation has been specifically approved by the Authority, an aeroplane with two or more turbine engines shall not be operated on a route where the diversion time to an en-route aerodrome from any point on the route, calculate at ISA and still-air conditions at the one-engine inoperative cruise speed for aeroplanes with two turbine engines and the all engines cruise speed for aeroplanes with more than two turbine engines, exceeds a threshold time established for such operations by the Authority & that:

The Authority shall approve the maximum diversion time for an operator of a particular type engaged in extended diversion time operations.

The Regulation also states that the Authority when approving maximum diversion times for aeroplanes with two turbine engines, take into account the following, to provide the overall level of safety intended by the provisions of the Civil Aviation (Airworthiness of Aircraft) Regulations, 2022.

1. The reliability of the propulsion system.
2. The Airworthiness certification for extended diversion time operations (EDTO) of the aeroplane type; and
3. The extended diversion time operations (EDTO) maintenance programme.

As such the approval process for EDTO is a joint operations and airworthiness responsibility and it should be approached from this perspective.

In terms of basic principles ICAO has established and set out in Annex 6 Part I that there are additional requirements for operations by aeroplanes with turbine engines beyond 60 minutes to an en-route alternate aerodrome including extended diversion time operations (EDTO). The rationale being that ICAO want to impose additional standards on all operations beyond 60 minutes not just EDTO to provide the overall level of safety intended by the provisions of Annex 6 Part I. The background being that ICAO at amendment cycle 36 to Annex 6 Part I introduced the following summarized below[2]:

-Applicability extended to aeroplanes with more than 2 engines-in reality (exact cicrumstances to be checked) this did not introduce significant changes for operators of aircraft of more than two engines and there was also no specific Certification Requirement

[2] See Annex 6 Part I (Section 4.7 for full detail)

-Criteria for all operations beyond 60 min is introduced

-No specific EDTO Approval unless operating beyond Threshold Time established by the State

Recognising the wider requirement above, for EDTO specifically ICAO set out (as above where a regulatory summary is given) that Unless the State of the Operator has issued a specific approval for EDTO, an aeroplane with two or more turbine engines shall not be operated on a route where the diversion time to an en-route alternate aerodrome from any point on the route, calculated in ISA and still-air conditions at the one-engine-inoperative cruise speed for aeroplanes with two turbine engines and at the all engines operating cruise speed for aeroplanes with more than two turbine engines, exceeds a threshold time established for such operations by that State. The specific approval shall identify the applicable threshold time established for each particular aeroplane and engine combination.

The key points to recognise are as follows: that when the diversion time exceeds the threshold time, the operation is considered to be an extended diversion time operation (EDTO) and on issuing such an Approval the State of Operator (i.e. Uganda) shall specify the maximum diversion time granted to the operator for each particular aeroplane and engine combination.

Around these key points there are detailed operational requirements (expanded upon in ICAO Document 10085 and other such reference documents at Para 1.2 above (Reference)

At least in terms of additional high level points ICAO reference that when the State of the Operator specifies maximum diversion time for aeroplanes with two turbine engines, the State needs to ensure that the following are taken into account in respect to the overall level of safety intended by the provisions of Annex 8:

1. Reliability of the propulsion system
2. Airworthiness certification for EDTO of the aeroplane type; and
3. EDTO maintenance programme

4. OPERATIONAL APPROVAL PROCESS

1. General Requirements

1. Application for EDTO Authorisation

Requests for authorization of EDTO operations with aeroplanes having two or more engines should be submitted by the candidate EDTO operator with the necessary elements to the UCAA. These elements are those necessary for the CAA to determine the applicable authorization process and launch the assessment of the operator's readiness for EDTO.

These elements are:

- the targeted date of start of EDTO;
- the contemplated maximum diversion time authority;
- the concerned aeroplane model(s) and fleet(s) (MSNs); and
- the intended EDTO route(s) or operational area(s).

1. Other elements may be provided if deemed relevant by the candidate EDTO operator to support its application.
2. EDTO authorizations are specific approvals granted individually by aeroplane/engine combination (AEC) and area of operation; however, authorizations may be combined for model variations within the same aeroplane family (e.g. A330-200/300) and for multiple geographic regions.

3. The request for authorization of EDTO operations should be submitted as an advance notice in accordance with the ICAO five-phased approach (Ref ICAO Document 8335) so that the UCAA can plan and launch the necessary oversight actions.

4. The required duration of this advance notice prior to the proposed start of EDTO operations should be:

    1. 60 to 90 days for in-service EDTO authorization; and

    - 180 days for accelerated EDTO authorization.

1. EDTO specific approval requirements — aeroplanes with two turbine engines. -

1. For operations with transport category aeroplanes with two turbine engines, the EDTO specific approval requires:

    1. validation or acceptance by the UCAA of the EDTO certification of the aeroplane granted by the State of Design of the aircraft manufacturer. The aeroplane type design should meet the requirements for EDTO design features and criteria specified in the regulations;

    - conformity of the "candidate" aircraft (MSN), including auxiliary power unit (APU) and engines, to the applicable EDTO configuration requirements listed in the EDTO configuration, maintenance and procedures (CMP) document;

    - a system to maintain and dispatch an EDTO aeroplane in accordance with an approved maintenance, reliability and training programme that includes EDTO mainteinance and realiability requirements;

    - demonstration that the maintenance checks, servicing and programmes are properly conducted;

    - demonstration that the operational limitations, flight preparation and in-flight procedures are properly conducted; and

    - authorization of the operator based on its application package: routes, desired diversion time, fleet, area of operations, planned date for the start of EDTO flights, experience records, manuals, training, etc.

1. The AEC 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 the specific approval is issued and operations specifications revised.

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

3. The complexity of this demonstration is basically linked to:

    1. the operator's experience with EDTO, long-range operations, the area of operation, the aircraft type, the engines, etc.;

    - as appropriate, the contemplated degree of direct in-service experience reduction; and

    - the type of intended EDTO operations (area of operations, frequency of EDTO flights, diversion time requested).

1. There are two types of EDTO authorization, either an "in-service" EDTO authorization or an "accelerated" EDTO authorization. Each of these have a different process approach, but the onus remains on the applicant operator to demonstrate compliance.

2. The specificity of an "accelerated" EDTO authorization is that the operator has to build a programme of process validation to address the lack of direct experience (with EDTO and/or with the candidate aircraft).

3. 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 programme 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 operator's background and EDTO objectives. It is not possible in this Advisory Circular to define the exact circumstances surrounding process validation each set of circumstances will be different and the inservice figures outlined below are **only a guide** and subject to further evaluation by the UCAA in the application process.

"In-service" EDTO specific approval for operations with transport category aeroplanes with two turbine engines

4. An "in-service" EDTO authorization[3] by specific approval is either:

    1. when the operator has accumulated more than one year of direct in-service experience with the aircraft without EDTO. In this case, the operator may apply for a diversion time of 120-minute maximum; or

    - when the operator has accumulated more than 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-minute maximum.

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

Note. — Authorization for EDTO operations beyond 180-minute diversion time requires prior authorization for 180-minute EDTO operations. Authorization for EDTO operations beyond 240-minute diversion time requires a minimum of two years of experience with 180-minute or higher EDTO operations.

Note-All in-service experience figures are subject to discussion during the application process (same with accelerated approval case)

"Accelerated" EDTO specific approval for operations with transport category aeroplanes with two turbine engines

2. An "accelerated" EDTO authorization by specific approval is either:

    1. when the operator plans 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 plans to conduct EDTO beyond 120 minutes with less than one year of 120-minute diversion time EDTO experience with the aircraft.

1. The operator may apply for any diversion time up to 180 minutes and may start EDTO at entry into service.

Note. — Authorization for EDTO operations beyond 180-minute diversion time requires prior experience with 180-minute EDTO operations.

[3] Exact in-service experience requirement is dependent upon the actual application

2. Granting of EDTO authorization.

1. The following criteria should be met prior to conducting EDTO operations:

    1. satisfy the authorization considerations (operational criteria to be met for the granting of the authorization) and all the associated stipulations of the UCAA ;

    - demonstrate that EDTO flight release practices, policies and procedures are established; and

    - 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 specific approval authorization 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 authorization (operator experience with the area of operations and aircraft model, contemplated diversion time, etc.) the validation flight in the aeroplane may be replaced by a flight on an approved simulator. This decision is ultimately at the discretion of the UCAA and is not a matter of negotiation.

1. When the foregoing has been reviewed and found acceptable, a recommendation from the FOI and the AWI will be forwarded to the responsible manager for authorization by specific approval, and the applicant will be issued an operations specification to conduct EDTO operations within specified limitations.

2. CONTINUITY OF AUTHORIZATION

1. The EDTO certification is not granted permanently. It is submitted to a continued surveillance by the State of Design of the in-service reliability of the worldwide fleet of the concerned aircraft model/type.

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.

3. The EDTO authorization is not granted permanently. It is submitted to a continued surveillance by the UCAA of the operator's in-service reliability (concerning the EDTO fleet of aircraft).

4. The operator's procedures and training for EDTO are required to be maintained once an EDTO specific approval is issued.

5. Where an air operator ceases EDTO operations for a period exceeding a time determined by the UCAA (nominally 12 months) an application for reinstatement should be submitted to the UCAA. (see above for further detail & the EDTO application form)

6. Where an air operator ceases actual EDTO operation for a period exceeding the time defined in this AC, but maintains simulated EDTO processes, procedures and training as prescribed in this manual, EDTO specific approval may be maintained until actual EDTO operation is resumed**.**

1. However, when actual EDTO operation resumes following a period of EDTO inactivity that exceeds the time defined in this AC, recurrent training should be completed by each flight crew member before conducting EDTO operations as per the requirements stipulated by the UCAA, and EDTO recurrent training should be completed by each flight dispatcher involved

in EDTO operations and relevant maintenance and engineering staff as per those requirements.

7. For minor revisions to EDTO authorizations, the authorization exercise should be focused on the requested changes to the programme. The intent is not to re-evaluate the entire approved programme unless warranted by reliability or operational concerns.

2. EDTO – AIRWORTHINESS CONSIDERATIONS

1. Background

"Aircraft airworthiness considerations for EDTO" refers to the assessment for EDTO of the type design, reliability and maintenance programme of the concerned aircraft model (i.e. a given AEC) for EDTO. The aim of this assessment is to ensure that:

1. 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; and
- the aircraft maintenance and reliability programmes can contribute to maintaining the desired level of reliability of relevant aircraft systems for EDTO. Special maintenance programme requirements for EDTO should be properly identified

1. Airworthiness Considerations for Aeroplanes with two Turbine Engines

1. General

1. The EDTO certification of the aircraft is granted by the State of Design of the aircraft manufacturer. This EDTO certification may also be called EDTO type design and reliability approval of the aircraft.

2. The EDTO certification of the aircraft is a prerequisite to the start of EDTO operations.

3. This EDTO certification therefore has to be validated or accepted by the CAA of the operator before the intended start of EDTO.

4. The EDTO certification is always granted to a given AEC. It is not granted indefinitely and is subject to continued surveillance by the State of Design of the in-service reliability of the worldwide fleet of the concerned aeroplane/engine combination.

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

Note 2.— EDTO certification may be called ETOPS certification in some documents as the term "ETOPS" may still be used instead of "EDTO"

5. Annex 6, Part I, Section 4.7, provides the basic requirements for the authorization of EDTO operations and the requirement for a specific approval, it does also outline airworthiness considerations. The significant ICAO guidance information is in ICAO Document 10085 (The EDTO Manual) also note EASA AMC-20-6B which is a recognized source of information Ultimately between ICAO Annex 6 Part I, relevant guidance documents and the far reaching principes within Annex 8, there is information aimed at achieving the the required level of safety.

6. The EDTO certification criteria are detailed in Chapter 5 of the Airworthiness Manual (Doc 9760), which contains the airworthiness requirements for EDTO, and in particular guidance on

the continuing airworthiness and airworthiness approval for aeroplanes with two turbine engines. EDTO Certification is not discussed in detail in this Advisory Circular.

7. The certified EDTO capability of the aeroplane is reflected in the type certificate data sheet (TCDS), the aircraft flight manual (AFM) or AFM EDTO supplement, as applicable, and the EDTO CMP document.

8. The EDTO certification of the aircraft granted by the State of Design should then be validated or accepted by the State of Registry and, if different, the State of the Operator prior to the intended start of EDTO operations by the operator.

Consult the Appendices for further technical explanation:

Appendix A: EDTO Flight Operations Requirements

Appendix B: EDTO Airworthiness Requirements

Appendix C: EDTO sample Operations Manual Content

Appendix D: EDTO operations training requirements

Appendix E: EDTO airworthiness training requirements

Uganda Civil Aviation Authority

APPENDICIES

Appendix A

2. EDTO FLIGHT OPERATIONS REQUIREMENTS

1. General.

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 programmes. 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

1. Conversion of Threshold and Maximum Diversion Time into Distance

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 expressed as a still-air (zero wind) range in nautical miles based on an assumed diversion speed schedule.
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. The conversion time-to-distance calculation is performed using aeroplane manufacturer data derived from operational documents and software tools or from basic aerodynamic speed relationships, as appropriate.
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 exceedance as long as the planned route of flight remains within the applicable still-air range from an en-route alternate aerodrome.
5. It should also be noted that the diversion speed/distance assessment is 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.

2. Determining the applicable threshold/diversion distances.

1. The time-to-distance conversion 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 based on a still-air standard day thrust limited driftdown 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.
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 1.
3. Operators applying for EDTO authorization should include justification for their selected OEI speed schedule and diversion distance calculation with their EDTO authorization application.

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. Table 1 is a typical example of manufacturer diversion distance information for operational planning and justification (data formats may vary).

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.

6. 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 driftdown portion of the engine failure profile.

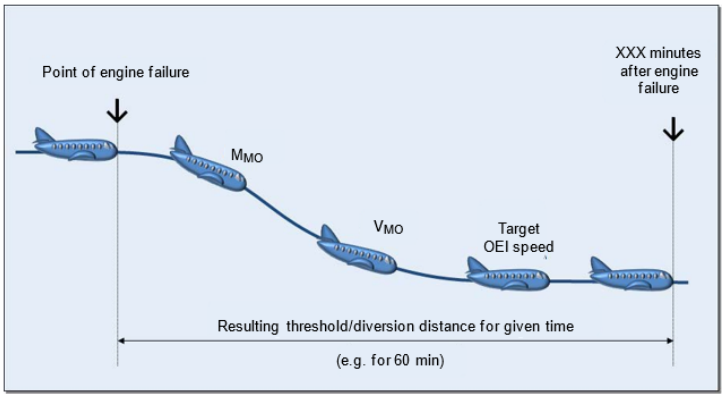


Figure 1 - Driftdown profile example: Max OEI speed/Max continuous thrust (MCT)

MAXIMUM DIVERSION DISTANCE							
Speed schedule	*A/C mass at critical point (x 1 000 kg)*	*FL for diversion*	*Diversion time (Min)* 60	120	180	300	370
MCT/330KT	170	190	439	866	1294		
	190	180	436	860	1285	2136	2500
	210	170	434	853	1272	2110	2500
	230	160	431	844	1257	2083	2500
	250	150	427	834	1241	2056	2500
	270	140	422	823	1225	2027	2496
MCT/300KT	170	220	424	837	1249		
	190	220	424	836	1249	2073	2500
	210	220	419	827	1238	2062	2500
	230	210	415	818	1224	2036	2500
							2448
							2413

Table 1 - Example of EDTO diversion distances information

7. Sixty-minute threshold

The 60-minute threshold distance calculation is used to determine whether the Standards for two-engine aeroplanes, 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.

8. EDTO threshold

This calculation is used to determine the EDTO entry and exit points in an EDTO operational area., the calculation is based on a 60-minute diversion time; 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.

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.

9. EDTO maximum diversion distance

1. The EDTO maximum diversion distance calculation 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 the distance associated with 60 minutes).

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 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.

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

2. Operations beyond 60 minutes.

1. Approval levels.

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. These programmes should address continuing airworthiness, release considerations including weather and MEL, flight planning, training, en-route alternate aerodromes and communication capability.

2. The operational EDTO programmes, in general, contain the same basic elements regardless of the EDTO diversion time authorization, but should be tailored as applicable to the relevant level of approved diversion time.

3. The following are major EDTO diversion time categories by Uganda CAA regulations:

2. Up to 90-minute authorization

1. EDTO authorizations up to 90 minutes are generally associated with benign operational areas where higher diversion times are not required to support direct routing.

2. 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.

3. Consideration are 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.

4. 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. Beyond 90-minute and up to 180-minute authorization

1. EDTO authorizations up to 180 minutes support most EDTO operational areas.

2. 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).

3. 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 that the MMEL appropriate to the approved maximum diversion time.

4. Fifteen per cent diversion time authorization increases

1. If the certified EDTO capability of the aeroplane is 120- or 180-minute maximum diversion time, an operator may request an increase in the operator's approved diversion time for specific routes or on an exceptional basis provided:

    1. the requested operator's approved diversion time does not exceed:

        1. 115 per cent of the certified maximum diversion time capability of the aeroplane for EDTO; and

        2. the capability of the most limiting EDTO significant system other than fire suppression systems minus 15 minutes;

- the operator's dispatch process (fuel calculation, MEL, etc.) supports the resulting increased diversion time; and

- such increases may require an assessment of the overall type design including TLSs and demonstrated reliability if the certified EDTO capability of the aeroplane is less than the contemplated increased diversion time.

1. Beyond 180-minute authorization

1. Beyond 180-minute maximum diversion time, authorization may be required for direct routing in some operational areas based on limited availability of en-route alternate aerodromes, or to manage day-of-flight operational exceptions.

2. Authorization to conduct operations with diversion times exceeding 180 minutes may be granted to operators with previous EDTO experience and an existing 180-minute EDTO authorization on the AEC listed in their application The authorization by specific approval to operate EDTO by more than 180 minutes may be area- specific, based on the availability of en-route alternate aerodromes in the operational area.

3. In view of the long diversion time involved (above 180 minutes), the operator is responsible to ensure at the flight planning stage, that on any given day in the forecast conditions (such as prevailing winds, temperature and applicable diversion speed), a diversion to an en-route alternate aerodrome will not exceed the capability of:

    1. the most limiting EDTO significant system other than fire suppression systems minus 15 minutes at the approved OEI cruise speed; and

    - the cargo fire suppression system minus 15 minutes, at the AEO cruise speed.

1. Flight preparation considerations.

1. EDTO area of operations. –

1. General

2. Following satisfactory compliance with the criteria outlined in this section, an air operator may be authorized to conduct EDTO with a particular AEC within a particular area of operation. The EDTO area of operation is limited by the maximum approved diversion time to an en-route alternate aerodrome at the approved diversion speed (under ISA conditions in still-air) from any point along the proposed route of flight.

3. The EDTO area of operations is established during the flight preparation process based on the designated en-route alternate aerodromes and the maximum diversion distance corresponding to the approved EDTO maximum diversion time and speed. This area is represented graphically by maximum diversion distance arcs or circles around the selected en-route alternate aerodromes to establish a geographic boundary limitation for the planned route of flight.

    Note. — The EDTO area boundary for route-planning purposes is based on a constant, still-air diversion distance radius from overhead the aerodrome location and neither considers potential routing nor approach path and descent profile, wind and temperature variations which may be encountered during an actual diversion.

4. The area(s) of operation approved for EDTO should be specified in an operations specification. Flight dispatch limitations should specify the maximum diversion time from an EDTO en-route alternate aerodrome for which an air operator can conduct a particular EDTO operation. The planned maximum diversion time at the approved diversion speed should not be any greater than the value specified in the operations specification.

2. EDTO entry and exit points – EDTO sector

1. The EDTO sector comprises the portion or portions of an EDTO route that extends beyond the threshold circles (i.e. the 60-minute circles in the example shown below) centred on each en-route alternate aerodrome. The beginning of the EDTO sector is the first point on the route that is beyond the EDTO threshold time/distance from an en-route alternate aerodrome and is also called the EDTO entry point (EEP). The end of the EDTO sector is the last point on the route that is beyond the EDTO threshold time/distance from an en-route alternate aerodrome, which is also called the EDTO exit point (EXP).

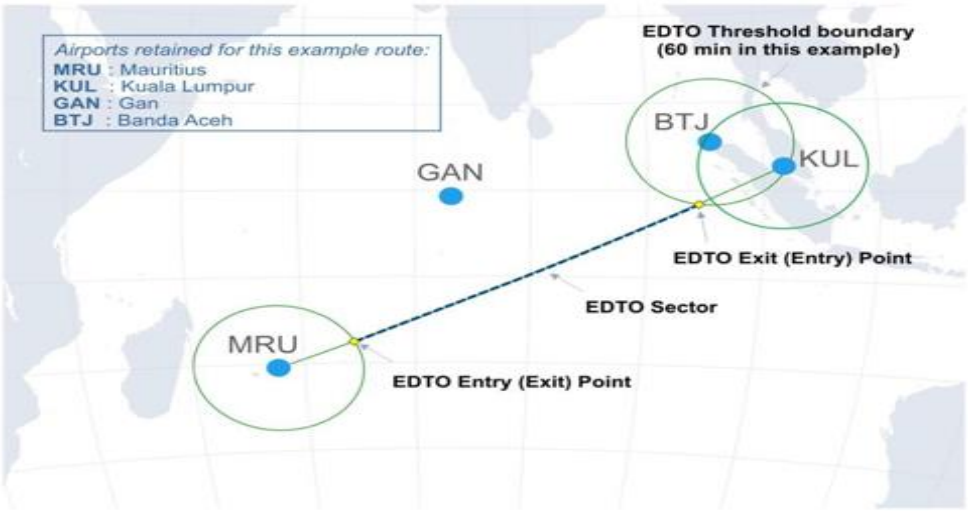


Figure 2 - Example EDTO entry and exit points on EDTO route

2. The aerodromes which define the EDTO entry and exit points on an EDTO route are not necessarily the departure and destination airports, but rather the last aerodrome within the applicable threshold time before the start of the EDTO sector and the first aerodrome after the EDTO sector where the remainder of the flight remains within the EDTO threshold time.

3. The EDTO entry and exit points on any given EDTO route are based on ISA still-air conditions and do not shift with prevailing winds. The EDTO sector which is defined by these points represents the portion of the route where the EDTO flight-planning considerations discussed in this chapter (fuel, alternate aerodromes, TLSs) are applied.

4. An EDTO route may have multiple EDTO sectors if the route enters and exits EDTO airspace more than once or has a non-EDTO segment in the middle of the EDTO sector. Approved operators may plan such a flight based on multiple EDTO sectors (as illustrated below) or alternatively by treating the entire portion of the flight between the first EEP and the last EXP as a single EDTO sector.

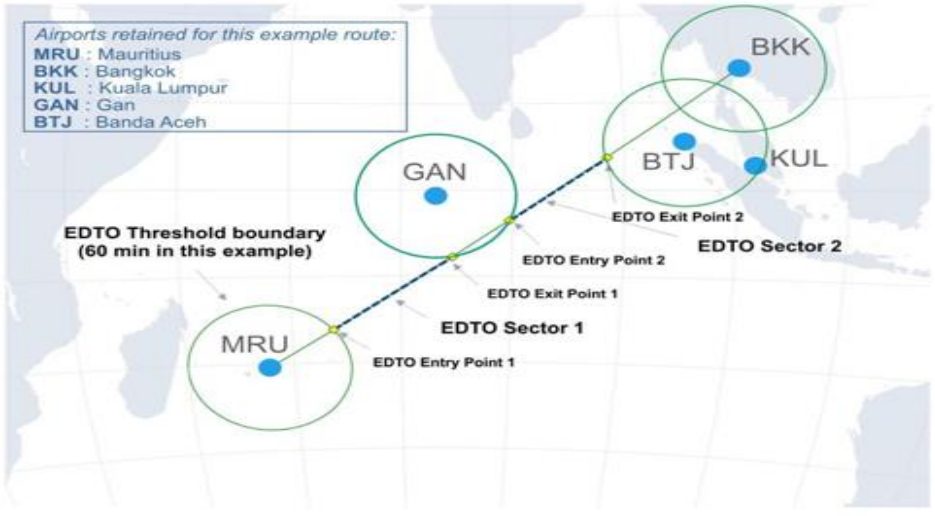


Figure 3 - Example of multiple EDTO sectors

3. EDTO equal time points

1. An equal time point (ETP) is the point of equal flying time between two EDTO en-route alternate aerodromes. The ETP can also be defined as, “the point at the farthest ‘air mile’ distance from a pair of EDTO en-route alternate aerodromes”. The ETP(s) define(s) the point(s) of the route from where the EDTO flight planning requirements (fuel, alternate aerodromes, TLSs) apply.

2. Unlike the EDTO entry and exit points which are based on still-air conditions, ETPs consider actual weather conditions (wind, temperature) and so their position on the route may be offset from the geometric midpoint between any given pair of EDTO en-route alternate aerodromes. If the flight level, wind and temperature are the same in both diversion directions, then the ETP is the geographic midpoint on the route between the EDTO en-route alternate aerodromes. If the weather conditions are different, the ETP moves along the route towards the most adverse en-route weather conditions.

3. In the example below (figure 4), there are example ETP’s (120 minutes)

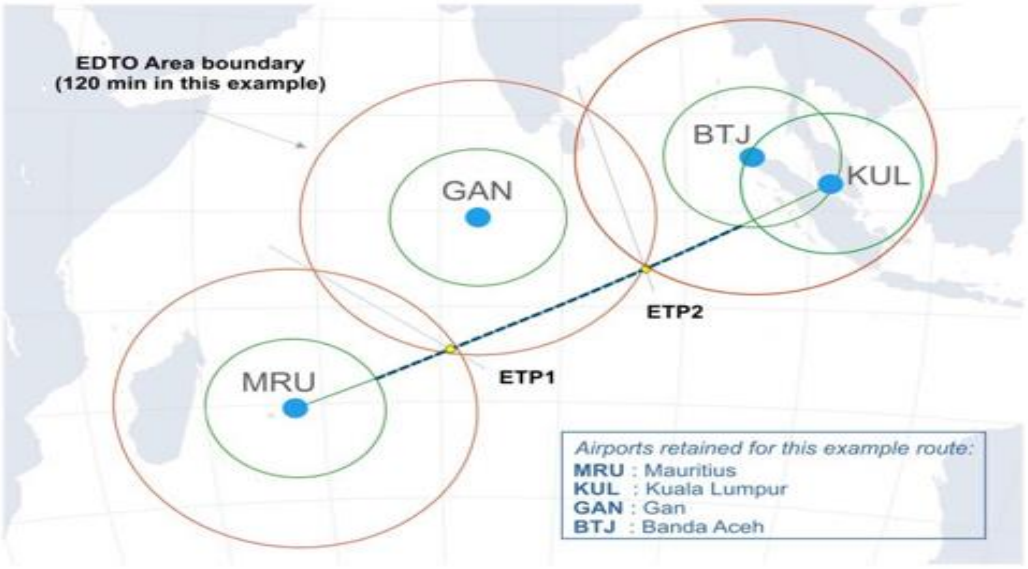


Figure 4 - Example EDTO equal time points (ETPs) (120 minutes)

.

4. An EDTO route will have at least one ETP and may have several depending on the length of the EDTO sector, the selected EDTO en-route alternate aerodromes, and the applicable EDTO maximum diversion time.

5. The operator may elect to designate a single EDTO en-route alternate aerodrome to establish the EDTO area of operation, in which case there will be no ETP. See Figure 3.5-5. In such a case, diversion fuel and TLS protections should be assessed for any potential diversion track between the EDTO entry and exit points.

4. Equal time point (ETP) calculations

1. The flight condition, flight level and associated forecast weather used to determine the position of EDTO ETPs within the EDTO sector may vary depending on the particular EDTO flight planning requirement being addressed, including the type of aeroplane.

2. ETPs need to be established for:

    1. computing the EDTO diversion fuel

    2. checking the maximum diversion time versus the applicable TLS values; and

    3. in-flight diversion decision-making.

1. ETPs established for the purpose of EDTO diversion fuel planning are determined based on a decompression flight level of 10 000 ft (3 000 m). A higher decompression flight level may be assumed if supported by the aeroplane's supplemental oxygen supply and/or required to maintain minimum en-route altitudes along the diversion flight path. A second ETP based on engine inoperative altitude may also be determined if diversion fuel protection is required for an engine–failure-only condition.

    Note 1. — Operators may elect to standardize on a single ETP calculation (either decompression or engine failure) to simplify their flight planning process and flight plan presentation.

    Note 2. — Fuel protection requirements for a pressurized engine failure condition are applicable to all aeroplanes engaged in EDTO operations.

2. ETP determination for the purpose of EDTO TLS planning may introduce yet another ETP calculation based on all-engine cruise speed and flight level, as this is the relevant flight condition used to evaluate cargo fire suppression diversion time protection for EDTO operations beyond 180 minutes. For aeroplanes where another EDTO significant system time other than cargo fire suppression has been established, the ETP basis used to evaluate diversion time protection for the other system is an engine failure condition with forecast weather conditions considered if the EDTO operation is beyond 180 minutes.

3. For EDTO operations up to and including 180 minutes, EDTO TLS requirements are directly related to the still-air EDTO maximum diversion time with a minimum additional margin of 15 minutes. For these operations, forecast weather conditions are not considered for EDTO TLS planning and therefore it is not necessary to determine TLS ETPs for EDTO flight planning purposes.

    Note. — EDTO operations up to and including 180 minutes may also encompass 15 per cent extensions to this authority (e.g. up to 207 minutes).

4. For in-flight progress monitoring and diversion decision-making, EDTO ETPs are considered to be the points along the route where the preferred or primary en-route diversion aerodrome switches to the next EDTO alternate listed on the operational flight plan. At the ETP itself, the diversion time to each of the two en-route alternate aerodromes which define the ETP is the same; however, as the flight passes the ETP it will get progressively closer to one aerodrome which becomes the new primary diversion aerodrome and progressively further away from the other aerodrome which was primary before passing the ETP. This same transition will occur at each ETP in the EDTO sector for cases where multiple ETPs are listed and a single listed EDTO alternate will be primary between any two sequential ETPs. Decompression ETPs are used as the basis for en-route progress monitoring relative to EDTO diversion aerodromes; however, operators may elect to also evaluate AEO and/or OEI ETPs for diversion decision-making,

depending on the nature of the in-flight emergency and with due consideration for the increased complexity of managing multiple decision points between diversion aerodromes.

Note. — Operators may choose to include the EDTO ETPs in the operational flight plan navigation log and/or as position fixes on the flight management system navigation displays to aid the flight crew with flight progress monitoring relative to the EDTO sector.

5. In the event of a diversion on an EDTO flight, the flight crew is not obligated to divert to the primary EDTO alternate aerodrome listed on the flight plan and may chose a different aerodrome as the nearest suitable landing site if this is deemed to be a safer course of action based on prevailing operational conditions.

2. Alternate aerodromes for EDTO. -

1. General

1. Alternate aerodromes, for the purposes of EDTO planning, are those aerodromes which an operator has been authorized to designate for en-route diversion planning within an approved EDTO area of operation. The operational assessment of these aerodromes involves two separate considerations, namely:

1. the basic adequacy of the aerodrome to support a safe approach and landing independent of operational variances; and

- the forecast conditions at the designated aerodromes to support a safe approach and landing at the expected times of use during a particular EDTO flight.

Note 1. — Including, the forecast crosswind component plus any gusts should be within operating limits and within the operator's maximum crosswind limitations taking into account the runway condition (dry, wet or contaminated) plus any reduced visibility limits .

1. An "adequate aerodrome" is an aerodrome which has been assessed to meet fundamental considerations other than weather, such as required runway length and an available approach procedure. These aerodromes are generally listed in an approved operator's manual.

2. An "EDTO alternate aerodrome" is an adequate aerodrome which has been designated for a particular EDTO flight based on a dispatch assessment of the operational criteria outlined in the following section. The designated aerodromes should be listed in the operational flight plan.

2. Landing performance considerations

1. The runway length assessment for the adequate aerodromes selected to support an EDTO operation should be based on the AFM for the altitude of the aerodrome, for the runway expected to be used, taking into account wind conditions, runway surface conditions, and aeroplane handling characteristics, permit the aeroplane to be stopped within the landing distance available as declared by the aerodrome authorities and computed in accordance with the applicable operational requirements.

2. Overweight landing procedures may need to be considered for EDTO diversion planning. For aeroplanes equipped with fuel jettison systems, expected landing mass may be reduced to allow for fuel jettisoning provided the operator can demonstrate that flight crews are properly trained and that diversion fuel requirements are not compromised.

3. The EDTO alternate aerodromes selected for a particular EDTO flight should be further evaluated to ensure sufficient runway length for the conditions at the expected time of arrival as part of the dispatch planning assessment. This assessment should take into account probable wind speed and direction, as well as expected runway surface condition.

4. For aerodromes with limiting local terrain, an evaluation of go-around climb gradient capability in the event of a missed approach following an OEI diversion may also need to be considered in the landing performance assessment.

3. Validity period/time window

1. The validity period is the time window during which a designated EDTO alternate aerodrome should be assessed for EDTO dispatch purposes to have the necessary conditions to allow a safe approach and landing in the event of an en-route EDTO diversion. The applicable time window should consider the earliest to latest expected arrival times for each EDTO alternate aerodrome based on the planned departure time. The validity period for a given EDTO alternate aerodrome is determined based on a diversion from the first and last EDTO ETPs for this alternate.

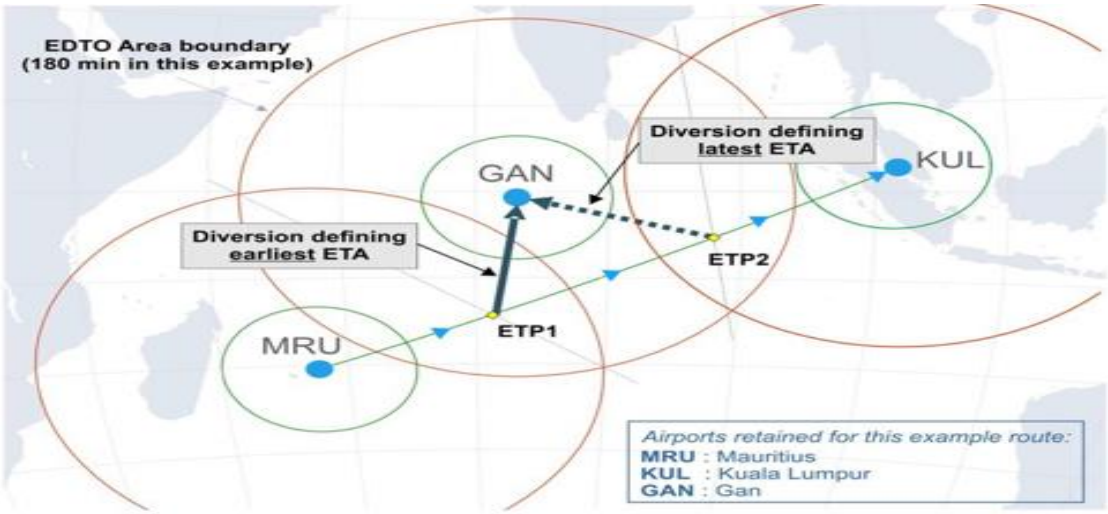


Figure 5 - EDTO alternate validity period

2. The required validity period (see figure 5) includes an additional margin such as one hour after the latest arrival time.

3. For cases where the EDTO alternate aerodrome is located before the EDTO EEP (e.g. first EDTO alternate) or after the EDTO EXP (e.g. last EDTO alternate), the concept of earliest to latest arrival time is less obvious because there is not both a “forward” and a “backward” diversion track within the EDTO sector . For these cases, the validity period as determined by the operational flight planning system should consider the potential en-route diversion exposure during the EDTO portion of the flight to include the EEP if the EDTO alternate aerodrome is located before the start of the EDTO sector and the EXP for the case of the last EDTO alternate aerodrome located after the EDTO sector. (see figure 6)

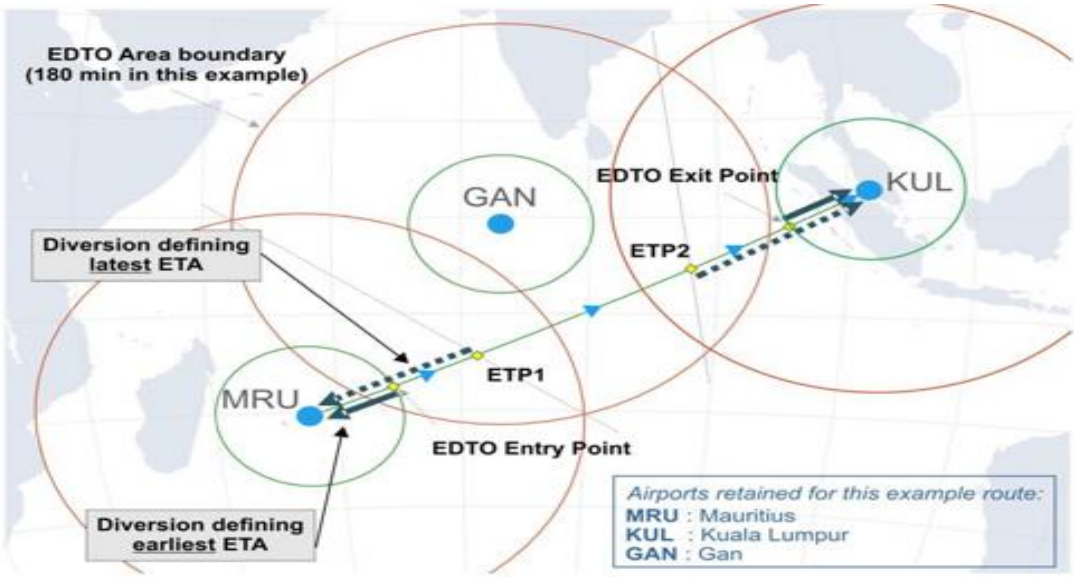


Figure 6 - Validity period of EDTO alternates located before or after EDTO sector

4. For the purpose of validity period determination is when a single EDTO alternate aerodrome is used to cover the entire EDTO sector, there are no EDTO ETPs, and the single EDTO alternate is therefore the primary planned diversion aerodrome for the entire EDTO sector. Consequently, the validity period should consider a forward diversion from the EEP to establish the earliest expected arrival time and a backward diversion from the EXP to establish the latest expected arrival time.

5. The EDTO alternate aerodrome validity period assessment should consider forecast weather conditions including visibility and ceiling minima based on the latest available information with appropriate dispatch planning margins as discussed in the next section. Hours of operation, NOTAMs, forecast winds and other operational factors may also be included in the assessment to ensure that a safe approach and landing can be accomplished within the applicable time window.

4. EDTO alternate aerodrome weather minima

1. EDTO alternate aerodrome weather minima, for the purpose of dispatch planning, is defined in the Regulations at the civil aviation (operation of aircraft – commercial air transport aeroplane) regulations, 2020, Part III-Section 111, including specific criteria for ceiling and visibility to ensure that forecast weather conditions will allow a safe approach and landing in the event of an en-route EDTO diversion. These weather minima should be assessed based on the latest available forecast information for the required validity period for each designated EDTO alternate aerodrome.

2. The EDTO dispatch planning minima requirements, according applicable regulations, are expressed as additives to the published operating minima for a particular approach or may also be expressed as fixed minima values. In either case, the intent of the requirements is that the aerodrome minima assessed for dispatch planning purposes are more conservative than the actual published operating minima required to conduct an approach and landing. This is to allow for the potential of deteriorating weather conditions after the EDTO flight has commenced, as illustrated in the following **example.**

Approach facility	*Ceiling*	*Visibility*
Precision approach	Authorized DH/DA plus an increment of 60 m (200 ft)	Authorized visibility plus an increment of 800 m
Non-precision approach or circling approach	Authorized MDH/MDA plus an increment of 120 m (400 ft)	Authorized visibility plus an increment of 1 500 m

Table 2 - EDTO dispatch planning minima

Note 1. — The above criteria for precision approaches are only to be applied to Category 1 approaches.

Note 2. — Circle-to-land approach procedures are not normally used for EDTO planning; however, if used, the same dispatch margins would apply to the published circling approach minima.

Note 3. — Approved required navigation performance (RNP) approach procedures may be utilized for EDTO planning.

Note 4. — When determining the usability of an instrument approach (IAP), forecast wind plus any gusts should be within operating limits, and within the operator's maximum crosswind limitations taking into account the runway condition (dry, wet or contaminated) plus any reduced visibility limits. Conditional forecast elements need not be considered, except that a PROB 40 or TEMPO condition below the lowest applicable operating minima should be taken into account.

Note 5. — The increments required by Table 1 are not applicable to Category II or III minima, based on the following criteria:

1. Aircraft is capable of engine-inoperative Cat II/III landing; and

2. Operator is approved for normal Cat II/III operations.

1. Consideration for conditional forecast elements may also be defined, for example, a PROB 40 or TEMPO condition below the lowest applicable operating minima is normally taken into account. Provisions for low landing minima (e.g. Category 2/3) may also be included in State regulations, contingent upon operator approval and aeroplane capability to conduct such operations.

Note. — The terms "Operating minima" or "landing minima" refer to the minima on the applicable approach chart, and not to the EDTO planning minima described.

2. When dispatching under the provisions of the MEL, those MEL limitations affecting instrument approach minima should be considered in assessing the EDTO alternate aerodrome minima as should any NOTAMs affecting the published approach procedure.

3. The EDTO planning minima apply for dispatch only. Once the flight has commenced, the normal published operating minima required to conduct a safe approach and landing are applicable.

2. Rescue and firefighting services (RFFS)

1. The RFFS protection of the EDTO alternate aerodromes that are deemed acceptable by the operator shall be contained in the operations manual (guide information here, State (i.e. Uganda) determination applies ultimately accounting for international safety standards)

2. An acceptable RFFS protection for en-route EDTO alternate aerodromes may be either:

1. aerodrome RFFS Category 4 for aeroplanes with maximum certificated take-off mass of over 27 000 kg, or aerodrome RFFS Category 1 for all other aeroplanes, if the operator can provide 30 minutes of notification; or

- if the operator cannot provide the above 30 minutes of notification, an acceptable RFFS protection may be two categories below the aeroplane RFFS category.

1. In the case where the departure and/or the destination aerodromes and/or the departure and/or the destination alternate aerodromes are also EDTO alternate aerodromes, the acceptable RFFS protection would need to comply with the most restrictive of the applicable requirements.

Note. — Further reductions of the RFFS capability for all-cargo operations might be acceptable.

2. EDTO fuel requirements

1. General

1. In addition to the normal contingency and reserve fuel requirements associated with non-EDTO flight operations, fuel planning for an EDTO flight must also consider the potential for an en-route diversion to a designated EDTO alternate aerodrome. This additional fuel planning protection is commonly referred to as the EDTO critical fuel scenario and is an important aspect of the EDTO flight preparation process.

2. The EDTO critical fuel requirement considers the potential for the following three failure scenarios from the most fuel-critical EDTO ETP or "critical point" (CP) between designated EDTO alternate aerodromes:

1. all-engine depressurization;

- one-engine-inoperative depressurization; and
- engine failure only (two-engine aeroplanes only).

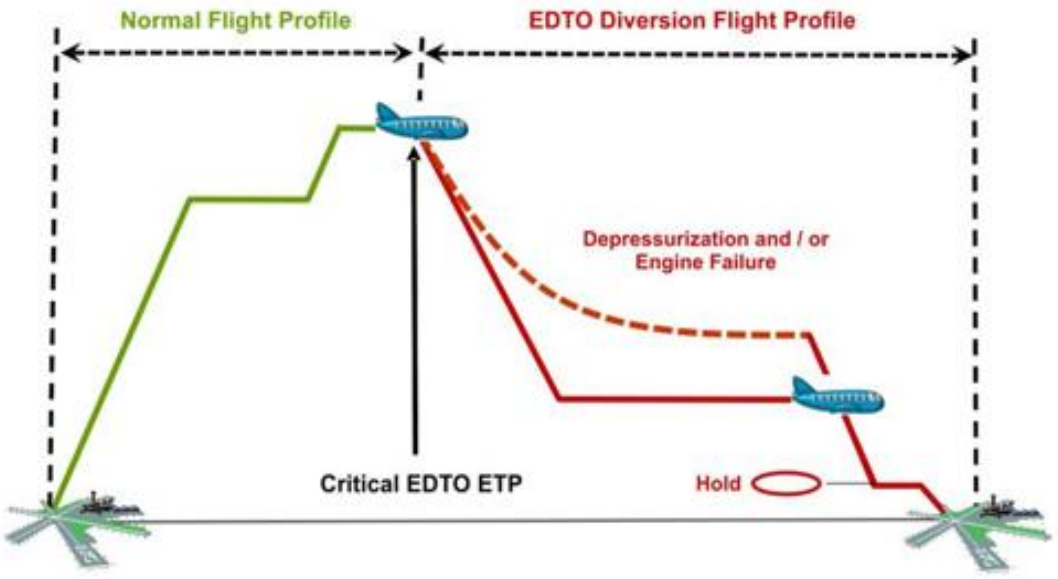


Figure 7 - EDTO critical fuel scenarios

1. The fuel required to satisfy the most limiting of these diversion scenarios will determine if additional EDTO critical fuel reserves are required for an EDTO flight. If the EDTO critical diversion fuel is less than the normal planned mission and reserve fuel remaining at the CP, there is no additional EDTO fuel uplift required. If, however, the normal planned fuel on board at the CP does not satisfy the critical fuel requirement, then additional EDTO reserve fuel uplift is required.

2. EDTO critical fuel reserve calculation

1. The EDTO critical fuel calculation can be best described in further detail by separating the diversion profiles into individual flight segments as follows:

1. descent from normal cruise altitude;
- cruise to EDTO alternate aerodrome;
- descend and hold over EDTO alternate aerodrome;approach and land at EDTO alternate aerodrome; and
- additional fuel allowances.

1. Common consideration should include the following:

Descent from normal cruise altitude

1. For the AEO and OEI depressurization scenarios, an emergency descent to depressurization altitude per the particular aeroplane's emergency descent procedures. The depressurization altitude is considered to be 3 000 m (10 000 ft); however, a higher altitude may be planned for if the aeroplane is equipped with sufficient supply for the planned diversion time.

Note. — Although oxygen requirements are generally considered to be separate from EDTO requirements, oxygen requirements still need to be complied with for both EDTO and non-EDTO operations. This includes the assumed depressurization diversion flight level used to calculate the EDTO critical fuel scenario which may be constrained by available oxygen supply.

2. For the engine failure only scenario, if applicable, a normal idle descent to thrust limited altitude or a thrust limited driftdown profile with MCT on the operating engine. The assumed driftdown speed is the same Mach/IAS speed schedule that is used to determine the maximum EDTO diversion distance. It may therefore be a different speed than the one selected to define the EDTO threshold.

Note. — This condition is rarely limiting. This is because the depressurization scenarios are based on a lower diversion flight level and thus carry a higher diversion fuel requirement. Consequently, some operators will not include the engine failure only scenario in their EDTO dispatch fuel calculations if determined to be a non-limiting condition.

Cruise to EDTO alternate aerodrome

1. For two-engine aeroplanes, the cruise speed used to calculate the engine failure critical fuel scenarios (engine failure combined with decompression and engine failure alone) should be the same as the approved OEI speed used to determine the EDTO maximum diversion distance. The cruise speed used for the all-engine decompression scenario calculation may be a different speed and is assumed to be all-engine long-range cruise (LRC) speed. There is no requirement to use the approved OEI speed for the all-engine critical fuel calculation.

Note. — The OEI speed used to calculate EDTO maximum diversion distance and engine inoperative critical fuel requirements for two-engine aeroplanes may vary for different geographic regions depending on route requirements, EDTO maximum diversion time, and

availability of en-route diversion aerodromes. Further, the OEI speed used to establish the 60-minute and threshold distances for a non-EDTO operation may be different than the speed selected for an EDTO operation. EDTO fuel planning requirements are not applicable to an operation that remains within the established EDTO threshold distance.

	60 Min/EDTO Threshold Distance	EDTO max diversion distance	Critical Fuel – All engine depressurization	Critical Fuel – Engine inoperative depressurization	Critical Fuel – Engine failure only
Two engine aeroplanes	Any selected OEI speed	Approved OEI speed	Any selected AEO speed	Approved OEI speed	Approved OEI speed

Table 3 - EDTO critical fuel scenario cruise speed modes

Descend and hold over EDTO alternate aerodrome.

The critical fuel calculation should allow for a normal descent to 450 m (1 500 ft) above the EDTO alternate aerodrome followed by 15 minutes of holding. The descent is initiated from either depressurization or engine inoperative altitude depending on the particular scenario.

Approach and land at EDTO alternate aerodrome.

Fuel allowance for a standard instrument approach, landing should be included. ICAO State that a missed approach fuel may also be specified in State Regulation (Uganda specific requirements apply) Note the conservative action is to specify a missed approach allowance.

Additional fuel allowances

Fuel to account for icing:

This allowance is based on the higher of two fuel requirements, as determined from operational fuel planning data provided by the aeroplane manufacturer and the operator's assessment of potential diversion icing exposure for the EDTO flight:

1. fuel to account for engine anti-ice, and if applicable, wing anti-ice, for the entire time during which icing is forecast; or

- fuel for the effect of potential ice accumulation on unheated surfaces (airframe icing) for 10 per cent of the time during which icing is forecast including the fuel used for engine and wing anti-ice during this period.

Fuel to account for errors in wind forecasting:

This fuel allowance is determined by applying a 5 per cent factor to the forecast wind magnitude (increase for headwind, decrease for tailwind) if the operator is using actual forecast winds based on a wind forecast model accepted by the authority. If the operator is not using actual forecast winds based on a wind model accepted by the UCAA, an additional 5 per cent fuel allowance should be applied to the total critical fuel requirement to allow for errors in wind data.

Fuel to account for deterioration in cruise fuel-burn performance:

This additional fuel allowance is based on operational analysis of actual cruise fuel mileage performance using tools provided by the aeroplane manufacturer or other sources. The analysis is

normally performed for each aeroplane conducting EDTO operations, as deterioration factors can vary within an operator's fleet. If the operator is not performing cruise fuel mileage analysis for its EDTO operation, an additional 5 per cent fuel factor should be added to the total critical fuel requirement to account for potential deterioration in cruise fuel-burn performance.

Note. — The fuel-burn performance of a particular aeroplane may be better than the performance level used for operational flight planning. For cases where the actual aeroplane performance has been determined to be better than the planning database level, the fuel-burn deterioration factor should be zero.

Fuel to account for auxiliary power unit (APU) use (if required):

If the APU is a required power source for the EDTO critical fuel diversion scenarios, the additional fuel consumption required to operate the APU should be included in the relevant diversion scenarios. For most aeroplanes, APU fuel is included in the engine failure critical fuel scenarios but is not included in the all-engine depressurization scenario unless required by aeroplane specific operating procedures.

Fuel to account for any relevant configuration deviation list (CDL) and/or MEL items.

1. EDTO critical fuel operational application

1. The operational application of the EDTO critical fuel requirement consists of the requisite flight preparation calculations and the presentation of these results on the operational flight plan. The operator's flight planning system should have the capability to determine the critical fuel required (CFR) as described above and the normal planned fuel load at each EDTO ETP to determine if a fuel load adjustment is needed for a particular EDTO flight.

2. Flight planning system implementations and flight plan formats for EDTO critical fuel can vary, and operators engaged in EDTO operations may use different methods to meet the requirements into their Operational Flight Plans (OFP).

2. Time-limited system (TLS) considerations.

1. General

1. There are two kinds of TLS:

    1. the systems limited by their capacity, e.g. the cargo fire extinguishers. Per design they cease to function once exhausted. The sizing of those systems may therefore have an impact on the aeroplane's maximum diversion time capability; and

    - the systems for which time capability is determined by their endurance or reliability. Systems falling into this category are normally designed to function over a duration which largely exceeds the duration of one flight. Therefore, the sizing of those systems usually has no impact on the aeroplane's maximum diversion time capability. For this reason, it is usually the maximum diversion time assumptions from the safety analyses that will define the related time limitation.

1. The time limitation of these systems may have to be considered in the design and the operation of an aeroplane for EDTO to ensure that EDTO operations are conducted within diversion times compatible with the capabilities of the relevant TLSs. Accordingly, this constraint applies only to time-limited EDTO significant systems.

2. The aircraft manufacturer should identify the capability of the most time-limiting EDTO significant system which is usually the cargo fire suppression system. However, for aeroplanes with two turbine engines certified under the new criteria, the aircraft manufacturer should also identify the capability of the other most limiting EDTO significant system. The corresponding limitations are identified in relevant aeroplane documentation (e.g. for a twin in the EDTO CMP document as well as in the AFM).

2. EDTO up to 180 minutes (including the 15 per cent operational extension)

1. The time required to fly the distance to the planned EDTO alternate or alternates (including a 15-minute margin for approach and landing) at the approved OEI cruise speed in still-air and standard day temperature, should not exceed the time specified in the AFM (or other relevant aeroplane documentation) for the aeroplane's most TLS(s) time.

2. Considering the current rate of cargo fire occurrences (on a passenger-carrying aeroplane) and the rate of engine failure, the probability of a simultaneous cargo fire and engine failure would be extremely remote (in the order of 10^{-13} per flight hour). Therefore, for the cargo fire suppression system, it may be acceptable to consider the AEO cruise speed (instead of the OEI cruise speed) when checking the time required to fly the distance to the planned EDTO alternate or alternates (including a 15-minute margin for approach and landing).

Note.— For twin-engine aeroplanes, it is acceptable to consider the same approved OEI cruise speed for the check of the aeroplane's most TLS(s) time.

3. For the aeroplane's most TLS time (other than cargo fire suppression), if any, is equal to or greater than the granted maximum diversion time plus 15 minutes, this check is applicable only to aeroplanes certified against the new EDTO criteria.

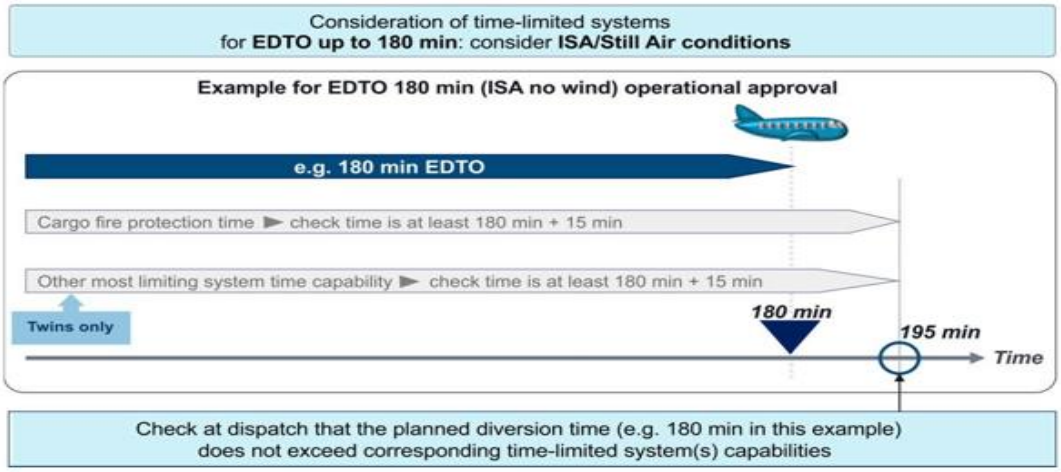


Figure 8 - Time-limited systems considerations for EDTO up to 180 minutes

4. It should be noted that some MMEL/MEL items may reduce the time capability of the EDTO TLS(s). These reductions should be taken into account when planning the aircraft on an EDTO sector, to ensure that the aircraft remains within the reduced time limitations as explained above. For example, an inoperative cargo fire suppression bottle would lead to a reduction of the related EDTO TLS capability.

3. EDTO beyond 180 minutes

1. A check should be performed at dispatch to confirm that the time required to fly the distance to the planned EDTO alternates (including the 15-minute margin for approach and landing) does not exceed:

    1. for all aeroplanes, the time specified in the AFM (or other relevant aeroplane manufacturer documentation) for the aeroplane's cargo fire suppression system, considering a diversion at AEO cruise speed and altitude corrected for forecast wind and temperature; and

    2. for twin-engine aeroplanes, the time specified in the AFM for the aeroplane's most TLS time (other than cargo fire suppression), considering a diversion at the approved OEI cruise speed and altitude corrected for forecast wind and temperature.

1. Any MMEL/MEL items impacting the capability of the EDTO TLS(s) should be taken into account, and corrected time limitations should be considered when performing this check.

2. For the aeroplane's most TLS time (other than cargo fire suppression), if any, is equal to or greater than the granted maximum diversion time plus 15 minutes, this check is applicable only to aeroplanes certified against the new EDTO criteria.

3. Should the time limitation(s) be exceeded, the operator should plan the aeroplane on another track, possibly with a reduced diversion distance, to ensure that the aircraft remains within the relevant system time limitations as described above.

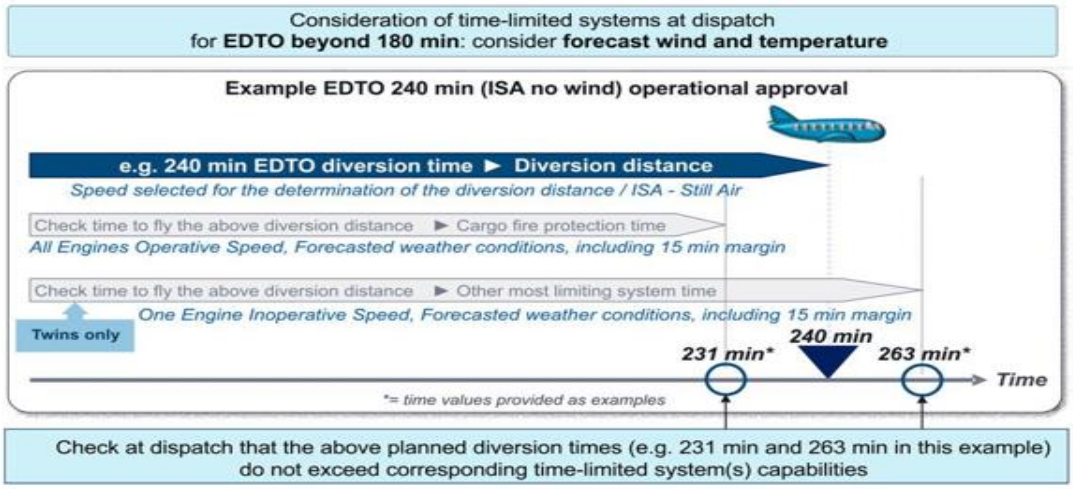


Figure 9 - Time-limited systems considerations for EDTO beyond 180 minutes

2. EDTO technical status of the aeroplane. -

1. General

1. As the time limitations of a given aeroplane may be impacted by the configuration and/or the maintenance programme of the aeroplane, the operator should implement tools and/or procedures to ensure that the relevant EDTO capability and time limitation(s) of the aeroplane dispatched are compatible with the contemplated EDTO flight.

2. The EDTO certification of the aeroplane entails the issuance of an EDTO CMP document, which provides the required configuration, maintenance, procedures and dispatch standards. For EDTO operations, the aircraft should therefore be configured, maintained and operated according to the EDTO CMP document requirements. This means that the operator should implement tools and/or procedures to track any aeroplane discrepancies that may impact the EDTO serviceability and operational capability of the aeroplane.

3. An EDTO maintenance release statement should provide the flight crew with the assurance that:

    1. the aircraft condition has been checked and confirmed to comply with the applicable EDTO dispatch requirements set forth in the company policies and applicable MEL;

    - the EDTO items of the applicable maintenance line check have been accomplished;

    - the aircraft configuration has been checked and confirmed to comply with the applicable configuration standards set forth in the EDTO CMP document (as applicable); and

    - the capability of relevant TLS(s) has been assessed.

1. The EDTO maintenance procedures manual (or equivalent) should define the content of the EDTO service check and the procedures associated with the EDTO maintenance release.

2. Maintenance release — twin-engine aeroplanes

1. The EDTO status of the aeroplane should be confirmed before each EDTO flight. For that purpose, an EDTO release statement should be provided to the flight dispatcher by the relevant operator maintenance organization (the maintenance control centre) for operational control and flight preparation purposes. This EDTO status of the aeroplane depends on:

    1. the certified EDTO capability of the aeroplane;

    - the configuration of the aeroplane versus the applicable configuration requirements of the EDTO CMP document;

    - the compliance of the aeroplane versus the applicable maintenance requirements of the EDTO CMP document;

    - the capability of relevant TLS(s); and

    - any inoperative system (MEL).

1. The relevant maintenance organization (the maintenance control centre) of the operator should issue this EDTO maintenance release statement as part of the maintenance release (e.g. certificate of release to service) of the aeroplane. This EDTO maintenance release statement, which is included in the aircraft maintenance logbook, should clearly indicate:

    1. whether the concerned aeroplane is EDTO capable (yes or no); and

    - the related maximum diversion time capability.

1. The flight dispatcher should carefully consider this information when preparing an EDTO flight for a given aeroplane, in order to ensure that the aeroplane will be dispatched within its EDTO capability.

    For EDTO operations beyond 180 minutes the operator has to check that the diversion flight times a dedicated process for the check and tracking of the time capability of the relevant EDTO TLS(s), if any (only for aeroplanes certified against the new EDTO criteria), should be implemented in order to ensure that this information is adequately provided by the relevant

maintenance organization (the maintenance control centre) of the operator, and taken into consideration by the flight operations organization (dispatchers and flight crews).

2. This may be done by including in the EDTO release statement the necessary check boxes for each of the possible values of time capability of the relevant TLS(s). The corresponding values should be updated, as part of the aeroplane's maintenance release, any time there is a situation impacting the time capability of the concerned TLS(s), e.g. in case of:

   1. the system being inoperative;
   2. the system being replaced by another with a lesser/greater time capability; and

   - maintenance action impacting the time capability of the system.

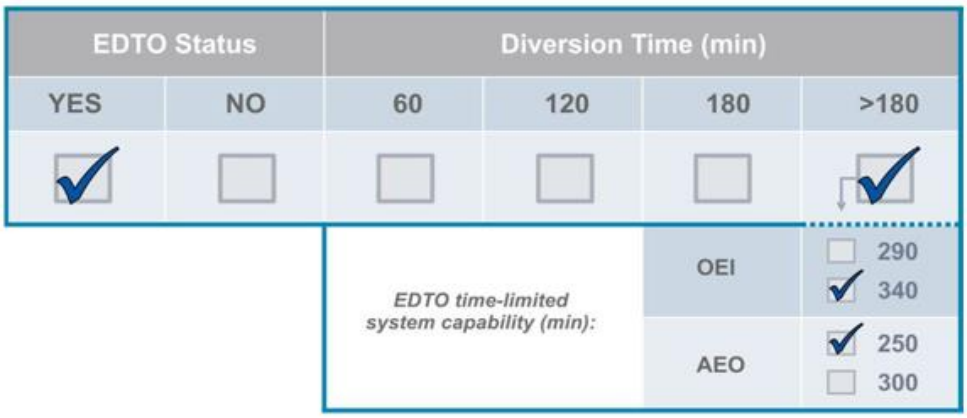


Figure 10 - EDTO release statement (EDTO beyond 180 minutes)

1. Minimum equipment list (MEL)

1. General Only

1. The operator's MEL should be developed based on the MMEL provided by the aeroplane manufacturer. The MMEL, **must be** customized by the operator as a function of its operational policies and considering relevant national operational requirements. The UCAA shall take the necessary steps to ensure that an EDTO operator's MEL complies with all applicable requirements for the relevant aeroplane fleet type(s) and approved EDTO maximum diversion time capability.

2. The operator's MEL should also consider the specificities of the EDTO area of operation, such as:

   1. maximum diversion time;

   - availability of en-route alternate aerodromes, and available facilities and equipment;
   - navigation and communication means; and
   - prevailing meteorological conditions.

1. The MMEL will normally include restrictions that are specific to EDTO operations. For example, a given MMEL item may require re-routing of the flight to remain within a lower maximum diversion time or even restrict the operation to a non-EDTO route as necessary. These specific requirements for EDTO flights must be clearly identified in the operator's MEL, and the operator's MEL cannot be less restrictive than the MMEL as appropriate to the approved maximum diversion time.

2. The EDTO restrictions of the MMEL/MEL may be related to:

    1. the allowable maximum diversion time;
    2. the capability of the TLS(s); and
    3. the applicable weather minima.

    Note.— MMEL documents may use different terms in some cases to describe EDTO dispatch restrictions. For example, the term "ER" may be used to represent EDTO within the context of the MMEL/MEL or a flight time restriction to landing at an alternate aerodrome may be imposed without a specific reference to EDTO.

1. MEL with EDTO restrictions related to maximum diversion time

These EDTO restrictions are related to the number of equipment or systems required to be operative at dispatch for a flight with a given maximum diversion time. These restrictions may be formulated as follows:

1. "May be inoperative provided that EDTO is not conducted", i.e. the aeroplane should be restricted to non-EDTO flights only; or

- "May be inoperative provided that EDTO beyond xxx minutes is not conducted", i.e. the aeroplane should not be dispatched on a flight with a diversion time above xxx minutes.

1. MEL with EDTO restrictions related to TLSs

These EDTO restrictions are related to components or equipment of the EDTO TLS(s), which may reduce the time capability of the system when they are degraded or inoperative (e.g. the cargo fire suppression system). These restrictions may be formulated as follows:

1. "May be inoperative provided that EDTO beyond xxx minutes is not conducted", i.e. the aeroplane should not be dispatched on a flight with diversion time above xxx minutes; or

- "May be inoperative provided that operations beyond xxx minute diversion time are not conducted."

1. MEL with EDTO restrictions related to weather minima

1. These EDTO restrictions are related to components or equipment necessary in the conduct of satellite-based or ground-based instrument approaches. There may be MEL limitations affecting the instrument approach capability of the aeroplane. In this case, those MEL limitations affecting instrument approach capability should be considered in assessing the EDTO alternate aerodrome minima. The operator's EDTO flight preparation procedures should ensure that aeroplane's approach capability including any MEL restrictions will meet the EDTO dispatch weather minima requirements for the designated EDTO alternate aerodromes.

2. These restrictions may be formulated as related to the aeroplane's approach capability and not necessarily connected to EDTO:

"May be inoperative provided approach minima do not require its use", i.e. the aeroplane's ability to conduct low visibility approaches is impacted.

2. In-flight considerations

1. General

Most EDTO unique flight operations requirements are addressed in the EDTO flight preparation process.**The additional in-flight considerations** for EDTO primarily consist of enhanced awareness of aeroplane system and fuel status, and monitoring of EDTO alternate aerodrome conditions to ensure a safe approach and landing during a potential EDTO diversion. **Normal and non-normal aeroplane** operating procedures are equally applicable to both EDTO and non-EDTO operations and are validated by the manufacturer to support EDTO during the certification process, if required. **Other concurrent** en-route operational considerations such as **long-range navigation, long-range communication and airspace constraints** (e.g. RVSM, MNPS, RNP, ADS.C, ADS-B, CPDLC) **are also equally applicable to both EDTO and non- EDTO flights** within a given operational area.

Note 1. — In-flight considerations for EDTO are separate but complementary to the flight preparation considerations. The pilot-in-command is not bound by the EDTO planning assumptions and may exercise discretionary authority to deviate from these assumptions in the event of an in-flight emergency.

Note 2. — The in-flight assessment criteria for fuel, aeroplane system and EDTO alternate weather status differ from the assessment criteria used for EDTO flight preparation.

2. In-flight monitoring. -

1. Communication/Navigation

1. EDTO operations include route segments which are outside the range of ground-based navigation and communication aids, and therefore long-range navigation and communication capability is generally required to support these operations. The requirement for long-range communication/navigation capability is, for the most part, not specifically connected to EDTO, but may be concurrent with an EDTO operation depending on the particular en-route airspace environment.

2. EDTO operators should establish procedures and minimum equipment requirements for the long-range navigation airspace regions of their approved EDTO areas of operation. This would include dual independent long-range navigation systems installed on the aeroplane, MEL equipment considerations, flight crew position monitoring and/or plotting procedures and contingency procedures in the event of a loss of long-range navigation capability. Long-range communication requirements are satisfied with dual high frequency (HF) radio installations and may also be supplemented with satellite-based voice and/or datalink communication systems. In addition to being able to communicate with oceanic control centres while en-route, EDTO communication capability should also consider the capability to communicate with the operator's maintenance and operations control facilities in the event that assistance is needed by the flight crew to manage a non-normal en-route situation. This company communication capability may be addressed in several ways including contracting with radio service providers, communication patches or relays and/or a dedicated operator HF station.

3. Some additional communication and navigation considerations for EDTO include the following:

    1. for all EDTO operations where voice communication facilities are available, voice communication should be provided. While planning an EDTO flight, an 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 are of poor quality and voice communication is not possible, communications using an alternative system should be substituted[4];

- 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. The system should provide communication capability between the flight crew and air traffic control, and between the flight crew and the air operator's operational control centre. While planning an EDTO flight beyond 180 minutes, an air operator should consider potential route and altitudes necessary for diversion to EDTO alternate aerodromes to determine 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;
- communication facilities are available to provide 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 a 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;
- 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 aerodrome and altitudes to be used in the event of a diversion; and
- visual and non-visual aids are available at the specified EDTO alternate aerodromes as required for the authorized types of approaches and operating minima.

1. Alternate aerodrome status (weather minima)

1. 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.

2. Prior to proceeding beyond the EEP, the pilot-in-command and the flight dispatcher should complete a review of all the EDTO alternate aerodromes identified on the operational flight plan and should ensure that the forecast weather is equal to or exceeds the published operating minima for the expected runway and approach procedure during the applicable validity period. For cases where the weather forecast does not meet the required published operating minima for landing, the flight plan should be amended where possible to include another EDTO alternate aerodrome (i.e. one which does meet the landing minima requirements) within the maximum authorized EDTO diversion time and within the aeroplanes EDTO TLS capability. If this cannot be done, the EDTO area of operation is compromised and the flight should continue as non-EDTO.

Note. — The in-flight EDTO alternate weather check prior to proceeding beyond the EEP is not the same as the flight preparation weather minima check described during flight

[4] Controller-pilot data link communications (CPDLC)and Automatic dependent surveillance – contract (ADS-C)

preparation. The in-flight check is based on published operating minima whereas the flight preparation check is based on the more conservative EDTO dispatch planning minima.

3. Once the flight has entered the EDTO area of operation, if the forecast for any of the designated EDTO alternate aerodromes is revised to below the landing limits or the EDTO alternate aerodrome becomes inadequate, the EDTO flight may continue at the pilot-in-command's discretion.

Note. — Despite the above consideration, it is good practice for the flight crew to continue to monitor the status of the EDTO alternate aerodromes after the flight has entered the EDTO sector. This is done for the next primary alternate when approaching an EDTO ETP.

2. Fuel progress monitoring

1. As with any flight, it is important for the flight crew to monitor and maintain awareness of the fuel state of the aeroplane. This is particularly critical for an EDTO flight, given the potential for a long diversion to the nearest en-route alternate aerodrome.

2. The EDTO critical fuel calculation, which is an integral element of the EDTO flight preparation process, is intended to ensure that the planned fuel load is sufficient to support an en-route diversion from the most critical EDTO ETP critical point (CP) in the event of an engine failure, a depressurization, or both, with appropriate planning allowances. This does not preclude the importance of en-route fuel progress monitoring, which is complementary to the flight preparation process. EDTO operators should develop appropriate en-route procedures for flight crews to track actual versus planned fuel burn on the operational flight plan (OFP) and appropriate contingency procedures in the event that the fuel state of the aeroplane becomes unacceptable to complete the intended mission. The importance of adhering to these procedures should be addressed in the EDTO training programme.

3. The EDTO critical fuel calculation is strictly a flight preparation consideration and does not apply once en-route, as operational variances such as more adverse winds than forecast may result in actual fuel burns which differ from the assumptions used to produce the OFP. EDTO operators should develop a minimum en-route fuel policy as the basis for the flight crew to determine if the fuel remaining on the aeroplane is sufficient to complete the mission. It is not necessary for the calculated critical fuel to be on board when passing the EDTO ETPs including the CP provided these en-route policy reserves are satisfied.

3. Procedures to support EDTO maintenance programme

1. Auxiliary power unit (APU) in-flight start programme

2. Uganda CAA establishes a requirement for EDTO operators to monitor the in-flight start performance of the APUs installed on their EDTO fleets as part of the EDTO reliability programme. It is required, the sampling intervals and reliability tracking procedures are established under the EDTO maintenance programme. The primary role of flight operations is to actually execute the in-flight start attempts when directed and to record the success or failure for appropriate maintenance action. Specific procedures to address the flight operations role should include:

    1. notification of APU in-flight start requirement to flight crews through the flight release process;

    2. in-flight start instructions including number of start attempts, allowable altitudes and time required in cruise (cold soak) before initiating start attempts; and

    3. documentation procedures for recording success or failure of start attempts.

Note 1. — The APU in-flight start sampling programme is in addition to cases where the APU must be started and running to support EDTO operations due to aeroplane configuration architecture, in-flight verifications, MEL status or en-route failure conditions.

Note 2. — The APU should demonstrate the required in-flight start reliability throughout the flight envelope (compatible with overall safety objective but not less than 95 %) taking account of all approved fuel types and temperatures.

1. Maintenance verification flights

1. The EDTO maintenance verification programme is accomplished through positive system verification on the ground using procedures provided by the aeroplane manufacturer. There are, however, cases where an EDTO significant system fault resolution may require in-flight verification through monitoring or exercising of the system by the flight crew. These cases are relatively infrequent, but may occur if a fault is dependent upon specific en-route conditions such as temperature or altitude.

2. EDTO operators should establish flight operations procedures to address maintenance verification flights when required to include the following:

    1. identification of verification flight requirement through the operational control and flight release process;

    - instructions to flight crew to identify the affected system(s) and what should be monitored or exercised; and

    - recording and coordination procedures following success or failure of system verification.

1. An EDTO verification flight may be accomplished during an EDTO flight (e.g. prior to entering the EDTO sector) or a non-EDTO flight or on a dedicated non-revenue flight.

2. EDTO significant system discrepancies

1. The application to the EDTO flight operations programme is often confused because some systems identified as EDTO significant for maintenance programme purposes may also have flight preparation and/or en-route implications. As such, EDTO operators should clearly establish the relevance of system discrepancies to the respective areas in their EDTO programme documentation.

2. The “EDTO significant systems list” is developed by the operator based on aeroplane manufacturer guidance) and approved by the State of the Operator as an integral component of the EDTO maintenance programme. This list is applicable to the EDTO reliability and EDTO verification programmes. The EDTO significant systems list is not intended for en-route purposes or for flight preparation purposes except as provided by the MEL.

3. Aeroplane systems which have EDTO flight preparation or flight release implications are a separate consideration from the EDTO significant systems list and should be addressed in the operator’s MEL. The MEL EDTO restrictions are based on the MMEL issued by the State of Design, which supports the certified EDTO capability of the aeroplane. Additional EDTO flight release restrictions may be included in the operator’s MEL to reflect the specifics of the authorization. The MEL should also include guidance on system failure responses after pushback and prior to take-off.

4. En-route flight crew responses to non-normal aeroplane system conditions are a separate consideration from the EDTO maintenance programme and flight release procedures. Non-normal conditions and flight crew procedures which call for a technical diversion are provided by the aeroplane manufacturer in the quick reference handbook (QRH) or by other methods (e.g. electronic checklists). These procedures are validated during the EDTO certification of the aeroplane and are common to both EDTO and non-EDTO operations.

3. EDTO flight release after non-technical diversions

1. The release of an EDTO flight requires completion of an EDTO service check performed by properly qualified maintenance personnel. Qualified maintenance personnel may not, however, be available on-site following a non-technical diversion to an en-route alternate aerodrome from which a subsequent EDTO flight release is required. For such situations, EDTO operators may establish procedures to allow flight crews to accomplish the flight release by coordinating remotely with EDTO maintenance personnel. The roles, responsibilities and qualifications of involved personnel should be clearly identified in the operator's EDTO procedures documentation, approved by the Uganda CAA.

2. Diversion considerations. -

1. A key element of being well prepared for an EDTO diversion is the preflight briefing where possible areas of concern can be reviewed and the potential plans of action communicated to all members of the flight crew without the added stress of required immediate action. A review of the weather and terrain along possible EDTO diversion tracks should ensure that the crew has a common plan for handling possible contingencies. On long flights, with crew members transitioning from a duty station to crew rest and back, it is important that standard operating procedures be followed to minimize any possible confusion about the aeroplane's position relative to EDTO ETPs and the direction of turn required to proceed to the nearest designated en-route alternate aerodrome on the operational flight release.

Note. — The EDTO alternate aerodromes determined during the EDTO flight preparation process provide one potential course of action in the event of an en-route diversion; however, the flight crew is not bound by the dispatch assumptions and may select another diversion aerodrome if determined to be more suitable for the prevailing operational conditions.

2. Diversion decision-making

1. It is not possible to cover every combination of circumstances that might occur during a diversion so operator guidance to flight crews may be general only. It is left up to the judgment of the flight crew to conduct the flight in the safest manner possible in light of the prevailing operational conditions that exist at the time.

Note. — The specific guidance provided by EDTO operators to their flight crews may also include the details of terrain clearance or oxygen limited escape route policies and procedures which the operator has established. Terrain clearance and oxygen requirements are generally independent of EDTO and should be covered as needed in other applicable sections of the operator's operations manual.

2. There are a number of events that might prompt the flight crew to consider diverting on an EDTO flight. Some of these events are "technical" in nature and are addressed by non-normal procedures established by the aeroplane manufacturer which are generally common to all (EDTO and non-EDTO) operations. Typical examples of these technical events might include an engine failure or fire, cabin fire or smoke, decompression, multiple loss of AC power sources, multiple loss of hydraulic system power sources, a cargo fire or any other relevant "technical" situation that may have an adverse effect on the safety of flight.

Note. — Flight crew guidance and checklists for en-route technical failures including technical diversion criteria are provided by the aeroplane manufacturer in the aeroplane operating manual or through other methods (e.g. electronic checklists). The aeroplane operating manual thus provides the basis of technical diversion decision-making, as opposed to the MEL or EDTO significant systems list which are intended for use on the ground and are not relevant to en-route operations.

3. However, the vast majority of diversions that have occurred in actual EDTO service have been due to non- technical causes. Passenger and crew medical emergencies, adverse en-route weather conditions or EDTO alternate aerodromes becoming unavailable may also result in a diversion or air turn back. The nature of the emergency and its possible consequences to the aeroplane, passengers and crew will dictate the best course of action suitable to the specific situation. The flight crew must decide on the best course of action based on all available information. Operator procedures documentation and training programmes should support this decision-making process.

4. As noted above, the EDTO alternate aerodromes listed in the flight release for a particular EDTO flight provide one diversion option to the pilot-in-command, as do the selected EDTO diversion planning speeds established by the operator. However, the EDTO alternates selected at dispatch may not be the only aerodromes available for the diversion and the EDTO OEI or AEO speeds used at the planning stage may not be the best choice for a particular circumstance. Operator policy should specify the authority of the pilot-in-command to deviate from these dispatch planning parameters in the event of an actual EDTO diversion.

3. Diversion strategies

1. Once the need for an EDTO diversion has been established and an en-route alternate aerodrome selected, the flight crew will need to consider how to actually conduct the diversion based on the nature of the emergency and prevailing operational considerations. Non-technical diversions or technical diversions which do not have a significant impact on the performance of the aeroplane would normally be performed at a typical cruise flight condition or at a higher all-engine cruise speed to minimize the diversion time as permitted by the aeroplane's fuel state.

2. For an engine failure diversion, the consequences of speed selection on the aeroplane's performance (e.g. fuel, altitude) can be significant particularly for a two-engine aeroplane. As such, it is important for the flight crew to understand these consequences and to have appropriate guidance to choose the safest and most appropriate diversion strategy, there are three primary considerations to determine the best course of action from the standpoint of OEI speed selection which may be described as follows:

    1. Time strategy: If minimum diversion time and getting the aeroplane on the ground as soon as possible are the most critical considerations, a high OEI speed strategy may be selected as permitted by the aeroplane's fuel state, altitude capability and structural integrity. For two-engine aeroplanes, the time strategy is sometimes considered to be equivalent to the approved OEI speed, but a higher speed approaching VMO/MMO could be selected if

conditions warrant. The flight crew is not bound by the speed assumptions used for EDTO flight preparation purposes.

- Fuel strategy: If the fuel remaining to accomplish the diversion is the most critical consideration, OEI long-range cruise (LRC) speed or even maximum range cruise (MRC) speed could be selected to optimize fuel management during the diversion. EDTO critical fuel planning will preclude the possibility of a fuel-critical EDTO diversion; however, fuel may nevertheless be a primary consideration in managing the diversion.
- Obstacle strategy: If the diversion track following engine failure will traverse high terrain, additional care should be taken in speed selection to ensure that en-route terrain clearance margins are maintained. The speed associated with maximum lift over drag ratio (L/Dmax) will provide the best OEI altitude performance and should be selected until clear of any limiting terrain.

1. Diversion decision-making and strategy considerations should be addressed in EDTO flight crew training programmes and procedures documentation. Aeroplane type specific information should be included such as flight management system (FMS) functionality to support a diversion and available engine inoperative performance data (e.g. altitude capability, diversion fuel, power setting) as implementations may vary for different EDTO fleets. The EDTO flight preparation assumptions and associated margins as relate to en-route diversion strategy considerations should also be addressed.

2. AEROPLANE PERFORMANCE DATA

1. An aeroplane should not be released on an EDTO flight unless the air operator's operations manual and/or as applicable the EDTO flight operations manual (EFOM) contain(s) sufficient performance data to support all phases of any applicable EDTO operation, including flight preparation and en-route operations. The performance data should be based on information provided or referenced in the approved aeroplane flight manual (AFM) or from other operational documentation or software tools provided by the aeroplane manufacturer.

2. The following aeroplane performance data should be available to support EDTO flight and en-route operations:

    1. EDTO area of operations (diversion distance);

    - detailed OEI performance data for standard and non-standard atmospheric conditions covering:

        1. driftdown (includes net performance);
        2. cruise performance (altitude coverage including 3 000 m (10 000 ft));
        3. fuel requirements;
        4. altitude capability (includes net performance); and
        5. holding;

    - detailed AEO performance data, including nominal fuel flow data, for standard and non-standard atmospheric conditions covering:

        1. cruise performance (altitude coverage including 3 000 m (10 000 ft)); and
        2. holding;

    - details of any other conditions relevant to EDTO flight preparation including fuel used for thermal anti-ice, ice accretion on the unprotected surfaces of the aeroplane, and

APU usage, as appropriate.

APPENDIX B AIRWORTHINESS REQUIREMENTS

1. EDTO MAINTENANCE AND RELIABILITY REQUIREMENTS

1. GENERAL

1. EDTO awareness

All personnel involved in the maintenance programme should be made aware of the special nature of EDTO and have an understanding as to its impact on their responsibility to the maintenance programme. The maintenance programme should contain the standards, guidance and directions necessary to support the proposed EDTO operations.

2. Assessment

The AWI having jurisdiction over the operator should assess over an appropriate period of time (e.g. at least 3 months) the maintenance programme's suitability to support the proposed EDTO operations before the authorization by specific approval for EDTO can be granted.

2. EDTO MAINTENANCE PROGRAMME

1. General

1. In the context of this manual, the term "EDTO maintenance programme" means the maintenance related elements (maintenance tasks, organization manuals, procedures, etc.) that must be implemented by the operators to support their EDTO operations. In this context, the aircraft maintenance programme for EDTO is one element of the operator's EDTO maintenance programme.

2. The operator's EDTO maintenance programme should contain the standards, guidance and directions necessary to support the intended EDTO operations. All personnel involved with EDTO should be made aware of the special nature of EDTO and have the knowledge, skills and ability to accomplish their specific areas of responsibility to the programme. The EDTO maintenance programme should identify personnel and areas where an EDTO qualification is required (see 1.2.2.4 and 1.7).

2. Elements of the EDTO maintenance programme

1. The typical elements of an operator's EDTO maintenance programme are identified below:

- EDTO maintenance procedures manual
- EDTO CMP document
- Aeroplane maintenance programme for EDTO
- EDTO significant systems
- EDTO-related maintenance tasks/EDTO qualified staff
- Parts control programme
- EDTO service check
- Reliability programme
- Propulsion system monitoring

- Verification programme
- Dual maintenance limitations
- Engine condition monitoring programme
- Oil consumption monitoring programme
- APU in-flight start monitoring programme
- Control of the aeroplane's EDTO status: EDTO release statement
- EDTO training

2. These elements are further detailed in this chapter. These elements should be set up by operators as part of their demonstration of compliance against the maintenance criteria of applicable EDTO operational regulation.

3. The required elements of the EDTO maintenance programme should be reviewed in conjunction with the applicable aeroplane maintenance programme to ensure that they are adequate to meet the specific EDTO maintenance requirements as defined in the EDTO CMP document for the AEC and any applicable instructions for continued airworthiness (ICA) that may affect EDTO requirements.

4. Maintenance personnel and other 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 programme.

3. EDTO MAINTENANCE PROCEDURES MANUAL (EMPM)

1. Background

1. The operator should include EDTO information in the relevant part(s) of the basic maintenance procedures manual (MPM) / Maintenace Control Manaul (MCM) or publish this information as a "stand alone" EDTO maintenance procedures manual (EMPM).

2. This EMPM or the EDTO content of the basic MPM / MCM defines EDTO maintenance practices supporting these operations as well as responsible persons and/or organizations. The manual should include, either directly or by reference to incorporated documents, the requirements described in this section.

2. Purpose

1. The purpose of the EMPM (or EDTO content of the basic MPM / MCM) is to provide involved personnel and EDTO authorized persons with a descriptive means aimed at ensuring safe and efficient EDTO operations.

2. Accordingly, all EDTO requirements, including supportive programme procedures, duties and responsibilities, should be identified as being related to EDTO. The EMPM (or the EDTO content of the basic MPM / MCM) should be submitted to the AWI for review and acceptance with sufficient lead-time prior to the scheduled commencement of EDTO operations of the particular aeroplane type, model or variant (AEC).

3. The EMPM (or EDTO content of the basic MPM / MCM) should typically address the following topics:

1. general information on applicable EDTO rules and the operator's EDTO programme;
- scope of operator's EDTO authorization (routes, fleet, diversion time, etc.);
- responsibilities (maintenance control centre, engineering, quality, training, planning and production, etc.);

- processes (daily review, reporting, dual maintenance limitations, etc.);
- EDTO maintenance procedures (aircraft release, EDTO service check, oil consumption monitoring, etc.); and
- EDTO maintenance training.

1. Revision control

1. Revisions to this EMPM (or the EDTO content of the basic MPM / MCM) should be reviewed and approved as applicable by the AWI for major changes to the programme. However, minor administrative revisions may not require formal review or acceptance by the AWI.

2. EDTO CONFIGURATION, MAINTENANCE AND PROCEDURES (CMP) DOCUMENT

1. General

1. The EDTO CMP document defines the minimum standards for EDTO relative to any system improvements (configuration), maintenance tasks or operational procedures required for the EDTO operational approval. These standards are defined and approved by the State of Design of the aeroplane manufacturer in the frame of the EDTO certification of the aeroplane.

2. Operators should comply with the applicable requirements stated in this document for each aeroplane for which an EDTO authorization is requested. Any deviation from these requirements should be approved by the CAA.

3. Operators should have procedures and responsible persons defined in their EMPM to ensure compliance with this document. The EDTO maintenance programme must include all tasks and related intervals as defined in the CMP, and the operational programme must include any procedures required by the CMP and be coordinated with the maintenance organization, where applicable.

3. AEROPLANE MAINTENANCE PROGRAMME FOR EDTO

1. General

1. The aeroplane maintenance programme for EDTO should contain the standards, guidance and directions necessary to support the intended EDTO operations.

2. The aircraft maintenance programme for EDTO should consider:

    1. all scheduled tasks applicable to both EDTO and non-EDTO operations, coming typically from the maintenance review board report/maintenance planning document (MRBR/MPD) or certification maintenance requirements (CMR) documents;

    - the additional specific task intervals coming typically from the EDTO CMP document; and

    - unscheduled maintenance affecting EDTO significant systems that must be managed according to the details provided in this section.

1. Applicability of the aircraft maintenance programme for EDTO

1. The aircraft should be maintained in accordance with the aircraft maintenance programme for EDTO as long as it is operated on EDTO flights.

2. It is not mandatory to comply with the aircraft maintenance programme for EDTO while the aircraft is not operated on EDTO. However, compliance with this aircraft maintenance programme for EDTO becomes mandatory as soon as the EDTO operations are resumed, which may entail execution of some tasks before EDTO operations can be resumed in order to restore the EDTO status of the aircraft.

2. Applicability of the aircraft maintenance programme for EDTO during mixed EDTO/non-EDTO operations

1. The applicability of the aircraft maintenance programme for EDTO in case of mixed EDTO/non-EDTO operations should be as follows:

    1. any tasks to be performed prior to an EDTO flight (e.g. tasks from the EDTO service check) are not required to be performed before the non-EDTO flights. Nevertheless, some tasks such as oil consumption monitoring may need to be continuously applied to maintain data continuity; and

    - the other EDTO maintenance tasks (i.e. those tasks required only for EDTO or those tasks with an interval specific to EDTO) must be performed, otherwise the aircraft status should be downgraded to non-EDTO.

1. It is not mandatory to perform the above-mentioned EDTO maintenance tasks if the aircraft is not operated on EDTO for an extended period of time. However, should the aircraft be put back into EDTO operations, an assessment of the aircraft maintenance status should be performed as follows:

    1. any task to be performed prior to an EDTO flight (e.g. tasks from the EDTO service check) is to be performed prior to each EDTO flight of the aeroplane;

    2. any task required only for EDTO should be performed as per the applicable interval; and

    3. any task with an interval specific to EDTO must be performed as per the applicable "EDTO" interval to ensure it is not exceeded when EDTO operations are resumed, i.e. should the time since last execution of the concerned task be more than the EDTO interval then the task should be executed before the first EDTO flight.

1. EDTO SIGNIFICANT SYSTEMS

1. Definition

1. The EDTO significant systems are the systems or functions that help preclude and protect a diversion once the aircraft is dispatched on an EDTO flight. The EDTO significant systems are usually defined as systems:

    1. whose failure could adversely affect the safety of an EDTO flight (preclusion of a diversion); and

    2. whose functioning is important to continued safe flight and landing during an EDTO diversion (protection of the diversion).

1. This list of EDTO significant systems is required mainly to allow the EDTO operator to track and report through the reliability programme the "EDTO relevant" events and to comply with the dual maintenance limitations criteria of the EDTO/ETOPS regulations.

2. Such systems include:

    1. electrical systems, including battery (if relevant);

    - hydraulics;

    - pneumatic systems;

    - flight instrumentation;

    - fuel systems;

- flight controls;
- ice protection systems;
- engine start and ignition;
- engine system instruments;
- navigation and communications;
- engines;
- auxiliary power units;
- air conditioning and pressurization;
- cargo fire suppression;
- engine fire protection;
- emergency equipment; and
- any other equipment required for EDTO.

1. EDTO/ETOPS significant systems are identified to support EDTO/ETOPS design standards as well as support the acceptance of maintenance and operational procedures.

2. Time-limited systems (TLSs)

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

   Note 1.— For aeroplanes 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 no identified system, and this limitation therefore applies to all systems other than the cargo fire protection system.

2. The time capability of the TLSs (i.e. the most limiting fire suppression system and the most limiting EDTO significant system other than the fire suppression system) are recorded in the AFM or AFM EDTO supplement, as applicable, the EDTO CMP document and TCDS, or in any other relevant manufacturer documentation or tools.

3. The time capability of the TLSs has to be adequately considered in the operational dispatch of the aircraft. for the consideration of the TLSs versus the maximum diversion time for the dispatch of the aircraft on EDTO routes.

3. Continued validity of EDTO certification (airworthiness monitoring)

1. EDTO certification is not granted permanently. It is subject to continued surveillance by the State of Design 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 (i.e. service bulletins issued by the aeroplane manufacturer, maintenance or procedures mandated to restore the reliability).

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).

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

2. EDTO-RELATED MAINTENANCE TASKS/EDTO QUALIFIED STAFF

1. An EDTO qualified staff is a person who has received the EDTO training. The operator identifies in its approved EMPM the requirements to be met for being rated as an EDTO qualified staff. The EMPM should also identify the tasks that shall be accomplished by an EDTO qualified staff, in accordance with any applicable regulations.

2. The maintenance tasks related to EDTO are tasks impacting EDTO significant system(s) tasks or sub-tasks which are not impacting any EDTO significant system(s), e.g. tasks supporting the overall verification process should not be considered as EDTO-related tasks.

3. The EDTO-related tasks may be scheduled tasks (from the aircraft maintenance programme for EDTO) as well as unscheduled tasks performed using manuals such as aircraft maintenance manuals, fault isolation manuals, and troubleshooting manuals.

4. The operator should select from the list of EDTO-related tasks those tasks which may be required to be performed by EDTO qualified staff.

5. The selected EDTO-related tasks should be retained for their EDTO relevance and could include the installation, testing and/or servicing of airframe and propulsion systems identified in the EDTO significant systems list, such as:

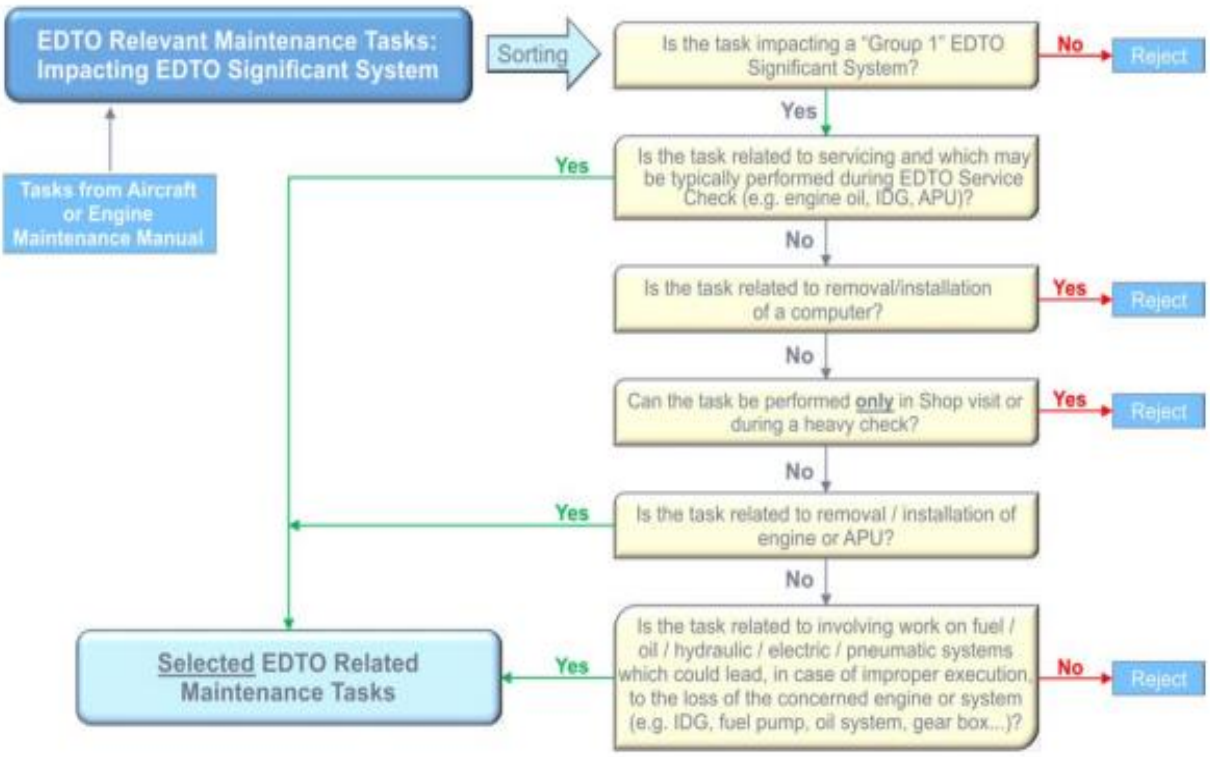
    1. removal/installation of engine or APU;

    - removal/installation of a component and involving work on fuel/oil/hydraulic/electric/pneumatic systems (VFG, fuel pump, oil system, gearbox, etc.) which could lead, in case of improper execution, to the loss of the concerned engine. This would typically mean tasks related to “Group 1” EDTO significant systems; and

    - servicing and which may be typically performed during EDTO pre-departure service check (e.g. engine oil, VFG, APU).

1. The filtering process for identification of these selected EDTO-related tasks should be implemented by the operator.

A typical flow chart for this filtering of the selected EDTO-related tasks is provided in Figure below.



2. PARTS CONTROL PROGRAMME

1. General

1. An EDTO operator should have a programme Identified in its EMPM that defines its management process of EDTO parts. This should include the ability to recognize and restrict EDTO based on part capability (90, 120, 180 minutes, etc.). This process should define how the technician identifies EDTO part capability and the coordination within the operator to ensure the flight does not exceed the configuration capability (90, 120, 180 minutes, etc.). This definition should include parts pooling arrangements and any part borrowing capability.

2. Operators should have processes in place to ensure compliance with the new CMP requirement until the IPC/IPD has been revised. If the operator allows non-EDTO parts to be installed on the aeroplane, the EMPM should define the processes to restrict the aeroplane and ensure the EDTO-approved parts are installed prior to EDTO dispatch.

3. Agreements where part pooling arrangements have been made should include propulsion system standards, as applicable. Some operators borrow parts on short-term notice and should have similar processes to ensure the correct part is installed to support the EDTO requirement.

2. Identification of EDTO parts

1. The operator must develop a parts control programme to ensure that proper configuration is maintained for EDTO. These EDTO configuration standards for a given aeroplane model are detailed in the applicable EDTO CMP document. Indeed, per EDTO operational criteria, it is the responsibility of the operator to ensure that the aircraft is configured in compliance with the applicable EDTO CMP document when dispatched on EDTO flights.

2. The EDTO CMP document is defined and approved by the State of Design in the frame of the EDTO certification of a given aircraft model. The required EDTO configuration is usually defined through service bulletin or modification numbers in the EDTO CMP document.

3. Therefore, an EDTO parts list should be developed in order to identify and to manage the EDTO components. This EDTO parts list, which may be provided by the aircraft manufacturer, should reflect the configuration requirements of the EDTO CMP document. For each CMP configuration item, the EDTO parts list should identify the part numbers (P/Ns) that are "not approved for EDTO" and those that are "approved (or mandatory) for EDTO". The pre-modification P/Ns are those with EDTO restriction (e.g. "not approved for EDTO" P/Ns), while the post-modification P/Ns are the P/Ns "approved (or mandatory) for EDTO".

4. The EDTO status of a given part may be identified on its tag, and this information may also be included in the illustrated parts catalogue. In case of doubt about EDTO status of a specific part, the EDTO CMP document should be used as the reference for assessment of the required EDTO configuration.

5. The EMPM should detail the process in place to ensure the proper identification of the EDTO status of the parts. This process should continuously ensure that any new EDTO configuration restrictions (e.g. coming from revised CMP standards) are properly identified.

3. EDTO parts provisioning

1. The EDTO requirements have an indirect impact on parts provisioning policy. These requirements may be split in two areas, standard and quantity of parts to be provisioned:

    1. Standard of parts to be provisioned.

    2. Quantity of parts to be provisioned: There is no required minimum quantity of spare parts in the EDTO rules; however, the more restrictive MMEL may have an impact on the operator's policy for spare provisioning. The assessment of spare requirement will have to take into account the different dispatch allowance between EDTO and non-EDTO, as well as the level of EDTO (e.g. 120 or 180 minutes) and area of operations. Spare requirement may be different if the return leg to main base can be done along a non-EDTO route (or with a lower diversion time). Dispatch reliability may also be used as a criterion for the assessment of spare parts requirements, as for non-EDTO operations.

1. EDTO SERVICE CHECK

1. General

1. EDTO operators should perform an EDTO service check prior to each EDTO flight in order to confirm adequate operation of significant systems prior to EDTO dispatch.

2. The systems to be checked are derived from the operator list of EDTO significant systems; indeed, the list of relevant systems depends on the design and technology of the aircraft. Furthermore, the EDTO CMP document may also not contain the service check tasks, as these tasks may not be identical for all operators and may depend on the route structure (network) and maintenance organization and processes in place (e.g. cockpit-based checks at transit).

3. The check is intended to ensure there are no existing EDTO log book items that are applicable to EDTO significant systems remaining prior to EDTO dispatch. The two objectives are to prevent system failures during the next EDTO flight and to correct system failures (before the next EDTO flight) that are not allowed by the EDTO MMEL.

2. Typical content of the EDTO service check

1. At a minimum, the EDTO service check should contain:

    1. verification that all EDTO significant systems defects have been resolved or have sufficient MEL coverage;

    - review of the aeroplane technical log for EDTO significant system items and servicing entries;
    - performance of an interior and exterior inspection. The exterior inspection is intended to be a general visual inspection (GVI) from ground level;
    - verification of engine oil level to include the APU if it is required for EDTO; and
    - assessment of the EDTO status of the aeroplane and related EDTO maintenance release.

1. The intent of item a) (EDTO significant systems), is not to perform a test on each item but to review the technical log and aeroplane messaging system for discrepancies in this area. Maintenance level messages are not typically reviewed or evaluated during this check as those soft faults are designed for planning during higher level maintenance checks.

2. Oil consumption for each propulsion system should be verified as acceptable prior to EDTO dispatch and that it meets the mission requirements of the EDTO flight. For operations where the APU must be running for the entire flight (e.g. MEL with generator inoperative), the APU oil consumption rate should support the operation. Some aeroplanes have only three generator sources and are at the minimum requirement for EDTO at dispatch. This requires the APU to be running during the EDTO portion of the flight or in some cases allow the APU to be available during EDTO. The CMP defines the specific operational requirements.

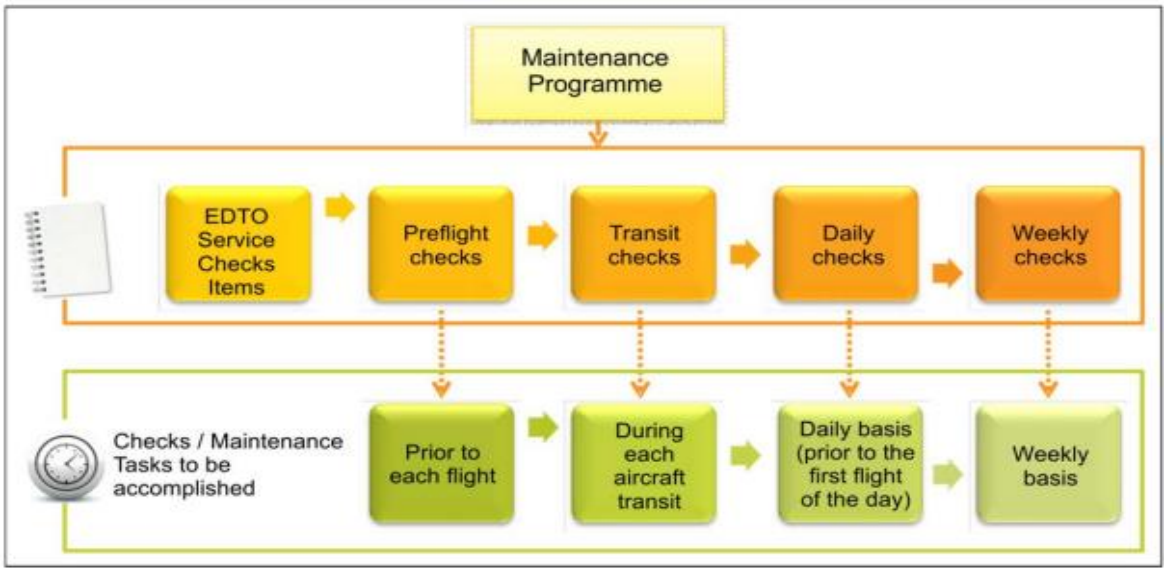
3. The EMPM should identify the EDTO qualification requirements for completing the EDTO service check. These qualifications are defined in the training section of the EMPM and should define the areas of the check which require EDTO qualification. The EMPM should also define how the check is signed for and how the flight crew determine if the check has been completed. The EDTO service check is required by regulation to be completed only prior to an EDTO flight, so the EMPM should define how the non-EDTO flights are to be managed. If the EDTO service check is not completed on these flights, the oil consumption and engine condition monitoring (ECM) data collection should continue. This check is not typically found in the scheduled maintenance programmes (e.g. MRBR/MPD) as these are driven by the structured MSG-3 analysis. This check, however, does need to be managed through the scheduled maintenance process of tracking and reporting.

2. EDTO service check and line check policy

1. The approach of single EDTO pre-departure service checks may not be compatible with the flight programme (e.g. the mission could be a sequence of EDTO/non-EDTO legs).

2. The regulation allows the introduction of the EDTO service check items in the existing line checks but distinct identification for the EDTO tasks should be marked on the service check task card. The qualification required for signature should also be indicated to ensure the person accomplishing the task understands its limitations.

3. In this case, the single EDTO pre-departure service check is replaced by an EDTO service check policy as illustrated in Figure below.



3. Execution of EDTO service check

1. The EDTO service check should be accomplished or verified by EDTO qualified staff (see 1.7).

2. Depending on the applicable national rule or policy, and depending also on the content of the EDTO service check, it may be accepted that the EDTO service checks/tasks are done by flight crew members, as long as they meet the qualification requirements.

3. This could typically be the case when the related EDTO service check calls for a cockpit check of relevant parameters. However, in this context, the flight crew should not be allowed nor required to perform a maintenance action (rectification).

4. Physical check versus cockpit check

The accuracy of indicating systems and reliability of aircraft systems and engines, combined with the low level of oil consumption of today's engines, make it possible to increase the number of legs between physical checks of the system or component. In this case, flight deck verification is acceptable. In addition, verification from the flight deck minimizes the risk of human error during physical check.

2. RELIABLITY PROGRAMME

1. Purpose

1. The EDTO operator should create an event-based EDTO reliability programme based on its EDTO significant systems list. This programme would enhance any existing reliability programme be it a statistical-based programme or a continuing analysis and surveillance (CASS) programme. The programme should be designed with the objective to allow early identification and prevention of EDTO-related significant events and ensure that EDTO reliability is maintained.

2. The programme should be event-oriented and incorporate reporting procedures for EDTO significant events and trends detrimental to EDTO flights. This information should be readily available for use by the operator and the AWI to help determine that the reliability level is adequate, and to assess the operator's competence and capability to safely perform EDTO. An EDTO reporting programme should be established which ensures that the AWI is notified, typically monthly, on the previous month's activities or more often if adverse trends reportable through this programme are identified.

3. Air operators who contract any part of their maintenance control system and/or reliability programmes that support their EDTO authorization to any other organization remain responsible for ensuring that all elements of this programme are addressed and continue to meet the applicable requirements. The EMPM should identify the processes and procedures of this agreement and identify the air operator's accountable staff.

2. Impact on EDTO diversion time capability

1. Air operator procedures to manage the EDTO diversion time capability of a given aeroplane or fleet of aeroplanes should be established and implemented. These procedures should provide the maintenance manager with the authority to limit, as may be deemed necessary, this EDTO diversion time capability of the applicable aeroplane or to reinstate it once adequate corrective actions have been identified and implemented.

2. A reduction of this EDTO diversion time capability may be needed if:

    1. an unresolved significant event is identified on any flight, including non-EDTO flights, of the operator's EDTO approved aeroplane type affected; or

    - an adverse trend is identified through the reliability programme; or
    - the approved EDTO capability of the aeroplane, granted by the State of Design, has been reduced.

1. APU in-flight start monitoring

1. The EDTO operational requirements require the EDTO operator to perform periodic high altitude and cold soak APU in-flight starts, typically when the APU is a back-up source for electrical or pneumatic power.

2. The capability of the APU to perform cold soak starts throughout the flight envelope is usually demonstrated by the manufacturer during the EDTO/ETOPS certification of the aeroplane.

3. Therefore, the purpose of the APU in-flight start monitoring programme by the operator is primarily to demonstrate and/or confirm the continued ability of the APU to perform high altitude cold soak starts and to ensure that the maintenance programme provides adequate support for that intent.

4. The APU in-flight start monitoring programme should demonstrate that a 95 per cent success rate is achieved for high altitude cold soak starts

    Note.— In this context, a successful start is usually defined as being one where the APU starts within three attempts. The maximum number of start attempts should be within the limits specified in the applicable aeroplane or APU documentation.

5. The APU in-flight starts should be performed within the concerned EDTO fleet of the operator, as well as the non-EDTO fleet, if any, if these APUs are configured and maintained in accordance with the EDTO CMP requirements.

2. Propulsion system reliability monitoring

1. Where reliability data indicate that the applicable in-flight shutdown (IFSD) rate of the propulsion system is no longer being met, the AWI should be notified of the corrective measures taken. If the reliability data show a continual degradation below the applicable target reliability level, a substantiated plan for resolution should be submitted and consideration for a reduction in EDTO capability may be warranted, as explained in 1.10.2.

2. The IFSD rate of the operator's fleet may be impacted significantly if the fleet is small in count (typically fewer than 15 aircraft). In this case, the IFSD rate computation will mainly be used as a trending mechanism. Exceedance of the target rate should therefore not be used as the only reason

to suspend EDTO operation. Indeed, when the number of engine hours over a year is not sufficient to be statistically representative, the reliability of EDTO operation should be reviewed on an individual event basis. An event-orientated analysis of each in-service event should therefore be performed. This analysis shall identify the root cause of the event and define the related corrective actions (if any).

3. Tracking and reporting of EDTO relevant events

1. The following events should be included in the reporting programme:

    1. in-flight shutdowns or flameouts;

    - diversion or turn-back;
    - uncommanded power changes or surges;
    - inability to control the engine or obtain desired power; and
    - significant events or adverse trends with EDTO significant systems.

1. The report should also identify the following:

    1. aeroplane identification;

    - engine identification (make and serial number);
    - total time, cycles and time since last shop visit;
    - for systems, time since overhaul or last inspection of the defective unit;
    - phase of flight;
    - corrective action; and
    - resulting action by the flight crew (divert, return, continue, etc.).

1. Assessment of EDTO reliability indicators

1. Where statistical assessment alone may not be applicable (i.e. when the fleet size is small), the air operator's performance should be reviewed on a case-by-case basis.

2. The review may include such items as actual data populating the air operator's reliability programme and this being compared, where possible, to worldwide fleet data of the concerned AEC and related EDTO maintenance significant systems, as well as air operator events, including IFSDs and loss of thrust, with the results of investigation into the cause(s) of the events.

3. This recommendation to focus on the root-cause of the events and the corrective action(s) taken, rather than on the reliability figures alone, may actually apply to any fleet.

4. Indeed, regardless of the reliability level, it is possible that a particular event may also warrant corrective action implementation even though the applicable reliability indicators are not being exceeded. It also implies that any EDTO relevant event in the operator's fleet (i.e. EDTO and non-EDTO) should be reviewed.

5. Analysis of propulsion reliability is only one part of the whole assessment that should be performed in the frame of decision process to grant, maintain or reduce the EDTO authorization.

2. PROPULSION SYSTEM MONITORING

1. Background

The engine reliability should be tracked at two levels:

1. by the manufacturers and the State of Design as part of the continued airworthiness surveillance of a given AEC (worldwide fleet). The goal of this tracking is to ensure that the EDTO capability of a given AEC is demonstrated and maintained.
2. by the EDTO operator and its CAA for the fleet (of this operator) of a given AEC. The goal of this tracking is to provide an indicator, but not the only indicator, of the reliability of the concerned operators' EDTO operations.

1. In-flight shutdown (IFSD) rate

1. The IFSD rate is a statistical indicator commonly used to assess the reliability of the concerned engine model versus the target rate set by applicable regulations.
2. The IFSD rate is a reliability figure calculated by dividing the chargeable number of in-flight shutdowns by the total engine operating hours accrued during the same period. The IFSD rate is usually computed over a 12-month rolling average basis for the concerned AEC; it is, therefore, the count of IFSD(s) over the total engine hours cumulated during the last 12 months.
3. The IFSD rate may be computed for the worldwide fleet of the concerned AEC; this is the rate monitored by the State of Design to assess the EDTO capability of a given AEC.
4. The IFSD rate should also be computed by the operator for its fleet of concerned AEC; this is the rate that may be considered by the CAA as part of the continued reliability assessment of the concerned operators' EDTO operations.
5. The IFSD alert levels are set out in AMC 20-6B for EASA and should be used as a guide.
6. The applicable IFSD alert levels are typically defined for a given maximum diversion time (e.g. 120, 180 minutes and beyond 180 minutes).
7. These IFSD levels for the operator may also consider the size of the fleet as this may have a great impact on the operator's IFSD rate; indeed, due to a smaller number of cumulated hours during 12 months, the impact of one engine failure on an operator's IFSD rate may be significantly higher than on the worldwide fleet rate.

2. IFSD definition

1. The definition of an IFSD is usually provided in the applicable national regulation. The commonly retained definition of an IFSD for EDTO is when an engine ceases to function (when the aeroplane is airborne) and is shutdown, whether self-induced, flight-crew initiated or caused by an external influence.
2. Typical examples of engine in-flight shutdown causes retained for the computation of the IFSD rate are: flameout, internal failure, flight-crew initiated shutdown, foreign object ingestion, icing, inability to obtain or control desired thrust or power, and cycling of the start control, however briefly, even if the engine operates normally for the remainder of the flight.
3. It should also be noted that the following events are normally not counted as IFSD:
   a) engine failures before take-off decision speed or after touchdown;
   b) airborne cessation of the functioning of an engine when immediately followed by an automatic engine relight; and
   c) engine does not achieve desired thrust or power but is not shut down.
4. In most national EDTO regulations, these events are not counted as IFSD but should still be reported to the competent authority in the frame of continued airworthiness for EDTO.

3. IFSD rate monitoring

1. The assessment of propulsion systems' reliability for the EDTO fleet should be made available to the AWI (with supporting data) in accordance with the approved EDTO maintenance control system.

2. Where the combined EDTO fleet is part of a larger fleet of the same AEC, data from the air operator's total fleet may be acceptable. The reporting requirements of Section 1.10 should still be observed for the EDTO fleet.

3. Any adverse trend requires an immediate evaluation to be done. The CAA should be advised of the result of the evaluation. The evaluation may result in corrective action and/or operational restrictions being applied.

4. The operator should investigate any indication of high IFSD rate.

5. However, as explained earlier, in the case of a smaller fleet, the high IFSD rate may be due to the limited number of engine operating hours used for the rate calculation. This can cause an IFSD rate being well above the target rate because of a single event. The underlying causes for such a jump in the rate should be considered by the AWI in assessing the need for corrective actions

6. Conversely, implementation of corrective actions may be warranted further to a series of IFSDs occurring in a larger fleet, typically in case of common cause events, even if these events have not led to an exceedance of the applicable IFSD alert level.

2. VERIFICATION PROGRAMME

1. General

1. The operator should have a verification programme that ensures positive corrective action on all-engine in-flight shut down occurrences and EDTO significant system failures, or that MEL relief is applied prior to an EDTO flight. The approved ground verification tasks should be defined in the EMPM and should promote positive ground verification prior to EDTO dispatch. These may include, but are not limited to, the aircraft maintenance manual, fault isolation manual, troubleshooting manual, scheduled maintenance task, MPD, operator approved procedures or any other approved instruction manual.

2. If an in-flight verification programme is approved, it should be defined in the EMPM. It is acceptable to use EDTO or non-EDTO flights for this verification process. The verification should be completed prior to reaching the EEP.

3. The operator should establish means to assure proper accomplishment of these verifications actions. 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 programme.

2. Purpose and content

1. The purpose of this verification programme is to ensure the effectiveness of maintenance actions taken on EDTO significant systems.

2. Troubleshooting procedures and maintenance tasks published by the aircraft or engine manufacturers are basically considered as adequate verification action. Nevertheless, the operator may be required to develop further verification action based on its own in-service experience.

3. The EMPM should include the list of EDTO significant systems or conditions (dual maintenance action, heavy maintenance, etc.), if any, requiring specific verification actions, considering the operator's own in-service experience and any applicable national regulations or guidance.

3. Typical verification actions

1. These specific verification actions may typically be required in case of:

1. simultaneous maintenance action/tasks on parallel EDTO significant systems. Typical additional verification action in this case would be an in-flight verification of relevant parameters prior to entry into the EDTO sector (e.g. during the first 60 minutes of the flight) or during a non-EDTO flight.

   Another acceptable verification action could be that the tasks are performed by different technicians on each EDTO significant system or performed by one technician directly supervised during the task application by another EDTO qualified technician. In both cases, the required ground verification test (and/or in-flight verification test, if needed) is performed by a qualified individual

2. maintenance action on items that cannot be fully verified on ground. An example of a condition that would require an in-flight verification is the replacement of an APU component that could affect the APU's ability to start at the EDTO cruise altitude after cold soak.

3. review of the relevant operator's EDTO maintenance experience indicating that the ground verification actions published in the aircraft maintenance manual or troubleshooting manual may not be fully effective for EDTO. Note that unless otherwise demonstrated by this review, it should be considered that the troubleshooting procedures and maintenance tasks published by the manufacturers are verification actions fully adequate and valid for EDTO.

1. Verification actions after complex maintenance check

1. Following multiple maintenance actions/tasks performed during a heavy check, it may be considered that the first flight after such a complex maintenance check cannot be an EDTO flight. In this case, this non-EDTO flight (which may be a commercial flight) may therefore be considered as the relevant verification action.

2. Nevertheless, it should be noted that the proper accomplishment of appropriate verification actions after the heavy check aims at ensuring that the aircraft is airworthy. Therefore, it is also acceptable to consider that an in-flight verification for EDTO may not be needed. The operator should make this decision on the need for a dedicated in-flight verification for EDTO and accordingly seek authorization from its Authority (UCAA).

3. Concerning the particular case of single-engine replacement, it is not required to perform a verification flight after such maintenance action. The instructions and verification actions provided in the aircraft or engine maintenance manuals should therefore apply. Nevertheless, as the engine replacement involves the deactivation/reactivation of several EDTO significant systems (electrical generators, hydraulic pumps, bleed air system, engine oil system, etc.), an operator may choose to call for an in-flight verification. The concerned parameters to be monitored should obviously include any relevant parameters indicating a proper engine functioning (fuel flow, EGT, etc.) but also be related to proper functioning of the other impacted EDTO significant systems. Depending on applicable policy, such verification may be performed before entering the EDTO sector of an EDTO flight.

4. The operator should include the applicable procedure for such a case in the EMPM, based on its own in-service experience and any applicable national regulations or guidance.

2. DUAL MAINTENANCE LIMITATIONS

1. Background

1. EDTO operators should have an approved programme to ensure maintenance performed on the same element of identical but separate EDTO significant systems during the same routine or non-routine maintenance visit prevents duplication of a human error. Dual maintenance is commonly

defined as any maintenance performed that could induce the same fault into redundant components of the same EDTO significant system or function.

2. The purpose is to minimize the risk of errors while performing the maintenance task on these parallel or identical EDTO significant systems. Indeed, such maintenance error(s) could lead to dual system failure which could potentially cause aircraft diversions in degraded configurations

2. Applicability and general recommendations

1. The "same" EDTO significant system is typically one that is in the same ATA reference and would reduce the redundancy level designed into the twin-engine aeroplane to support EDTO. An example would be maintenance on the left-engine-driven electrical generator and the right-engine-driven electrical generator.

2. Simultaneous maintenance on different engine driven components on both engines should also be considered as dual maintenance due to the possibility of affecting both propulsion system oil or fuel supplies. An example of this would be maintenance performed on the number one engine-driven electrical generator and the number two engine hydraulic pump. Each are in separate ATA references but a similar human error could cause a dual engine failure.

3. In this context, the list of EDTO significant systems may identify the systems that are identical (see 1.14.2.9) and those that are similar (see 1.14.2.10). The "similar" category may be further split in two sub-categories "substantially similar" and "redundant", as indicated in Section 1.14.2.10.

4. Any maintenance actions on EDTO significant systems which are not falling in these categories are therefore not subject to dual maintenance limitations.

5. Some (but not necessarily all) of the maintenance actions on EDTO significant systems which are in these categories may therefore be subject to dual maintenance limitations.

6. The determination can be made by evaluating common mechanical tasks that historically have created this situation of dual system fault or loss, or through an evaluation of the maintenance tasks and aeroplane level of consequences of improper maintenance. Consideration should be given to the difficulty of the task, accessibility to the component, and testing procedures.

7. The selected tasks are commonly those that are mechanical in nature and are managing fluid or pneumatics (fuel, oil, air, etc.) that may be used for control purposes. In case of improper maintenance, these components may develop some leakage after a period of time in the next flight. Some examples are engine-driven component installation, fuel couplings, pneumatic couplings and control pressure lines to actuators or valves.

8. Tasks that should not be selected are typically maintenance tasks on electronic systems or software which are using internal monitoring and fault detection. The risk of inducing twice the same non-detected human error is minimal due to the design of the system and software, especially those systems which include an operational and/or functional verification check following maintenance action.

9. Identical EDTO significant systems

   Two or more systems may be identified as "identical" EDTO significant systems when they are the same (fit, form and function). Examples of "identical" EDTO significant systems are the left engine-driven electrical generator and the right engine-driven electrical generator.

10. Similar EDTO significant systems

    Two or more systems may be identified as "similar" when they are either:

    1. "substantially similar" EDTO significant systems: These are engine-driven components mounted on both engines with similar attach procedures. Examples of "substantially

similar" EDTO significant systems are the electrical generator mounted on engine one and the engine-driven hydraulic pump mounted on engine two. Improper installation of these components could result in oil loss on both engines; and

2. "redundant" EDTO significant systems: These are systems providing the same redundant function. Examples of "redundant" EDTO significant systems are the engine-driven electrical generator and the APU-driven electrical generator. Improper maintenance could lead to multiple loss of EDTO significant systems and/or loss of redundancy in the related EDTO significant function (e.g. dual loss of electrical power sources). Even though the tasks may not be exactly the same, the potential impact of a maintenance error on the level of redundancy should be considered to retain (or not) the related tasks as dual maintenance action. This could typically be the case of tasks involving complex removal/installation procedures where possibilities exist to induce a fault that could lead to the same consequence (i.e. loss of concerned system or function) in both systems.

1. Compliance

1. An acceptable programme of dual maintenance limitations to prevent loss of EDTO significant system redundancy should be defined in the operator's EMPM. This programme should take into account the aircraft design architecture and systems reliability, the operator's experience and any applicable UCAA or guidance.

2. There are different ways to comply with this dual maintenance limitation requirement. It may include (but is not limited to) the following processes:

    1. the execution of tasks performed on identical or similar EDTO significant systems is staggered;

    - the task is performed by separate EDTO-qualified technicians;
    - the maintenance action on each of the elements in the EDTO significant system is performed by the same technician under the direct supervision of a second EDTO qualified individual; and
    - the operator verifies the corrective action to those EDTO significant systems as per applicable verification actions.

1. The servicing of fluids and gases is not considered maintenance; however, this should be conducted properly as defined in the manufacturer procedures manual. One technician serving two separate but similar systems is not considered dual maintenance, but the servicing instructions should be followed to ensure EDTO reliability standards are maintained. Operators should emphasize this in their EDTO training programme.

2. ENGINE CONDITION MONITORING PROGRAMME

1. The EDTO operator should implement an engine condition monitoring programme to detect deterioration at an early stage to allow for corrective action before safe operation is affected, and to ensure internal limit margins (e.g. rotor speeds, exhaust gas temperatures) are maintained to support single-engine diversion scenarios. Engine margins preserved through this programme should also account for the effects of additional engine loading demands (e.g. anti-icing, electrical) which may be required during the single-engine flight phase associated with the diversion.

2. This programme should describe the parameters to be monitored, the method of data collection, and the corrective action process. The programme should reflect the type certificate holder's instructions and the industry practice**.**

3. At a minimum, the programme should record these parameters consistently during a benign part of flight, typically at cruise, and record them electronically or manually. These parameters can be defined by the engine manufacturers but could typically include N1, N2, N3, FF, EGT, oil pressure and oil temperature.

4. Monitoring should be on a continual basis. The information should be collected and trended in a timeline to ensure these parameters are maintained in an acceptable interval. If an electronic reporting and transmitting system is being used, a back-up method should be created to take the place of any automated system that is failed for greater than this interval.

5. Operators may choose to use engine manufacturer support for this programme. These programmes offered by the manufacturer provide even further enhanced information and protection and are acceptable to meet this requirement. This information should be sent to the operator in a timely manner (interval to be agreed by the authority) and include procedures to ensure that the information is continuous regardless of day or time. Most engine manufacturer data exceed the minimum requirement for this programme and would enhance the operator internal procedures.

3. OIL CONSUMPTION MONITORING PROGRAMME

1. Purpose

The oil consumption monitoring programme is required to allow operators to detect unexpected oil consumption that could be the result of an oil leak or unforeseen engine wear which can impact the EDTO dispatch capability of the aircraft.

2. Content

1. Regulations do not specify what the maximum oil consumption rate should be for EDTO (i.e. it can be the same as for non-EDTO operations) and what procedure should be applied to compute the consumption rate and detect unusual oil uplift. The oil consumption programme should reflect the type certificate holder's recommendations and be sensitive to oil consumption trends as well as unusual oil uplifts.

2. 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 programme. If the APU is required for EDTO operation, it should be included in the oil consumption programme.

3. This oil consumption monitoring programme for EDTO should define a baseline consumption rate (normal usage) and detect oil consumption based on the previous flight results. This oil consumption or loss must not exceed the manufacturer's maximum allowable usage rate and is defined in the aircraft maintenance manual.

4. An evaluation must be made prior to the next EDTO flight to ensure the consumption supports the mission requirements. The programme should ensure there were no sudden increases in consumption/loss and, if there were, to initiate proper corrective action.

4. APU IN-FLIGHT START MONITORING PROGRAMME

1. Purpose

1. The purpose of the APU in-flight start monitoring programme is to demonstrate and/or confirm that the APU is able to start at altitude while in flight. This in-flight verification is necessary as the capability of the APU to start at altitude can usually not be demonstrated while the aircraft is on ground.

2. The requirement for APU in-flight start monitoring in the frame of EDTO is usually an operational requirement, i.e. it should be required by the applicable national EDTO operational requirements.

3. The EDTO CMP document contains the configuration and maintenance items necessary to meet the reliability objectives for the APU (run reliability and in-flight start reliability), as defined by the certification requirements. As the continued monitoring of the APU in-flight start capability is an operational requirement, it is usually not reflected in the EDTO CMP document or other aircraft/engine maintenance document (e.g. MRBR or MPD). It allows the operator to adapt, as necessary, its programme for APU in-flight start monitoring to reflect its own utilization of the APU.

4. Since the introduction of the initial ETOPS rules, it is usually a requirement for certification that the aircraft manufacturers demonstrate the in-flight start reliability of the APU when the following two conditions are met:

    1. the in-flight start of the APU and use of the APU electrical and/or bleed power source(s) is required in case of in-flight failure of another power source(s) within the EDTO sector; and

    - the continued operation of the APU is not required in the EDTO sector when the aircraft is dispatched in fully operational electrical or bleed configuration (no MEL/MMEL).

1. This in-flight start capability demonstrated by the manufacturers in the frame of the certification activities should be maintained and monitored by the EDTO operators. This is why the operator should develop a programme to monitor the APU cold soak in-flight start and run reliability. Furthermore, tracking and reporting of APU run reliability (including failed in-flight starts) should also be implemented when the APU is classified as an EDTO significant system.

2. Content

1. The interval between the APU in-flight start tests is usually not prescribed by the regulations. It may be expected to perform these initial in-flight starts on a routine basis typically for the first 6 to 12 months of EDTO operations. The Authority may still ask the operator to perform high-altitude/cold soak start of the APU on a regular basis even after the first months of operations. The applicable national regulations or guidance should mention that the operator may adjust the sampling intervals according to system performance and fleet maturity. In particular, experience has shown that oversampling has the potential to actually degrade the APU in-flight start capability, therefore care should be taken in establishing appropriate sampling intervals.

2. In other words, it is expected that the initial programme may be alleviated and the interval increased, further to a review of relevant maintenance records performed by the Authority when satisfactory in-service experience has been accumulated. Note that the interval should also take into account the normal utilization of the APU (e.g. on ground). An operator having a low utilization of the APU may have to check it more frequently.

3. The typical interval to initially check the APU is once per month per aircraft. As noted above, this interval may be increased, typically to once every three months per aircraft. Some highly experienced EDTO operators have increased this interval up to once or twice per year per aircraft.

4. Therefore, the operator should propose an APU in-flight start/run programme that is acceptable to its CAA, considering its own experience and any applicable national regulations or guidance. The proposed programme should include periodic sampling of each aeroplane's APU in-flight start capabilities, i.e. the operator should ensure that each aeroplane's APU of the operator's EDTO fleet is periodically checked rather than repeatedly sampling the same APUs.

5. The APU in-flight start tests do not need to be performed systematically during EDTO flights. The start attempts should also not be performed systematically at the top of the aeroplanes and APU operating envelope. However, the duration of the cold soak as well as the altitude of the test should be representative of typical EDTO operations. In other words, the objective of the programme should be to collect data points spread between a range of typical cruise duration and altitudes.

6. In addition to the in-flight starts performed on a routine basis, as described in the Section 4.12, it may be recommended to perform a high-altitude cold soak start test after maintenance action(s) that may impact the start capability of the APU (APU change, replacement of electronic control box, fuel control unit, igniters, etc.).

3. APU in-flight start reliability objective

1. The reliability objective for APU high-altitude relight should be defined in the applicable national regulation. Usually a 95 per cent success rate is expected to be demonstrated.

2. An APU in-flight start attempt should be classified as "successful" when the APU is started within three start attempts.

3. This 95 per cent criterion serves to monitor the APU in-flight start capability once the EDTO operation has begun. In other words, it is not required to demonstrate the 95 per cent success rate prior to starting EDTO. Accordingly, this analysis/evaluation of in-flight start capability should be done only once a significant set of data has been collected for comparison versus the 95 per cent figure. Typically, the number of high-altitude starts required to demonstrate a 95 per cent success rate should include a minimum of 20 attempts.

4. It is the concerned EDTO fleet of the operator that must be monitored. The non-EDTO fleet, if any, may also be included in the programme but only if these APUs are also configured and maintained in accordance with the EDTO CMP requirements.

4. Procedure

1. The APU in-flight start test is not a maintenance task. The primary role of the maintenance and engineering organization is to actually:

    1. launch the request of an APU in-flight start check which will be executed by the flight operations organization; and

    - record the success or failure for appropriate further maintenance action(s).

1. Specific procedures to address the maintenance and engineering roles should include:

    1. notification of the APU in-flight start requirement to flight crews through the maintenance release process; and

    - documentation procedures for recording and tracking of success or failure of start attempts as well as reporting to Authority.

1. CONTROL OF THE AEROPLANE'S EDTO STATUS: EDTO RELEASE STATEMENT

1. Purpose

1. The EDTO certification of the aeroplane entails the issuance of an EDTO CMP document which gathers the required configuration, maintenance, procedures and dispatch standards. For EDTO

operations, the aircraft should therefore be configured, maintained and operated according to the EDTO CMP document requirements. This means that the operator should implement tools and/or procedures to control any aeroplane discrepancies that may impact the EDTO serviceability of the aeroplane. This may require the implementation of a system to continuously track and manage the EDTO status of the aeroplane.

2. It is the responsibility of the operator to ensure that the relevant time limitations of the aeroplane engaged in EDTO operations are not exceeded, and that the aeroplane is certified for EDTO and configured for the planned EDTO mission.

3. As the time limitations of a given aeroplane may be impacted by the configuration and/or the maintenance programme of the aeroplane, the operator should implement tools and/or procedures to ensure that the relevant EDTO capability and time limitation(s) of the aeroplane dispatched are compatible with the contemplated EDTO flight.

4. An EDTO maintenance release statement should therefore be provided to the flight crew to confirm that:

    1. the aircraft condition has been checked and confirmed to comply with the applicable EDTO dispatch requirements set forth in the company policies and applicable MEL;

    - the EDTO items of the applicable maintenance line check have been accomplished;

    - the aircraft configuration has been checked and confirmed to comply with the applicable configuration standards set forth in the EDTO CMP document (as applicable); and

    - the capability of relevant TLS(s) has been assessed.

1. The EDTO maintenance procedures manual (or equivalent) should define the content of the EDTO service check and the procedures associated with the EDTO maintenance release

2. EDTO status: Downgrading and restoration

1. If the MEL cannot be complied with for EDTO, or if the aircraft configuration and/or maintenance do not comply with the applicable EDTO CMP Standards, the “non-EDTO” status of the aircraft should be indicated in the aeroplane maintenance logbook.

2. The discrepancy should be recorded and reported to the personnel within flight operations in charge of preparation of the EDTO flights. For example, the deferred discrepancy could be entered in the deferred defects list, and the “non-EDTO” status recorded on the aeroplane technical log or maintenance logbook.

3. To restore the aircraft back to “EDTO” status, all the EDTO discrepancies should be assessed and/or rectified in line with the applicable EDTO CMP configuration and maintenance standards and/or the MEL EDTO requirements. For example, the corresponding deferred defect item should be cleared and the restored “EDTO” status recorded in the aeroplane technical log or maintenance logbook. The up-to-date EDTO status should be recorded and reported to the personnel within flight operations in charge of preparation of the EDTO flights

4. The changing of the aircraft EDTO status to “EDTO/non-EDTO" should be carried out by the EDTO authorized person responsible for the aircraft and advised to the maintenance control centre (or other control system) prior to aeroplane release for service.

5. The changing of the aircraft EDTO status to “EDTO/non-EDTO” away from main base by the flight crew when an EDTO authorized person is not available should only be permitted on receipt of authorization from the maintenance control centre (or other control system). The EDTO status change should be recorded in the aeroplane technical log or maintenance logbook by the flight crew prior to the aeroplane release for service.

3. EDTO release statement — twin-engine aeroplanes

1. The EDTO status of the aircraft should be indicated to the flight crew prior to each EDTO flight. For that purpose, an EDTO release statement should be issued and it may be included in the aircraft maintenance logbook.

2. This EDTO status of the aeroplane depends on:

    1. the certified EDTO capability of the aeroplane;

    - the configuration of the aeroplane versus the applicable configuration requirements of the EDTO CMP document;
    - the compliance of the aeroplane versus the applicable maintenance requirements of the EDTO CMP document;
    - the capability of relevant TLS(s); and
    - any inoperative system (MEL).

1. An EDTO maintenance release statement should therefore be issued as part of the maintenance release (e.g. certificate of release to service) of the aeroplane. This EDTO maintenance release statement, which is typically included in the aircraft maintenance logbook, should be provided to the operator's flight operations organization for operations control and flight preparation purposes. It should clearly indicate:

    1. whether the concerned aeroplane is EDTO capable (yes or no); and

    - the related maximum diversion time capability.

1. Figures below are typical examples of EDTO release statements for two-engine aeroplane EDTO operations.

2. As shown in Figure below, the EDTO status of the concerned aeroplane is as follows:

    1. the aeroplane is capable of EDTO; and
    2. its maximum diversion time capability is 120 minutes.

EDTO Status		Diversion Time (min)		
YES	NO	60	120	180
☑	☐	☐	☑	☐

Example of EDTO release statement (120 minutes)

As shown in Figure below, the EDTO status of the concerned aeroplane is as follows:

1. the aeroplane is restricted to non-EDTO operations; and
2. accordingly, its maximum diversion time capability is 60 minutes.

EDTO Status		Diversion Time (min)		
YES	NO	60	120	180
☐	☑	☑	☐	☐

Example of EDTO release statement (60 minutes)

APPENDIX C

1. SAMPLE EDTO FLIGHT OPERATIONS MANUAL (EFOM) CONTENT

1. General

1. The operator should include EDTO information in the relevant part(s) of the Operations Manual (OM) or publish this information as a "stand alone" EDTO flight operations manual (EFOM). See all the Operations Manual Checklist in the EDTO Application Form.

2. This EFOM or the EDTO content of the Operations Manual define EDTO flight operations practices supporting these operations as well as responsible persons and/or organizations. The manual should include, either directly or by reference to incorporated documents, the requirements described in Appendix A of this Advisory Circular.

2. Purpose

1. The purpose of the EFOM (or EDTO content of the basic OM) is to provide involved personnel and EDTO authorized persons with a descriptive means aimed at ensuring safe and efficient EDTO operations.

2. Accordingly, all EDTO requirements, including supportive programme procedures, duties and responsibilities, should be identified as being related to EDTO. The EFOM should be submitted to the FOI for review and authorization by specific approval with sufficient lead-time prior to the scheduled commencement of EDTO operations of the particular aeroplane type, model or variant (AEC).

3. The EFOM (or EDTO content of the Operations Manual) should be divided under these headings as follows: note there will normally be an extensive EDTO/Navigation Manual dealing with all Long Range Airspace, Communication, Navigation and Surveillance aspects (not just EDTO)

4. Part A. General/Basic:

    1. Introduction
        1. Brief description of EDTO
        2. Definitions

    - Operations approval
        1. Criteria
        2. Assessment
        3. Approved diversion time
    - Training and checking
    - Operating procedures
    - EDTO operational procedures
    - EDTO flight preparation and planning
        1. Aeroplane serviceability
        2. EDTO orientation charts
        3. EDTO alternate aerodrome selection
        4. En-route alternate weather requirements for planning
        5. EDTO computerised Flight Plans
    - Flight crew procedures
        1. Dispatch

2. Re-routing or diversion decision-making
3. EDTO verification (following maintenance) flight requirements
4. En-route monitoring

1. Part B. Aeroplane Operatting Matters
    1. Specific type-related EDTO operations
        1. EDTO specific limitations
        2. Types of EDTO operations that are approved
        3. Placards and limitations
        4. OEI speed(s)
        5. Identification of EDTO aeroplanes
    - Dispatch and flight planning, plus in-flight planning
        1. Type-specific flight planning instructions for use during dispatch and post dispatch
        2. Procedures for engine(s)-out operations, EDTO (particularly the one-engine-inoperative cruise speed and maximum distance to an adequate aerodrome should be included)
    - EDTO fuel planning
    - Critical fuel scenario
    - MEL/CDL considerations
    - EDTO specific minimum equipment list items
    - Aeroplane systems
        1. Aeroplane performance data including speed schedules and power settings
        2. Aeroplane technical differences, special equipment (e.g. satellite communications) and modifications required for EDTO.

1. Part C. Route and aerodrome instructions (normally supplemented with Navigation Manual)
    1. EDTO area and routes, approved area(s) of operations and associated limiting distances
    - EDTO an-route alternates
    - Meteorological facilities and availability of information for in-flight monitoring
    - Specific EDTO computerised flight plan information
    - Low altitude cruise information, minimum diversion altitude, minimum oxygen requirements and any additional oxygen required on specified routes if MSA restrictions apply
    - Aerodrome characteristics (landing distance available, take off distance available) and weather minima for aerodromes that are designated as possible alternates.

1. Part D. Training

    This part should contain the route and aerodrome training for EDTO operations. This training should have 12 months of validity or as required by the applicable operational requirements. Flight crew training records for EDTO.

    The operator's training programme in respect to EDTO should include initial and recurrent training/checking as specified in this Advisory Circular.

2. Revision control

Revisions to this EFOM (or EDTO content of the Operations Manual) should be reviewed and approved as applicable by the FOI for major changes to the programme. However, minor administrative revisions may not require formal review, acceptance or approval by the FOI, just acknowledge.

APPENDIX D - EDTO OPERATIONS TRAINING REQUIREMENTS

1. EDTO TRAINING PROGRAMME

1. General Only (application process deals with specifics)

1. An operator's flight operations personnel should complete approved training on EDTO prior to the operator receiving an EDTO authorization. Flight crews, dispatchers and other relevant flight operations personnel should be trained and posess the appropriate background in EDTO operations requirements,processes and the operator's specific EDTO procedures in order to properly support the operation. An operator's training programme should take into consideration the background and experience of the personnel being trained. Changes in EDTO regulations and operator policy related to the EDTO operation should be emphasized on a regular basis. This may be included in regular recurrent training or through circulation of printed training material, as applicable.

2. EDTO training programmes should include the specific regulations, authorizations (fleets, operational areas), policies, procedures and documentation related to the particular EDTO operation and therefore they can vary in both content and delivery.

3. What is important from the standpoint of EDTO flight operations training programme approval is that the programme be well defined and well suited to support the nature and specificity of the particular EDTO operation(s). Flight crew training programmes should include the content and duration of academic training, simulated flight demonstrations, line checks and currency requirements. Dispatcher training programmes should also address theory training considerations as well as the specific tools and methods used for EDTO flight preparation. Some operators may choose to combine the theory training sections for flight crews and dispatchers to promote a better understanding of how the respective functions support the EDTO programme.

Note. — EDTO operators should establish a system to track and identify the EDTO training status of their flight operations personnel to ensure that all personnel supporting the EDTO operations have completed the approved training programme and have satisfied any currency requirements.

2. EDTO flight operations academic training

1. The following academic curriculum elements should be addressed in an operator's EDTO training programme for flight operations personnel as applicable to the particular operation. Typically, an instructor-led CBT or combined course of up to half a day is sufficient to address the basic training requirements but this may be extended if warranted for the particular circumstances. The curriculum elements are considered relevant and applicable for both flight crews and flight dispatch personnel in a combined training programme, but may have different degrees of emphasis in the flight preparation and en-route areas if separate programmes are tailored for each audience.

    1. Familiarity with EDTO Standards and relevant CAA applicable regulations

    2. EDTO operational programme approval(s)
        1. EDTO fleet(s)

        2. EDTO area(s) of operations

3. EDTO type design approval – a brief synopsis
4. EDTO threshold(s), maximum diversion time(s) and speed(s)

- EDTO flight planning considerations
  1. EDTO area(s) of operations
  2. Alternate aerodromes for EDTO
  3. EDTO fuel reserves
  4. TLS considerations
  5. EDTO technical status and MEL considerations
  6. EDTO flight release and computer flight plan
- EDTO en-route considerations
  1. Standard operating procedures
  2. In-flight monitoring
  3. Diversion considerations
  4. Non-normal and contingency procedures
- Aeroplane performance data
- EDTO operations manual.

1. EDTO flight operations practical training

1. The EDTO theory training considerations provide a basic EDTO training foundation which should be supplemented by practical training as appropriate to the particular roles and responsibilities of flight operations personnel involved in the EDTO operation. For flight dispatch and operations control personnel, this should include training and practical exercises in the specific tools and methods used to support the operation (e.g. EDTO flight planning system). The demonstration of operational procedures related to flight preparation and adherence to any task-related checklists should also be included in the practical training.

2. For flight crews, practical EDTO training typically consists of a line-oriented flight training (LOFT) exercise conducted in a flight simulator device to demonstrate both normal and non-normal EDTO procedures. A typical EDTO LOFT scenario may include the elements listed below and is normally two to four hours in duration. Other en-route considerations specific to the particular operational area such as long-range navigation and communication procedures should be addressed in addition to the EDTO specific training elements:

   1. Preflight briefing

- EDTO flight release
- Cockpit preparation
- En-route (normal)
  1. Entering EDTO sector
  2. En-route monitoring procedures
  3. FMS procedures (as applicable)
  4. Navigation and communication
- En-route (non-normal)
  5. Contingency procedures

6. Selected non-normal conditions and checklists
7. Diversion decision-making
8. FMS procedures (as applicable)
9. En-route diversion

- Post-flight procedures.

1. During the introduction into service of a new EDTO type, or conversion of pilots not previously EDTO qualified where EDTO approval is sought, a minimum of two (guide only) EDTO sectors should be completed including an EDTO line check.

2. EDTO recurrent training & Checking

1. Recurrent training for EDTO flight operations personnel should be conducted annually; and specific currency requirements should be defined in each EDTO operator's approved training programme. A condensed or shortened refresher academics course is typically suitable for recurrent training purposes for personnel who have maintained an active role in supporting the EDTO operation, while the initial training course may be more appropriate for personnel who are no longer current as defined by the approved programme.

2. Practical recurrent training should consider student exposure to different potential operational situations as opposed to repeating the same scenarios in each training cycle. A recurrent EDTO LOFT may, for example, introduce different non-normal diversion conditions (engine failure, decompression, cargo fire, etc.) over time to provide a more meaningful training experience. Selection of the demonstrated contingencies may be recorded in each student's training records to ensure that different scenarios are introduced in each recurrent training session.

3. Checking programmes should incorporate in accordance with a suitable cycle incorporate EDTO elements.

APPENDIX E

1. EDTO AIRWORTHINESS TRAINING

1. EDTO operators should create an EDTO training programme to support EDTO qualifications but also to educate personnel on the special nature of EDTO and to assure that EDTO programme tasks are properly accomplished. This training course is an integral part of the operator's EDTO maintenance programme as defined in Appendix B and may be in addition to any specific aeroplane technical training required for the position. The course is to ensure that all personnel who have assigned EDTO responsibilities are provided with the necessary training so that EDTO tasks are properly planned and accomplished. The course should be approved by the national authority and written into the EMPM.

2. The training programme should include consideration of any contracted maintenance provider and contain the process of qualification of individuals. The EMPM should define how the training records are tracked and stored, and a notification process should be implemented to notify qualified personnel when training is required. The process of delegating any training should be defined in the EMPM. Any recurrent training requirements should be included in the description.

2. EDTO TRAINING

1. EDTO operators should create an EDTO training programme to support EDTO qualifications but also to educate personnel on the special nature of EDTO and to assure that EDTO programme tasks are properly accomplished. This training course is an integral part of the operator's EDTO maintenance programme and may be in addition to any specific aeroplane technical training required for the position. The course is to ensure that all personnel who have assigned EDTO

responsibilities are provided with the necessary training so that EDTO tasks are properly planned and accomplished. The course should be approved by the national authority and written into the EMPM.

2. The training programme should include consideration of any contracted maintenance provider and contain the process of qualification of individuals. The EMPM should define how the training records are tracked and stored, and a notification process should be implemented to notify qualified personnel when training is required. The process of delegating any training should be defined in the EMPM. Any recurrent training requirements should be included in the description.

3. The EDTO maintenance training should cover:

1. initial training to ensure that all maintenance personnel have the knowledge, skills and ability to perform an adequate EDTO technical procedure for the specific AEC; and

- recurrent training to ensure that all maintenance personnel maintain and update, if necessary, their awareness of EDTO maintenance specificities.

1. If recurrent training is part of the operator-approved programme, the recurrent time line should be defined in the programme, and a notification system should be in place to notify personnel and management of any required training. A process should be in place to manage contract maintenance personnel as personnel change due to attrition. Recurrent training can be accomplished through a test process and controlled through management personnel at the individual stations. Failure of this test requires the staff to retake the training programme

2. This EDTO training programme should typically include:

1. introduction to EDTO regulations;

- focus on applicable elements of national EDTO regulation;
- overview of EDTO certification of twin-engine aircraft;
- EDTO significant systems;
- EDTO authorization (maximum diversion times, TLSs, operator's approved diversion time, EDTO routes, EDTO MEL);
- CMP and EDTO maintenance programme;
- EDTO pre-departure service check (including the EDTO maintenance release)
- EDTO reliability programme procedures, for example, (as applicable):
    1. Parts control programme ;
    2. EDTO service check;
    3. Reliability programme ;
    4. Propulsion system monitoring;
    5. Verification programme ;
    6. Dual maintenance limitations ;
    7. Engine condition monitoring;
    8. Oil consumption monitoring; and
    9. APU in-flight start monitoring programme ;
- additional procedures for EDTO (as applicable).

1. The training format can be created as an instructor-led course or as a computer-based training course and should include the general nature of EDTO. The programme should also reflect the specific operator EDTO maintenance programme requirements. As revisions to the EMPM are developed, the training programme should be revised to include any major changes to the EDTO maintenance programme.

2. The training course can be created by the operator or it can be contracted for development from an outside source. In either case, the programme is the responsibility of the operator and should have the authorization of the CAA.

3. The operator determines the level of qualification required for EDTO signature authority which should be defined in the EMPM and approved by the CAA. The specific theoretical, practical, and/or process training should be defined in the associated syllabus. EDTO training may not differ greatly between aeroplane models but those differences should be defined in the programme. The intent is not to revise the training programme for small administrative changes to the EMPM but to focus on major changes to the programme driven by a new procedure or process.

End of Advisory Circular.