EDTO Workshop

Module N° 6 – Flight Operations considerations
Course Structure

Module 1
Course introduction

Module 2
Basic concepts

Module 3
Approval

Module 4
Aircraft Certification Considerations

Module 5
Maintenance Considerations

Module 6
Flight Operations Considerations

Module 7
Implementing EDTO Regulations

Module 8
Continued Surveillance

Module 9
Summary

Module 10
Assessment
At the end of this module, participants will understand the flight operations requirements supporting EDTO operations.
• EDTO Flight Operations Program Overview
• Airplane performance considerations
• Approval route planning / EDTO area of operations
• Dispatch planning
• Enroute considerations
• Procedures documentation and training
EDTO Flight Operations Program Overview
EDTO Flight Operations Program

Overview

1) Define EDTO routes that will be covered by application.

2) For each route, establish a list of Adequate En-route Alternate Airports.

3) Determine EDTO diversion time required and EDTO engine inoperative planning speed.

4) Establish EDTO Area of Operations.

5) Establish a system for obtaining EDTO flight plan data.
   - EDTO en-route alternates, Equal Time Points,
     Critical Fuel Scenario, Time Limited Systems.

6) Arrange to obtain weather data for EDTO en-route alternates.

7) Ensure there is a method of communication between the airplane and the airline during the flight (flight following).
Overview (cont’d)

8) Review EDTO provisions in the FAA approved MMEL to establish the airline’s MEL.

9) Establish a method to check APU in-flight start reliability.

10) Designate an EDTO Check Airman.

11) Establish and document airline operating procedures for EDTO.
    Note: If the airline plans to change Boeing FCOM procedures, determine if changes need to be re-validated

12) Revise the airlines flight crew guidance material to include EDTO practices and procedures.

13) Train flight dispatchers and flight crew on EDTO requirements, performance data, MEL and airline unique EDTO processes.
Section 303, EDTO Flight Operations Guidelines

- Airplane Performance Data
- Airport Information
- Dispatch
- En-route
- EDTO Procedures Documentation

Section 304, Flight Operations Training Guidelines

- EDTO Unique Requirements
- Check Airmen used in EDTO
- Review of Training Program and Operating Manuals

* New advisory materials are consistent with current EDTO practices
Chapter III - Operational Approval Considerations

Section 8: EDTO Operations Manual Supplement
Section 9: Flight Preparation and In-Flight Procedures
Section 10: Operational Limitations
Section 11: EDTO Enroute Alternate Aerodromes
Section 12: Initial/Recurrent Training

Appendix 3 - Operational Limitations
Appendix 4 - Flight Preparation and Inflight Procedures
Appendix 5 - EDTO Enroute Alternate Aerodromes
Appendix 6 - EDTO Training Programme
Appendix 7 - Typical EDTO Operations Manual Supplement

* New EASA guidance is largely harmonized with FAA rules
Defining the EDTO area of operations

Performing EDTO Flight Planning

Conducting EDTO Flights

Conclusions
EDTO
Extended Diversion Time Operations

Applies to operations conducted over a route that:

– In Still air and ISA conditions –

- contains a point further than applicable threshold (e.g. 60 min flying time for twins)

- at the approved:
  - One Engine Inoperative (OEI) speed for twins
  - All Engine Operative (AEO) speed for airplanes with more than 2 engines

- from an adequate airport.
Adequate Airport

To be qualified as adequate an airport must be:

- available,
- compatible with the performance requirements for the expected landing weight,
- have ground operational services such as ATS, lighting, communications, weather reporting,
- have at least one let-down navigation aid (ILS, VOR, NDB, Radar),
- have emergency services: Minimum Rescue and Fire Fighting Category: 4

*Note: Other criteria should be taken into account (e.g. Hotel Capacity, Maintenance facilities,...)*
**EDTO**

**Extended Diversion Time Operations**

Applies to operations conducted over a route that:

- **In Still air and ISA conditions** –
  - contains a point *further than applicable threshold* (e.g. 60 min flying time for twins)
  - at the *approved speed*:
    - One Engine Inoperative (OEI) speed *for twins*
    - All Engine Operative (AEO) speed *for airplanes with more than 2 engines*
  - from an *adequate airport*. 

Area of operations is EDTO required? Continued
**Diversion Speed**

The approved one engine inoperative speed

- A diversion speed could be an IAS, TAS or even a MACH number.

- As TAS is not constant, the diversion speed is established at a given MACH/IAS combination, according to the aircraft capability:

```
1. A/THR : OFF
2. SPD ON FCU : M.82/300 kt - PULL.
3. ALT ON FCU : SET CRUISE FL AND PULL
   NOTE : THE THRUST IS FIXED AT MCT, THE SPEED IS CONTROLLED BY THE ELEVATOR
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**A330 SINGLE ENGINE OPERATION 3.06.30 P 1**

**STANDARD STRATEGY**

**SEQ. 001 REV. 05**

**PROCEDURE**

- Before Descent (deceleration not below green dot)
  1. Start ECM actions and simultaneously set MCT.
  2. Determine cruise FL (ALT ceiling from 3.06.30).
  3. Notify ATC.

- Descent M.82/300 kt
  1. A/THR : OFF
  2. SPD ON FCU : M.82/300 kt - PULL.
  3. ALT ON FCU : SET CRUISE FL AND PULL.
  NOTE : THE THRUST IS FIXED AT MCT, THE SPEED IS CONTROLLED BY THE ELEVATOR.

**Descent to Landing**

- Fuel and time: CHECK 3.06.30 Page 3
- Fuel and time: CHECK 3.06.30 Page 8

* * IF VS BECOMES < 500 ft/Min. SELECT VS 400.

---

**Area of operations is EDT0 required?**

**Diversion speed**
Area of operations is EDTO required?

Diversion speed (Cont)

Which speed to follow?

Point of Engine Failure

Descent + Cruise at the selected speed schedule

60 min
Descent profile example:
Speed schedule
Max speed/MCT

Area of operations is EDTO required?

Diversion speed (Cont)

Point of Engine Failure

Increasing Speed with decreasing weight

Which speed to follow?

ICAO EDTO Course - Flight Operations
The “Strategy” is defined in terms of a diversion speed

The chosen speed (which will be approved) will have an impact on:

- The diversion distance
- The fuel consumption
- The obstacle clearance
The “Strategy” is defined in terms of a diversion speed.

- The chosen speed (which will be approved) will have an impact on the diversion distance and the fuel consumption.

- Use Speed Schedule Max Speed / MCT
- Reduce if dictated by fuel considerations
EDTO
Extended Diversion Time Operations

Applies to operations conducted over a route that:

- In Still air and ISA conditions –

- contains a point **further than applicable threshold** (e.g. 60 min flying time for twins)

- at the **approved speed:**
  - One Engine Inoperative (OEI) speed *for twins*
  - All Engine Operative (AEO) speed *for airplanes with more than 2 engines*

- from an **adequate airport.**
How do we account for aircraft weight and the diversion FL?
Reference Gross Weight and Diversion FL
Choice of the parameters

- The heaviest of the estimated gross-weights at the critical points of the route or set of routes included in the area of operation.

- Optimum diversion FL with regards to the reference gross weight

Calculation requires some loops. A conservative way is to initialize with:
- the TOW –1FH for 1 hour diversion distance, or
- The TOW –2FH for 2 hour diversion distance, or
- The TOW –3FH for 3 hour diversion distance, etc...
### Initialize with a high weight to be conservative. Consider a reduction if necessary.

**ICAO EDTO Course - Flight Operations**

**Area of operations is EDTO required?**

**Reference gross weight (Cont)**

<table>
<thead>
<tr>
<th>SPEED SCHEDULE</th>
<th>A/C WEIGHT AT CRITICAL POINT (KG)</th>
<th>FL FOR DIVERSION</th>
<th>ISA 60</th>
<th>ISA 90</th>
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Drawing the threshold circles:

1. Determine the “Adequate airports” over the intended route

2. Get the threshold distance (e.g. for 60 min) from relevant aircraft performance manual or tool.

3. Draw the circles centered on each “Adequate Airport”

4. If the route goes outside these circles, EDTO is required.
Area of operations – EDTO
Threshold and diversion time?

» Is EDTO required?
» What is the needed diversion time?

» Example: EDTO operations with a twin engine aircraft
1. Determine the “Adequate airports” over the intended route
2. Get the 60 minute distance from relevant manual/tool
3. Draw the circles centered on each “Adequate Airport”
4. If the route goes outside these circles, EDTO is required
Choose a **diversion time** so that the desired route is covered.

Go for **maximum achievable speed** and check obstacle clearance and fuel consumption.
## Area of operations – EDTO

### Required EDTO diversion time

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<th>SPEED SCHEDULE</th>
<th>A/C WEIGHT AT CRITICAL POINT (KG)</th>
<th>FL FOR DIVERGON (ISA)</th>
<th>DIVERSION TIME (MIN)</th>
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<td>200000</td>
<td>190</td>
<td>421</td>
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</table>
The approved area of operations depends on the:
- Speed Schedule
- Reference Weight

The area of operations is calculated for:
- ISA conditions ($\Delta$ISA)
- No wind

120 min diversion time covers the route.
Airplane Performance Considerations
Section 2.4 provides EDTO Planning Information *

- EDTO Area of Operation (Diversion Distance)
- Net level off weight
- EDTO Critical Fuel Reserves
- Drift-down Cruise Range Capability

* Performance data for a range of engine inoperative speeds is included
One-Engine Inoperative Cruise Speed

- A speed within the certified operating limits of the airplane that is specified by the certificate holder and approved by the FAA for

1) Calculating required fuel reserves needed to account for an inoperative engine;

or

2) Determining whether an EDTO alternate is within the maximum diversion time authorized for an EDTO flight
• Engine fails at normal cruise altitude
• MCT on operating engine(s)
• Driftdown at engine-out planning speed *
• Level off/cruise at thrust limited altitude

**Zero Wind**

Diversion Distance is a function of:
- Diversion Time
- Engine Inoperative Speed
- Reference Weight
787-8 Operational Flight Envelope

- $V_{LO}/M_{LO}$: Max Speed for Landing Gear Operation
- $V_{LE}/M_{LE}$: Max Speed with Landing Gear Extended
- $V_{MO}/M_{MO}$: Max Operating Limit Speed
## EDTO Diversion Distance

### 777-300ER / GE90-115BL

<table>
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<tr>
<th>SPEED (M/KIAS)</th>
<th>WEIGHT AT DIVERSION (1000 KG)</th>
<th>DIVERSION DISTANCE (NM)</th>
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Example Inputs & Outputs - EDTO Diversion Distance

**New Method**

<table>
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<th>No</th>
<th>ETOPS Approval Time (min)</th>
<th>Airspeed (kts)</th>
<th>Range (nm)</th>
<th>Total Fuel (kg)</th>
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• Higher speeds (above Max L/D) reduce altitude capability
  – Terrain clearance, MORA considerations
  – True airspeed benefit versus altitude loss
• Higher speeds (above LRC) increase diversion fuel required
## Effect of Engine Out Cruise Speed (Cont)

### 787-8 / TR-1000C

Reference Weight = 218,500 kg  
Initial Altitude = 35,000 ft  
PET Database: 878RCF.dat v1.2 dtd Oct 25, 2011

### Diversion Distance (NM)

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Defining the EDTO area of operations

Performing EDTO Flight Planning

Conducting EDTO Flights

Conclusions
EQUAL TIME POINT (EQUITIME POINT): ETP
The ETP is the point of equal flight time between two diversion airports. The ETP is at the furthest 'air mile' distance from a pair of suitable airfields.

The “EDTO” ETP is determined for the engine-failure case only. Effect of wind and temperature are therefore considered at the one-engine-inoperative cruise altitude.
CRUISE FL

Engine-out diversion flight level

To SLL

To BOM

EDTO alternate aerodrome
Time window ETP

ICAO EDTO Course - Flight Operations
Let’s assume the same conditions in both directions.
Now, let’s assume different conditions in both directions.

In which direction does the ETP move?

- **To SLL?**
  - Adverse Wind (Head), lower diversion FL and colder conditions (Reduced TAS)

- **To BOM?**
  - Favorable Wind (Tail), higher diversion FL and hot conditions (Increased TAS)
ETP takes into consideration Wind and Temperature effect at the engine-out diversion flight level.

-60 kt/ISA - 5

+60 kt/ISA + 5
Earliest Estimated Time of Arrival (ETA) at SLL

Normal cruise speed/FL

Normal Cruise

Time window for SLL must consider:
ETA (EU-OPS1.297 / FAR 121.624b)
Latest Estimated Time of Arrival (ETA) at SLL

Time window for SLL must consider:
- ETA +1 h (current AMC 20-6 and EU-OPS1.297)

Or
- ETA (FAR 121.624b)

Remark
The Time Window (period of suitability) is provided for the Estimated Time of Departure and must be adjusted to the Actual Time of Departure should a delay occur.
<table>
<thead>
<tr>
<th>EASA AMC 20-6</th>
<th>EU-OPS 1.297 / AMC 20-6 Rev 2</th>
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<tr>
<td>FAA AC 120-42a</td>
<td>FAR 121.646(b)</td>
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<td>- Fuel from DEP to ETP (furthest point from the diversion Airport)</td>
<td>- Fuel from DEP to ETP (furthest point from the diversion Airport)</td>
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<td>- Fuel to diversion Airport (from ETP )</td>
<td>- Fuel to diversion Airport (from ETP )</td>
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<td>+ Approach and Go-around</td>
<td>+ Instrument Approach and landing</td>
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<td>+ Circuit to land</td>
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<tr>
<td>+ Final reserve (15 minutes holding at 1500ft)</td>
<td>+ Final reserve (15 minutes holding at 1500ft)</td>
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<tr>
<td>+ Specific reserves (contingency fuel, ice accretion, APU...)</td>
<td>+ Specific reserves (contingency fuel, ice accretion, APU...)</td>
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</table>

Three scenarios are taken into account for the diversion:
**Scenario 1**
Depressurization
*FL 100 (or MSA) at LRC cruise*

**Scenario 2**
Depressurization + Engine failure
*FL 100 (or MSA) at the approved speed strategy*

**Scenario 3**
Only Engine Failure
Optimum diversion FL (or MSA) at the approved speed strategy
EDTO Fuel Requirements
- Fuel from DEP to ETP
- Fuel from ETP to diversion A/P

Scenario 1
Depressurization
*FL 100 (or MSA) at LRC cruise*

Scenario 2
Depressurization + Engine failure
*FL 100 (or MSA) at the Approved Speed Strategy*
ETOPS Fuel Requirements
- Fuel from DEP to ETP
- Fuel from ETP to diversion A/P

Fuel considerations
Fuel requirements (Cont)

This point is critical with regard to the EDTO fuel scenario.
1. Fly to the alternate airport
2. 15-minute holding at 1500 ft
3. Instrument approach and landing
4. Go-around
5. Visual approach and landing
6. Reduced “Additional fuel” for:
   - error in wind forecasting (5% wind factor instead of 5% diversion fuel)
   - Icing (effect of [Anti Icing] for 100% exposure time or [AI+icing drag] for 10% of exposure time only)

**It may lead to up to 15% reduction in the EDTO Fuel**
Critical Point

The point – among the equal time points (ETP) – on the route which is critical regards to the ETOPS fuel requirements if a diversion has to be initiated from that point.

Usually the last ETP within the EDTO segment.
The standard fuel is still applicable, indeed, both standard and EDTO fuel requirements should be compared.

Only, the most penalising one must be retained for dispatch.

As a matter of fact, EDTO fuel requirements are most of the time covered by the standard fuel.
Which one of these two routes (JFK to SNN or JFK to FRA) will most probably require extra fuel for EDTO?

**JFK-SNN** certainly requires additional fuel for EDTO as the destination (SNN) is the last EDTO alternate airport as well.
FAR 121.646(b) and EASA AMC 20-6 Appendix 4

- **Most limiting of the following scenarios at critical Equal Time Point between EDTO Alternates**
  - Engine failure
  - Depressurization
  - Engine failure and depressurization (combined failure)

- **Engine out fuel based on selected EDTO planning speed, all engine fuel based on LRC speed**

- **15-minute hold at destination and fuel allowances**

- **Fuel Adjustments**
  - Wind forecast errors, Temperature
  - Fuel burn deterioration (5% or established in-service value)
  - Forecast Icing, APU fuel burn, MEL/CDL

- **New FAA and EASA rules provide significant fuel relief relative to previous guidelines**
FAR 121-646 (b)*, EASA AMC 20-6, Appendix 4
Cabin decompression, engine failure or both at critical ETP
(Compare higher of three fuel values to normal fuel load)

Forecast winds and temperatures

Fuel adjustments

- Up to 5% contingency fuel ** (Engine Deterioration)
- 5% Factor on wind speed (wind errors) ***
- Greater of:
  - Fuel for airframe icing+ wing and engine TAI (10% of the forecast icing time)
  - Fuel for wing and engine TAI (entire forecast icing time)
- APU fuel if needed

** Or actual fuel burn characteristics
*** Or 5% fuel increase if acceptable forecast winds are not used

* New rules provide significant relief relative to previous standards

ICAO EDTO Course - Flight Operations
**787-8 / GENX-1B70**

**787-8 / GENX-1B70**
GW = 200,000 KG
Diversion Distance = 1000 nm
Nil wind, standard day, no icing
Nominal Performance
PET v1.6  Database: 878G70.dat v1.1 Nov 17, 2011

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<th>Engine Inop Driftdown Fuel</th>
<th>Engine Inop Decompression Fuel</th>
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*Operational conditions may change these relationships*
Check normal planned fuel load at critical point against critical fuel requirement

**Example: Critical fuel uplift required**

- Fuel quantity on board
- Critical fuel required

Additional fuel required for ETOPS critical fuel scenario plus fuel to carry it

**ETP Alternates**
EDTO Performance Data

Traditional Boeing FPPM data for earlier models

Section 3.3 provides EDTO Enroute Performance *

- Altitude Capability
- Cruise Tables
- Diversion Fuel and Time
- Holding

* Performance data for a range of engine inoperative speeds is included

FPPM is not provided for 787
FCOM/QRH Engine Inoperative Performance

Not intended for EDTO Planning

QRH PI Section provides ‘get you home’ engine inoperative performance *

- Max Continuous Power
- Optimum driftdown speed, level off altitude and range capability (LRC cruise)
- LRC altitude capability, cruise control, diversion fuel/time
- Holding

* LRC and optimum drift down speed only (EDTO planning speeds not included)
## ENGINE INOP
### MAX CONTINUOUS THRUST

### Driftdown Speed/Level Off Altitude

100 ft/min residual rate of climb

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Includes APU fuel burn.
Engine Inoperative Diversion Strategies

Diversion speed and thrust selection are at the discretion of the flight crew based on prevailing operational conditions.

• ‘Obstacle Clearance’ Strategy
  – Best altitude profile for terrain clearance
  – Optimum driftdown (L/D max) speed *(QRH)*

• ‘Fuel’ Strategy
  – Best fuel burn performance
  – Fixed speed descent to LRC cruise ceiling followed by LRC cruise *(QRH)*

• ‘Fixed Speed’ (EDTO) Strategy
  – Minimum diversion time (at the expense of fuel and altitude)
  – Driftdown and cruise at EDTO planning speed *(PET only for 787)*
FMC Engine Out Cruise - 787

- Displays performance for each of the three engine inoperative speed strategies*

*EDTO speed (CO SPD) must be provided by operator for AMI load
EDTO Approval
Route Planning
• Selection of Desired Routes
• Selection of adequate enroute alternate airports
• **Diversion Distance Determination**
  – Diversion Time Required
  – Engine Inoperative Speed Selection
  – Reference Weight

• Critical Fuel Estimates

* May be an iterative process
Potential Twin EDTO Routes
to/from South America

Typical Twin 60 Minute Area (400 nm)
Potential Twin EDTO Routes to/from South America (Cont)
* Optimum routing can vary significantly from Great Circle Track
Adequate Airport
- An airport that an airplane operator may list with approval from the FAA because that airport meets the landing limitations of 121.197 and is either
  1) An airport that meets the requirements of Part 139, Subpart D* of this chapter, excluding those that apply to aircraft rescue and firefighting service (RFFS), or
  2) A military airport that is active and operational

* Or equivalent requirements if outside U.S. jurisdiction

EDTO Alternate Airport*
- An adequate airport listed in the certificate holder’s operations specifications that is designated in a dispatch or flight release for use in the event of a diversion during EDTO. This definition applies to flight planning and does not in any way limit the authority of the pilot-in-command during flight

* Meets adequate airport requirements plus RFFS and weather.

Note: The term ‘Suitable Airport’ is no longer used for EDTO
FAA RFFS 7 Requirement for >180 minute EDTO does not apply to EASA

- ICAO RFFS Category 4 up to and including 180 minutes
  - For all EDTO per AMC 20-6
- RFFS Category 4 for operations beyond 180 minutes (including 207 minutes) plus RFFS 7 adequate airport area coverage for route
  - FAA
- Augmentation from local fire fighting assets with 30-minute response time if equipment not located at airport
Pacific Area of Operation RFFS
240-Minute EDTO

777-300ER / GE90-115B
Reference Weight = 340,000 KG
Diversion Speed = 0.84M / 320 KIAS
240 Minutes = 1693 NM
EDTO Entry Point *

- The first point on the route of an EDTO flight, determined using a one-engine inoperative cruise speed under standard conditions in still air, that is
  
  1) More than 60 minutes from an adequate airport for airplanes with two engines;
  
  2) More than 180 minutes from an adequate airport for passenger-carrying airplanes with more than two engines

*The EDTO Exit Point is the last point in the route that exceeds the EDTO threshold
777-200ER / Trent 895
Reference Weight = 280,000 KG
Diversion Speed = 0.84M / 320 KIAS
60 Minutes = 435 NM
EDTO Area of Operation

1) For turbine-engine-powered airplanes with two engines, an area beyond \textbf{60 minutes} from an adequate airport, computed using a one-engine inoperative cruise speed under standard conditions in still air.

2) For turbine-engine-powered passenger-carrying airplanes with more than two engines, an area beyond \textbf{180 minutes} from an adequate airport, computed using a one-engine inoperative cruise speed under standard conditions in still air.
EDTO Route Planning Example

240 Minute EDTO Area

777-200ER / Trent 895
Reference Weight = 280,000 KG
Diversion Speed = 0.84M / 320 KIAS
60/240 Minutes = 435/1694 NM

Waypoint Constraint
(S4352, W13745)

Example 240 Minute Area of Operation
Evaluate Equal Time Points*

- The point of equal diversion time to EDTO alternates at the approved one engine inoperative cruise speed.
- Equal Time Points (ETPs) between alternates are typically determined from a computerized flight planning service using forecast weather conditions at decompression and engine inoperative cruise altitudes.
- Decompression ETPs may be used as the basis for all planning including Time Limited Systems.

* The Critical Point (CP) is the Equal Time Point at which the EDTO diversion fuel is closest to, or exceeds, the normal planned fuel on board.

*Adjust fuel load if required
EDTO Equal Time Points (ETPs)

AKL-EZE 240 Minutes

Note: Still Air ETPS shown for reference
Considerations for Higher Diversion Time Approval

- Airplane is configured to a higher airworthiness standard
  - CMP, MMEL Compliance
- Fewer alternates required for dispatch, but more alternates available within EDT0 diversion time capability
  - Allows selection of more favorable enroute alternates
- Mitigates potential for less direct ‘dog-leg’ routing and associated operational issues:
  - Increased route time increases potential for problems
  - Increased over water exposure
  - Reduced operating efficiency (time, fuel)

*Higher diversion time approval improves both safety and dispatch flexibility*
Refine EDTO Planning Parameters

• Determine Diversion Distances from FPPM data or PET Analysis
  – Airframe/engine combination(s)
  – Engine inoperative speed
  – Reference weight
  – Diversion time required

• Finalize list of adequate alternate airports
  – Consider remote areas of route, EDTO entry/exit regions
  – Establish backup alternates to allow for airports unavailable at dispatch, potential routing variations

* May be an iterative process
En route (EDTO) Alternates
Published Data

10-9 Airport Information

Approach Minimums

Published Procedures

ICAO EDTO Course - Flight Operations Page 79
Easter Island (IPC)*

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Periodo análisis: 1990-2005

* IPC is also unavailable when LAN flights from Santiago are committed to land
EDTO Route Planning Example
240 Minute EDTO Area - Without IPC

777-200ER / Trent 895
Reference Weight = 280,000 KG
Diversion Speed = 0.84M / 320 KIAS
60/240 Minutes = 435/1694 NM

Example 240 Minute Area of Operation
EDTO/EDTO Beyond 180 Minutes

- Additional requirements defined by FAR 121.633(b) and Chapter 3 Sec. 7.2.3 AMC 20-6
- Allowed routing must also consider airplane time limited system capability corrected for forecast wind and temperature
  - All engine cruise speed for cargo fire suppression time capability minus 15 minutes
  - Engine inoperative cruise speed for other EDTO significant system time capability minus 15 minutes.

- For 240 minute EDTO, time limited system planning is in addition to still air EDTO area (maximum diversion time).
  - For EDTO ‘beyond 240 minutes’, still air EDTO area is not applicable as there is no specific maximum diversion time.
Consideration of Time Limited Systems at dispatch
For EDTO up to 180 min: consider ISA /Still Air conditions

Example for EDTO 180 min (ISA no wind) operational approval

- 180 min EDTO diversion time ➤ distance 1275 Nm
- One engine Speed (e.g. average TAS = 425 kts) ISA, Still Air
- Cargo fire protection time ➤ check time is 180 min + 15 min
- Other most limiting system time capability ➤ check time is 180 min + 15 min

1. Check at dispatch that these values do not exceed corresponding Time Limited system(s) capabilities
2. If one or both values are reduced (e.g. in case of MMEL) ➤ Select another route within the corrected Time Limited system(s) capabilities

Manufacturer has to identify the time limited system(s) capabilities and to include the corresponding values in the AFM and EDTO / ETOPS CMP Document
Consideration of Time Limited Systems at dispatch
For EDTO >180 min: consider forecast wind and temperature

Example for EDTO 240 min (ISA no wind) operational approval

240 min EDTO diversion time ➤ distance 1700Nm

*One engine Speed (e.g. average TAS = 425 kts) ISA, Still Air*

Cargo fire protection time ➤ check time to cover 1700Nm

*All engines Speed, Actual weather conditions, incl. 15min margin*

Other most limiting system time capability ➤ check time to cover 1700Nm

*One engine Speed, Actual weather conditions, incl. 15min margin*

*= time values provided as examples

1. Check at dispatch that these values do not exceed corresponding Time Limited system(s) capabilities
2. If one or both values are reduced (e.g. in case of MMEL) ➤ Select another route within the corrected Time Limited system(s) capabilities

Manufacturer has to identify the time limited system(s) capabilities and to include the corresponding values in the AFM and EDTO / ETOPS CMP Document

The time capability of the cargo fire suppression system is 260 min.
The time capability of all the other ETOPS significant systems is 300 min.
The maximum diversion distance is 1 700 nm.
The type-design reliability and performance of this airplane/engine combination has been evaluated under 14 CFR 25.1535 and found suitable for **beyond 180 minutes** extended operations (EDTO) configured in accordance with Boeing Document D044W054 "MODEL 777 EDTO Configuration, Maintenance, and Procedures". The actual maximum approved diversion time for this airplane may be less based on its most limiting system time capability. This finding does not constitute approval to conduct EDTO.

Determine the configuration of the airplane prior to the use of the following system time capabilities:

**System Time Capabilities:**

The most limiting EDTO significant system time (other than cargo fire suppression) is **345 minutes**.

The most limiting cargo fire suppression system time is **302 minutes**.

---

* **777-200ER Maximum Cargo Fire Suppression time is 272 minutes** *(a 302 minute system option is subject to certification)*
EDTO Flight Plan Example
EZE - AKL, 330 Minutes

777-200ER / Trent 895
Diversion GW: 240,000 KG
All Engine: .84 Mach, FL 290 = 497 KTAS
Engine Out: .84 Mach / 320 KIAS = 2393 NM

Note: Time Limited System Boundaries based on 50% Annual Winds for Reference

- 345 Minute Engine Inoperative System Boundary
- 302 Minute Cargo Fire Suppression System Boundary

Example
JUNE 25 WIND OPTIMIZED
EDTO Dispatch Planning
• Review forecast weather and NOTAMs to determine EDTO alternates from airline’s approved list
• Establish allowed area of operation based on EDTO alternates available
• Compute Equal Time Points and critical fuel requirements based on forecast winds
• Evaluate MEL implications, as required
• Produce EDTO Flight Plan
Requirements

- **Must be at or above authorized minimums for dispatch**
  (FAR 121.624, 121.625 and EU-OPS 1.297)
  - Weather reports and/or forecasts should be available
  - Validity period based on earliest to latest (FAA) or one hour after latest (EASA) expected arrival times
    - Some relief from previous practice

- **AC 120-42B and AMC 20-6 provide additional guidance**
  - Non precision and Cat I approaches
  - Authorized Cat II/III approaches
  - GPS/RNAV Approaches *(FAA)*
  - Conditional forecast elements
--- | --- | ---
For airports with at least one operational navigational facility providing a straight-in non-precision approach procedure, or Category I precision approach, or, when applicable, a circling maneuver from an instrument approach procedure. | Add 400 ft to the MDA or DH as applicable. | Add 1 sm or 1600m to the landing minimum. |
For airports with at least two operational navigational facilities, each providing a straight-in approach procedure to different suitable runways. | Add 200 ft to the higher DH or MDA of the two approaches used. | Add ½ sm or 800 m [4] to the higher authorized landing minimum of the two approaches used. |
One useable authorized Category II ILS IAP. | 300 feet | 3/4 sm (1200 m) or RVR 4000 (1200 m) |
One useable authorized category III ILS Instrument Approach Procedure (IAP). | 200 feet | 1/2 sm (800 m) [4] or RVR 1800 feet (550 m) |

- **Dispatch check is from earliest to latest expected arrival times**
- **Once airborne, normal operating minima apply up to ETOPS entry (EEP)**
2. DISPATCH MINIMA – EN-ROUTE ALTERNATE AERODROMES

An aerodrome may be nominated as an ETOPS en-route alternate for flight planning and release purposes if the available forecast weather conditions for a period commencing at the earliest potential time of landing and ending one hour after the latest nominated time of use of that aerodrome, equal or exceed the criteria required by Table 1 below.

<table>
<thead>
<tr>
<th>Approach Facility</th>
<th>Ceiling</th>
<th>Visibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precision Approach</td>
<td>Authorised DH/DA plus an increment of 200 ft</td>
<td>Authorised visibility plus an increment of 800 metres</td>
</tr>
<tr>
<td>Non-Precision Approach or Circling approach</td>
<td>Authorised MDH/MDA plus an increment of 400 ft</td>
<td>Authorised visibility plus an increment of 1500 metres</td>
</tr>
</tbody>
</table>

- The above criteria for precision approaches are only to be applied to Category 1 approaches.
- When determining the usability of an Instrument Approach (IAP), forecast wind plus any gusts should be within operating limits, and within the operators 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.
- When dispatching under the provisions of the MEL, those MEL limitations affecting instrument approach minima should be considered in determining EDTO alternate minima.

*relief for advanced landing systems (Cat II/III) may also be approved*
South Pacific Icing Forecast  FL100-FL300

TAFS and METARS (SCIP)

Extracted from Jeppesen Weather Services (www.jetplan.com)
**MMEL, DDG, MEL**

- **Master Minimum Equipment List** (*MMEL*)
  - FAA Document maintained by airplane model
  - Contains all approved deviations for inoperative equipment

- **Minimum Equipment List** (*MEL*)
  - Airline document required by FAR 121.628 and EU-OPS 1.030
  - Can not be less restrictive than MMEL

- **Dispatch Deviations Guide** (*DDG*)
  - Boeing *advisory* document to assist operator interpretation of MMEL
  - Contains expanded operational *(O)* and maintenance *(M)* procedures
  - Also includes approved Configuration Deviation List *(CDL)*
• Certain MMEL/DDG items have unique dispatch requirements for EDTO flights.
  – EDTO items are denoted as either ‘ER’ or by a diversion time limit
• ‘ER’: Refers to extended operations of an airplane which has a type design approval for EDTO
  – This term is used in all applicable MMELs except the 777 and 787
• The 777 and 787 MMEL use a diversion time limit instead of the term ‘ER’ to denote EDTO dispatch requirements
### 737 Example: APU Generator (ATA 24)

![Boeing Logo]  

**ATA 24**  
**737 Dispatch Deviations Guide**  
**Section 2**

<table>
<thead>
<tr>
<th>Interval</th>
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<th>Required</th>
<th>Procedure</th>
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</thead>
<tbody>
<tr>
<td>C</td>
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<td>0</td>
<td></td>
</tr>
</tbody>
</table>

*Except for ER operations, may be inoperative.*
787 Example: Auxiliary Power Unit

Section 2

787 Dispatch Deviations Guide

49-11-01 Auxiliary Power Unit (APU)

<table>
<thead>
<tr>
<th>Interval</th>
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<th>Procedure</th>
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<tbody>
<tr>
<td>C</td>
<td>1</td>
<td>0</td>
<td>(O)</td>
</tr>
</tbody>
</table>

May be inoperative provided:

a. VFSG systems operate normally.
b. Flight remains within 180 minutes of landing at a suitable airport.
Beyond 180 Minute Diversion Time Considerations *

- **FAR Part 121, Appendix P and Policy Letter 40**
  - Fuel Quantity Indicating System (FQIS)
  - APU, both electrical and pneumatic
  - Auto throttle system
  - Second communication system (SATCOM Voice)
  - Engine-out auto-land *(if used for planning)*

- **EASA AMC 20-6, Appendix 4**
  - Fuel Quantity Indicating System (FQIS)
  - APU, both electrical and pneumatic
  - Automatic engine or propeller control system
  - Communication system(s) relied on by the flight crew to comply with communication requirements

*Requirements included in affected MMEL/DDG Documents*
EDTO Flight Plan Example

EZE - AKL, 330 Minutes

777-200ER / Trent 895
Diversion GW: 240,000 KG
All Engine: .84 Mach, FL 290 = 497 KTAS
Engine Out: .84 Mach / 320 KIAS = 2393 NM

Note: Time Limited System Boundaries based on 50% Annual Winds for Reference

345 Minute Engine Inoperative System Boundary
302 Minute Cargo Fire Suppression System Boundary

Example
EDTO Flight Plan Example
Boeing ‘FLE’ Format

Fuel Summary - FAR International Reserves

///// THIS FLIGHT PLAN COMPLIES WITH THE 330 MIN EDTO RULE /////

PLAN 0331 06252046Z FOR ETD 1900Z
FLT REL IFR /26 SAEZ/EZE TO NZAA/AKL MACH: M84 REGN 772895
PROGS 2512NWS ELEV 0067FT 0023FT AVG W/C P003 ISA DEV M06
COMP 2046Z FOR ETD 1900Z/26JUN13 REGN 772895 777-200 TRENT895 LBS

SUBJECT TO THE FOLLOWING CONDITIONS
EDTO FLIGHT/MAX DIVERSION TIME IN STILL AIR LIMITED TO 330 MINUTES
FROM THE FOLLOWING EDTO ALTERNATE AIRPORTS - SAWH/USH
NZCH/CHC

FUEL TIME CORR OWE 322191 PYLD 102549 APLD .. .. ..
DEST NZAA 200689 12+13 .. .. .. EZFW 424740 MZFW 440000 AZFW .. .. ..
RESV 16869 01+13 .. .. .. ETOW 660000 MTOW 660000 ATOW .. .. ..
DEST-MNVR 0 00+00 .. .. .. ELDW 459311 MLDW 470000 ALDW .. .. ..
ALTERNATE 11126 00+45 .. .. .. NZWN FL330 0259 NM M.77 W/C P026
HOLD-ALT 6576 00+30 .. .. ..
EDTO ADD 0 00+00
REQD 235260 14+41 .. .. .. NOTE - LDGWT INCLUDES RESERVE FUEL
EXTRA 000000 00+00 .. .. .. NOTE - APM 0000 PCN
TAXI 1000 SCHEDULE TIMES ETD 1900/.. .. ..
TOTAL 236260 14+41 .. .. .. RTE ETA 0713/.. .. ..

INCREMENTAL BURN PER 1000 LBS INCREASE/DECREASE IN TOW: 294

ATC CLRNC: .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. .. ..
# Diversion Fuel Buildup

--- **EQUAL TIME POINT DATA - ETP01 SAWH/USH - NZCH/CHC ---**

**DIVERSION SUMMARY**

<table>
<thead>
<tr>
<th>ETP LOCATION</th>
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<tr>
<td>ETE FROM ORIGIN</td>
<td>06+53</td>
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<td>GWT AT DIVERSION</td>
<td>532058</td>
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<td>FOB</td>
<td>07318</td>
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**DIVERSION AIRPORTS**

- SAWH/USH
- NZCH/CHC

<table>
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**CRITICAL FUEL REQUIRED CALCULATION**

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<th>DECOMP DECOMP PRESS</th>
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<td>FL</td>
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</table>

**EDTO Flight Plan Example**

**Boeing ‘FLE’ Format (Cont)**

---

**ETP 1 is the Critical Point for this flight**

**EDTO Engine out Speed determined by airline policy**

**Diversion Time is based on Forecast Winds and may exceed EDTO Time**
Defining the EDTO area of operations

Performing EDTO Flight Planning

Conducting EDTO Flights

Conclusions
EDTO Flight Crew Considerations
• Dispatch
• Cockpit Preparation
• En-route
• Diversion Decision
• Diversion Strategies (Speed Selection)
• Post Flight

* Note: Refer to Company Operating Procedures
Check Aircraft Configuration
- Check EDTO / ETOPS Status of the aircraft (MEL/CDL)
- Check Time Limited Systems

Nominate EDTO Alternate Airports

Consider EDTO Fuel Requirements

Prepare Flight Folder

<table>
<thead>
<tr>
<th>AIRCRAFT DATE</th>
<th>REGISTRATION</th>
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<tbody>
<tr>
<td>ETD</td>
<td>FLIGHT N°</td>
</tr>
<tr>
<td>ETOPS STATUS</td>
<td>DESTINATION</td>
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<tr>
<td>ETOPS APPROVED: COMPANY</td>
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</tr>
<tr>
<td>ETOPS APPROVED: CREW</td>
<td>✔</td>
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<tr>
<td>ETOPS APPROVED: ROUTE</td>
<td>✔</td>
</tr>
<tr>
<td>MAINTENANCE RELEASE STATEMENT</td>
<td>✔</td>
</tr>
<tr>
<td>MEL/CDL</td>
<td>✔</td>
</tr>
<tr>
<td>TIME LIMITED SYSTEM</td>
<td>✔</td>
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</table>

NOTAMS
- Departure Airport
- Destination Airport
- En route alternates
- En route

WEATHER FOLDER
- TAF METARS SIGMETS:
  - Departure Airport
  - Destination Airport
  - En-route Alternate
- WINDS AND TEMP CHARTS
  - Cruise FL
  - Diversion FL
- TEMPS charts
- ICING FORECAST
Check Aircraft Configuration
- Check EDT0 / ETOPS Status of the aircraft (MEL/CDL)
- Check Time Limited Systems

Nominate EDT0 Alternate Airports
- Check NOTAM
- Check Weather (TAF/METAR)

Consider ETOPS Fuel Requirements

Prepare Flight Folder

---

<table>
<thead>
<tr>
<th>AIRCRAFT DATE</th>
<th>REGISTRATION FLIGHT N°</th>
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<tbody>
<tr>
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<td>MEL/CDL</td>
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<tr>
<td>TIME LIMITED SYSTEM</td>
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</table>

| NOTAMS | |
| Departure Airport | ✓ |
| Destination Airport | ✓ |
| En route alternates | ✓ |
| En route | ✓ |

| WEATHER FOLDER | |
| TAF METARS SIGMETs: | |
| Departure Airport | ✓ |
| Destination Airport | |
| En-route Alternate | |
| WINDS AND TEMP CHARTS | |
| Cruise FL | |
| Diversion FL | |
| TEMSi charts | |
| ICNG FORECAST | |

---
Check suitability of adequate aerodromes

EINN APT 19990412778V01 A0426/99 99 12APR1400/99 16APR1730
ILS RWY06 OUT OF SERVICE

EINN APT 19990409492V01 A0416/99 99 15APR0700/99 15APR1900
CRANE MAX HGT 45M/148FT AGL 0PR PSN 524301.88N0085127.12W
LIGHTED RED

EINN APT 19990409474V01 A0415/99 99 15APR1900/99 30DEC1700 EST
CRANE MAX HGT 40M/131FT AGL 0PR PSN 524301.88N0085127.12W
LIGHTED RED

EINN APT 19990407715V01 A0407/98 99 15APR0700/99 15APR1900
CRANE MAX HGT 45M/148FT AGL 0PR PSN 524301.88N0085127.12W LIGHTED RED

EINN APT 19990405791V01 A0395/99 99 06APR0815/99 13APR1700 EST
RESCUE LAUNCH UNSERVICEABLE
REF AIP EINN AD 2-3

EINN APT 19990226312V01 A0187/99 99 22FEB1920/99 30JUN1600 EST
REF AIP PAGES EINN AD 2-18
EINN AD 2-20 EINN 2-21
AIP SECTION EINN AD 2-22
INTRODUCTION OF SURVEILLANCE RADAR APPROACHES DEFERRED.

EINN APT 19990130504V01 A0053/99 99 19JAN1230/99 30APR1600 EST
CAUTION ADVISED WHEN TURNING ON TURNING AREA AT END RWY24
DUE POSSIBILITY OF LOW FRICTION PARTICULARLY IN WET CONDITIONS

EINN APT 19980732208V01 A1078/98 98 29JUL1000/ PERM
AMEND MSA AS FOLLOWS
SECTOR 150 TO 240 - 2800FT
SECTOR 240 TO 330 - 3400FT
SECTOR 330 TO 060 - 2800FT
SECTOR 060 TO 150 - 2400FT
REF PAGES EINN AD 2.24-7, EINN AD 2.24-8, EINN 2.24-9.
Check suitability of adequate aerodromes (Cont)

**WEATHER**

**EINN METAR 130830Z 30019G36KT 8000 -SHRA FEW008 BKN018CB BKN045 07/00 Q1013 NOSIG**

**EINN METAR 130800Z 31016KT 9999 FEW020 SCT045 07/M01 Q1013 NOSIG**

**EINN METAR 130800Z NIL**

**EINN METAR 130730Z 31016KT 9999 FEW020 SCT045 07/M02 Q1013 NOSIG**

**EINN METAR 130700Z 32014KT 9999 FEW020 06/M02 Q1013 NOSIG**

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<th>Time</th>
<th>Condition</th>
<th>Temperature</th>
<th>Humidity</th>
<th>Visibility</th>
<th>Dew Point</th>
<th>Pressure</th>
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<td>3153M16</td>
<td>3166M20</td>
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<td>3140M17</td>
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**BIKF TAF 130400Z 130606 01020KT 9999 SCT025 BECMG 0002 33005KT CAVOK**

**BIKF TAF 130700Z 130918 01020KT 9999 SCT018**

**BIKF METAR 130830Z 02022KT 9999 BKN028 M03/M09 Q1028**

**BIKF METAR 130800Z 02022KT 9999 BKN030 M03/M09 Q1027**

**BIKF METAR 130730Z 01023KT 9999 BKN030 M03/M11 Q1027**

**BIKF METAR 130700Z 01023KT 9999 BKN030 M04/M11 Q1027**

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<th>Humidity</th>
<th>Visibility</th>
<th>Dew Point</th>
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**BGSF TAF 130511Z 130606 VRB08KT 9999 SCT180 BECMG 0911 SCT035 BKN090 PROB30 1218 4000 SRRA VV030**
Check Aircraft Configuration
- Check EDTO Status of the aircraft
- Check Time Limited Systems

Nominate EDTO Alternate Airports
- Check NOTAM
- Check Weather (TAF/METAR)

Consider EDTO Fuel Requirements

Prepare Flight Folder

| AIRCRAFT | REGISTRATION |
| ETD      | FLIGHT N°    |
| DATE     | DESTINATION |
| ETOPS STATUS |            |
| ETOPS APPROVED : COMPANY | ✓ |
| ETOPS APPROVED : CREW | ✓ |
| ETOPS APPROVED : ROUTE | ✓ |
| MAINTENANCE RELEASE STATEMENT | ✓ |
| MEL/CDL | ✓ |
| TIME LIMITED SYSTEM | ✓ |

NOTAMS
- Departure Airport | ✓
- Destination Airport | ✓
- En route alternates | ✓
- En route | ✓

WEATHER FOLDER
- TAF METARS SIGMETS:
  - Departure Airport
  - Destination Airport
  - En-route Alternate
- WINDS AND TEMP CHARTS
  - Cruise FL
  - Diversion FL
- TEMSI charts
- ICING FORECAST
PLAN 8250 EINN TO KJFK G330 M81/F IFR 04/13/99
NONSTOP COMPUTED 0838Z FOR ETD 1200Z PROGS 1300ADF ED330PW KGS

ATTN CAPT.
FLT RELEASE AIB330 EINN/KJFK ON 04/13/99

/// THIS LOG INCORPORATES THE ETOPS 120 MIN RULE /////

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<th>PRF</th>
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<th>AVG WIND</th>
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PERFORMANCE FACTOR = 1%
AIRCON NORMAL
MEL/CDL STATUS: APU INOP.

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FUEL BURN ADJUSTMENT FOR 4000FT DECREASE IN CRZ ALTITUDE: KGS

FUEL BURN ADJUSTMENT FOR 1000KGS INCREASE/DECREASE IN TOW: 0173 KGS
### Check Aircraft Configuration
- Check EDTO Status of the aircraft
- Check Time Limited Systems

### Nominate EDTO Alternate Airports
- Check NOTAM
- Check Weather (TAF/METAR)

### Consider EDTO Fuel Requirements

### Prepare Flight Folder

---

#### AIRCRAFT DATE

<table>
<thead>
<tr>
<th>ETD</th>
<th>FLIGHT N°</th>
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<tbody>
<tr>
<td>ETD</td>
<td>DESTINATION</td>
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</tbody>
</table>

#### ETOPS STATUS
- ETOPS APPROVED: COMPANY
- ETOPS APPROVED: CREW
- ETOPS APPROVED: ROUTE

#### MAINTENANCE RELEASE STATEMENT
- MEL/CDL

#### TIME LIMITED SYSTEM

#### NOTAMS
- Departure Airport
- Destination Airport
- En-route alternates
- En-route

#### WEATHER FOLDER
- TAF METARS SIGMETs:
- Departure Airport
- Destination Airport
- En-route Alternate
- WINDS AND TEMP CHARTS
- Cruise FL
- Diversion FL
- TEMPS charts
- ICNG FORECAST
Pre-Takeoff Checks

Specific pre-takeoff checks

- Flight crew: e.g. fuel x-feed valve, CSM/G
- Maintenance: e.g. engine oil level and DPI.

Checks may vary with aircraft model

DATA in FMGS

- EEP, ETP, EXP, CRUISE WINDS
- Entered as “FIX INFO” or “ABEAM”
  - display these points on the ND
  - no need to create additional waypoints in the F-PLN, to avoid these points being transmitted via CPDLC or ADS
Cockpit preparation
Continued
The ETP computed by the FMGS (AEO) is different from the EDTO ETP (OEI).
Cockpit preparation
Before EDTO sector
Crew Notifications

Crew must be notified of any significant changes affecting:

- Forecast weather
- Aerodrome availability
- Any other required services at EDTO alternate airports designated for the flight.
Crew must check any changes that would preclude a safe approach and landing at an EDTO alternate airport during the time window

- Check minima at diversion airfields, ...
- Appropriate course of action must be taken if normal minima not fulfilled before EEP:
  - Selection of another EDTO alternate airport, re-routing, turn back,
  - Consider A/C EDTO capability and operator’s approved max DT in case of re-routing or selection of another EDTO alternate
- Normal flight monitoring
- Keep awareness of diversion airport status
- Monitor Fuel On Board
- If one suitable airport closes:
  - Flight may continue
- Diversion decision making:
  - As for a non-EDTO flight
  - Consider the additional EDTO Diversion requirements, if any, given in the AFM / FCOM / CMP (e.g. diversion mandatory when flying on a single electrical source)
- No diversion procedure specific to EDTO
  - Note: may vary with aircraft model
  - Diversion in case of engine failure (twins only)
- Comply with route requirements (NAT, MNPS,...) as for non-EDTO
- Selected diversion speed may differ from the approved engine-out diversion speed
Appendix 7 to EASA AMC 20-6 (Typical Format)

• **Part A: General/Basic**
  - Introduction, Operations approval, Training & checking, Operating procedures, flight preparation & planning…

• **Part B: Aeroplane Operating Matters**
  - Type specific operations, dispatch, flight planning, enroute, fuel planning, MEL/CDL, aeroplane systems…

• **Part C: Route and Aerodrome Instructions**
  - EDTO area and routes, enroute alternates, weather, CFP information, minimum altitudes, aerodrome characteristics…

• **Part D: Training**
  - Operators initial/recurrent route and aerodrome training programs.
APU High Altitude Start Program

**AC 120-42B Section 301, AMC 20-6 Appendix 8**

- Required for all airplanes unless APU must be running for EDTO (e.g. 737)
- Start attempts made and recorded per operators approved sampling program*
  - On non-EDTO Flights
  - On return leg of EDTO Flights
- Supports EDTO Maintenance Program (common checklist item)
  - Flight crew performs start attempts
  - Reliability section tracks data
- Target 95% start reliability or attend to system (12 month rolling average)

* Minimum 2 hour cold soak at normal planned cruise altitude
Chapter 3 of AC 120-42B

• Following engine failure or shutdown, the PIC must proceed to the nearest suitable airport at which a safe landing can be made *(FAR 121.165)*

• The PIC should consider all relevant factors in determining the suitability of an airport
  • Airplane configuration, system status and fuel
  • En-route winds, weather and minimum altitudes
  • Airport weather, terrain and runway conditions
  • Approach aids, lighting, RFFS and passenger facilities
  • PIC familiarity and available airport information

• None of the following justify flying beyond the nearest suitable airport:
  • Available fuel supply
  • Passenger accommodation other than safety
  • Maintenance/repair resources
Engine Inoperative Diversion Strategies (Speed Selection)

- **Obstacle Strategy**
- **Fuel Strategy**
- **EDTO Strategy**

**Note:** Offset or waypoint track may be required to meet airspace constraints.
787 FMC Alternate Airports Function

- Reduces Diversion Task Load
  - Candidate airports automatically prioritized by ETA
  - Uplink capability for up to 20 alternates
  - Direct, offset or ‘overhead’ routing
  - Engine out performance data
Training should address airline specific operating policies

TYPICAL SYLLABUS ELEMENTS
(Refer to AC 120-42B Section 304 and AMC 20-6, Appendix 6)

- Familiarity with EDTO rules
- Flight planning
- Engine inoperative speeds
- Alternate requirements
- En-route procedures
- Weather forecasting (if required)
- Critical point calculation
- Diversion recovery plan (if applicable)
- Critical fuel reserves
- Minimum equipment list
- EDTO critical systems
- Dispatch release
- Diversion decisions
- Diversion profile
- PIC responsibilities
# Practical application of academics training

## Training Manual

### 787 ETOPS/LOFT

#### NORTH ATLANTIC

### ROUTE OF FLIGHT

<table>
<thead>
<tr>
<th>ORIGIN</th>
<th>London Heathrow Airport (EGLL)</th>
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<tbody>
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<td>Parking Stand 319, RWY 27L</td>
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<table>
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<tr>
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<thead>
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<td>ZFW</td>
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**WIND**

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### 2-1 787 ETOPS LOFT NORTH ATLANTIC

#### PREFLIGHT

- Normal procedures
- **ETOPS preparation**

#### ENGINE START

- Normal procedures
- Pushback from gate during start

#### TAXI OUT

- Normal procedures

#### TAKEOFF

- Normal procedures
- Heavy weight takeoff

#### CLIMB AND CRUISE

- Normal procedures
- Complete normal cruise level off
- Navigation performance degradation exercises prior to entering MNPS area
- RVSM requirement degradation exercises
- Reposition to point prior to EEP

**Before ETOPS Entry Point (EEP):**

- Complete ETOPS Company Operating procedure
- Obtain weather updates for Enroute Alternates
- Check FMS BRG/DIST to next alternate
Additional Boeing Guidance Information

Welcome to Extended Operations

ETOPS Guide Volume III
Operational Guidelines and Methods

1. INTRODUCTION
2. ETOPS FUNDAMENTALS
3. DEFINITIONS
4. ETOPS ROUTE PLANNING
5. ETOPS DISPATCH PLANNING
6. ETOPS TRAINING

APPENDICES
- ETP CALCULATION
- SAMPLE AIRPORT INFORMATION
- AC 120-42B
- GENERIC APPROVAL PLAN TEMPLATE
Defining the EDTO area of operations

Performing EDTO Flight Planning

Conducting EDTO Flights

Conclusions
Conclusions

**EDTO Area of Operation**

**EDTO Flight Operation**

**EDTO Flight**

**No Day Conditions**
- Approved diversion speed strategy
- Operator’s approved EDTO Diversion Time

**Day Conditions**
- **EDTO Fuel:**
  - 3 diversion scenarios
  - Additional fuel reserves: icing, wind forecast, ...

- **Time-limited System**
- **Pre-flight Checks**
- **WTH/NTM Follow up**

**WTH/NTM Follow up**

**ICAO EDTO Course - Flight Operations**
Module 6
EDTO Flight Operations considerations