

## Annex C

### Civil Aviation Advisory Publication (CAAP) 82-1(0) – Extended Diversion Time Operations (EDTO) – Approvals Under CAO 82.0



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## Civil Aviation Advisory Publication

July 2007

*This publication is only advisory but it gives a CASA preferred method for complying with the Civil Aviation Regulations (CARs) 1988.*

*It is not the only method, but experience has shown that if you follow this method you will comply with the Civil Aviation Regulations.*

*Always read this advice in conjunction with the appropriate regulations.*

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# EXTENDED DIVERSION TIME OPERATIONS (EDTO)

## The relevant regulations and other references

This publication should be read in conjunction with Subsection 3BC of Civil Aviation Order (CAO) 82.0.

## Who this CAAP applies to

This CAAP applies to all operators of Australian aircraft.

## Why this CAAP was written

This CAAP provides background information and guidance to operators of turbine-engined aeroplanes having a maximum payload capacity exceeding 3410 kg, or having a maximum certificated passenger capacity of more than nineteen, engaged in Regular Public Transport (RPT) or Charter operations who are seeking approval under CAO 82.0 to conduct EDTO.

Definitions relating to EDTO are in CAO 82.0, subsection 2 (General) and Appendix 4 (Maintenance Matters).

## Status of this CAAP

This is the first CAAP to be written on this subject.

## For further information

Telephone the CASA Office closest to you on 131757.

**1. Abbreviations**

<b>AD</b>	Airworthiness Directive
<b>AFM</b>	Aircraft Flight Manual
<b>AOC</b>	Air Operators Certificate
<b>APU</b>	Auxiliary Power Unit
<b>ATC</b>	Air Traffic Control (in general)
<b>CAAP</b>	Civil Aviation Advisory Publication
<b>CAO</b>	Civil Aviation Order
<b>CAR</b>	Civil Aviation Regulations (1988)
<b>CASA</b>	Civil Aviation Safety Authority
<b>CASR</b>	Civil Aviation Safety Regulations
<b>CMP</b>	Configuration Maintenance and Procedures
<b>DH</b>	Decision Height
<b>EASA</b>	European Aviation Safety Agency
<b>EDTO</b>	Extended Diversion Time Operations
<b>ETOPS</b>	Extended Twin-Engined Aeroplane Operations
<b>FAA</b>	Federal Aviation Administration (of the USA)
<b>FAR</b>	Federal Aviation Regulations (of the USA)
<b>HF</b>	High Frequency (3000 to 30 000 KHZ)
<b>ICAO</b>	International Civil Aviation Organisation
<b>IFSD</b>	In-flight Shut Down
<b>INTER</b>	Intermittent
<b>JAR</b>	Joint Aviation Requirements (of the Joint Aviation Authorities)
<b>MCM</b>	Maintenance Control Manual
<b>MDA</b>	Minimum Descent Altitude
<b>MEL</b>	Minimum Equipment List
<b>MMEL</b>	Master Minimum Equipment List
<b>NAA</b>	National Airworthiness Authority (for a country other than Australia)
<b>NOTAM</b>	Notice to Airmen
<b>PDSC</b>	Pre-departure Service Check
<b>PIC</b>	Pilot-in-command
<b>QFE</b>	An Altimeter set to QFE will read zero when the aircraft is on the runway
<b>QNH</b>	Altimeter Subscale Setting to Obtain Elevation or Altitude
<b>PROB</b>	Probable, Probability
<b>RAT</b>	Ram Air Turbine
<b>SATCOM</b>	Satellite Communication
<b>STC</b>	Supplemental Type Certificate
<b>TCDS</b>	Type Certificate Data Sheet
<b>TEMPO</b>	Temporary

## 2. Introduction

### 2.1 Extended Diversion Time Operations (EDTO)

2.1 The EDTO approval process for large aeroplanes is valid for regular public transport (RPT) or charter operations which include certain cargo operations (see Civil Aviation Order (CAO) 82.0 3BC). To be eligible for EDTO, the specified airframe/engine combination must have been certificated to the airworthiness standards of Transport Category aeroplanes Federal Aviation Regulation (FAR) Part 25, the European Aviation Safety Agency (EASA) CS25 or the equivalent.

2.2 Applications for approval to conduct EDTO should be made using a specific Civil Aviation Safety Authority (CASA) form, available from CASA offices or via CASA's website at [www.casa.gov.au](http://www.casa.gov.au). At least 90 days should be allowed for processing by CASA, particularly in the case of new applications. It should be noted that the information requested in the form is comprehensive and providing it will assist operators in the planning of these operations.

## 3. Type Design Approval

**3.1 The process, which will normally lead to the type design EDTO approval, can be divided into two steps as follows:**

### 3.1.1 Eligibility for EDTO

3.1.1.1 The applicant must show that the design features of the particular airframe/engine combination are suitable for the intended operations. The considerations for type design approval are currently detailed in the Federal Aviation Regulation (FAR) Part 25/33, the European Aviation Safety Agency (EASA) CS25 and associated advisory material.

### 3.1.2 Capability for EDTO

3.1.2.1 The applicant must show that the particular airframe/engine combination, having been recognised as eligible for EDTO, demonstrates a level of reliability suitable for the intended operation. Manufacturer's and/or operator's reliability monitoring programmes may be taken into account for this purpose.

### 3.2 Evidence of type design approval

3.2.1 Evidence that the type design of the aeroplane is approved for extended range operation is normally reflected by a statement in the Aircraft Flight Manual (AFM) and Type Certificate Data Sheet (TCDS) or Supplemental Type Certificate (STC), which contains directly, or by reference, the following pertinent information:

- Special limitations (if necessary), including any limitations associated with a specific maximum diversion time;

- Additional markings or placards (if required);
- Revision to the performance section;
- The airborne equipment, installation, and flight crew procedures required for the specific extended range operations; and
- Description or reference to a document containing the approved aeroplane configuration, maintenance and procedures (CMP) standards.

3.2.2 Detailed compliance documents for the type design approval are not required if CASA has already given approval to another operator to operate extended range operations with the same airframe/engine combination.

3.2.3 CASA does not evaluate airframe/engine combination design features, or their reliability, for the suitability of EDTO. However, type design approvals for extended range operations, for an aircraft with a type acceptance certificate issued under Civil Aviation Safety Regulation (CASR) 21.29A, issued by the National Airworthiness Authority (NAA), for a country other than Australia, of the state of type design, are acceptable to CASA.

### **3.3 Modifications of type design**

3.3.1 Modifications or maintenance actions to achieve or maintain the reliability objective of EDTOs for the airframe/engine combination are incorporated into the design CMP standard document.

- Additional modifications or maintenance actions generated by an operator or manufacturer of the aeroplane must be made through the normal approval process.
- The operator or manufacturer (as appropriate) must thoroughly evaluate such changes to ensure that they do not adversely affect reliability or conflict with requirements for EDTO approval.
- The Airworthiness Directive (AD) process may be utilised as necessary to implement a CMP standard change.

### **3.4 Continuing Airworthiness**

3.4.1 The type design EDTO approval holder must periodically review the in-service reliability of the airframe/engine combination. Whenever an urgent problem makes it necessary, CASA may require that the type design CMP standard be revised to achieve and maintain the desired level of reliability and, therefore safety of the EDTO. The CMP standards in effect prior to a revision will no longer be considered suitable for continued EDTO.

3.4.2 The CMP standards and their revision may require priority actions to be implemented before the next EDTO flight, and other actions to be implemented according to a schedule acceptable to CASA.

### **3.5 Operations Approval (Airworthiness)**

3.5.1 The type design approval does not reflect a continuing airworthiness or operational approval to conduct EDTOs. Therefore, before approval, each operator must demonstrate the ability to maintain and operate the aeroplane so as to achieve the necessary reliability, and to train its personnel to achieve competence in EDTOs (see section 6 of this CAAP).

3.5.2 To maintain airworthiness approval for specific extended range operations, an operator must show compliance with the latest revision of the applicable CMP standards and any applicable Airworthiness Directives.

## **4. Operational Approval Considerations**

### **4.1 General**

4.1.1 Three levels of operational approval are used for two-engine aeroplanes:

- EDTOs with a maximum diversion time from 90 minutes up to 180 minutes to an en-route alternate (at the approved one-engine-inoperative cruise speed under standard conditions in still air);
- EDTOs with a maximum diversion time from 180 minutes up to 240 minutes to an en-route alternate (at the approved one-engine-inoperative cruise speed under standard conditions in still air); and
- EDTOs with a maximum diversion time above 240 minutes (at the approved one-engine-inoperative cruise speed under standard conditions in still air).

4.1.2 In the case of aeroplanes with more than two engines a single level of approval is used, above 180 minutes (at the approved one-engine inoperative cruise speed under standard conditions in still air).

*Note: In the case of all EDTO beyond 180 minutes, additional flight dispatch requirements apply. Refer CAO 82.0, Appendix, 5, clause 4.*

### **4.2 Requesting Approval**

4.2.1 Application for an EDTO approval is regulated under CAO 82.0 Appendix, 4. Applications should be made using the appropriate CASA form.

### **4.3 Operational Assessment Process**

4.3.1 In considering an application from an operator to conduct EDTOs, a comprehensive assessment will be made of the operator's ability to conduct EDTO.

This will include, but will not be limited to: past performance, flight crew training and experience, maintenance programme and aircraft certification status.

4.3.2 The data provided with the request must substantiate the operator's ability and competence to safely conduct and support these operations, and must include the means used to satisfy the considerations outlined in this section. (Any reliability assessment obtained, either through analysis or service experience, will be used as guidance in support of operational judgements regarding the suitability of the intended operation.)

### **4.4 Assessment of the Operator's Propulsion System Reliability**

4.4.1 An assessment will be made of the applicant's ability to achieve and maintain a level of propulsion system reliability acceptable for EDTO approval. CASA will need to assess whether the operator's past experience and compliance record is acceptable for EDTO or, alternatively, whether the operator has established the processes necessary for successful and reliable EDTO, and shows that such processes can be successfully applied throughout such operations.

### **4.5 Engineering Modifications and Maintenance Programme Considerations**

4.5.1 Although these considerations are normally part of the operator's continuing airworthiness programme, the maintenance and reliability programme may need to be supplemented in consideration of the special requirements of EDTO (see Appendix, B of this CAAP). The following items, as part of the operator's programme, will be reviewed to ensure that they are adequate for EDTO.

- *Engineering Modifications*

The operator must provide to CASA all titles and numbers of all modifications, additions, and changes which were made in order to substantiate the incorporation of the CMP standard in the aeroplanes used in EDTO.

- *Maintenance Procedures*

Following approval of the changes in the maintenance and training procedures, substantial changes to maintenance and training procedures, practices, or limitations established to qualify for EDTOs must be submitted to CASA before such changes may be adopted.

- *Reliability Reporting*

The reliability reporting programme, as supplemented and approved, must be implemented prior to, and continued after, approval of EDTO.

Data from this process must result in a suitable summary of problem events, reliability trends and corrective actions and be provided regularly to CASA and to the relevant airframe and engine manufacturers.

- *Implementation*

Approved modifications and inspections, which would maintain the reliability objective for the propulsion and airframe systems as a consequence of Airworthiness Directive actions, and/or revised CMP standards, must be promptly implemented. Other recommendations made by the engine and airframe manufacturers must also be considered for prompt implementation. This would apply to both installed and spare parts.

*Note: In principle, the CMPs do not repeat Airworthiness Directives. An operator thus needs to ensure compliance with both the ADs applicable in Australia and the CMP standards when operating EDTO.*

- *Control Process*

Procedures, and a centralised control process, must be established which would preclude an aeroplane being released for EDTO after propulsion system shutdown, or EDTO significant system failure on a previous flight, or significant adverse trends in system performance, without appropriate corrective action having been taken. Confirmation of such action as being appropriate may, in some cases, require the successful completion of one or more non-revenue or non-EDTO revenue flights (as appropriate) prior to being released on an EDTO. As an alternative the first 60 minutes of an EDTO flight can be used as a verification flight.

- *Programmes*

The maintenance programme used must ensure that the airframe and propulsion systems will continue to be maintained at the level of performance and reliability necessary for EDTO, including such programmes as engine condition monitoring and engine and auxiliary power unit (APU) (if required for EDTO) oil consumption monitoring.

- *Qualified Personnel*

The maintenance programme must ensure that adequate numbers of qualified personnel are trained and authorised to adequately perform the maintenance programme.

*Note: Flight crew are not precluded from being trained and authorised to act as maintenance personnel.*

## 5. Flight Preparation and In-flight Considerations

### 5.1 The flight release considerations specified in this section specifically apply to EDTOs.

#### 5.1.1 Minimum Equipment List (MEL)

- *System redundancy levels* appropriate to EDTOs must be reflected in the Master Minimum Equipment List (MMEL). An operator's MEL may be more restrictive than the MMEL considering the kind of EDTO proposed and equipment and service problems unique to the operator. Systems considered to have a fundamental influence on flight safety may include, but are not limited to, the following:
  - electrical, including battery;
  - hydraulic;
  - pneumatic;
  - flight instrumentation;
  - fuel;
  - flight control;
  - ice protection;
  - engine starts and ignition;
  - propulsion system instruments;
  - navigation and communications;
  - auxiliary power unit;
  - air conditioning and pressurisation;
  - cargo fire suppression;
  - engine fire protection;
  - emergency equipment; and
  - any other equipment necessary for EDTOs.
- *Communication and Navigation Facilities*
  - an aeroplane must not be released on an EDTO unless:

- Communications facilities are available to provide, under normal conditions of propagation at the appropriate one-engine-inoperative cruise altitudes, reliable two-way voice communications between the aeroplane and the operator and between the aeroplane and the appropriate air traffic services unit over the planned route of flight, and the routes to any suitable alternate to be used in the event of diversion. Where EDTO approval exceeds 180 minutes, a second means of communication is required – see CAO 82.0, Appendix 5.
- Non-visual ground or other navigation aids are available and located so as to provide, taking account the navigation equipment installed in the aeroplane, the navigation accuracy necessary for the planned route and altitude of flight, and the routes to any alternate aerodrome and altitudes to be used in the event of an engine shutdown; and
- Visual and non-visual aids are available at the specified alternates for the anticipated types of approaches and operating minima.

*Note: Engine and APU oil consumption must also be considered as necessary.*

- *Alternate Aerodromes*

- An aeroplane must not be released on an EDTO unless the required take-off, destination and alternate aerodromes, including EDTO alternate aerodromes, to be used in the event of a propulsion system failure or an aeroplane system failure(s) which requires a diversion, are listed in the flight deck documentation and specified in the operational flight plan.
- Since these EDTO alternates serve a different purpose than the destination alternate aerodrome, and would normally be used only in the event of an engine failure or some other aeroplane system failure, an aerodrome must not be listed as an EDTO alternate unless the requirements of CAO 82.0 Appendix, 2 are met, and:
- The aerodrome services and facilities are adequate to permit the conduct of an instrument approach procedure to the runway expected to be used while complying with the applicable aerodrome landing minima;

- The latest available forecast weather conditions, for a period commencing at the earliest time of landing and ending at the latest time of landing, at that aerodrome, equals or exceeds the authorised weather planning minima for EDTO alternate aerodromes in CAO 82.0 Appendix, 5, clauses 7 or 8;
- In addition, for the same period, the forecast crosswind component, including gusts, for the landing runway expected to be used must not exceed the manufacturer recommended crosswind for a one-engine inoperative landing, taking into account the runway condition (dry, wet or contaminated). When planning and conducting the flight, adverse weather conditions at EDTO alternates having forecast probabilities of less than 40% may be disregarded; however, any INTER or TEMPO must be taken into account when determining the amount of fuel to be carried;
- During the course of the flight the flight crew are to be informed, by the operator, of any significant changes in conditions at required EDTO alternates. Before proceeding beyond the extended diversion time entry point, the forecast weather for the time periods established above, aeroplane status, fuel remaining, runway surface conditions, landing distances and aerodrome services and facilities at designated EDTO alternates must be evaluated. If any conditions are identified (such as weather forecast below landing minima) which would preclude safe approach and landing, the pilot-in-command must be notified and an acceptable alternate selected where safe approach and landing can be made;
- After an EDTO flight has proceeded beyond the applicable EDTO entry point, the operator must keep the pilot-in-command (PIC) informed of any significant changes in conditions at required EDTO alternates; the pilot may continue the flight as planned if the meteorological forecast is subsequently revised below the landing minima for a required EDTO alternate aerodrome; and
- In addition, the operator's programme should provide flight crews with information on adequate aerodromes appropriate to the route to be flown which are not forecast to meet CAO 82.0 Appendix, 5 clauses 7 or 8 en-route alternate weather minima.
- Aerodrome facility information, and other appropriate planning data concerning these

aerodromes, should be provided to flight crews for use when executing a diversion.

- *Aeroplane Performance Data*
  - The operator's Operations Manual should contain sufficient data to support the critical fuel reserve and area of operations calculation.
  - The following data should be based on CASA-approved information provided or referenced in the Aircraft Flight Manual (AFM):
    - Detailed one-engine-inoperative performance data, including fuel flow for standard and non-standard atmospheric conditions, and as a function of airspeed and power setting, where appropriate, covering:
      - Driftdown (includes net performance);
      - Cruise altitude coverage including 10 000 ft;
      - Holding;
      - Altitude capability (includes net performance); and
      - Missed approach.
    - Detailed all-engine-operating performance data, including nominal fuel flow data, for standard and non-standard atmospheric conditions and as a function of airspeed and power setting, where appropriate, covering:
      - Cruise (altitude coverage including 10 000 ft); and
      - Holding.
    - Details of any other conditions relevant to EDTO which can cause significant deterioration of performance, such as ice accumulation on the unprotected surfaces of the aeroplane, Ram Air Turbine (RAT) deployment, thrust reverser deployment, etc.

## **5.2 Aircraft performance**

5.2.1 In determining an EDTO area of operation, for any given airframe/engine combination, operators will nominate the performance data used (altitudes, airspeeds, thrust settings and fuel flow). The resulting aircraft performance must ensure compliance with terrain and obstruction clearance requirements.

## **6. Flight Crew Training, Evaluation, and Operations Manuals**

### **6.1 Adequacy of Flight Crew Training and Operations Manuals**

6.1.1 CASA will review in-service experience of EDTO significant systems. The review will include system reliability levels and individual event circumstances, including actions taken by the crew in response to equipment failures or unavailabilities. The purpose of the review will be to verify the adequacy of information provided in training programmes and operations manuals. The aviation community should provide information for, and participate in, these reviews.

CASA may use the information resulting from these reviews to require the operator to amend flight crew training programmes, operations manuals and checklists, as necessary.

### **6.2 Flight Crew Training and Evaluation Programme**

6.2.1 The operator's training programme in respect of EDTOs must provide training for flight crew members, followed by subsequent evaluations and proficiency checks as well as refresher training, in the following areas:

- Introduction to EDTO regulations and EDTO approvals;
- Routes and aerodromes intended to be used in the EDTO area of operations;
- Performance (flight planning, including all contingencies, and flight performance progress monitoring); and
- Procedures:
  - Diversion procedures and diversion 'decision-making'. Special initial and recurrent training to prepare flight crews to evaluate probable propulsion and airframe systems failures must be conducted. The goal of this training must be to establish crew competency in dealing with the most probable operating contingencies; and
  - Use of appropriate navigation and communication systems, including appropriate flight management devices.

6.2.2 The flight crew must be provided with detailed initial and recurrent training which emphasises abnormal and emergency procedures to be followed in the event of foreseeable failures for each area of operation, including:

- Procedures for single and multiple failures in flight that would precipitate go/no-go and diversion decisions. If standby sources of electrical power significantly degrade cockpit instrumentation to the pilots, then training which simulates approach with the standby generator as the sole power source must be conducted during initial and recurrent training;
- Operational restrictions associated with these failures including any applicable Minimum Equipment List (MEL) considerations;
- Procedures for air start of the propulsion systems, including the APU, if required;
- Crew incapacitation;
- Use of emergency equipment including protective breathing and ditching equipment;
- Procedures to be followed in the event that there is a change in conditions at designated en-route alternates, which would preclude safe approach and landing;
- Understanding and effective use of approved additional or modified equipment required for EDTOs;
- Training on the fuel management procedures to be followed during the en-route portion of the flight. These procedures must provide for an independent cross-check of fuel quantity indicators. For example, fuel flows could be used to calculate fuel burned and compared with indicated fuel remaining; and
- Operators must develop and incorporate annual EDTO refresher training programmes for flight crew qualified for EDTO operations.

### **6.3 EDTO Check Programme**

6.3.1 The objective of the EDTO check programme should be to ensure standardised flight crew practices and procedures and also to emphasise the special nature of EDTOs. Only those with a demonstrated understanding of the unique requirements of EDTO should be designated as check pilots for EDTO.

## **7. Operational Limitations**

### **7.1 Flight Release Limitation**

7.1.1 The flight release limitation should specify the maximum diversion time from an EDTO alternate aerodrome for which an operator can conduct a particular EDTO. The maximum diversion time at the approved one-engine-inoperative cruise speed (under standard conditions in still air) must not be any greater than the value stated in the Air

Operator Certificate (AOC) holders EDTO Approval issued by CASA.

## **7.2 Use of Maximum Diversion Time**

7.2.1 The procedures established by the operator must ensure that EDTO is limited to flight plan routes where the approved maximum diversion time to EDTO alternates can be met under standard conditions in still air. Operators must provide for:

- Company procedures to state that, upon occurrence of an in-flight shut down of an engine in a two-engine aeroplane, the pilot must promptly initiate diversion to fly to, and land at, the nearest aerodrome, in terms of time, determined to be suitable by the flight crew; and
- A practice to be established such that, in the event of a single or multiple EDTO Maintenance significant system failure, the pilot will initiate the diversion procedure to fly to, and land at, the nearest aerodrome in terms of time, determined to be suitable by the flight crew, unless it has been justified that no substantial degradation of safety results from continuation of the planned flight.

7.2.2 Contingency procedures should not be interpreted in any way which prejudices the final authority and responsibility of the pilot-in-command for the safe operation of the aeroplane.

## **7.3 Requirement for EDTO approval**

7.3.1 Requirements for EDTO approval:

- An operator's aeroplane must not be operated on an EDTO flight unless authorised in the EDTO approval issued by CASA for both maintenance and operations; and
- Operators of aeroplanes with more than two engines operating on EDTO routes, in passenger carrying operations must comply with the operational and process requirements specified in the EDTO rules in CAO 82.0 from the 1st July 2015.

*Note: It is expected that the vein of CAO 82.0 that deals with EDTO will be incorporated in CASR Part 121 when this Part is made.*

## **7.4 Validation of Operator EDTO Maintenance and Operations Capability**

7.4.1 The operator must demonstrate that it has the competence and capability to safely conduct, and adequately

support, the intended operation. Before being granted EDTO operational approval, the operator must provide evidence that:

- The EDTO maintenance checks, servicing, and programmes called for in Appendix, B of this CAAP are being properly conducted and certified for by qualified personal; and
- EDTO flight release practices, policies, and procedures are established for operations to and from representative departure and destination aerodromes.

## **7.5 EDTO Proving Flight**

7.5.1 Following a type design approval for EDTOs in accordance with section 3 of this CAAP, and satisfactory application of the criteria in section 4, and before the issue by CASA of the operations approval, the operator's application and supporting data is to be forwarded to CASA. Following review and concurrence by CASA, an operational proving flight must be conducted in accordance with any additional guidance specified in the review and concurrence. When the proving flight has been evaluated and found acceptable, an applicant will be authorised to conduct EDTO with the specified airframe/engine combination. Approval to conduct EDTO is given by the issuance by CASA of operations specifications containing appropriate limitations.

7.5.2 A proving flight, in the aeroplane or an approved flight simulator (as determined by CASA on a case-by-case basis), must also incorporate demonstration of the following emergency procedures:

- Total loss of thrust of one engine;
- Total loss of normal generated electrical power; and
- Any other condition considered to be equivalent in airworthiness, crew workload, or performance risk.

## **7.6 Criteria for Operations beyond 180 minutes**

7.6.1 Each operator requesting approval to conduct EDTOs beyond 180 minutes must hold a current 180 minutes EDTO approval for the airframe/engine combination listed in their application. The amount of service experience may be increased or decreased after a review of the operator's experience taking into account all factors including the number of sectors. Before approval, the operator's capability to conduct operations and implement effective EDTO programmes in accordance with the criteria detailed in section 3 of this CAAP will be examined.

The record of the operator in conducting its 180 minute programme will be considered when granting approvals beyond 180 minutes diversion time. These operators must also demonstrate the additional capabilities discussed in this section. The area of operation will be defined by a specified maximum diversion time to an adequate aerodrome at the approved one-engine-inoperative cruise speed in still air.

7.6.2 The release limitation will be a specified maximum diversion time to an EDTO alternate at the approved one-engine-inoperative speed in still air.

## **7.7 Release Considerations**

### **7.7.1 Minimum Equipment List (MEL)**

- The MEL should reflect adequate levels of EDTO significant system redundancy to support the EDTO time requested. The systems listed in paragraph 5.1.1 of this CAAP must be considered.

### **7.7.2 Weather**

- An operator should substantiate that the weather information system which it utilises can be relied upon to forecast terminal and en-route weather with a reasonable degree of accuracy and reliability in the proposed area of operation.

## **7.8 Flight Planning**

7.8.1 The effects of wind and temperature at the one-engine-inoperative cruise altitude must be accounted for in the calculation of equal-time points. In addition, the operator's programme must provide flight crews with information on adequate aerodromes appropriate to the route to be flown which are not forecast to meet CAO 82.0, Appendix 5 EDTO alternate weather minima. Aerodrome facility information and other appropriate planning data concerning these aerodromes must be provided to flight crews for use when executing a diversion.

## **7.9 Crew Training and Evaluation**

7.9.1 If standby sources of electrical power significantly degrade cockpit instrumentation, approved training which simulates an instrument approach with the standby generator as the sole power source, must be conducted during initial and recurrent training.

## **7.10 Contingency Procedures**

7.10.1 Flight crews must be provided with detailed initial and recurrent training that emphasises established contingency procedures for each area of operation intended to be used.

## **7.11 Diversion Decision Making**

7.11.1 Special initial and recurrent training to prepare flight crews to evaluate probable propulsion and airframe systems failures must be conducted. The goal of this training must be to establish crew competency in dealing with the most probable operating contingencies.

7.11.2 Specific instruction must be included in the company operations manual so that paragraph 5.1.1 (*Alternate Aerodromes*) of this CAAP is observed, with the additional proviso that an alternate must be selected that is within the maximum diversion time, at the approved one-engine-inoperative speed (under standard conditions in still air).

## **7.12 Communications**

7.12.1 The operator must show the availability of communications services and facilities for air traffic control (ATC) communications and communications with the dispatch office. For company communications, operators must use the most reliable voice-based communications technology available. Rapid and reliable ATC communications are determined by the facilities operated by ATC units in the areas of operations. Operators must consider enhancements to their operational control system as soon as they become feasible.

## **7.13 Automated System Monitoring**

7.13.1 The provision of automated aeroplane system status monitoring must be considered in order to enhance the flight crew's ability to make timely diversion decisions.

## **7.14 Navigation Facilities**

7.14.1 Operators must show the availability of navigation facilities is adequate for the operation, taking into account the navigation equipment installed on the aeroplane, the navigation accuracy necessary for the planned route and altitude of flight, and the routes and altitudes to the aerodromes the operator may designate as EDTO alternates. Navigation facilities required to ensure a safe approach and landing must be available.

## **7.15 Weather Information System**

7.15.1 An operator should substantiate that the weather information system which it utilises can be relied upon to forecast terminal and en-route weather with a reasonable degree of accuracy and reliability in the proposed area(s) of operation. Such factors as staffing, dispatcher training, sources of weather reports and forecasts and, when possible, a record of forecast reliability, should be evaluated.

## **7.16 Passenger Recovery Plan**

7.16.1 The operator's formal passenger recovery plan for general application required under CAO 82.0 should be reviewed and determined to be adequate for the proposed EDTO in the event of an unplanned diversion and deplanement. The recovery plan should address the safety and wellbeing of passengers and crew at the diversion aerodrome, and include a plan to transfer the passengers and crew from that aerodrome safely and without undue delay.

7.16.2 The operator should be prepared to demonstrate the processes required to initiate and carry out its passenger recovery plan before EDTO approval is granted. The operator is expected to maintain the accuracy and completeness of its recovery plan.

## **8. Continuing Surveillance**

### **8.1 Continuing Surveillance**

8.1.1 The fleet average In Flight Shut Down (IFSD) rate for the specified airframe/engine combination will continue to be monitored in accordance with Appendix, B paragraph H of this CAAP. CASA will monitor the EDTOs that it has authorised to ensure that the levels of reliability achieved in EDTOs remain at the necessary levels and that the operation continues to be conducted safely.

In the event that an acceptable level of reliability is not maintained, if significant adverse trends exist, or if significant deficiencies are detected in the type design or the conduct of the EDTO operation, CASA will initiate a special evaluation, impose operational restrictions, if necessary, and stipulate corrective action for the operator to adopt in order to resolve the problems in a timely manner. CASA will alert the Certification Authority when a special evaluation is initiated and provide for their participation.

## **9. Polar Area Operations**

### **9.1 Polar Area (North and South Pole) Operations**

9.1.1 This section documents the requirement for the operator to develop plans in preparation for all polar flights in the north and south polar areas, and identifies equipment and aeroplane configuration requirements.

### **9.2 Area Approval**

9.2.1 Operators are required to obtain CASA approval to conduct these operations and also obtain approval to operate in the area of magnetic unreliability. CASA approval is granted by issue of appropriate operational specifications.

### **9.3 Requirements for En-route Alternates Aerodromes**

9.3.1 Unless conducting an EDTO, operators are expected to designate a set of alternate aerodromes that are not beyond the threshold time for the aeroplane type, such that one or more is forecast to be at or above the EDTO planning minima for the time during which it may be required. The flight must be able to make a safe landing and the aeroplane manoeuvred off the runway at the selected diversion aerodrome. In the event of a disabled aeroplane following landing, the capability to move the disabled aeroplane must exist so as not to block the operation of any recovery aeroplane. In addition, those aerodromes designated for use must be capable of protecting the safety of all personnel. For this purpose, facilities should be available to:

- Offload the passengers and crew in a safe manner during adverse weather conditions; and
- Provide for the physiological needs of the passengers and crew for the duration of the stay at the diversion aerodrome until safe evacuation, and the operator must be able to safely extract passengers and crew as soon as possible (execution and completion of the passenger recovery is expected as soon as possible within 48 hours following diversion).

9.3.2 For these operations, the passenger recovery plan discussed in paragraph 7.16.1 of this CAAP must include special consideration for the possibility of extreme weather, limited passenger facilities and the need to initiate passenger recovery without delay.

### **9.4 Fuel Freeze Strategy and Monitoring**

9.4.1 The operator may wish to develop a fuel freeze strategy and monitoring programme in lieu of using the standard minimum fuel freeze temperatures for specific types of fuel used. In such cases, the operator's fuel freeze analysis and monitoring program for the aeroplane fuel load is subject to CASA approval.

9.4.2 The operator should have procedures established that require coordination between maintenance, dispatch, and assigned flight crew to convey the determined fuel freeze temperature of the fuel load on board the aeroplane.

## **9.5 Communication Capability**

9.5.1 The operator must have an effective voice communications and/or data link capability for all portions of the flight route. Company communications may be accomplished using High Frequency (HF) voice, HF data link, Satellite Communication (SATCOM) voice or SATCOM data link. It is recognised that SATCOM may not be available for short periods during flight over the poles, particularly when operating on Polar Routes 1 and 2. Communication capability with HF radios may also be affected during periods of solar flare activity. The operator needs to consider, for each dispatched flight, the predicted solar flare activity and its effect on communications.

9.5.2 Training: The operator should reflect the following training requirements in its approved training programs:

- QFE/QNH and metre/feet conversions (required for flight crew and dispatcher training);
- Training requirements for fuel freeze – maintenance, dispatch, and flight crew training (special curriculum segments);
- General route-specific training on weather patterns;
- Relevant aircraft system limitations e.g. fuel temperature limits;
- Maintenance role in providing aeroplane systems capability information to dispatch and flight crew to aid the PIC in diversion decision-making;
- Crew training in the use of the extreme weather anti-exposure suit, where applicable;
- Dispatch and crew considerations during solar flare activity; and
- Training for flight crew and dispatcher role in the operator's passenger recovery plan.

## **9.6 Special Equipment for Polar Operations**

9.6.1 A minimum of two cold-weather anti-exposure suits will be required to be on board, so that outside coordination at a diversion aerodrome with extreme climatic conditions can be accomplished safely. A short-term MEL relief for this item may be granted provided the operator has arranged ground support provisions for providing such protective clothing at alternate aerodromes. CASA may relieve the operator from this requirement if the season of the year makes it unnecessary.

## **9.7 Proving Flight Before Approval**

9.7.1 In order to receive authorisation to conduct these operations, the operator may be required to conduct a CASA-observed proving flight. The proving flight may be conducted in the aeroplane or an approved flight simulator, as determined by CASA on a case-by-case basis. As part of the proving flight, the operator may be required to exercise its reaction and recovery plan in the event of a diversion to one of its designated alternates, with emphasis on:

- Communications;
- Coordination;
- Facilities;
- Accuracy of Notice to Airmen (NOTAM) and weather information; and
- Operability of ground equipment during the simulated diversion.

9.7.2 The details of the operator's recovery plan may be considered by CASA before the proving flight. CASA will give favourable consideration to a request by the operator to conduct the proving flight in passenger revenue status if the operator's recovery plan has previously been evaluated and deemed satisfactory by CASA. The carriage of cargo revenue is permissible for the purposes of a proving flight.

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Air Transport Operations Group

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**APPENDIX, A TO CAAP 82-1(0)****EXTENDED DIVERSION TIME OPERATIONS ALTERNATE REQUIREMENTS****A. GENERAL**

**A1.** One of the distinguishing features of two-engine extended diversion time operations (EDTOs), is the concept of an EDTO alternate aerodrome being available to which an aeroplane can divert after a single engine failure or failure combinations which require a diversion. Whereas most two-engined aeroplanes operate in an environment where there is usually a choice of diversion aerodromes available, the extended range aeroplane may have only one alternate within a range dictated by the endurance of a particular airframe system (e.g. cargo fire suppressant), or by the approved maximum diversion time for that route.

**A2.** It is, therefore, important that any aerodrome designated as an EDTO alternate has the capabilities, services and facilities to safely support that particular aeroplane. Also that the weather conditions at the time of arrival provide a high assurance that adequate visual references are available upon arrival at decision height (DH) or minimum descent altitude (MDA), additionally that the surface conditions are within acceptable limits to permit the approach and landing to be completed safely with one propulsion system and/or airframe systems inoperative.

**A3.** As well as satisfying the International Civil Aviation Order (ICAO) Annex 6 requirements in relation to crew qualification for operations on such routes, operators must show that the facilities and services specified are available for the proposed operations.

**B. EDTO AERODROME SELECTION**

**B1.** For an adequate aerodrome to be suitable as an EDTO alternate, it must have the capabilities, services and facilities necessary to designate it as an adequate aerodrome. Also it must have weather and field conditions at the time of that particular operation which provide a high assurance that an approach and landing can be safely completed with one propulsion system and/or airframe systems inoperative, in the event that a diversion to the en-route alternate becomes necessary. Due to the natural variability of weather conditions with time, as well as the need to determine the suitability of a particular en-route aerodrome prior to departure, the EDTO alternate weather minima for planning purposes are generally higher than the weather minima necessary to initiate an instrument approach. This is necessary to assure that the instrument approach can be conducted safely if the flight has to divert to the alternate aerodrome. The visual reference necessary to complete safely an approach and landing is determined by, among other things, the accuracy with which the aeroplane can be controlled along the approach path by reference to instrument aids. Since it is also determined by the tasks the pilot is required to accomplish to manoeuvre the aeroplane so as to complete the landing, the weather minima for non-precision approaches are generally higher than for precision approaches.

**C. STANDARD EN-ROUTE ALTERNATE AERODROME PRE-DEPARTURE WEATHER MINIMA**

**C1.** When an EDTO alternate meets the criteria specified in Civil Aviation Order (CAO) 82.0, Appendix, 5 clauses 7 or 8, but is forecast to deteriorate intermittently (INTER) or temporarily (TEMPO) below the landing minima, it may be nominated as a required EDTO alternate provided the critical fuel reserves have been calculated to include 30 or 60 minutes holding, as necessary. When a forecast provides for a probability (PROB) of less than 40% for a condition to occur, the condition need not be taken into account.

**D. EDTO ALTERNATE SUITABILITY IN FLIGHT**

**D1.** The suitability of an EDTO alternate aerodrome, for an aeroplane which encounters a situation in flight which may require a diversion while en-route on an EDTO, is based on a determination that the aerodrome is still suitable for the circumstances, and that the weather and field conditions at that aerodrome will permit an instrument approach to be initiated and a landing completed.

**APPENDIX, B TO CAAP 82-1(0)****EXTENDED DIVERSION TIME MAINTENANCE REQUIREMENTS****A. GENERAL**

**A1.** The system of maintenance (generally known as maintenance programme) should contain the standards, guidance and directions necessary to support the intended operations. Maintenance personnel involved, including maintenance sub-contractors' personnel, should be made aware of the special nature of extended diversion time operation (EDTO) and have the qualifications, authorisation, knowledge, skill and ability to accomplish the requirements of the programme.

**A2.** Any changes to the maintenance and training procedures, practices or limitations established in the qualification for EDTO must be submitted to the Civil Aviation Safety Authority (CASA) or an authorised person prior to implementation.

**A3.** EDTO-specific maintenance requirements do not apply in the case of aeroplanes having more than two engines.

**B. EDTO MAINTENANCE PROGRAMME**

**B1.** The approved system of maintenance of the aircraft should be reviewed and supplemented as necessary to ensure that it adequately provides for the continued airworthiness for the aircraft being considered for EDTO:

- EDTO related tasks should be identified on the operator's routine work forms and related instructions.
- EDTO related procedures, such as maintenance of EDTO significant system items should be clearly defined in the system of maintenance.
- An EDTO service check should be developed to verify that the status of the aeroplane and certain critical items are acceptable. This check should be accomplished and signed off by an authorised and qualified person prior to an EDTO flight. A member of the flight crew may also perform these checks, if appropriately trained and authorised.
- Logbooks should be reviewed and documented, as appropriate, to ensure proper Minimum Equipment List (MEL) procedures, deferred items and maintenance checks, and that system verification procedures have been properly performed.

**B2. Scheduled Maintenance of Multiple Identical Systems**

- The operator should identify specific maintenance activities that are to be carried out to multiple identical systems on a planned basis.
- If the maintenance activities identified above are carried out, a subsequent EDTO verification flight is not required if the operator has identified the activity and has a procedure in place which provides an equivalent level of safety.
- Where the disturbance to multiple identical systems is unavoidable during a scheduled check, the maintenance personnel carrying out the maintenance task must not repeat that task on an identical system, on the same aeroplane during that check.
- If a disturbance occurs which is otherwise unavoidable during a scheduled check, separate maintenance personnel must carry out the respective system's maintenance tasks with an independent physical check completed and signed for by an authorised person.

- Any maintenance task which disturbs multiple identical elements of EDTO significant systems should be identified as such on the operator's work forms and instructions.
- Upon completion of maintenance, complete and adequate testing should be carried out in accordance with the aeroplane maintenance manual/s and modification instructions.
- An EDTO verification flight should be carried out where ground testing cannot provide positive assurance of serviceability.
- After the disturbance of a component which, if it was to leak, could cause loss of system fluid (oil, fuel, hydraulic or air) a high power engine ground run is required to check system integrity.

*Note: Servicing of fluids and gases is not considered multiple maintenance action.*

### **B3. Unscheduled maintenance**

- When unscheduled maintenance is carried out which disturbs identical elements of EDTO significant systems the system should be tested after rectification in accordance with the aeroplane maintenance manual procedures to provide positive assurance of serviceability.
- An EDTO verification flight should be carried out where ground testing cannot provide positive assurance of serviceability.
- Maintenance action must be taken to isolate faults that are intermittent in nature and if the fault cannot be positively corrected an EDTO verification flight should be carried out.

## **C. EDTO MANUAL**

**C1.** The operator should develop a manual for use by personnel involved in EDTO. All EDTO maintenance requirements and procedures should be identified in this manual as well as the specific duties, number and identity of qualified and authorised personnel, responsibilities, processes and procedures assigned to the various Maintenance & Engineering departments. Samples of the forms and reports should be included.

**C2.** The EDTO Manual can be a chapter in the operator's existing Maintenance Control Manual (MCM) or it can be produced as a separate document. In either case, the EDTO Manual should provide complete details on each topic or can reference other documentation where the information is located. For example, the EDTO Pre-departure Service Check (PDSC) can be listed in the EDTO Manual or the EDTO Manual can reference the operator's PDSC task card or other manual where the check is defined. The format of the EDTO Manual, as well as identification number should be consistent with the operator's documentation system. Document handling should be in accordance with the operator's current policies relative to revision and distribution.

## **D. OIL CONSUMPTION PROGRAMME**

**D1.** The operator should implement an ETOPS oil consumption monitoring programme. The operator's oil consumption programme should reflect the manufacturer's recommendations. The programme should contain procedures to monitor and respond to oil consumption trends. It should consider the amount of oil added at each departing station with reference to the running average consumption, i.e. the monitoring must be continuous up to, and including, oil added at each departure station. If oil analysis is meaningful to this make and model, it should be included in the programme. If the auxiliary power unit (APU) is required for EDTO operation, it should be added to the oil consumption programme.

## **E. ENGINE CONDITION MONITORING**

**E1.** This programme should describe the parameters to be monitored, method of data collection and corrective action process. The programme should reflect manufacturer's instructions and industry practice. The information resulting from this monitoring process is to be used by the operator to detect deterioration at an early stage to allow for corrective action before safe operation is affected. The programme must ensure that engine limit margins are maintained so that a prolonged single-engine diversion may be conducted without exceeding approved engine limits (i.e. rotor speeds, exhaust gas temperature) at all approved power levels and expected environmental conditions. Engine margins preserved through this programme must account for the effects of additional engine loading demands (e.g. anti-icing, electrical, etc.) which may be required during the single-engine flight phase associated with the diversion.

## **F. VERIFICATION PROGRAMME AFTER MAINTENANCE**

**F1.** The operator must develop a verification programme, or procedures should be established, to ensure corrective action following an engine shutdown, EDTO significant system failure or adverse trends or any prescribed events which require a verification flight or other action and establish means to assure their accomplishment. A clear description of who must initiate verification actions, and the section or group responsible for the determination of what action is necessary, must be identified in the programme. Primary systems or conditions requiring verification actions must be described in the operator's EDTO manual. A maintenance verification flight can be a non-revenue flight, a non-EDTO revenue flight, or the first 60 minutes of an EDTO flight. It is essential that the verification of a maintenance action be done immediately following the action. If verification will take longer than 60 minutes, then the aircraft must remain within 60 minutes of an alternate airport until verification is accomplished. If the verification is unsatisfactory, the flight must either be re-routed to remain within the operator's EDTO Threshold Time of an EDTO Alternate Aerodrome or turn back.

## **G. RELIABILITY PROGRAMME**

**G1.** An EDTO reliability programme should be developed or the existing reliability programme supplemented. This programme must be designed to achieve early identification and prevention of EDTO related problems as the primary goal. The programme should be event-orientated and incorporate reporting procedures for significant events detrimental to EDTO flights. This information should be readily available for use by the operator and CASA to help establish that the reliability level is adequate, and to assess the operator's competence and capability to safely continue EDTO. CASA must be notified within 72 hours of events reportable through this programme.

**G2.** In addition to the items required to be reported by regulation, the following items must-be included:

- In-flight shutdowns;
- Diversion or turnback;
- Uncommented power changes or surges; and
- Inability to control the engine or obtain desired power; and problems with EDTO significant systems.

**G3.** The report must identify the following:

- Aeroplane identification;
- Engine identification (make and serial number);
- Total time, cycles and time since last maintenance inspection;
- For systems, time since overhaul or last inspection of the defective unit;
- Phase of flight; and
- Corrective action.

## **H. PROPULSION SYSTEM MONITORING**

**H1.** The operator's assessment of propulsion systems reliability for the extended range fleet must be made available to CASA (with the supporting data) on at least a quarterly basis, to ensure that the approved system of maintenance continues to maintain a level of reliability necessary for EDTO.

**H2.** The assessment must include - as a minimum - engine hours flown in the period, in-flight shut-down rate for all causes and engine removal rate, on a 12 month moving average basis. Where the combined extended range fleet is part of a larger fleet of the same airframe/engine combination, data from the operator's total fleet will be acceptable. However, the reporting requirements of section G of this Appendix, should still be observed for the extended range fleet.

**H3.** If the in-flight shut down (IFSD) rate computed on a 12 month rolling average exceeds the following values, the operator must investigate common cause effects or systemic errors:

- 0.05/1000 engine hours for EDTO up to and including 120 minutes.
- 0.03/1000 engine hours for EDTO beyond 120 minutes up to and including 180 minutes.
- 0.02/1000 engine hours for EDTO beyond 180 minutes.

**H4.** Any adverse sustained trend would require an immediate evaluation to be accomplished by the operator in consultation with CASA. The evaluation may result in corrective action or operational restrictions being applied.

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

## **I. MAINTENANCE TRAINING**

**I1.** The maintenance training must focus on the special nature of EDTO. This programme must be in addition to the operator's normal maintenance training. The goal of this programme is to ensure that all personnel involved in EDTO are provided with the necessary training so that the EDTO maintenance tasks are properly accomplished and to emphasise the special nature of EDTO maintenance requirements. Qualified maintenance personnel are those who have completed the operator's EDTO training programme and have satisfactorily performed EDTO tasks under supervision, within the framework of the operator's approved procedures for personnel authorisation.

**J. EDTO PARTS CONTROL**

**J1.** The operator must develop a parts control programme with support from the manufacturer, that ensures the proper parts and configuration are maintained for EDTO. The programme includes verification that parts placed on an EDTO aeroplane during parts borrowing or pooling arrangements, as well as those parts used after repair or overhaul, maintain the necessary EDTO configuration for that aeroplane.