



Civil Aviation Advisory Publication

January 2015

Extended Diversion Time Operations (EDTO)

This Civil Aviation Advisory Publication (CAAP) provides guidance, interpretation and explanation on complying with the *Civil Aviation Regulations 1988* (CAR) or a Civil Aviation Order (CAO).

This CAAP provides advisory information to the aviation industry in support of a particular CAR or CAO. Ordinarily, the CAAP will provide additional 'how to' information not found in the source CAR, or elsewhere.

A CAAP is not intended to clarify the intent of a CAR, which must be clear from a reading of the regulation itself, nor may the CAAP contain mandatory requirements not contained in legislation.

Note: Read this advisory publication in conjunction with the appropriate regulations/orders.

This CAAP will be of interest to:

This CAAP applies to all Air Operator Certificate (AOC) holders' of Australian aeroplanes used to conduct regular public transport (RPT) and charter operations.

Why this publication was written

This CAAP provides background information and guidance to AOC holders seeking approval under CAO 82.0 to conduct extended diversion time operations (EDTO). The objectives of the changes in this CAAP revision are to:

- adopt international standards for EDTO
- ensure consistency of safety standards through the EDTO approval process
- provide appropriate EDTO standards for larger aeroplanes

Status of this CAAP

This is the first revision to be made to this CAAP and supersedes CAAP 82-1(0) published July 2007. The following are the major changes included in this revision:

- included Section 2 Definitions
- clarify the specific EDTO requirements for aeroplanes with two engines and those aeroplanes with more than two engines
- introduce the 60 minute threshold time for aeroplanes with two engines
- consolidate original Appendix A into Subsection 5.3 EDTO Alternate aerodromes
- expanded section 6 related to training and inclusive of syllabus Appendix 1
- expanded Section 9 Polar Operations
- removal of Appendix B maintenance requirements

For further information

Telephone the CASA Office closest to you on 131 757.

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The relevant regulations and other references

- Civil Aviation Order (CAO) 82.0 Air Operator's Certificates.
- Annex 6, Part I – Operation of Aircraft, to the Chicago Convention.
- CASA Form 977 – Application for Extended Diversion Time Operations (EDTO) Approval available from: www.casa.gov.au/forms
- Federal Aviation Administration (FAA) AC 120-42B- Extended Operations (ETOPS) and Polar Operations.
- European Aviation Safety Agency (EASA) AMC 20-6 Rev. 2 Extended Range Operation with Two-Engine Aeroplanes ETOPS Certification and Operation.
- Transport Canada TP 6327E-Safety Criteria for Approval of Extended Range Twin-Engine Operations.

1. Acronyms

AD	Airworthiness Directive
AFM	Aircraft Flight Manual
AOC	Air Operators Certificate
APU	Auxiliary Power Unit
ATC	Air Traffic Control
CAAP	Civil Aviation Advisory Publication
CAO	Civil Aviation Order
CAR 19887	Civil Aviation Regulations (1988)
CASA	Civil Aviation Safety Authority
CASR 1998	Civil Aviation Safety Regulations (1998)
CMP	Configuration Maintenance and Procedures
DH	Decision Height
EASA	European Aviation Safety Agency
EDTO	Extended Diversion Time Operations

ETOPS	Extended Twin-Engined Aeroplane Operations
FAA	Federal Aviation Administration (of the USA)
FAR	Federal Aviation Regulations (of the USA)
HF	High Frequency (3000 to 30 000 KHZ)
ICAO	International Civil Aviation Organization
IFSD	In-flight Shut Down
INTER	Intermittent
ISA	International Standard Atmosphere
JAR	Joint Aviation Requirements (of the Joint Aviation Authorities Europe)
MCM	Maintenance Control Manual
MDA	Minimum Descent Altitude
MEL	Minimum Equipment List
MMEL	Master Minimum Equipment List
NAA	National Airworthiness Authority
NOTAM	Notice to Airmen
PDSC	Pre-departure Service Check
PIC	Pilot-in-command
QFE	Q code – nautical height (see definitions)
QNH	Q code – field elevation (see definitions)
PIC	Pilot in Command
PROB	Probability
RAT	Ram Air Turbine
RFFS	Rescue and firefighting services
SATCOM	Satellite Communication
STC	Supplemental Type Certificate
TCDS	Type Certificate Data Sheet
TEMPO	Temporary

2. Definitions

ADEQUATE AERODROME – An aerodrome at which the aeroplane landing distance performance requirements at the expected landing weight can be met and which is expected to be available, if required, and which has the necessary facilities and services, such as air traffic services, lighting, communications, meteorological services, navigation aids, aerodrome rescue and fire-fighting services and at least one suitable authorised instrument approach procedure.

APPROVED ALL ENGINE OPERATING (AEO) SPEED – The approved AEO cruise speed for the aeroplane must be a speed, within the certified limits of the aeroplane, selected by the operator and approved by CASA. The AEO speed may be different from the speed used for the maximum diversion time and threshold time.

AREA OF OPERATION – The area within which EDTO operations are approved where the EDTO diversion time, at any point along the proposed route of the flight, to an EDTO en-route alternate aerodrome, is within the operators approved EDTO maximum diversion time, in ISA conditions, still air, at the approved OEI or AEO cruise speed, as applicable.

APPROVED ONE ENGINE INOPERATIVE (OEI) SPEED – The approved OEI cruise speed for the intended area of operation must be a speed, within the certificated limits of the aeroplane, selected

by the operator and approved by CASA. The speed should be the same speed used to determine the fuel reserves for one engine inoperative flight, but may be different from the speed used for the maximum diversion and threshold time.

COCKPIT DOCUMENTATION – means any document taken into, or downloaded in the cockpit of an aeroplane by (or for) the pilot in command, for the purpose of flying and navigating the aeroplane, and includes, for example, a computerised flight plan.

CRITICAL POINT (CP) – is the point along a route which is most critical from a fuel requirement point of view from which an aeroplane can proceed towards the destination or initiate a diversion to another aerodrome. The CP is usually, but not always, the last equal- time point (ETP - see below).

DIVERSION DECISION – Procedures for flight crew should outline the criteria that indicate when a diversion or change of routing is recommended whilst conducting an EDTO flight. For an EDTO flight, in the event of the shutdown of an engine, the diversion decision should take into account the procedure for the engine shutdown, the diversion to fly to and land at the nearest aerodrome appropriate for landing.

EDTO – any flight by a turbine-engine aeroplane where the flight time from a point on the route to an adequate aerodrome, at the OEI cruise speed for aeroplanes with two engines, or at the AEO cruise speed for aeroplanes with more than two engines, is greater than the threshold time.

EDTO ALTERNATE AERODROME – is an adequate aerodrome that is listed in the operator's operations manual that meets the requirements specified in Section 2 of CAO 82.0 and the weather requirements of the EDTO alternate aerodrome planning minima requirements in Sections 7 and 8 of Appendix 5 to CAO 82.0.

EDTO DISPATCH – is when the aeroplane first moves under its own power for the purpose of taking-off for an EDTO flight.

EDTO MAXIMUM DIVERSION DISTANCE – is the approved EDTO maximum diversion time at the approved OEI cruise speed, or in the case of aeroplanes with more than two engines the approved AEO cruise speed, used throughout the flight profile.

EDTO SIGNIFICANT SYSTEMS – are the aeroplane's propulsion systems and any other aeroplane systems whose failure or malfunction could adversely affect the safety of an EDTO flight, or whose functioning is specifically important to continued safe flight and landing during an EDTO aeroplane diversion.

ENTRY POINT – is the first point along the aeroplane's outbound route beyond which the aeroplane is no longer continuously within the threshold time, at the approved cruise speed (OEI or AEO), in still air and international standard atmosphere (ISA) conditions, from an adequate aerodrome.

EQUAL TIME POINT (ETP) – is a point along the route which is located at the same flight time from two points. *(Note: also referred to as Equi-Time Point)*

EXIT POINT – is the first point along the aeroplane's route where the aeroplane can fly continuously within the Threshold time, at the approved cruise speed (OEI or AEO), in still air and ISA conditions, from an adequate aerodrome.

FLIGHT/DISPATCH RELEASE – can take many forms (i.e. a computerised flight plan) and will include references to:

- the EDTO alternates for the flight
- the approved EDTO maximum diversion time under which the flight has been released or dispatched.

The release will also take into account the Minimum Equipment List (MEL), weather and Notice to Airmen (NOTAM) information relevant to the flight.

MAXIMUM DIVERSION TIME – is the time approved by CASA for an operator's airframe/engine combination.

For an aeroplane with 2 turbine engines the approved maximum diversion time should not exceed the most limiting EDTO significant system time limitation identified in the AFM reduced by an operational margin of at least 15 minutes.

For an aeroplane with more than 2 turbine engines type design approval is not required. The maximum diversion time should take into consideration the aeroplane's EDTO significant systems (i.e. time limiting system) – if any – indicated in the AFM or in the OEM Operations Manual. It must be relevant to that particular operation for a particular aeroplane type and the operator's operational and EDTO experience with the aeroplane type; or, if relevant, with another aeroplane type or model.

For aeroplanes with more than two engines the maximum diversion time may be limited by the capability of the Cargo Fire Suppression Systems (CFSS).

OPERATOR'S APPROVED DIVERSION TIME – is the maximum time authorised by CASA that the operator can operate an aeroplane type at the approved OEI cruise speed (under standard conditions in still air) from an adequate aerodrome for the area of operation.

QFE – is the barometric altimeter setting that causes an altimeter to read zero when at the reference datum of a particular airfield (in practice, the reference datum is either an airfield center or a runway threshold). In ISA temperature conditions the altimeter will read height above the airfield/runway threshold in the vicinity of the airfield.

QNH – is the barometric altimeter setting that causes an altimeter to read airfield elevation when on the airfield. In ISA temperature conditions the altimeter will read altitude above mean sea level in the vicinity of the airfield

THRESHOLD TIME – is not an operating limit. It is a flight time to an en-route alternate aerodrome which is established by CASA as being the EDTO threshold beyond which particular consideration is given to aeroplane capability, as well as the operator's relevant operational experience before granting an EDTO approval up to the maximum diversion time. The CASA approved threshold time for aeroplanes with two turbine engines is 60 minutes and for aeroplanes with more than two turbine engines – 180 minutes. The maximum threshold time approved by CASA is 180 minutes.

3. Introduction

3.1 EDTO

3.1.1 The EDTO approval process for large aeroplanes is valid for RPT or charter operations. For aeroplanes with two engines to be eligible for EDTO, the specified airframe/engine combination must have been certified to the airworthiness standards of Transport Category aeroplanes Federal Aviation Regulation (FAR) Part 25, the EASA CS25 or the equivalent.

3.1.2 Application for an EDTO approval is regulated under Appendix 4 to CAO 82.0 and applications for approval to conduct EDTO should be made using Form 977, available from: <http://www.casa.gov.au/forms>. At least 90 days should be allowed for processing by CASA, particularly with new applications. It should be noted that the information requested in the form is comprehensive and a complete compilation will assist operators in the planning of these operations.

3.2 EDTO approval process - aeroplanes with two turbine engines

3.2.1 The approval process in order to gain CASA EDTO approval can be divided into two steps. Eligibility for EDTO:

- 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 FAR Part 25/33, the EASA CS25 and associated advisory material.

Capability for EDTO:

- The applicant must demonstrate that an airframe/engine combination, having been recognised as eligible for EDTO, also has a level of reliability appropriate to the intended operation. Manufacturer's or operator's reliability monitoring programs may be taken into account for this purpose.

3.3 Evidence of type design approval – aeroplanes with two turbine engines

3.3.1 Evidence that the type design of the aeroplane is approved for EDTO 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 information:

- special limitations (if necessary), including any limitations associated with a specific maximum diversion time
- additional markings or placards (if required)
- reference to the performance section
- specific EDTO equipment installation, and related flight crew EDTO procedures
- description or reference to a document containing the approved aeroplane configuration, maintenance and procedures (CMP) standards.

3.3.2 Detailed compliance documents for the type design approval are not required if CASA has already given approval to another operator to operate EDTO with the same airframe/engine combination. An applicant can contact their regional CASA office for this information.

3.3.3 CASA does not evaluate airframe/engine combination design features, or their reliability, for the suitability of EDTO; however, for an aircraft with a type acceptance certificate issued under regulation 21.029A of CASR 1998, issued by the National Airworthiness Authority (NAA), for a country other than Australia, of the state of type design approvals for EDTO are acceptable by CASA.

3.4 Modifications of type design – aeroplanes with two turbine engines

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

3.4.2 Approval is required for additional modifications or maintenance actions generated by an operator or manufacturer of the aeroplane.

3.4.3 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.

3.4.4 The Airworthiness Directive (AD) process may be utilised as necessary to implement a CMP standard change.

3.5 Continuing airworthiness – aeroplanes with two turbine engines

3.5.1 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 safety of the EDTO. In effect, the CMP standards prior to a revision will no longer be considered suitable for continued EDTO.

3.5.2 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.

3.6 Operations approval (airworthiness) – aeroplanes with two turbine engines

3.6.1 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 EDTO (see section 6 of this CAAP).

3.6.2 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 ADs and Service Bulletins.

4. Operational approval considerations

4.1 General

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

- EDTO with a maximum diversion time from 60 minutes up to 180 minutes to an en-route alternate (at the approved OEI cruise speed)
- EDTO with a maximum diversion time from 180 minutes up to 240 minutes to an en-route alternate (at the approved OEI cruise speed)
- EDTO with a maximum diversion time above 240 minutes (at the approved OEI cruise speed).

4.1.2 From 1st July 2015 an EDTO approval will be required for aeroplanes with more than two engines for operations with a maximum diversion time more than 180 minutes (at the approved AEO cruise speed).

Note: In the case of EDTO flights with maximum diversion times beyond 180 minutes, additional flight dispatch requirements apply. Refer to Appendices 4 and 5 to CAO 82.0.

4.2 Operational assessment process

4.2.1 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 program
- aircraft certification status.

4.2.2 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.

4.3 Assessment of the operator's propulsion system reliability – aeroplanes with two turbine engines

4.3.1 An assessment will be made to ensure 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.

4.4 Engineering modifications and maintenance program considerations – aeroplanes with two turbine engines

4.4.1 Although these considerations are normally part of the operator's continuing airworthiness program, the maintenance and reliability program may need to be supplemented in consideration of the special requirements of EDTO. The following items, as part of the operator's program, will be reviewed to ensure that they are adequate for EDTO.

4.4.2 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.

4.4.3 Maintenance procedures:

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

4.4.4 Reliability reporting for aeroplanes:

- The reliability reporting program, as supplemented and approved, must be implemented prior to, and continued after the 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.

4.4.5 Implementation:

- Approved modifications and inspections, which would maintain the reliability objective for the propulsion and airframe systems as a consequence of AD actions 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 ADs. An operator needs to ensure compliance with both the ADs applicable in Australia and the CMP standards when operating EDTO.

4.4.6 Control process:

- Procedures, and a centralised control process, must be established which would prevent:
 - o an aeroplane being released for EDTO after propulsion system shutdown
 - or
 - o EDTO significant system failure on a previous flight
 - or
 - o 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.

4.4.7 Programs:

- The maintenance program 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 programs as engine condition monitoring and engine and auxiliary power unit (APU) (if required for EDTO) and oil consumption monitoring.

4.4.8 Qualified personnel:

- The maintenance program must ensure that adequate numbers of qualified personnel are trained and authorised to competently perform the maintenance program.

5. Flight preparation and in-flight considerations

The flight preparation includes completion of the flight release. The flight release can have many steps and take many different forms such as a computerised flight plan with references to the EDTO alternate aerodromes for the flight, and the approved EDTO maximum diversion time under which the flight has been released or dispatched. The release will also take into account the MEL, weather and NOTAM information relevant to the flight. The following flight release considerations apply to EDTO.

5.1 MEL

5.1.1 System redundancy levels appropriate to EDTO 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
- any other equipment necessary for EDTO.

5.1.2 MEL considerations for aeroplanes with more than two engines on an EDTO should include reference to system requirements appropriate for the approved maximum diversion time (e.g. communications, fuel and cargo fire suppression systems requirements). Engine and APU oil consumption should also be considered.

5.2 Communication and navigation facilities

5.2.1 An aeroplane must not be released for an EDTO unless communications facilities are available to provide, under normal conditions of propagation at the appropriate OEI cruise altitudes, reliable:

- two-way communications between the aeroplane and the operator's operational control centre
- two-way communication between the aeroplane and the appropriate air traffic service (ATC) unit over the planned route of flight
- over the routes to any suitable alternate to be used in the event of diversion
- non-visual ground or other navigation aids are available and located to provide the navigation accuracy necessary for the planned route and altitude of flight, and the routes to any alternate aerodrome and altitudes to be used (taking into account the navigation equipment installed in the aeroplane)
- visual and non-visual aids are available at the specified alternates for the anticipated types of approaches and operating minima.

5.2.2 Where EDTO approval exceeds 180 minutes, a second means of communication is required. (See Appendix 5 to CAO 82.0).

5.3 EDTO alternate aerodromes

5.3.1 An aeroplane must not be released for 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 aeroplane system failure(s) which require a diversion, are listed in the cockpit documentation and specified in the operational flight plan.

5.3.2 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 aeroplane system failures, an aerodrome must not be listed as an EDTO alternate unless the requirements of Appendix 2 to CAO 82.0 - Adequate Aerodromes - physical requirements are met.

5.3.3 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 i.e. approach lights requirements etc.

5.3.4 Prior to dispatch of the flight, the latest available forecast weather conditions for the period commencing at the earliest time of landing and ending at the latest time of landing at that aerodrome equals or exceeds the authorised alternate aerodrome planning minima requirements for EDTO alternate aerodromes in clauses 7 or 8 of Appendix 5 to CAO 82.0. CASA may approve an AOC holder to use global positioning system (GPS)/ area navigation (RNAV) based instrument approach and low visibility category (CAT) II or CAT III approaches and landing procedures at an EDTO alternate aerodrome.

5.3.5 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's recommended crosswind for a one-engine inoperative landing (if published); or
- the maximum demonstrated crosswind (whichever is less), taking into account the runway condition (dry, wet or contaminated).

5.3.6 When planning and conducting the flight, adverse weather conditions at EDTO alternates having forecast probabilities of less than 40% may be disregarded, except for phenomena such as:

- fog
- mist

- dust
- sand
- smoke
- haze restricting visibility below the minima.

5.3.7 When planning and conducting the flight, adverse weather conditions at EDTO alternates forecasting intermittent (INTER) or temporary (TEMPO) should be taken into account when determining the amount of fuel to be carried.

5.3.8 During the course of the flight, the operator must inform the flight crew of any significant changes in conditions at required EDTO alternates. Before proceeding beyond the EDTO entry point, the forecast weather for the time periods established above, the following must be evaluated:

- aeroplane status (e.g. inflight un-serviceability's or MEL items that may affect the operation)
- fuel remaining
- runway surface conditions
- landing distances
- aerodrome services and facilities at designated EDTO alternates.

If any conditions are identified prior to the EDTO entry point (i.e. weather forecast below landing minima) which would preclude a safe approach and landing, the pilot-in-command (PIC) must be notified and an acceptable EDTO alternate selected where a safe approach and landing can be made.

5.3.9 After an EDTO flight has proceeded beyond the applicable EDTO entry point, the operator must keep the 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.

5.3.10 Operators should provide flight crews with information on adequate aerodromes appropriate to the route to be flown which are not suitable aerodromes, such as the weather forecast for these aerodromes does not meet clauses 7 or 8 to Appendix 5 to CAO 82.0 – alternate aerodrome planning minima. Pilots should monitor the conditions at adequate aerodromes relevant to the flight throughout the flight.

5.3.11 Aerodrome facility information and other appropriate planning data concerning these aerodromes should be provided to flight crews in the event that a diversion is required at any stage during the flight.

5.3.12 For EDTO planning purposes, the minimum International Civil Aviation Organization (ICAO) rescue and firefighting services (RFFS) CAT 4 (or equivalent) must be available within 30 minutes notice at each aerodrome listed as an EDTO alternate aerodrome.

5.4 Aeroplane performance data

5.4.1 The operator's operations manual should contain sufficient data to support the most critical fuel scenario (ensuring reserves) and area of operations calculation (i.e. maximum diversions distance rings).

5.4.2 The following data should be based on information provided in the AFM:

- Detailed OEI performance data, including fuel flow for standard and non-standard atmospheric conditions, as a function of airspeed and power setting (where appropriate) covering:
 - o approved OEI cruise speed
 - o drift down (includes net performance)
 - o cruise altitude coverage (including 10,000ft.)

- o holding
- o altitude capability (including net performance)
- o missed approach.
- Detailed AEO performance data, including nominal fuel flow data, for standard and non-standard atmospheric conditions, as a function of airspeed and power setting (where appropriate) covering:
 - o approved AEO cruise speed
 - o cruise altitude coverage (including 10,000ft.)
 - o 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, etc.

5.5 Aeroplane performance

5.5.1 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 obstacle clearance requirements.

5.6 Flight dispatcher and operational control

5.6.1 For EDTO flights flight dispatcher and operational control:

- provide operational control exercising responsibility for initiation, continuation, termination or diversion of an EDTO flight
- incorporate flight dispatch procedures for the control and supervision of EDTO flights.

5.6.2 Flight dispatch officers:

- assist the PIC in flight preparation and provide relevant information
- assist the PIC in preparing the operational flight plan.
- furnish the PIC while in flight:
 - o with information which may be necessary for the safe conduct of the flight
 - o with the appropriate information prior to the EDTO entry point.
- In the case of an emergency:
 - o initiate procedures as outlined in the operations manual
 - o convey safety related information to the PIC that may be necessary for the safe conduct of the flight.

6. Flight crew training and documentation

6.1 Adequacy of flight crew training and operations manuals

6.1.1 An operator should ensure that prior to conducting EDTO, each crew member has completed EDTO training and checking successfully in accordance with a syllabus approved by CASA and detailed in the operations manual. See Appendix 1 to this CAAP for an example of EDTO training syllabus.

6.1.2 The training should be aeroplane type and area of operation specific in accordance with the applicable operational requirements.

6.1.3 The operator should ensure that flight crew members are not assigned to operate EDTO routes for which they have not successfully completed the required training, including route qualification training.

6.2 Reviews

6.2.1 CASA will review in-service experience of EDTO significant systems for aeroplanes with two engines. The review will include system reliability levels and individual event circumstances (including actions taken by the crew in response to equipment failures or malfunctions). The purpose of the review will be to verify the adequacy of information provided in training programs and operations manuals. The operator should provide information for, and participate in, these reviews.

6.2.2 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.

6.3 Flight crew training and evaluation program

6.3.1 The operator's training program must provide initial and recurrent training for flight crew members for EDTO operations. This training should be followed by subsequent evaluations and proficiency checks.

6.3.2 An example of a training syllabus can be found in Appendix 1 to this CAAP.

6.3.3 Specific 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. (See section 7.9 – Diversion decision making)

6.3.4 The use of appropriate navigation and communication systems, including appropriate flight management devices is vital to this training.

6.4 Specific EDTO training requirements

6.4.1 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 unforeseeable failures for each area of operation, including:

- procedures for single and multiple failures in-flight affecting EDTO entry and diversion decisions.
 - o For example, if standby sources of electrical power significantly degrade cockpit instrumentation, then training which simulates approach with the standby generator as the sole power source should be conducted during initial and recurrent training
- operational restrictions associated with these failures (including any applicable MEL considerations)
- crew incapacitation
- use of emergency equipment (including cold weather gear and ditching equipment)
- procedures to be followed in the event that there is a change in conditions at designated EDTO en-route alternates for the flight, which would preclude safe approach and landing
- understanding and effective use of approved additional or modified equipment required for EDTOs
- flight crew procedures unique to EDTO
- fuel management procedures to be followed during the en-route portion of the flight.
 - o These procedures must provide for an independent cross-check of fuel quantity indicators, (e.g. fuel flows could be used to calculate fuel burned and compared with indicated fuel remaining).

- fuel management accounting for discrepancies between planned fuel remaining and actual fuel remaining
- passenger recovery plan.

6.5 EDTO check program

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

6.6 Diversion decision making

6.6.1 The operator's operations manual must establish procedures for flight crew outlining the criteria that indicate when a diversion or change of routing is recommended whilst conducting an EDTO.

6.6.2 Contingency procedures should not be interpreted in a way that prejudices the final authority and responsibility of the PIC for the safe operation of the aeroplane.

6.7 Flight dispatcher

6.7.1 Dispatchers provide assistance to the PIC in pre-flight preparations and act as a close link between the aircraft in-flight and the ground services and also between the crew members and the operator's other ground staff.

6.7.2 Flight operations personnel that are involved in the dispatch of EDTO flights should be competently trained and recent in duties related to EDTO dispatch and in-flight following.

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 OEI (or AEO for aeroplanes with more than two engines) cruise speed must not be any greater than the value stated in the Air Operator Certificate (AOC) holder's 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 EDTO maximum diversion time to EDTO alternates can be met under standard conditions in still air. Operators must provide:

- company procedures to state that, upon occurrence of an in-flight shut down of an engine in a two-engine aeroplane, the PIC, considering all the relevant factors must promptly initiate diversion to, and land at, the nearest suitable aerodrome
- a practice to be established such that, in the event of a single or multiple EDTO significant system failure, the pilot will initiate the diversion procedure to fly to, and land at, the nearest suitable aerodrome. Taking into account the nature of the diversion and suitability of aerodromes, unless it has been justified that no substantial degradation of safety results from continuation of the planned flight.

7.3 Requirements for EDTO approval

7.3.1 The requirements for EDTO approval are:

- 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
- from 1st July 2015, operators of aeroplanes with more than two turbine engines will require approval to operate with EDTO maximum diversion times greater than the threshold time of 180 minutes.
- passenger carrying operations must comply with the operational and process requirements specified in the EDTO rules in CAO 82.0 (these aeroplane types are not required to be EDTO type design approved)

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, the operator will be authorised to conduct EDTO with the specified airframe/engine combination. CASA will issue an approval to conduct EDTO containing operations specifications and appropriate limitations.

7.4 Validation of operator EDTO maintenance and operations capability

7.4.1 The operator must demonstrate that they have 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 programs are properly conducted and certified by qualified personal
- EDTO flight release practices, policies, and procedures are established for operations to and from representative departure and destination aerodromes.

7.5 EDTO proving flight for aeroplanes with two engines.

7.5.1 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 pressurization
- total loss of normal generated electrical power
- any other condition considered to be equivalent in airworthiness, crew workload, or performance risk.

Note: Alternative electrical power sources, such as the APU and electrical systems designed to operate with the total loss of normal generated electrical power, are essential for these demonstrations.

7.6 Criteria for EDTO beyond 180 minutes - aeroplanes with two-turbine engines

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 programs in accordance with the criteria detailed in section 4 of this CAAP will be examined.

7.6.2 The record of the operator in conducting its 180 minute program will be considered when granting approvals beyond 180 minutes diversion time. 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.

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

7.7 Release considerations

7.7.1 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 of this CAAP must be considered.

7.7.2 Weather:

- An operator should verify that the weather information system utilised 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.
- If the dispatch of a flight is delayed, pilots or operations personnel should monitor weather forecasts and aerodrome status at the nominated EDTO en-route alternate aerodromes to ensure that the weather remains within the specified planning minima requirements until dispatch.

7.8 Flight planning

7.8.1 The effects of wind and temperature for the flight (including flight at the OEI cruise altitude) must be accounted for in the calculation of equal time points. The operator's program must provide flight crew members with information on adequate aerodromes appropriate to the route to be flown which are not forecast to meet Appendix 5 to CAO 82.0 – EDTO alternate planning weather minima.

7.8.2 Aerodrome facility information and other appropriate planning data concerning these aerodromes must be provided to flight crew for use when executing a diversion.

7.9 Diversion decision making

7.9.1 Specific instruction must be included in the operator's operations manual so that paragraph 5.3 (EDTO Alternate aerodromes) of this CAAP is observed, with the additional provision that an EDTO alternate aerodrome must be selected within the EDTO maximum diversion time, at the approved OEI speed for aeroplanes with two engines, or the AEO cruise speed for aeroplanes with more than two engines. Factors to be considered when deciding the appropriate course of action and suitability of an aerodrome for diversion may include, but are not limited to:

- aircraft configuration/weight/systems status
- wind and weather conditions en-route to the diversion aerodrome
- fuel required for the diversion
- aerodrome condition, terrain, weather, and wind
- runways available and runway surface condition
- approach aids and lighting
- RFFS capability at the diversion aerodrome
- facilities for aircraft occupants – disembarkation & shelter provisions
- medical facilities
- pilot's familiarity with the aerodrome
- information about the aerodrome available to the flight crew.

7.9.2 If one engine is shut down on an aeroplane that has three or more engines the PIC may fly past the nearest suitable en-route alternate aerodrome in point of time if the PIC determines that doing so is as safe as landing at the nearest suitable aerodrome. In making a decision to fly beyond the nearest suitable en-route alternate aerodrome, the PIC should consider all relevant factors and also consider the possible difficulties that may occur if the flight is continued beyond the nearest suitable alternate. When an aeroplane with more than two engines bypasses a suitable en-route alternate, the PIC should carefully consider the risk associated with the next possible failure, which could degrade or compound the current engine inoperative condition. The next possible failure could be a system failure or another engine failure; which, in either case, would affect the flight crew work load and their possible success in completing the associated abnormal approach and landing procedures.

7.9.3 It is even possible that a contingency outside of system failure (i.e. passenger illness) could compound the flight crew work load normally associated with the current failure condition.

7.10 Communications

7.10.1 The operator must show the availability of communications services and facilities for 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.

7.10.2 Communication systems in addition to those normally required are necessary for flights where the EDTO maximum diversion time is more than 180 minutes. Satellite communication (SATCOM) and aircraft communications addressing and reporting system (ACARS) may be used to supplement communication systems.

7.10.3 If an EDTO flight includes polar operations, the operator must consider the limitations of SATCOM and high frequency (HF) communication systems in the polar area.

7.11 Automated system monitoring

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

7.12 Navigation facilities

7.12.1 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 the 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.

7.12.2 If an EDTO flight includes polar operations and areas of magnetic unreliability, the operator must consider:

- grid navigation in regards to flight planning,
- available ground based navigational aids for en-route navigation
- approach and landing requirements
- specific aeroplane operational procedures.

7.13 Weather information system

7.13.1 An operator should verify that the weather information system which it utilises can be relied on to forecast terminal and en-route weather with a reasonable degree of accuracy and reliability in the proposed area(s) of operation. Such factors that should be evaluated are:

- staffing

- dispatcher training
- sources of weather reports and forecasts
- a record of forecast reliability (when possible).

7.14 Passenger recovery plan

7.14.1 The operator's formal passenger recovery plan for general application required under CAO 82.0 should be reviewed and determined to be satisfactory for the proposed EDTO in the event of an unplanned diversion and disembarkation.

7.14.2 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 delay.

7.14.3 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 Aeroplanes with two turbine engines

8.1.1 CASA will monitor the authorised operator to ensure that the levels of reliability achieved in EDTO remain at the necessary levels and that the operation continues to be conducted safely. The fleet average in-flight shut down (IFSD) rate for the specified airframe/engine combination will continue to be monitored.

8.1.2 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)
- stipulate corrective action for the operator to adopt in order to resolve the problems in a timely manner.

CASA will alert the relevant Certification Authority (i.e. the relevant NAA) 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 Polar operations, although not categorised under EDTO, do require similar planning, equipment, and operational requirements as those of EDTO flights.

9.1.2 The north polar area is defined as the entire area north of latitude 78 degrees north, and the south polar area is defined as the entire area south of latitude 60 degrees south.

9.1.3 The operator must develop plans in preparation for all polar flights in the north and south polar areas, and identify equipment and aeroplane configuration requirements.

9.1.4 The passenger recovery plan (as mentioned in paragraph 7.14 of this CAAP) must include special consideration for polar area operations. Such considerations as:

- the possibility of extreme weather
- limited passenger facilities
- the need to initiate passenger recovery without delay.

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 issuing appropriate operational specifications.

9.3 Requirements for en-route alternate aerodromes

9.3.1 Operators are expected to designate a set of alternate aerodromes for the aeroplane type, such that one or more can reasonably be expected to be available for the time during which they 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.

9.3.2 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 aeroplanes; therefore, the 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
- 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 (satisfactory completion of the passenger recovery is expected as soon as possible – within 48 hours following diversion).

9.3.3 CASA may approve operations to ice or snow covered runways with appropriately approved and equipped aeroplanes.

9.4 Fuel freeze strategy and monitoring

9.4.1 The operator must have a strategy and monitoring procedures for fuel freezing. The operator may wish to develop a fuel freeze strategy and monitoring program (e.g. alternate fuel freeze point temperature determination based on actual measurements of uploaded fuel), in lieu of using the standard minimum fuel freeze temperatures for specific types of fuel used.

Note: 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. The fuel freezing temperature information should be conveyed to the flight crew in sufficient time before the area is reached where fuel freezing temperatures are likely to occur.

9.4.3 Appropriate contingency planning or procedures should be in place for in-flight re-planning to avoid likely areas of fuel freezing.

9.4.4 For dispatch of polar area operations, the operator should consider:

- a review of the MEL status the Fuel Quantity Indicating System (FQIS)
- the fuel tank temperature indicating system.

9.5 Communication capability

9.5.1 The operator must have an effective voice communications or data link capability for all portions of the flight route. Operators communications may be accomplished using:

- HF voice
- HF data link
- SATCOM voice
- SATCOM data link.

9.5.2 It is recognised that SATCOM may not be available for short periods during flight over the poles. Communication capability with HF radios may also be affected during periods of solar flare activity; therefore, the operator should consider the predicted solar flare activity and its effect on communications for each dispatched flight.

9.6 Navigation facilities

9.6.1 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 the flight, and the routes and altitudes to the aerodromes the operator may designate as alternates. Navigation facilities required to ensure a safe approach and landing must be available.

9.6.2 In areas of magnetic unreliability, the operator must consider:

- grid navigation in regards to flight planning and en-route procedures
- available ground based navigational aids for en-route navigation
- approach and landing requirements
- specific aeroplane operational procedures.

9.7 Training

9.7.1 The operator should include the following training requirements in its approved training programs:

- QFE/QNH and metre/feet conversions, if required for the particular Polar Area of operation (required for flight crew and dispatcher training)
- fuel freeze – maintenance, dispatch, and flight crew training (special curriculum segments)
- general route-specific weather pattern training
- 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
- grid navigation in regards to flight planning and en-route procedures
- the operator's passenger recovery plan.

9.8 Crew exposure to radiation during solar flare activity

9.8.1 The operator should have provisions for mitigating crew exposure to the effects of solar flare activity at the altitudes and latitudes expected in such operations.

9.9 Special equipment for polar operations

9.9.1 A minimum of two cold-weather anti-exposure suits are required to be on board to ensure 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 or there are no adequate aerodromes within the polar area of operation.

9.10 Proving flight before approval

9.10.1 In order to receive authorisation to conduct polar area 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 (determined by CASA on a case-by-case basis).

9.10.2 As part of the proving flight, the operator may be required to exercise their reaction and recovery plan in the event of a diversion to one of its designated alternates, with emphasis on:

- communications
- coordination
- facilities
- accuracy of NOTAM and weather information
- operability of ground equipment during the simulated diversion.

9.10.3 The details of the operator's recovery plan may be considered by CASA before the proving flight. CASA will give 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 is permissible for the purposes of a proving flight.

Executive Manager
Standards Division

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Appendix 1 – EDTO training

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

1. Introduction to EDTO regulations

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

2. Normal operations

- Flight planning and dispatch:
 - o EDTO fuel requirements
 - o Route alternate selection –weather minima
 - o MEL – EDTO specific
 - o EDTO service check and tech log
 - o Pre-flight flight management system set up.
- Flight performance progress monitoring:
 - o Flight management, navigation and communication systems
 - o Aeroplane system monitoring
 - o Weather monitoring
 - o In-flight fuel management (to include independent pilot cross checking of fuel quantity).

3. Abnormal and contingency procedures

- Diversion procedures and diversion ‘decision making’:
 - o Initial and recurrent training to prepare flight crew to evaluate potential significant system failures. The goal of this training should be to establish crew competency in dealing with the most probable contingencies. The decision should include the factors that may require medical, passenger related or non-technical diversions.
- Navigation and communication systems (including appropriate flight management devices in degraded modes).
- Fuel management with degraded systems.
- Initial and recurrent training which emphasises abnormal and emergency procedure to be followed in the event of foreseeable failure for each area of operation, including:
 - o procedures for single and multiple failures in flight affecting EDTO entry and diversion decisions. If standby sources of electrical power significantly degrade the cockpit instrumentation to the pilots, then training for approaches with the standby generator as the sole power source should be conducted during initial and recurrent training.
 - o operational restrictions associated with these system failures (including any applicable MEL considerations).

4. EDTO line flying under supervision

- During the introduction into service of a new EDTO type, or conversion of flight crew not previously EDTO qualified, a minimum of two EDTO sectors should be completed including a line check.
- EDTO subjects should also be included in annual refresher training.

5. Flight operations personnel other than flight crew

- The operator’s training program in respect of EDTO should provide training (where applicable) for operations personnel other than flight crew (e.g. dispatchers) in addition to recurrent training in the following areas:
 - o EDTO regulations/operations approvals
 - o aeroplane performance/diversion procedures
 - o area of operation
 - o fuel requirements
 - o dispatch considerations MEL, configuration deviation list, weather minima, and alternate airports
 - o documentation.