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Международная  
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гражданской  
авиации

منظمة الطيران  
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Ref.: AN 11/1.3.25-12/10

4 April 2012

**Subject:** Adoption of Amendment 36 to Annex 6, Part I

**Action required:** a) Notify any disapproval before 16 July 2012; b) Notify any differences and compliance before 15 October 2012; c) Consider the use of the Electronic Filing of Differences System (EFOD) for notification of differences and compliance

Sir/Madam,

1. I have the honour to inform you that Amendment 36 to the *International Standards and Recommended Practices, Operation of Aircraft — International Commercial Air Transport — Aeroplanes* (Annex 6, Part I to the Convention on International Civil Aviation) was adopted by the Council at the fifth meeting of its 195th Session on 7 March 2012. Copies of the Amendment and the Resolution of Adoption are available as attachments to the electronic version of this State letter on the ICAO-NET (<http://portal.icao.int>).

2. When adopting the amendment, the Council prescribed 16 July 2012 as the date on which it will become effective, except for any part concerning which a majority of Contracting States have registered their disapproval before that date. In addition, the Council resolved that Amendment 36, to the extent it becomes effective, will become applicable on 15 November 2012.

3. Amendment 36 arises from:

- a) proposals developed by the Secretariat, with the assistance of the third meeting of the Flight Recorder Panel Working Group of the Whole (FLIRECP/WG/WHL/3), related to flight recorders;
- b) a proposal arising from the Secretariat, with the assistance of the Special Operations Task Force (SOTF), regarding extended diversion time operations (EDTO); and
- c) proposals developed by the Secretariat, in consultation with the Operations Panel (OPSP), regarding fuel planning, in-flight fuel management and the selection of alternate aerodromes.

4. The amendment concerning flight recorders addresses problems arising from recent accidents with regard to the availability and recovery of flight data. Consideration was given to the latest technology to ensure the availability of the data during investigations. To address this issue, the proposed amendment includes aeroplane mass limitations related to cockpit voice recorders (CVRs) and cockpit audio recording systems, alternate power source for CVRs, underwater locator beacons, clarification of the composition of flight recorder systems and alignment of provisions relating to type certificate with those in Annex 8 — *Airworthiness of Aircraft*.

5. The amendment concerning extended diversion time operations (EDTO) represents the culmination of over ten years of work to develop and refine the amendments in a manner that will benefit both air operators and regulators. The new provisions are based on best practices and lessons learned from extended range operations by twin-engined aeroplanes (ETOPS) to ensure that all operators and new entrants operate at the same level of safety in order to maintain the current track record of long-range operations.

6. In 2008, in conjunction with International Air Transport Association (IATA), ICAO recognized the need for updating and amending the fuel and alternate aerodrome selection provisions of Annex 6. Many of these provisions were unchanged since their introduction in the 1950's, and a revision was in order to enable air operators to take advantage of the latest technologies and operating practices in the industry. The amendment concerning fuel use improves safety and offers a performance-based approach to fuel planning and alternate selection that should provide increased efficiency, resulting in cost savings and environmental benefits.

7. In accordance with the decision of the 26th Session of the Assembly, I would like to bring to your attention the Organization's long-standing practice of providing documentation to States upon request. In this regard, I wish to refer you to the ICAO-NET website (<http://portal.icao.int>) where you can access all relevant documentation. The practice of dispatching printed copies of such documentation has now been discontinued.

8. In conformity with the Resolution of Adoption, may I request:

- a) that before 16 July 2012 you inform me if there is any part of the adopted Standards and Recommended Practices (SARPs) amendments in Amendment 36 concerning which your Government wishes to register disapproval, using the form in Attachment B for this purpose. Please note that only statements of disapproval need be registered and if you do not reply it will be assumed that you do not disapprove of the amendment;
- b) that before 15 October 2012 you inform me of the following, using the form in Attachment C for this purpose:
  - 1) any differences that will exist on 15 November 2012 between the national regulations or practices of your Government and the provisions of the whole of Annex 6, Part I, as amended by all amendments up to and including Amendment 36, and thereafter of any further differences that may arise; and
  - 2) the date or dates by which your Government will have complied with the provisions of the whole of Annex 6, Part I, as amended by all amendments up to and including Amendment 36.

9. With reference to the request in paragraph 8 a) above, it should be noted that a registration of disapproval of Amendment 36 or any part of it in accordance with Article 90 of the Convention does not constitute a notification of differences under Article 38 of the Convention. To

comply with the latter provision, a separate statement is necessary if any differences do exist, as requested in paragraph 8 b) 1). It is recalled in this respect that international Standards in Annexes have a conditional binding force, to the extent that the State or States concerned have not notified any difference thereto under Article 38 of the Convention.

10. With reference to the request in paragraph 8 b) above, it should be also noted that the Council, at the third meeting of its 192nd Session on 4 March 2011, agreed that pending the development of a concrete policy and operational procedures governing the use of EFOD, this system be used as an alternative means for filing of differences to all Annexes, except for Annex 9 — *Facilitation* and Annex 17 — *Security — Safeguarding International Civil Aviation against Acts of Unlawful Interference*. EFOD is currently available on the USOAP restricted website (<http://www.icao.int/usoap>) which is accessible by all Member States (AN 1/1-11/28 refers) and you are invited to consider using this for notification of compliance and differences.

11. Guidance on the determination and reporting of differences is given in the Note on the Notification of Differences in Attachment D.

12. Please note that a detailed repetition of previously notified differences, if they continue to apply, may be avoided by stating the current validity of such differences.

13. I would appreciate it if you would also send a copy of your notifications, referred to in paragraph 8 b) above, to the ICAO Regional Office accredited to your Government.

14. As soon as practicable after the amendment becomes effective, on 16 July 2012, replacement pages incorporating Amendment 36 will be forwarded to you.

Accept, Sir/Madam, the assurances of my highest consideration.



Raymond Benjamin  
Secretary General

**Enclosures:**

- A — Amendment to the Foreword of Annex 6, Part I
- B — Form on notification of disapproval of all or part of Amendment 36 to Annex 6, Part I
- C — Form on notification of compliance with or differences from Annex 6, Part I
- D — Note on the Notification of Differences



**ATTACHMENT A** to State letter AN 11/1.3.25-12/10

**AMENDMENT TO THE FOREWORD OF ANNEX 6, PART I**

*Add* the following at the end of Table A:

<i><b>Amendment</b></i>	<i><b>Source(s)</b></i>	<i><b>Subject</b></i>	<i><b>Adopted/Approved Effective Applicable</b></i>
36	Secretariat, with the assistance of the third meeting of the Flight Recorder Panel Working Group of the Whole (FLIRECP/WG/WHL/3); Secretariat, with the assistance of the Special Operations Task Force (SOTF); Secretariat, in consultation with the Operations Panel (OPSP)	Amendment concerning: a) carriage requirements for flight recorders; b) extended diversion time operations (EDTO); and c) fuel planning, in-flight fuel management and the selection of alternate aerodromes.	7 March 2012 16 July 2012 15 November 2012

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**ATTACHMENT B** to State letter AN 11/1.3.25-12/10

**NOTIFICATION OF DISAPPROVAL OF ALL OR PART OF  
AMENDMENT 36 TO ANNEX 6, PART I**

To: The Secretary General  
International Civil Aviation Organization  
999 University Street  
Montreal, Quebec  
Canada H3C 5H7

**(State)** \_\_\_\_\_ hereby wishes to disapprove the following parts of  
Amendment 36 to Annex 6, Part I:

Signature \_\_\_\_\_

Date \_\_\_\_\_

*NOTES*

- 1) If you wish to disapprove all or part of Amendment 36 to Annex 6, Part I, please dispatch this notification of disapproval to reach ICAO Headquarters by 16 July 2012. If it has not been received by that date it will be assumed that you do not disapprove of the amendment. **If you approve of all parts of Amendment 36, it is not necessary to return this notification of disapproval.**
- 2) This notification should not be considered a notification of compliance with or differences from Annex 6, Part I. Separate notifications on this are necessary. (See Attachment C.)
- 3) Please use extra sheets as required.

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**ATTACHMENT C** to State letter AN 11/1.3.25-12/10

**NOTIFICATION OF COMPLIANCE WITH OR DIFFERENCES FROM  
ANNEX 6, PART I  
(Including all amendments up to and including Amendment 36)**

To: The Secretary General  
International Civil Aviation Organization  
999 University Street  
Montreal, Quebec  
Canada H3C 5H7

1. No differences will exist on \_\_\_\_\_ between the national regulations and/or practices of **(State)** \_\_\_\_\_ and the provisions of Annex 6, Part I, including all amendments up to and including Amendment 36.

2. The following differences will exist on \_\_\_\_\_ between the regulations and/or practices of **(State)** \_\_\_\_\_ and the provisions of Annex 6, Part I, including Amendment 36 (Please see Note 3) below.)

<b>a) Annex Provision</b>	<b>b) Difference Category</b>	<b>c) Details of Difference</b>	<b>d) Remarks</b>
(Please give exact paragraph reference)	(Please indicate A, B, or C)	(Please describe the difference clearly and concisely)	(Please indicate reasons for the difference)

(Please use extra sheets as required)

3. By the dates indicated below, **(State)** \_\_\_\_\_ will have complied with the provisions of Annex 6, Part I, including all amendments up to and including Amendment 36 for which differences have been notified in 2 above.

a)	<b>Annex Provision</b>	b)	<b>Date</b>	c)	<b>Comments</b>
	(Please give exact paragraph reference)				

(Please use extra sheets as required)

Signature \_\_\_\_\_

Date \_\_\_\_\_

#### *NOTES*

- 1) If paragraph 1 above is applicable to you, please complete paragraph 1 and return this form to ICAO Headquarters. If paragraph 2 is applicable to you, please complete paragraphs 2 and 3 and return the form to ICAO Headquarters.
- 2) Please dispatch the form to reach ICAO Headquarters by 15 October 2012.
- 3) A detailed repetition of previously notified differences, if they continue to apply, may be avoided by stating the current validity of such differences.
- 4) Guidance on the notification of differences from Annex 6, Part I is provided in the Note on the Notification of Differences at Attachment D.
- 5) Please send a copy of this notification to the ICAO Regional Office accredited to your Government.

\_\_\_\_\_

**NOTE ON THE NOTIFICATION OF DIFFERENCES TO ANNEX 6, PART I  
AND FORM OF NOTIFICATION**

*(Prepared and issued in accordance with instructions of the Council)*

1. *Introduction*

1.1 The Assembly and the Council, when reviewing the notification of differences by States in compliance with Article 38 of the Convention, have repeatedly noted that the state of such reporting is not entirely satisfactory.

1.2 With a view to achieving a more comprehensive coverage, this note is issued to facilitate the determination and reporting of such differences and to state the primary purpose of such reporting.

1.3 The primary purpose of reporting of differences is to promote safety and efficiency in air navigation by ensuring that governmental and other agencies, including operators and service providers, concerned with international civil aviation are made aware of all national regulations and practices in so far as they differ from those prescribed in the ICAO Standards.

1.4 Contracting States are, therefore, requested to give particular attention to the notification before 15 October 2012 of differences with respect to Standards in Annex 6, Part I. The Council has also urged Contracting States to extend the above considerations to Recommended Practices.

1.5 Contracting States are asked to note further that it is necessary to make an explicit statement of intent to comply where such intent exists, or where such is not the intent, of the difference or differences that will exist. This statement should be made not only to the latest amendment but to the whole Annex, including the amendment.

1.6 If previous notifications have been made in respect of this Annex, detailed repetition may be avoided, if appropriate, by stating the current validity of the earlier notification. States are requested to provide updates of the differences previously notified after each amendment, as appropriate, until the difference no longer exists.

2. *Notification of differences to Annex 6, Part I, including Amendment 36*

2.1 Past experience has indicated that the reporting of differences to Annex 6, Part I has in some instances been too extensive since some appear merely to be a different manner of expressing the same intent.

2.2 Guidance to Contracting States in the reporting of differences to Annex 6, Part I can only be given in very general terms. Where the national regulations of States call for compliance with procedures that are not identical but essentially similar to those contained in the Annex, no difference should be reported since the details of the procedures existing are the subject of notification through the medium of aeronautical information publications. Although differences to Recommended Practices are not notifiable under Article 38 of the Convention, Contracting States are urged to notify the Organization of the differences between their national regulations and practices and any corresponding Recommended Practices contained in an Annex. States should categorize each difference notified on the basis of whether the corresponding national regulation is:

- a) ***More exacting or exceeds the ICAO Standard or Recommended Practice (SARP) (Category A)***. This category applies when the national regulation is more demanding than the corresponding SARP, or imposes an obligation within the scope of the Annex which is not covered by a SARP. This is of particular importance where a State requires a higher standard which affects the operation of aircraft of other Contracting States in and above its territory;
- b) ***Different in character or other means of compliance (Category B)\****. This category applies when the national regulation is different in character from the corresponding ICAO SARP, or when the national regulation differs in principle, type or system from the corresponding SARP, without necessarily imposing an additional obligation; and
- c) ***Less protective or partially implemented/not implemented (Category C)***. This category applies when the national regulation is less protective than the corresponding SARP; or when no national regulation has been promulgated to address the corresponding SARP, in whole or in part.

2.3 When a Contracting State deems an ICAO Standard concerning aircraft, operations, equipment, personnel, or air navigation facilities or services to be not applicable to the existing aviation activities of the State, notification of a difference is not required. For example, a Contracting State that is not a State of Design or Manufacture and that does not have any national regulations on the subject, would not be required to notify differences to Annex 8 provisions related to the design and construction of an aircraft.

2.4 For States that have already fully reported differences from Annex 6, Part I or have reported that no differences exist, the reporting of any further differences occasioned by the amendment should be relatively straightforward; however, attention is called to paragraph 1.5 wherein it is indicated that this statement should be not only to the latest amendment but to the whole Annex, including the amendment.

### 3. *Form of notification of differences*

3.1 Differences should be notified in the following form:

- a) *Reference*: The number of the paragraph or subparagraph in Annex 6, Part I as amended which contains the Standard or Recommended Practice to which the difference relates;
- b) *Category*: Indicate the category of the difference as A, B or C in accordance with paragraph 2.2 above;

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\* The expression “different in character or other means of compliance” in b) would be applied to a national regulation which achieves, by other means, the same objective as that of the corresponding ICAO SARPs and so cannot be classified under a) or c).

- c) *Description of the difference:* Clearly and concisely describe the difference and its effect; and
- d) *Remarks:* Under “Remarks” indicate reasons for the difference and intentions including any planned date for implementation.

3.2 The differences notified will be recorded in a Supplement to the Annex, normally in the terms used by the Contracting State when making the notification. In the interest of making the supplement as useful as possible, please make statements as clear and concise as possible and confine remarks to essential points. Comments on implementation, in accordance with paragraph 4 b) 2) of the Resolution of Adoption, should not be combined with those concerning differences. The provision of extracts from national regulations cannot be considered as sufficient to satisfy the obligation to notify differences. General comments that do not relate to specific differences will not be published in Supplements.

— END —



**AMENDMENT No. 36**

**TO THE**

**INTERNATIONAL STANDARDS  
AND RECOMMENDED PRACTICES**

# **OPERATION OF AIRCRAFT**

**ANNEX 6**

**TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION**

**PART I**

**INTERNATIONAL GENERAL AVIATION — AEROPLANES**

The amendment to Annex 6, Part I, contained in this document was adopted by the Council of ICAO on **7 March 2012**. Such parts of this amendment as have not been disapproved by more than half of the total number of Contracting States on or before **16 July 2012** will become effective on that date and will become applicable on **15 November 2012** as specified in the Resolution of Adoption. (State letter AN 11/1.3.25-12/10 refers.)

**MARCH 2012**

**INTERNATIONAL CIVIL AVIATION ORGANIZATION**





**AMENDMENT 36 TO THE INTERNATIONAL STANDARDS AND  
RECOMMENDED PRACTICES**

***OPERATION OF AIRCRAFT — INTERNATIONAL COMMERCIAL  
AIR TRANSPORT — AEROPLANES***

**RESOLUTION OF ADOPTION**

*The Council*

Acting in accordance with the Convention on International Civil Aviation, and particularly with the provisions of Articles 37, 54 and 90 thereof,

1. *Hereby adopts* on 7 March 2012 Amendment 36 to the International Standards contained in the document entitled *International Standards and Recommended Practices, Operation of Aircraft, International Commercial Air Transport — Aeroplanes* which for convenience is designated Annex 6, Part I to the Convention;
2. *Prescribes* 16 July 2012 as the date upon which the said amendment shall become effective, except for any part thereof in respect of which a majority of the Contracting States have registered their disapproval with the Council before that date;
3. *Resolves* that the said amendment or such parts thereof as have become effective shall become applicable on 15 November 2012;
4. *Requests the Secretary General:*
  - a) to notify each Contracting State immediately of the above action and immediately after 16 July 2012 of those parts of the amendment which have become effective;
  - b) to request each Contracting State:
    - 1) to notify the Organization (in accordance with the obligation imposed by Article 38 of the Convention) of the differences that will exist on 15 November 2012 between its national regulations or practices and the provisions of the Standards in the Annex as hereby amended, such notification to be made before 15 October 2012, and thereafter to notify the Organization of any further differences that arise;
    - 2) to notify the Organization before 15 October 2012 of the date or dates by which it will have complied with the provisions of the Standards in the Annex as hereby amended;
  - c) to invite each Contracting State to notify additionally any differences between its own practices and those established by the Recommended Practices, when the notification of such differences is important for the safety of air navigation, following the procedure specified in subparagraph b) above with respect to differences from Standards.

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**NOTES ON THE PRESENTATION OF THE  
AMENDMENT TO ANNEX 6, PART I**

The text of the amendment is arranged to show deleted text with a line through it and new text highlighted with grey shading, as shown below:

- |   |                                   |
|---|-----------------------------------|
| 1. <del>Text to be deleted is shown with a line through it.</del>   | text to be deleted                |
| 2. New text to be inserted is highlighted with grey shading.  | new text to be inserted           |
| 3. <del>Text to be deleted is shown with a line through it</del> followed by the replacement text which is highlighted with grey shading. | new text to replace existing text |

TEXT OF AMENDMENT 36 TO THE  
INTERNATIONAL STANDARDS  
AND RECOMMENDED PRACTICES  
OPERATION OF AIRCRAFT

ANNEX 6  
TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION  
PART I  
INTERNATIONAL COMMERCIAL AIR TRANSPORT — AEROPLANES

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ABBREVIATIONS AND SYMBOLS  
(used in this Annex)

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**EDTO** Extended diversion time operations

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ETOPS — Extended range operations by turbine-engined aeroplanes

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*Editorial Note.*— Replace all occurrences of the term “ETOPS” by “EDTO” in Annex 6, Part I.

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CHAPTER 1. DEFINITIONS

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**Alternate aerodrome.** An aerodrome to which an aircraft may proceed when it becomes either impossible or inadvisable to proceed to or to land at the aerodrome of intended landing where the necessary services and facilities are available, where aircraft performance requirements can be met and which is operational at the expected time of use. Alternate aerodromes include the following:

**Take-off alternate.** An alternate aerodrome at which an aircraft ~~can~~ would be able to land should this become necessary shortly after take-off and it is not possible to use the aerodrome of departure.

**En-route alternate.** An alternate aerodrome at which an aircraft would be able to land after experiencing an abnormal or emergency condition in the event that a diversion becomes necessary while en route.

~~**ETOPS en-route alternate.** A suitable and appropriate alternate aerodrome at which an aeroplane would be able to land after experiencing an engine shutdown or other abnormal or emergency condition while en route in an ETOPS operation.~~

**Destination alternate.** An alternate aerodrome ~~to at~~ which an aircraft ~~may proceed~~ would be able to land should it become either impossible or inadvisable to land at the aerodrome of intended landing.

*Note.— The aerodrome from which a flight departs may also be an en-route or a destination alternate aerodrome for that flight.*

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*Editorial Note.— In due course, consequential amendments will be made to Annexes 2; 3; 6, Parts II and III; 11; PANS-ATM and PANS-OPS, Volume I, to include these definitions.*

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**Extended diversion time operations (EDTO).** Any operation by an aeroplane with two or more turbine engines where the diversion time to an en-route alternate aerodrome is greater than the threshold time established by the State of the Operator.

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**EDTO critical fuel.** The fuel quantity necessary to fly to an en-route alternate aerodrome considering, at the most critical point on the route, the most limiting system failure.

*Note.— Attachment D contains guidance on EDTO critical fuel scenarios.*

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**EDTO-significant system.** An aeroplane system whose failure or degradation could adversely affect the safety particular to an EDTO flight, or whose continued functioning is specifically important to the safe flight and landing of an aeroplane during an EDTO diversion.

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**Isolated aerodrome.** A destination aerodrome for which there is no destination alternate aerodrome suitable for a given aeroplane type.

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

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**Point of no return.** The last possible geographic point at which an aeroplane can proceed to the destination aerodrome as well as to an available en route alternate aerodrome for a given flight.

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

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## CHAPTER 4. FLIGHT OPERATIONS

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### 4.2 Operational certification and supervision

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#### 4.2.10 Fuel and oil records

4.2.10.1 An operator shall maintain fuel and oil records to enable the State of the Operator to ascertain that, for each flight, the requirements of 4.3.6 and 4.3.7.1 have been complied with.

4.2.10.2 An operator shall maintain oil records to enable the State of the Operator to ascertain that trends for oil consumption are such that an aeroplane has sufficient oil to complete each flight.

4.2.10.3 Fuel and oil records shall be retained by the operator for a period of three months.

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### 4.3 Flight preparation

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#### 4.3.4 Alternate aerodromes

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##### 4.3.4.1 Take-off alternate aerodrome

4.3.4.1.1 A take-off alternate aerodrome shall be selected and specified in the operational flight plan if either the weather-meteorological conditions at the aerodrome of departure are at or below the applicable operator's established aerodrome operating-landing minima for that operation or if it would not be possible to return to the aerodrome of departure for other reasons.

4.3.4.1.2 The take-off alternate aerodrome shall be located within the following flight time distance from the aerodrome of departure:

- a) for aeroplanes having two engines. Not more than a distance equivalent to a flight time of one hour at the single engine cruise speed; and with two engines, one hour of flight time at a one-engine-inoperative cruising speed, determined from the aircraft operating manual, calculated in ISA and still-air conditions using the actual take-off mass; or
- b) for aeroplanes having with three or more engines. Not more than a distance equivalent to a flight time of two hours at the one engine inoperative cruise speed, two hours of flight time at an all-engine operating cruising speed, determined from the aircraft operating manual, calculated in ISA and still-air conditions using the actual take-off mass; or
- c) for aeroplanes engaged in extended diversion time operations (EDTO) where an alternate aerodrome meeting the distance criteria of a) or b) is not available, the first available alternate aerodrome located within the distance of the operator's approved maximum diversion time considering the actual take-off mass.

4.3.4.1.3 For an aerodrome to be selected as a take-off alternate the available information shall indicate that, at the estimated time of use, the conditions will be at or above the operator's established aerodrome operating minima for that operation.

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##### 4.3.4.2 En-route alternate aerodromes

En-route alternate aerodromes, required by 4.7 for extended range-diversion time operations by aeroplanes with two turbine engines, shall be selected and specified in the operational and air traffic services (ATS) flight plans.

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#### 4.3.4.3 *Destination alternate aerodromes*

4.3.4.3.1 For a flight to be conducted in accordance with the instrument flight rules, at least one destination alternate aerodrome shall be selected and specified in the operational and ATS flight plans, unless:

- a) the duration of the flight from the departure aerodrome, or from the point of in-flight re-planning to the destination aerodrome is such that, taking into account all ~~and the meteorological conditions and operational information relevant to the flight, at the estimated time of use, a prevailing~~ are such that there is reasonable certainty exists that:
  - 1) ~~at the estimated time of arrival at the aerodrome of intended landing, and for a reasonable period before and after such time, the approach and landing may be made under visual meteorological conditions; or and~~
  - 2) ~~b) the aerodrome of intended landing is isolated and there is no suitable destination alternate aerodrome. separate runways are usable at the estimated time of use of the destination aerodrome with at least one runway having an operational instrument approach procedure; or~~
- b) the aerodrome is isolated. Operations into isolated aerodromes do not require the selection of a destination alternate aerodrome(s) and shall be planned in accordance with 4.3.6.3 d) 4);
  - 1) for each flight into an isolated aerodrome a point of no return shall be determined; and
  - 2) a flight to be conducted to an isolated aerodrome shall not be continued past the point of no return unless a current assessment of meteorological conditions, traffic, and other operational conditions indicate that a safe landing can be made at the estimated time of use.

*Note 1.— Separate runways are two or more runways at the same aerodrome configured such that if one runway is closed, operations to the other runway(s) can be conducted.*

*Note 2.— Guidance on planning operations to isolated aerodromes is contained in the Flight Planning and Fuel Management Manual (Doc 9976).*

4.3.4.3.2 Two destination alternate aerodromes shall be selected and specified in the operational and ATS flight plans when, for the destination aerodrome:

- a) meteorological conditions at the estimated time of use will be below the operator's established aerodrome operating minima for that operation; or
- b) meteorological information is not available.

4.3.4.4 Notwithstanding the provisions in 4.3.4.1, 4.3.4.2, and 4.3.4.3; the State of the Operator may, based on the results of a specific safety risk assessment conducted by the operator which demonstrates how an equivalent level of safety will be maintained, approve operational variations to alternate aerodrome selection criteria. The specific safety risk assessment shall include at least the:

- a) capabilities of the operator;
- b) overall capability of the aeroplane and its systems;
- c) available aerodrome technologies, capabilities and infrastructure;

- d) quality and reliability of meteorological information;
- e) identified hazards and safety risks associated with each alternate aerodrome variation; and
- f) specific mitigation measures.

*Note.— Guidance on performing a safety risk assessment and on determining variations, including examples of variations, are contained in the Flight Planning and Fuel Management Manual (Doc 9976) and the Safety Management Manual (SMM) (Doc 9859).*

#### 4.3.5 ~~Weather~~ Meteorological conditions

4.3.5.1 A flight to be conducted in accordance with the visual flight rules shall not be commenced unless current meteorological reports or a combination of current reports and forecasts indicate that the meteorological conditions along the route or that part of the route to be flown under the visual flight rules will, at the appropriate time, be such as to ~~render~~ enable compliance with these rules possible.

4.3.5.2 ~~A flight to be conducted in accordance with instrument flight rules shall not be commenced unless information is available which indicates that conditions at the aerodrome of intended landing or, where a destination alternate is required, at least one destination alternate aerodrome will, at the estimated time of arrival, be at or above the aerodrome operating minima.~~

~~— Note.— It is the practice in some States to declare, for flight planning purposes, higher minima for an aerodrome when nominated as a destination alternate than for the same aerodrome when planned as that of intended landing.~~

4.3.5.2 A flight to be conducted in accordance with the instrument flight rules;

- a) shall not take off from the departure aerodrome unless the meteorological conditions, at the time of use, are at or above the operator's established aerodrome operating minima for that operation; and
- b) shall not take off or continue beyond the point of in-flight re-planning unless at the aerodrome of intended landing or at each alternate aerodrome to be selected in compliance with 4.3.4, current meteorological reports or a combination of current reports and forecasts indicate that the meteorological conditions will be, at the estimated time of use, at or above the operator's established aerodrome operating minima for that operation.

4.3.5.3 To ensure that an adequate margin of safety is observed in determining whether or not an approach and landing can be safely carried out at each alternate aerodrome, the operator shall specify appropriate incremental values, acceptable to the State of the Operator, for height of cloud base and visibility to be added to the operator's established aerodrome operating minima.

*Note.— Guidance on the selection of these incremental values is contained in the Flight Planning and Fuel Management Manual (Doc 9976).*

4.3.5.4 The State of the Operator shall approve a margin of time established by the operator for the estimated time of use of an aerodrome.

*Note.— Guidance on establishing an appropriate margin of time for the estimated time of use of an aerodrome is contained in the Flight Planning and Fuel Management Manual (Doc 9976).*

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*Editorial Note.— Renumber subsequent paragraphs.*

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#### 4.3.6 Fuel and oil supply requirements

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*Editorial Note.— Replace 4.3.6 in its entirety with the following:*

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4.3.6.1 An aeroplane shall carry a sufficient amount of usable fuel, to complete the planned flight safely and to allow for deviations from the planned operation.

4.3.6.2 The amount of usable fuel to be carried shall, as a minimum, be based on:

a) the following data:

- 1) current aeroplane-specific data derived from a fuel consumption monitoring system, if available; or
- 2) if current aeroplane-specific data is not available, data provided by the aeroplane manufacturer; and

b) the operating conditions for the planned flight including:

- 1) anticipated aeroplane mass;
- 2) Notices to Airmen;
- 3) current meteorological reports or a combination of current reports and forecasts;
- 4) air traffic services procedures, restrictions and anticipated delays; and
- 5) the effects of deferred maintenance items and/or configuration deviations.

4.3.6.3 The pre-flight calculation of usable fuel required shall include:

- a) *taxi fuel*, which shall be the amount of fuel expected to be consumed before take-off;
- b) *trip fuel*, which shall be the amount of fuel required to enable the aeroplane to fly from take-off or the point of in-flight re-planning until landing at the destination aerodrome taking into account the operating conditions of 4.3.6.2 b);
- c) *contingency fuel*, which shall be the amount of fuel required to compensate for unforeseen factors. It shall be 5 per cent of the planned trip fuel or of the fuel required from the point of in flight re-planning based on the consumption rate used to plan the trip fuel but in any case shall not be lower than the amount required to fly for five minutes at holding speed at 450 m (1 500 ft) above the destination aerodrome in standard conditions;

*Note.— Unforeseen factors are those which could have an influence on the fuel consumption to the destination aerodrome, such as deviations of an individual aeroplane from the expected fuel consumption data, deviations from forecast meteorological conditions, extended taxi times before take-off, and deviations from planned routings and/or cruising levels.*



d) *destination alternate fuel*, which shall be:

- 1) where a destination alternate aerodrome is required, the amount of fuel required to enable the aeroplane to:
  - i) perform a missed approach at the destination aerodrome;
  - ii) climb to the expected cruising altitude;
  - iii) fly the expected routing;
  - iv) descend to the point where the expected approach is initiated; and
  - v) conduct the approach and landing at the destination alternate aerodrome; or
- 2) where two destination alternate aerodromes are required, the amount of fuel, as calculated in 4.3.6.3 d) 1), required to enable the aeroplane to proceed to the destination alternate aerodrome which requires the greater amount of alternate fuel; or
- 3) where a flight is operated without a destination alternate aerodrome, the amount of fuel required to enable the aeroplane to fly for 15 minutes at holding speed at 450 m (1 500 ft) above destination aerodrome elevation in standard conditions; or
- 4) where the aerodrome of intended landing is an isolated aerodrome:
  - i) for a reciprocating engine aeroplane, the amount of fuel required to fly for 45 minutes plus 15 per cent of the flight time planned to be spent at cruising level, including final reserve fuel, or two hours, whichever is less; or
  - ii) for a turbine engine aeroplane, the amount of fuel required to fly for two hours at normal cruise consumption above the destination aerodrome, including final reserve fuel;

e) *final reserve fuel*, which shall be the amount of fuel calculated using the estimated mass on arrival at the destination alternate aerodrome or the destination aerodrome, when no destination alternate aerodrome is required:

- 1) for a reciprocating engine aeroplane, the amount of fuel required to fly for 45 minutes, under speed and altitude conditions specified by the State of the Operator; or
- 2) for a turbine engine aeroplane, the amount of fuel required to fly for 30 minutes at holding speed at 450 m (1 500 ft) above aerodrome elevation in standard conditions;

f) *additional fuel*, which shall be the supplementary amount of fuel required if the minimum fuel calculated in accordance with 4.3.6.3 b), c), d) and e) is not sufficient to:

- 1) allow the aeroplane to descend as necessary and proceed to an alternate aerodrome in the event of engine failure or loss of pressurization, whichever requires the greater amount of fuel based on the assumption that such a failure occurs at the most critical point along the route;
  - i) fly for 15 minutes at holding speed at 450 m (1 500 ft) above aerodrome elevation in standard conditions; and
  - ii) make an approach and landing;

- 2) allow an aeroplane engaged in EDTO to comply with the EDTO critical fuel scenario as established by the State of the Operator;
- 3) meet additional requirements not covered above;

*Note 1.— Fuel planning for a failure that occurs at the most critical point along a route (4.3.6.3 f) 1)) may place the aeroplane in a fuel emergency situation based on 4.3.7.2.*

*Note 2.—Guidance on EDTO critical fuel scenarios are contained in Attachment D;*

- g) *discretionary fuel*, which shall be the extra amount of fuel to be carried at the discretion of the pilot-in-command.

**4.3.6.4 Recommendation.**— *Operators should determine one final reserve fuel value for each aeroplane type and variant in their fleet rounded up to an easily recalled figure.*

**4.3.6.5** An aeroplane shall not take off or continue from the point of in-flight re-planning unless the usable fuel on board meets the requirements in 4.3.6.3 b), d), e) and f) if required.

**4.3.6.6** Notwithstanding the provisions in 4.3.6.3 a), b), c), d), and f); the State of the Operator may, based on the results of a specific safety risk assessment conducted by the operator which demonstrates how an equivalent level of safety will be maintained, approve variations to the pre-flight fuel calculation of taxi fuel, trip fuel, contingency fuel, destination alternate fuel, and additional fuel. The specific safety risk assessment shall include at least the:

- a) flight fuel calculations;
- b) capabilities of the operator to include:
  - i) a data-driven method that includes a fuel consumption monitoring programme; and/or
  - ii) the advanced use of alternate aerodromes; and
- c) specific mitigation measures.

*Note.— Guidance for the specific safety risk assessment, fuel consumption monitoring programmes and the advanced use of alternate aerodromes is contained in the Flight Planning and Fuel Management Manual (Doc 9976).*

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*Editorial Note.— Insert new 4.3.7 and renumber subsequent paragraphs accordingly.*

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### 4.3.7 In-flight fuel management

**4.3.7.1** An operator shall establish policies and procedures, approved by the State of the Operator, to ensure that in-flight fuel checks and fuel management are performed.

**4.3.7.2** The pilot-in-command shall continually ensure that the amount of usable fuel remaining on board is not less than the fuel required to proceed to an aerodrome where a safe landing can be made with the planned final reserve fuel remaining upon landing.

**4.3.7.2.1** The pilot-in-command shall request delay information from ATC when unanticipated circumstances may result in landing at the destination aerodrome with less than the final reserve fuel plus any fuel required to proceed to an alternate aerodrome or the fuel required to operate to an isolated aerodrome.

4.3.7.2.2 The pilot-in-command shall advise ATC of a minimum fuel state by declaring MINIMUM FUEL when, having committed to land at a specific aerodrome, the pilot calculates that any change to the existing clearance to that aerodrome may result in landing with less than planned final reserve fuel.

*Note 1.— The declaration of MINIMUM FUEL informs ATC that all planned aerodrome options have been reduced to a specific aerodrome of intended landing and any change to the existing clearance may result in landing with less than planned final reserve fuel. This is not an emergency situation but an indication that an emergency situation is possible should any additional delay occur.*

*Note 2.— Guidance on declaring minimum fuel is contained in the Flight Planning and Fuel Management Manual (Doc 9976).*

4.3.7.2.3 The pilot-in-command shall declare a situation of fuel emergency by broadcasting MAYDAY MAYDAY MAYDAY FUEL, when the calculated usable fuel predicted to be available upon landing at the nearest aerodrome where a safe landing can be made is less than the planned final reserve fuel.

*Note 1.— The planned final reserve fuel refers to the value calculated in 4.3.6.3 e) 1) or 2) and is the minimum amount of fuel required upon landing at any aerodrome.*

*Note 2.— The words “MAYDAY FUEL” describe the nature of the distress conditions as required in Annex 10, Volume II, 5.3.2.1, b) 3.*

*Note 3.— Guidance on procedures for in-flight fuel management are contained in the Flight Planning and Fuel Management Manual (Doc 9976).*

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#### **4.7 Additional requirements for extended-range operations by aeroplanes with two turbine engines (ETOPS)-operations by aeroplanes with turbine engines beyond 60 minutes to an en-route alternate aerodrome including extended diversion time operations (EDTO)**

##### **4.7.1 Requirements for operations beyond 60 minutes to an en-route alternate aerodrome**

4.7.1.1 Operators conducting operations beyond 60 minutes, from a point on a route to an en-route alternate aerodrome shall ensure that:

a) for all aeroplanes:

1) en-route alternate aerodromes are identified; and

2) the most up-to-date information is provided to the flight crew on identified en-route alternate aerodromes, including operational status and meteorological conditions;

b) for aeroplanes with two turbine engines, the most up-to-date information provided to the flight crew indicates that conditions at identified en-route alternate aerodromes will be at or above the operator's established aerodrome operating minima for the operation at the estimated time of use.

*Note.— Guidance on compliance with the requirements of these provisions is contained in Attachment D.*

4.7.1.2 In addition to the requirements in 4.7.1.1, all operators shall ensure that the following are taken into account and provide the overall level of safety intended by the provisions of Annex 6, Part I:

- a) operational control and flight dispatch procedures;
- b) operating procedures; and
- c) training programmes.

#### 4.7.2 Requirements for extended diversion time operations (EDTO)

~~4.7.1~~ 4.7.2.1 Unless the operation has been specifically approved by the State of the Operator, an aeroplane with two or more turbine engines shall not, except as provided in 4.7.4, be operated on a route where the flight time at single engine cruise speed diversion time from any point on the route, calculated in ISA and still air conditions at the one-engine inoperative cruise speed for aeroplanes with two turbine engines and at the all-engine operating cruise speed for aeroplanes with more than two turbine engines, to an adequate en-route alternate aerodrome exceeds a threshold time established for such operations by that State.

*Note 21.— In the context of the approval of operations at which the requirements of 5.2.11 can be met, guidance material on adequate and suitable alternate aerodromes is contained in Attachment D. When the diversion time exceeds the threshold time, the operation is considered to be an extended diversion time operation (EDTO).*

*Note 42.— Guidance on the establishment of an appropriate threshold time and on approval of extended diversion time operations are contained in Attachment D.*

*Note 3.— For the purpose of EDTO, the take-off and/or destination aerodromes may be considered en-route alternate aerodromes.*

~~4.7.2~~ In approving the operation, the State of the Operator shall ensure that:

- a) ~~the airworthiness certification of the aeroplane type;~~
- b) ~~the reliability of the propulsion system; and~~
- c) ~~the operator's maintenance procedures, operating practices, flight dispatch procedures and crew training programmes;~~

~~provide the overall level of safety intended by the provisions of Annexes 6 and 8. In making this assessment, account shall be taken of the route to be flown, the anticipated operating conditions and the location of adequate en-route alternate aerodromes.~~

4.7.2.2 The maximum diversion time, for an operator of a particular aeroplane type engaged in extended diversion time operations shall be approved by the State of the Operator.

*Note.— Guidance on the conditions to be used when converting diversion times to distances are contained in Attachment D.*

4.7.2.3 When approving the appropriate maximum diversion time for an operator for a particular aeroplane type engaged in extended diversion time operations, the State of the Operator shall ensure that:

- a) for all aeroplanes: the most limiting EDTO significant system time limitation, if any, indicated in the Aeroplane Flight Manual (directly or by reference) and relevant to that particular operation is not exceeded; and
- b) for aeroplanes with two turbine engines: the aeroplane is EDTO certified.

*Note 1.— EDTO may be referred to as ETOPS in some documents.*

*Note 1<sup>2</sup>.— Guidance on compliance with the requirements of this provision is contained in Attachment D.*

*Note 2.— The Airworthiness Manual (Doc 9760) contains guidance on the level of performance and reliability of aeroplane systems intended by 4.7.2, as well as guidance on continuing airworthiness aspects of the requirements of 4.7.2.*

4.7.3— A flight to be conducted in accordance with 4.7.1 shall not be commenced unless, during the possible period of arrival, the required en-route alternate aerodrome(s) will be available and the available information indicates that conditions at those aerodromes will be at or above the aerodrome operating minima approved for the operation.

4.7.2.3.1 Notwithstanding the provisions in 4.7.2.3 a); the State of the Operator may, based on the results of a specific safety risk assessment conducted by the operator which demonstrates how an equivalent level of safety will be maintained, approve operations beyond the time limits of the most time-limited system. The specific safety risk assessment shall include at least the:

- a) capabilities of the operator;
- b) overall reliability of the aeroplane;
- c) reliability of each time limited system;
- d) relevant information from the aeroplane manufacturer; and
- e) specific mitigation measures.

*Note.— Guidance for the specific safety risk assessment is contained in Attachment D.*

4.7.2.4 For aeroplanes engaged in EDTO, the additional fuel required by 4.3.6.3 f) 2) shall include the fuel necessary to comply with the EDTO critical fuel scenario as established by the State of the Operator.

*Note.— Guidance on compliance with the requirements of this provision is in Attachment D.*

4.7.2.5 A flight shall not proceed beyond the threshold time in accordance with 4.7.2.1 unless the identified en-route alternate aerodromes have been re-evaluated for availability and the most up to date information indicates that, during the estimated time of use, conditions at those aerodromes will be at or above the operator's established aerodrome operating minima for the operation. If any conditions are identified that would preclude a safe approach and landing at that aerodrome during the estimated time of use, an alternative course of action shall be determined.

4.7.2.6 The State of the Operator shall, when approving maximum diversion times for aeroplanes with two turbine engines, ensure that the following are taken into account in providing the overall level of safety intended by the provisions of Annex 8:

- a) reliability of the propulsion system;
- b) airworthiness certification for EDTO of the aeroplane type; and
- c) EDTO maintenance programme.

*Note 1.— EDTO may be referred to as ETOPS in some documents.*

*Note 2.— The Airworthiness Manual (Doc 9760) contains guidance on the level of performance and reliability of aeroplane systems intended by 4.7.2.5, as well as guidance on continuing airworthiness aspects of the requirements of 4.7.2.5.*

4.7.4 4.7.2.7 **Recommendation.**— *The State of the Operator of an aeroplane type with two turbine engines which, prior to 25 March 1986 was authorized and operating on a route where the flight time at single-engine one engine inoperative cruise speed to an adequate en-route alternate aerodrome exceeded the threshold time established for such operations in accordance with 4.7.1 4.7.2.1, should give consideration to permitting such an operation to continue on that route after that date.*

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## CHAPTER 6. AEROPLANE INSTRUMENTS, EQUIPMENT AND FLIGHT DOCUMENTS

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### 6.3 Flight recorders

*Note 1.— Crash protected flight recorders comprise one or more of the following ~~four~~ systems: a flight data recorder (FDR), a cockpit voice recorder (CVR), an airborne image recorder (AIR) and/or a data link recorder (DLR). Image and data link information may be recorded on either the CVR or the FDR.*

*Note 2.— Lightweight flight recorders comprise one or more of the following ~~four~~ systems: an aircraft data recording system (ADRS), a cockpit audio recording system (CARS), an airborne image recording system (AIRS) and/or a data link recording system (DLRS). Image and data link information may be recorded on either the CARS or the ADRS.*

...

6.3.1.2.1 All turbine-engined aeroplanes of a maximum certificated take-off mass of 5 700 kg or less for which the application for a-type certificate is first issued certification is submitted to a Contracting State on or after 1 January 2016 shall be equipped with:

...

*Note.— “The application for Type certificate first issued certification is submitted to a Contracting State” refers to the date of application issuance of the original “Type certificate” for the aeroplane type, not the date of certification of particular aeroplane variants or derivate models.*

...

6.3.1.2.12 All aeroplanes which are required to record normal acceleration, lateral acceleration and longitudinal acceleration for which the application for a-type certificate is first issued certification is submitted to a Contracting State on or after 1 January 2016 and which are required to be fitted with

an FDR shall record those parameters at a maximum sampling and recording interval of 0.0625 seconds.

6.3.1.2.13 All aeroplanes which are required to record pilot input and/or control surface position of primary controls (pitch, roll, yaw) for which the application for a type certificate is first issued certification is submitted to a Contracting State on or after 1 January 2016 and which are required to be fitted with an FDR shall record those parameters at a maximum sampling and recording interval of 0.125 seconds.

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## 6.3.2 Cockpit voice recorders and cockpit audio recording systems

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### 6.3.2.1 Operation

6.3.2.1.1 All turbine-engined aeroplanes of a maximum certificated take-off mass of over 2 250 kg, up to and including 5 700 kg for which the application for a type certificate is first issued certification is submitted to a Contracting State on or after 1 January 2016 and required to be operated by more than one pilot shall be equipped with either a CVR or a CARS.

6.3.2.1.2 **Recommendation.**— *All turbine-engined aeroplanes of a maximum certificated take-off mass of 5 700 kg or less for which the individual certificate of airworthiness is first issued on or after 1 January 2016 and required to be operated by more than one pilot should be equipped with either a CVR or a CARS.*

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*Insert new text as follows:*

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### 6.3.2.4 Cockpit Voice Recorder alternate power

6.3.2.4.1 An alternate power source shall automatically engage and provide ten minutes, plus or minus one minute, of operation whenever aeroplane power to the recorder ceases, either by normal shutdown or by any other loss of power. The alternate power source shall power the CVR and its associated cockpit area microphone components. The CVR shall be located as close as practicable to the alternate power source.

*Note 1.— “Alternate” means separate from the power source that normally provides power to the CVR. The use of aeroplane batteries or other power sources is acceptable provided that the requirements above are met and electrical power to essential and critical loads is not compromised.*

*Note 2.— When the CVR function is combined with other recording functions within the same unit, powering the other functions is allowed.*

6.3.2.4.2 All aeroplanes of a maximum certificated take-off mass of over 27 000 kg for which the application for type certification is submitted to a Contracting State on or after 1 January 2018 shall be provided with an alternate power source, as defined in 6.3.2.4.1, that powers the forward CVR in the case of combination recorders.

6.3.2.4.3 **Recommendation.**— *All aeroplanes of a maximum certificated take-off mass of over 27 000 kg for which the individual certificate of airworthiness is first issued on or after 1 January 2018 should be provided with an alternate power source, as defined in 6.3.2.4.1, that powers at least one CVR.*

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End of new text.

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6.3.4.5.1 **Recommendation.**— *All aeroplanes of a maximum certificated take-off mass of over 5 700 kg for which the application for the type certificate is first issued certification is submitted to a Contracting State on or after 1 January 2016 and which are required to be equipped with both a CVR and an FDR, should be equipped with two combination recorders (FDR/CVR).*

6.3.4.5.2 All aeroplanes of a maximum certificated take-off mass of over 15 000 kg for which the application for the type certificate is first issued certification is submitted to a Contracting State on or after 1 January 2016 and which are required to be equipped with both a CVR and an FDR, shall be equipped with two combination recorders (FDR/CVR). One recorder shall be located as close to the cockpit as practicable and the other recorder located as far aft as practicable.

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### 6.5.3 All aeroplanes on long-range over-water flights

6.5.3.1 In addition to the equipment prescribed in 6.5.1 or 6.5.2 ...

- a) life saving rafts...; and
- b) equipment for making the pyrotechnical distress signals described in Annex 2; and
- c) at the earliest practicable date but not later than 1 January 2018, on all aeroplanes of a maximum certificated take-off mass of over 27 000 kg, a securely attached underwater locating device operating at a frequency of 8.8 kHz. This automatically activated underwater locating device shall operate for a minimum of 30 days and shall not be installed in wings or empennage.

*Note.— Underwater Locator Beacon (ULB) performance requirements are as contained in the SAE AS6254, Minimum Performance Standard for Underwater Locating Devices (Acoustic) (Self-Powered), or equivalent documents.*

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## APPENDIX 9. FLIGHT RECORDERS

(Note — See Chapter 6, 6.3)

The material in this Appendix concerns flight recorders intended for installation in aeroplanes engaged in international air navigation. Crash protected flight recorders comprise one or more of the following four systems: a flight data recorder (FDR), a cockpit voice recorder (CVR), an airborne image recorder (AIR) and/or a data link recorder (DLR). Lightweight flight recorders comprise one or more of the following four systems: an aircraft data recording system (ADRS), a cockpit audio recording system (CARS), an airborne image recording system (AIRS) and/or a data link recording system (DLRS).

### 1. General requirements

1.1 The flight recorder systems containers shall:



- a) be painted a distinctive orange or yellow colour;
- b) carry reflective material to facilitate their location; and
- c) have securely attached an automatically activated underwater locating device operating at a frequency of 37.5 kHz. At the earliest practicable date but not later than 1 January 2018, this device shall operate for a minimum of 90 days.

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*Editorial Note.— Delete Attachment D in toto and replace by the following new Attachment D.*

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## ATTACHMENT D

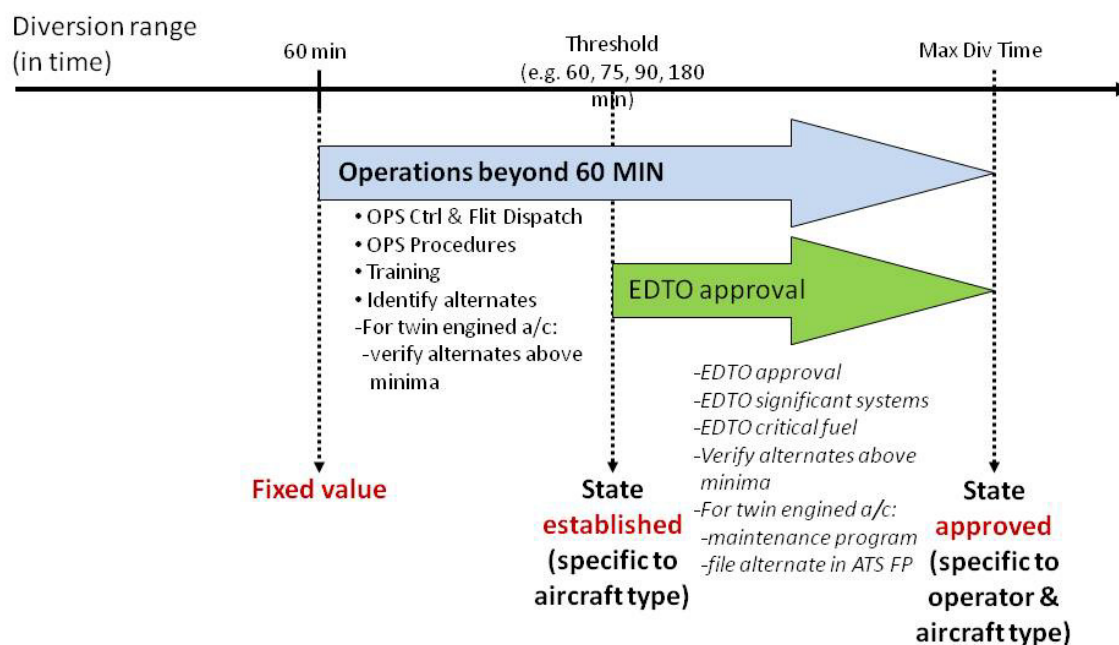
### GUIDANCE FOR OPERATIONS BY TURBINE ENGINE AEROPLANES BEYOND 60 MINUTES TO AN EN-ROUTE ALTERNATE AERODROME INCLUDING EXTENDED DIVERSION TIME OPERATIONS (EDTO) *(Supplementary to Chapter 4, 4.7)*

#### 1. Introduction

1.1 The purpose of this Attachment is to provide guidance on the general provisions relating to operations by turbine engine aeroplanes beyond 60 minutes flying time to an en-route alternate aerodrome and extended diversion time operations contained in Chapter 4, Section 4.7. The guidance also assists States in establishing a threshold time and approving the maximum diversion time for a given operator with a specific aeroplane type. The provisions in Section 4.7 are divided into: a) the basic provisions that apply to all aeroplanes operating beyond 60 minutes to an en-route alternate aerodrome and; b) provisions to fly beyond a threshold time, and up to a maximum diversion time, approved by the State of the Operator, that may be different for each operator/aeroplane type combination. This Attachment provides guidance on the means of achieving the required level of safety envisaged.

1.2 Similar to the threshold time, the maximum diversion time is the range (expressed in time) from a point on a route to an en-route alternate aerodrome up to which the State of the Operator will grant approval. When approving the operator's maximum diversion time, States will need to consider not only the capable range of the aircraft, taking into consideration any limitation of the aeroplanes type certificate, but also the operator's previous experience on similar aircraft types and routes.

Figure 1: Generic EDTO graphical representation.



1.3 The material in this Attachment is organized to address guidance on operations beyond 60 minutes to an en-route alternate aerodrome for all airplanes with turbine engines (Section 2) and guidance for extended diversion time operations (Section 3). The EDTO section is further divided into general provisions (Section 3.1), provisions that apply to aeroplanes with more than two engines (Section 3.2) and provisions that apply to aeroplanes with two engines (Section 3.3). The two engine and more than two engine aeroplane sections are organized exactly the same way. It should be noted that these sections may appear to be similar and thus repetitive, however there are requirement differences based on the aeroplane type. The reader should see Section 2, 3.1 and then either 3.2 for aeroplanes with more than two engines or 3.3 for aeroplanes with two engines.

## 2. Operations by aeroplanes with turbine engines beyond 60 minutes to an en-route alternate aerodrome

### 2.1 General

2.1.1 All provisions for operating by aeroplanes with turbine engines beyond 60 minutes to an en-route alternate aerodrome also apply to extended diversion time operations (EDTO).

2.1.2 In applying the requirements for aeroplanes with turbine engines in Chapter 4, Section 4.7, it should be understood that:

- operational control refers to the exercise by the operator of responsibility for the initiation, continuation, termination or diversion of a flight;
- flight dispatch procedures refer to the method of control and supervision of flight operations. This does not imply a specific requirement for licensed flight dispatchers or a full flight following system;
- operating procedures refer to the specification of organization and methods established to exercise operational control and flight dispatch procedures in the appropriate manual(s) and should cover at least a description of responsibilities

concerning the initiation, continuation, termination or diversion of each flight as well as the method of control and supervision of flight operations; and

- d) training programme refers to the training for pilots and flight operations officers/flight dispatchers in operations covered by this and following sections.

2.1.3 Aeroplanes with turbine engines operating beyond 60 minutes to an en-route alternate aerodrome are not required to have specific additional approval by the State of the Operator except if they engage in extended diversion time operations.

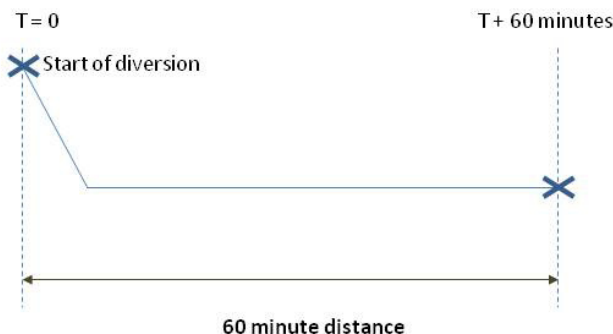
## 2.2 Conditions to be used when converting diversion times to distances

2.2.1 For the purpose of this guidance, an “approved one-engine-inoperative (OEI) speed” or “approved all-engine-operative (AEO) speed” is any speed within the certified flight envelope of the aeroplane.

### 2.2.2 *Determination of the 60 minute distance – aeroplanes with two turbine engines*

2.2.2.1 For determining whether a point on the route is beyond 60 minutes to an en-route alternate, the operator should select an approved one-engine-inoperative (OEI) speed. The distance is calculated from the point of the diversion followed by cruise for 60 minutes, in ISA and still air conditions as shown in the figure 2 below. For the purposes of computing distances, credit for driftdown may be taken.

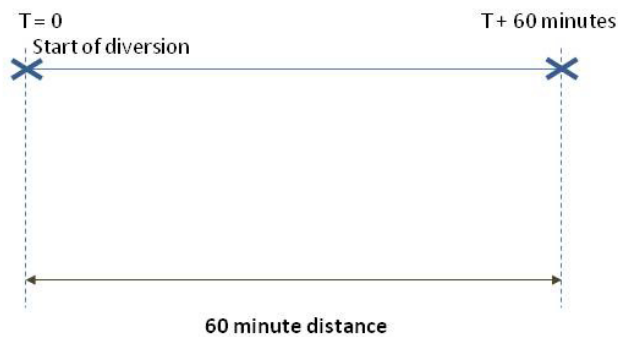
**Figure 2: 60 min distance - Aeroplanes with two turbine engines**



### 2.2.3 *Determination of the 60 minute distance – aeroplanes with more than two turbine engines*

2.2.3.1 For determining whether a point on the route is beyond 60 minutes to an en-route alternate, the operator should select an approved all-engine-operative (AEO) speed. The distance is calculated from the point of the diversion followed by cruise for 60 minutes, in ISA and still air conditions as shown in the figure 3 below.

**Figure 3: 60 min distance - Aeroplanes with more than two turbine engines**



## 2.3 Training

2.3.1 Training programmes should ensure requirements of Chapter 9, 9.4.3.2 are complied with such as but not limited to, route qualification, flight preparation, concept of extended diversion time operations and criteria for diversions.

## 2.4 Flight dispatch and operational requirements

2.4.1 In applying the general flight dispatch requirements of Chapter 4 particular attention should be paid to the conditions which might prevail any time that the operation is beyond 60 minutes to an en-route alternate aerodrome, e.g. systems degradation, reduced flight altitude, etc. For compliance with the requirement of Chapter 4, Section 4.7, at least the following aspects should be considered:

- a) identify en-route alternate airports;
- b) ensure that prior to departure the flight crew is provided with the most up-to-date information on the identified en-route alternate aerodromes, including operational status and meteorological conditions and, in flight, make available means for the flight crew to obtain the most up-to-date weather information;
- c) methods to enable two-way communications between the aeroplane and the operator's operational control centre;
- d) ensure that the operator has a means to monitor conditions along the planned route including the identified alternate airports and ensure that procedures are in place so that the flight crew are advised of any situation that may affect the safety of flight;
- e) ensure that the intended route does not exceed the established aeroplane threshold time unless the operator is approved for EDTO operations;
- f) pre-flight system serviceability including the status of items in the minimum equipment list;
- g) communication and navigation facilities and capabilities;

- h) fuel requirements; and
- i) availability of relevant performance information for the identified en-route alternate aerodrome(s).

2.4.2 In addition, operations conducted by aeroplanes with two turbine engines require that prior to departure and in flight, the meteorological conditions at identified en-route alternate aerodromes will be at or above the aerodrome operating minima required for the operation during the estimated time of use.

## 2.5 En-route alternate aerodromes

2.5.1 Aerodrome(s) to which an aircraft may proceed in the event that a diversion becomes necessary while en route, where the necessary services and facilities are available, where aircraft performance requirements can be met, and which are expected to be operational if required, need to be identified any time that the operation is beyond 60 minutes to an en-route alternate aerodrome.

*Note.— En-route alternate aerodromes may also be the take off and/or destination aerodromes.*

## 3. Extended diversion time operations (EDTO) requirements

### 3.1 Basic concept

3.1.1 This section addresses provision that apply in addition to those in Section 2 of this Attachment to operations by aeroplanes with two or more turbine engines where the diversion time to an en-route alternate aerodrome is greater than the threshold time established by the State of the Operator (extended diversion time operations).

#### 3.1.2 *EDTO significant systems*

3.1.2.1 EDTO significant systems may be the aeroplane propulsion system and any other aeroplane systems whose failure or malfunctioning could adversely affect safety particular to an EDTO flight, or whose functioning is specifically important to continued safe flight and landing during an aeroplane EDTO diversion.

3.1.2.2 Many of the aeroplane systems which are essential for non-extended diversion time operations may need to be reconsidered to ensure that the redundancy level and/or reliability will be adequate to support the conduct of safe extended diversion time operations.

3.1.2.3 The maximum diversion time should not exceed the value of the EDTO significant system limitation(s), if any, for extended diversion time operations identified in the Aeroplane's Flight Manual directly or by reference, reduced with an operational safety margin, commonly 15 minutes, specified by the State of the Operator.

3.1.2.4 The specific safety risk assessment to approve operations beyond the time limits of an EDTO significant time-limited system per the provisions in Chapter 4, Section 4.7, 4.7.2.3.1 should be based on the safety risk management guidance contained in the *Safety Management Manual* (Doc 9859). Hazards should be identified and safety risks assessed according to predicted probability and the severity of the consequences based on the worst foreseeable situation. When addressing the following components of the specific safety risk assessment it should be understood that:

- a) capabilities of the operator refer to the operator's quantifiable in-service experience, compliance record, aeroplane capability, and overall operational reliability that:
  - 1) is sufficient to support operations beyond the time limits of an EDTO significant time-limited system;
  - 2) demonstrate the ability of the operator to monitor and respond to changes in a timely manner; and
  - 3) there is an expectation that the operator's established processes, necessary for successful and reliable extended diversion time operations, can be successfully applied to such operations;
- b) overall reliability of the aeroplane refers:
  - 1) to quantifiable standards of reliability taking into account the number of engines, aircraft EDTO significant systems and any other factors that may affect operations beyond the time limits of a particular EDTO significant time limited system; and
  - 2) relevant data from the aeroplane manufacturer and data from the operator reliability program used as a basis to determine overall reliability of the aeroplane and its EDTO significant systems;
- c) reliability of each time limited system refers to quantifiable standards of design, testing and monitoring that ensure the reliability of each particular EDTO significant time limited system;
- d) relevant information from the aeroplane manufacturer refers to technical data and characteristics of the aeroplane and worldwide fleet operational data provided by the manufacturer and used as a basis to determine overall reliability of the aeroplane and its EDTO significant systems; and
- e) specific mitigation measures refer to the safety risk management mitigation strategies, which have manufacturer concurrence, that ensure an equivalent level of safety is maintained. These specific mitigations shall be based on:
  - 1) technical expertise (e.g. data, evidence) proving the operator's eligibility for an approval of operations beyond the time limit of the relevant EDTO significant system; and
  - 2) an assessment of relevant hazards, their probability and severity of the consequences that may adversely impact the safety of the operation, of an aeroplane operated beyond the limit of a particular EDTO significant time limited system.

### 3.1.3 *Threshold time*

3.1.3.1 It should be understood that the threshold time established in accordance with Chapter 4, Section 4.7 is not an operating limit. It is a flight time to an en-route alternate aerodrome, which is established by the State of the Operator as being the EDTO threshold beyond which particular consideration should be given to the aeroplane capability as well as the operator's relevant operational experience, before granting an EDTO approval.

### 3.1.4 *Maximum diversion time*

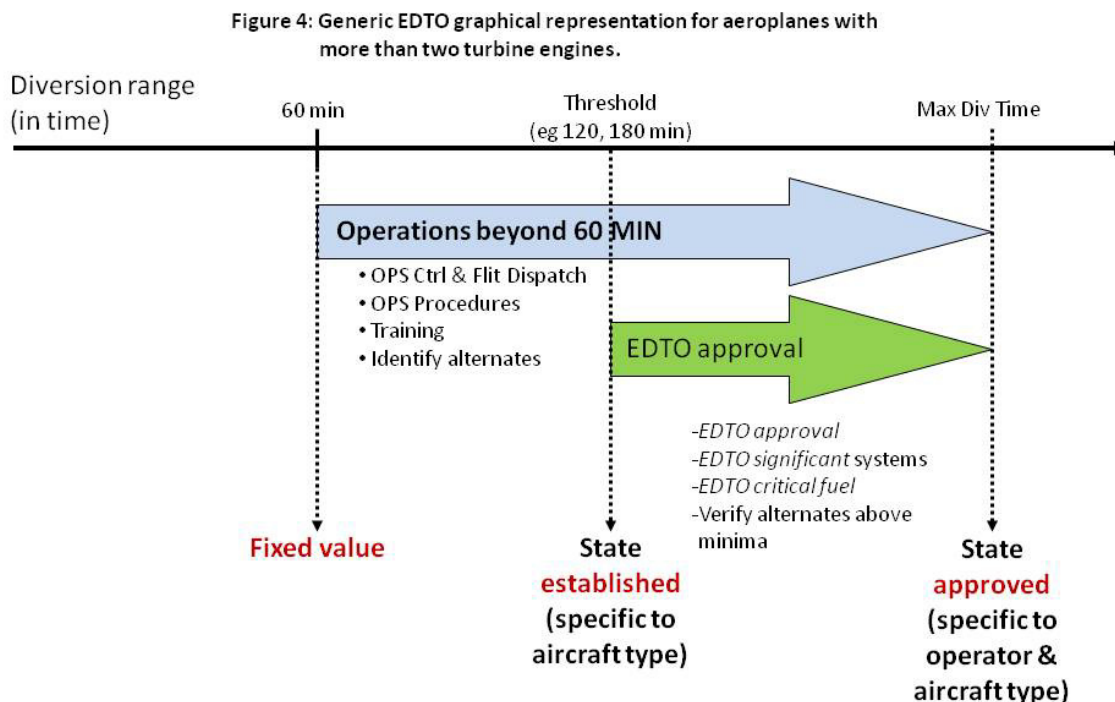
3.1.4.1 It should be understood that the maximum diversion time approved in accordance with Chapter 4, Section 4.7 should take into consideration the most limiting EDTO significant system time limitation, if any, indicated in the Aeroplane's Flight Manual (directly or by reference) for a particular aeroplane type and the operator's operational and EDTO experience, if any, with the aeroplane type, or if relevant with another aeroplane type or model.

## 3.2 EDTO for aeroplanes with more than two turbine engines

### 3.2.1 *General*

3.2.1.1 This section addresses provision that apply in addition to those in Sections 2 and 3.1 of this Attachment in particular to aeroplanes with more than two turbine engines.

*Note.— EDTO may be referred to as ETOPS in some documents.*



### 3.2.2 *Operational and diversion planning principles*

3.2.2.1 When planning or conducting, extended diversion time operations, an operator and pilot-in-command, should ensure that:

- when planning an EDTO flight, the minimum equipment list, the communications and navigation facilities, fuel and oil supply, en-route alternate aerodromes and aeroplane performance, are appropriately considered;
- if no more than one engine is shut down, the pilot-in-command may elect to continue beyond the nearest en-route alternate aerodrome (in terms of time) if he determines that it is safe to do so. In making this decision the pilot-in-command should consider all relevant factors; and

- c) in the event of a single or multiple failure of an EDTO significant system or systems (excluding engine failure), proceed to and land at the nearest available en-route alternate aerodrome where a safe landing can be made unless it has been determined that no substantial degradation of safety results from any decision made to continue the planned flight.

### 3.2.2.2 *EDTO critical fuel*

3.2.2.2.1 An aeroplane with more than two engines engaged in EDTO operations should carry enough fuel to fly to an en-route alternate aerodrome as described in Section 3.2.6 of this Attachment. This EDTO critical fuel corresponds to the additional fuel that may be required to comply with Annex 6, 4.3.6.3 f) 2).

3.2.2.2.2 The following should be considered, using the anticipated mass of the aeroplane, in determining the corresponding EDTO critical fuel:

- a) fuel sufficient to fly to an en-route alternate aerodrome, considering at the most critical point of the route, simultaneous engine failure and depressurization or depressurization alone, whichever is more limiting;
  - 1) the speed selected for the diversions (i.e. depressurization, combined or not with an engine failure) may be different from the approved all-engine-operative speed used to determine the EDTO threshold and maximum diversion distance (see 3.2.8);
- b) fuel to account for icing;
- c) fuel to account for errors in wind forecasting;
- d) fuel to account for holding, an instrument approach and landing at the en-route alternate aerodrome;
- e) fuel to account for deterioration in cruise fuel burn performance; and
- f) fuel to account for APU use (if required).

*Note.— Guidance on EDTO critical fuel planning can be found in the Flight Planning and Fuel Management Manual (Doc 9976).*

3.2.2.3 The following factors may be considered in determining if a landing at a given aerodrome is the more appropriate course of action:

- a) aeroplane configuration, weight, systems status, and fuel remaining;
- b) wind and weather conditions en-route at the diversion altitude, minimum altitudes en-route and fuel consumption to the en-route alternate aerodrome;
- c) runways available, runway surface condition, weather, wind and terrain, in proximity of the en-route alternate aerodrome;
- d) instrument approaches and approach/runway lighting available, rescue and fire fighting services (RFFS) at the en-route alternate aerodrome;
- e) the pilot's familiarity with that aerodrome and information about that aerodrome provided to the pilot by the operator; and



- f) facilities for passenger and crew disembarkation and accommodation.

### 3.2.3 *Threshold time*

3.2.3.1 In establishing the appropriate threshold time and to maintain the required level of safety, it is necessary for States to consider that:

- a) the airworthiness certification of the aeroplane type does not restrict operations beyond the threshold time, taking into account the aeroplane system design and reliability aspects;
- b) specific flight dispatch requirements are met;
- c) necessary in-flight operational procedures are established; and
- d) the operator's previous experience on similar aircraft types and routes.

3.2.3.2 For determining whether a point on a route is beyond the EDTO threshold to an en-route alternate aerodrome, the operator should use the approved speed as described in Section 3.2.8 of this Attachment.

### 3.2.4 *Maximum diversion time*

3.2.4.1 In approving the maximum diversion time, the State of the Operator should take into consideration the aeroplane's EDTO significant systems (e.g. limiting time limitation, if any, and relevant to that particular operations) 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.

3.2.4.2 For determining the maximum diversion distance to an en-route alternate, the operator should use the approved speed as described in Section 3.2.8 of this Attachment.

3.2.4.3 The operator's approved maximum diversion time should not exceed the most limiting EDTO significant system time limitation identified in the Aeroplane's Flight Manual reduced by an operational safety margin, commonly 15 minutes, specified by the State of the Operator.

### 3.2.5 *EDTO significant systems*

3.2.5.1 In addition to the provisions in section 3.1.1 of this Attachment, this section addresses particular provisions for aeroplanes with more than two turbine engines.

#### 3.2.5.2 *Consideration of time limitations*

3.2.5.2.1 For all operations beyond the EDTO threshold as determined by the State of the Operator, the operator should consider, at time of dispatch and as outlined below, the most limiting EDTO significant system time limitation, if any, indicated in the Aeroplane's Flight Manual (directly or by reference) and relevant to that particular operation.

3.2.5.2.2 The operator should check that from any point on the route, the maximum diversion time does not exceed the most limiting EDTO significant system time limitation reduced with an operational safety margin, commonly 15 minutes, specified by the State of the Operator.

3.2.5.2.3 Not applicable. Considerations for the maximum diversion time subject to cargo fire suppression time limitations are considered in 3.3.5.2.2.

3.2.5.2.4 For that purpose, the operator should consider the approved speed as described in Section 3.2.8.2 or consider adjusting that speed with forecast wind and temperature conditions for operations with longer threshold times (e.g. beyond 180 minutes) as determined by the State of the Operator.

### 3.2.6 *En-route alternate aerodromes*

3.2.6.1 In addition to the en-route alternate aerodrome provisions described in Section 2.3 of this Attachment the following apply:

- a) for route planning purposes, identified en-route alternate aerodromes need to be located at a distance within the maximum diversion time from the route and which could be used if necessary; and
- b) in extended diversion time operations, before an aeroplane crosses its threshold time during flight, there should always be an en-route alternate aerodrome within the approved maximum diversion time whose conditions will be at or above the operator's established aerodrome operating minima for the operation during the estimated time of use.

If any conditions, such as weather below landing minima, are identified that would preclude a safe approach and landing at that aerodrome during the estimated time of use, an alternative course of action should be determined such as selecting another en-route alternate aerodrome within the operator's approved maximum diversion time.

*Note.— En route alternate aerodromes may also be the take off and/or destination aerodromes.*

### 3.2.7 *Operational approval procedure*

3.2.7.1 In approving an operator with a particular aeroplane type for extended diversion time operations, the State of the Operator should establish an appropriate threshold time and maximum diversion time and in addition to the requirements previously set forth in this Attachment, ensure that:

- a) specific operational approval is granted (by the State of the Operator);
- b) the operator's past experience and compliance record is satisfactory and the operator establishes the processes necessary for successful and reliable extended diversion time operations and shows that such processes can be successfully applied throughout such operations;
- c) the operator's procedures are acceptable based on certified aeroplane capability and adequate to address continued safe operation in the event of degraded aeroplane systems;
- d) the operator's crew training programme is adequate for the proposed operation;
- e) documentation accompanying the authorization covers all relevant aspects; and
- f) it has been shown (e.g. during the EDTO certification of the aeroplane) that the flight can continue to a safe landing under the anticipated degraded operating conditions which would arise from:
  - 1) the most limiting EDTO significant system time limitation, if any, for extended diversion time operations identified in the Aeroplane's Flight Manual directly or by reference; or

- 2) any other condition which the State of the Operator considers to be equivalent in airworthiness and performance risk.

3.2.8 *Conditions to be used when converting diversion times to distances for the determination of the geographical area beyond threshold and within maximum diversion distances*

3.2.8.1 For the purpose of this guidance, an approved all-engine-operative (AEO) speed is any all-engine-operative speed within the certified flight envelope of the aeroplane.

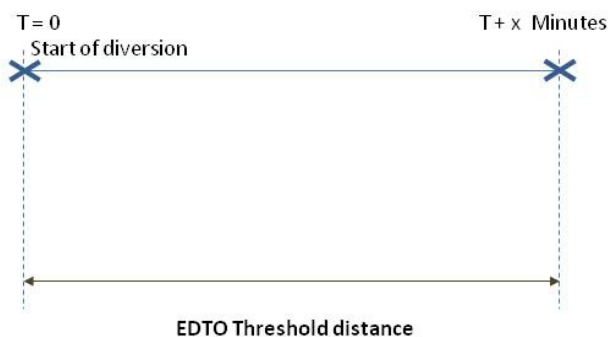
*Note.— See Section 3.2.5.2.2 of this Attachment for operational considerations.*

3.2.8.2 When applying for EDTO an operator should identify, and the State of the Operator should approve the AEO speed(s), considering ISA and still air conditions that will be used to calculate the threshold and maximum diversion distances. The speed that will be used to calculate the maximum diversion distance may be different from the speed used to determine the 60-minute and EDTO thresholds.

3.2.8.3 *Determination of the EDTO threshold*

3.2.8.3.1 For determining whether a point of the route is beyond the EDTO threshold to an en-route alternate, the operator should use the approved speed (see 3.2.8.1 and 3.2.8.2). The distance is calculated from the point of the diversion followed by cruise for the threshold time as determined by the State of the Operator as shown on the figure 5 below.

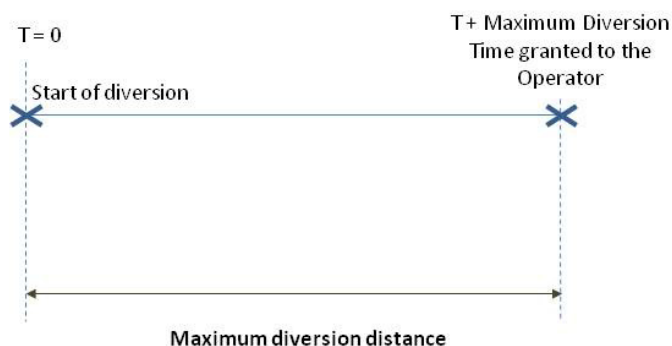
**Figure 5: Threshold distance - Aeroplanes with more than two turbine engines**



3.2.8.4 *Determination of the maximum diversion time distance*

3.2.8.4.1 For determining the maximum diversion time distance to an en-route alternate, the operator should use the approved speed (see 3.2.8.1 and 3.2.8.2). The distance is calculated from the point of the diversion followed by cruise for the maximum diversion time as approved by the State of the Operator, as shown of the figure 6 below.

**Figure 6: Maximum diversion distance - Aeroplanes with more than two turbine engines**



3.2.9 *Airworthiness certification requirements for extended diversion time operations beyond the threshold time*

3.2.9.1 Not applicable. There are no additional EDTO airworthiness certification requirements for aeroplanes with more than two engines.

3.2.10 *Maintaining operational approval*

3.2.10.1 In order to maintain the required level of safety on routes where these aeroplanes are permitted to operate beyond the established threshold time, it is necessary that:

- a) specific flight dispatch requirements are met;
- b) necessary in-flight operational procedures are established; and
- c) specific operational approval is granted by the State of the Operator.

3.2.11 *Airworthiness modifications and maintenance programme requirements*

3.2.11.1 Not applicable. There are no additional EDTO airworthiness or maintenance requirements for aeroplanes with more than two engines.

3.2.12 *Examples*

3.2.12.1 On establishing the appropriate threshold and approved maximum diversion time for an operator with a particular aeroplane type, the State of the Operator should consider, but not be limited to, the following; the airworthiness certification of the aeroplane, the operator's experience in conducting operations beyond the 60-minute threshold, flight deck crew experience in conducting such operations, the maturity of that operator's flight dispatch system, the communication capability with the operators operational control centre (ACARS, SATCOM, HF, etc.), the robustness of both the operator's standard operating procedures and the familiarity of the crews with those procedures, the maturity of the operator's Safety Management System, the crew training programme and the reliability of the propulsion system. The following examples are based on those considerations and are taken from actual State requirements:

- a) State A: This State has established the threshold time based on the capability of the operator and the aeroplane type for an aeroplane with more than two engines at 180 minutes and approved a maximum diversion time of 240 minutes. That

operator will need to have specific approval to be further than 180 minutes to an en-route alternate aerodrome (all-engine-operative (AEO) speed in ISA and still air conditions), remain within 240 minutes to an en-route alternate airport and meet the requirements in Chapter 4; 4.7.1 – 4.7.2.4.

If that operator with the particular aeroplane type plans a route within the threshold time established by the State of the Operator (in the above example this is 180 minutes) to an en-route alternate aerodrome, that operator would not require any additional approval from the State of the Operator and only need to comply with the requirements in Chapter 4; 4.7.1 if the operation was conducted beyond 60 minutes from an en-route alternate aerodrome.

- b) State B: The CAA is approached by an operator who is in the process of expansion, having acquired aeroplane(s) with more than two engines capable of EDTO. The operator submits an application to amend its AOC to include this new aeroplane type on newly granted routes. These routes take the flight beyond 60 minutes to an en-route alternate, thus requiring the establishment of a threshold time and approval of a maximum diversion time. Taking into account:
- 1) that the operator has not had previous experience with the routes and area of operation;
  - 2) the new aeroplane type;
  - 3) the inexperience of the company and its flight operations/operations control department at planning and dispatching such flights; and
  - 4) the new operating procedures to be established.

State B determines that the threshold time for Operator B should be limited to 120 minutes and approves a maximum diversion time of 180 minutes.

As the operator gains experience with the operation and the procedures over time, the State may amend the initially established threshold time and approved maximum diversion time.

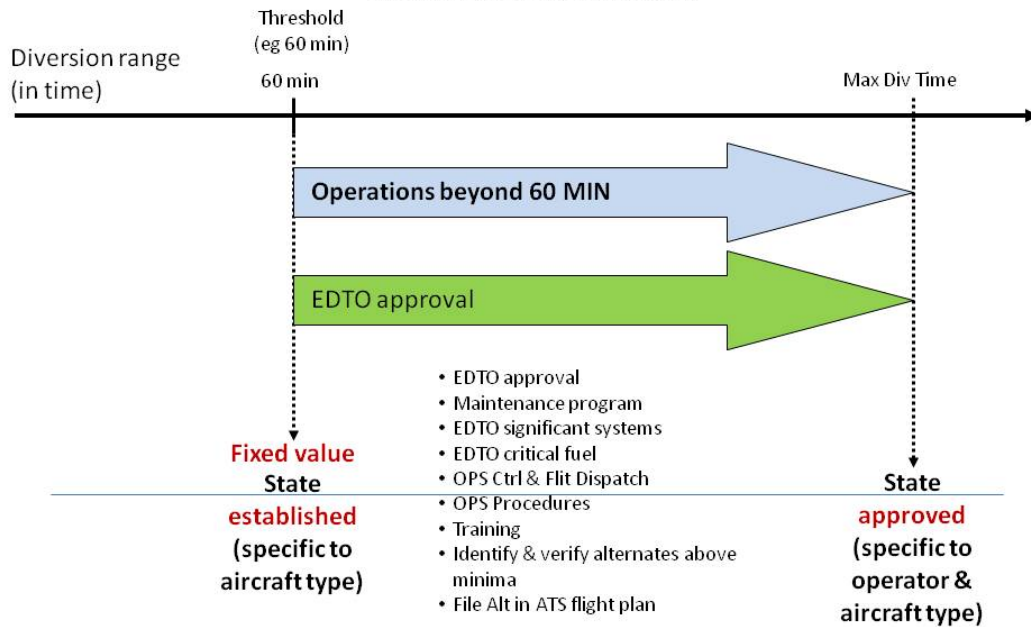
### 3.3 EDTO for aeroplanes with two turbine engines

#### 3.3.1 *General*

3.3.1.1 This section addresses provision that apply in addition to those in Sections 2 and 3.1 of this Attachment in particular to aeroplanes with two turbine engines.

3.3.1.2 EDTO provisions for aeroplanes with two turbine engines do not differ from the previous provisions for extended range operations by aeroplanes with two turbine engines (ETOPS). Therefore, EDTO may be referred to as ETOPS in some documents.

Figure 7: Generic EDTO graphical representation for aeroplanes with two turbine engines.



### 3.3.2 Operational and diversion planning principles

3.3.2.1 When planning or conducting, extended diversion time operations, an operator and pilot in command, should normally ensure that:

- when planning an EDTO flight, the minimum equipment list, the communications and navigation facilities, fuel and oil supply, en-route alternate aerodromes or aeroplane performance, are appropriately considered;
- if an aeroplane engine shutdown, proceed to and land at the nearest (in terms of the least flying time) en-route alternate aerodrome where a safe landing can be made; and
- in the event of a single or multiple failure of an EDTO significant systems or systems (excluding engine failure), proceed to and land at the nearest available en-route alternate aerodrome where a safe landing can be made unless it has been determined that no substantial degradation of safety results from any decision made to continue the planned flight.

#### 3.3.2.2 EDTO critical fuel

3.3.2.2.1 An aeroplane with two engines engaged in EDTO operations should carry enough fuel to fly to an en-route alternate aerodrome as described in Section 3.3.6 of this Attachment. This EDTO critical fuel corresponds to the additional fuel that may be required to comply with Annex 6, 4.3.6.3 f) 2).

3.3.2.2.2 The following should be considered, using the anticipated mass of the aeroplane, in determining the corresponding EDTO critical fuel:

- a) fuel sufficient to fly to an en-route alternate aerodrome, considering at the most critical point of the route, failure of one engine or simultaneous engine failure and depressurization or depressurization alone, whichever is more limiting;
  - 1) the speed selected for the all-engine-operative diversion (i.e. depressurization alone) may be different from the approved one-engine-inoperative speed used to determine the EDTO threshold and maximum diversion distance (see 3.3.8);
  - 2) the speed selected for the one-engine-inoperative diversions (i.e. engine failure alone and combined engine failure and depressurization) should be the approved one-engine-inoperative speed used to determine the EDTO threshold and maximum diversion distance (see 3.3.8);
- b) fuel to account for icing;
- c) fuel to account for errors in wind forecasting;
- d) fuel to account for holding, an instrument approach and landing at the en-route alternate aerodrome;
- e) fuel to account for deterioration in cruise fuel burn performance; and
- f) fuel to account for APU use (if required).

*Note.— Guidance on EDTO critical fuel planning can be found in the Flight Planning and Fuel Management Manual (Doc 9976).*

3.3.2.3 The following factors may be considered in determining if a landing at a given aerodrome is the more appropriate course of action:

- a) aeroplane configuration, weight, systems status, and fuel remaining;
- b) wind and weather conditions en-route at the diversion altitude, minimum altitudes en-route and fuel consumption to the en-route alternate aerodrome;
- c) runways available, runway surface condition, weather, wind, and terrain, in proximity of the en-route alternate aerodrome;
- d) instrument approaches and approach/runway lighting available, rescue and fire fighting services (RFFS) at the en-route alternate aerodrome;
- e) pilot's familiarity with that aerodrome and information about that aerodrome provided to the pilot by the operator; and
- f) facilities for passenger and crew disembarkation and accommodation.

### 3.3.3 *Threshold time*

3.3.3.1 In establishing the appropriate threshold time and to maintain the required level of safety, it is necessary for States to consider that:

- a) the airworthiness certification of the aeroplane type specifically permits operations beyond the threshold time, taking into account the aeroplane system design and reliability aspects;

- b) the reliability of the propulsion system is such that the risk of double engine failure from independent causes is extremely remote;
- c) any necessary special maintenance requirements are fulfilled;
- d) specific flight dispatch requirements are met;
- e) necessary in-flight operational procedures are established; and
- f) the operator's previous experience on similar aircraft types and routes.

3.3.3.2 For determining whether a point on a route is beyond the EDTO threshold to an en-route alternate aerodrome, the Operator should use the approved speed as described in Section 3.3.8 of this Attachment.

#### 3.3.4 *Maximum diversion time*

3.3.4.1 In approving the maximum diversion time, the State of the Operator should take into consideration the EDTO certified capability of the aeroplane, the aeroplanes EDTO significant systems (e.g. limiting time limitation, if any, and 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.

3.3.4.2 For determining the maximum diversion distance to an en-route alternate, the operator should use the approved speed as described in Section 3.3.8 of this Attachment.

3.3.4.3 The operator's approved maximum diversion time should not exceed the EDTO certified capability of the aeroplane nor the most limiting EDTO significant system time limitation identified in the Aeroplane's Flight Manual reduced by an operational safety margin specified, commonly 15 minutes, by the State of the Operator.

#### 3.3.5 *EDTO significant systems*

3.3.5.1 In addition to the provisions in section 3.1.1 of this Attachment, this section address particular provisions for aeroplanes with two turbine engines.

3.3.5.1.1 The reliability of the propulsion system for the aeroplane-engine combination being certified is such that the risk of double engine failures from independent causes is assessed as provided in the *Airworthiness Manual* (Doc 9760) and found acceptable to support the diversion time being approved.

*Note.— EDTO may be referred to as ETOPS in some documents.*

#### 3.3.5.2 *Consideration of time limitations*

3.3.5.2.1 For all operations beyond the EDTO threshold as determined by the State of the Operator, the operator should consider, at time of dispatch and as outlined below, the EDTO certified capability of the aeroplane and the most limiting EDTO significant system time limitation, if any, indicated in the Aeroplane's Flight Manual (directly or by reference) and relevant to that particular operations.

3.3.5.2.2 The operator should check that from any point on the route, the maximum diversion time at the approved speed as described in Section 3.3.8.2 does not exceed the most limiting EDTO significant system time limitation, other than the cargo fire suppression system, reduced with an operational safety margin, commonly 15 minutes, specified by the State of the Operator.



3.3.5.2.3 The operator should check that from any point on the route, the maximum diversion time, at all engine operating cruise speed, considering ISA and still air conditions, does not exceed the cargo fire suppression system time limitation reduced with an operational safety margin, commonly 15 minutes, specified by the State of the Operator.

3.3.5.2.4 The operator should consider the approved speed as described in 3.3.5.2.2 and 3.3.5.2.3 above or consider adjusting that speed with forecast wind and temperature conditions for operations with longer threshold times (e.g. beyond 180 minutes) as determined by the State of the Operator.

### 3.3.6 *En-route alternate aerodromes*

3.3.6.1 In addition to the en-route alternate aerodrome provisions described in Section 2.5 of this Attachment the following apply:

- a) for route planning purposes, identified en-route alternate aerodromes need to be located at a distance within the maximum diversion time from the route and which could be used if necessary; and
- b) in extended diversion time operations, before an aeroplane crosses its threshold time during flight, there should always be an en-route alternate aerodrome within the approved maximum diversion time whose conditions will be at or above the operator's established aerodrome operating minima for the operation during the estimated time of use.

If any conditions, such as weather below landing minima, are identified that would preclude a safe approach and landing at that aerodrome during the estimated time of use, an alternative course of action should be determined such as selecting another en-route alternate aerodrome within the operator's approved maximum diversion time.

3.3.6.2 During flight preparation and throughout the flight the most up-to-date information should be provided to the flight crew on the identified en-route alternate aerodromes, including operational status and meteorological conditions.

*Note.— En route alternate aerodromes may also be the take off and/or destination aerodromes.*

### 3.3.7 *Operational approval procedure*

3.3.7.1 In approving an operator with a particular aeroplane type for extended diversion time operations, the State of the Operator should establish an appropriate threshold time and approve a maximum diversion time and in addition to the requirements previously set forth in this Attachment, ensure that:

- a) specific operational approval is granted (by the State of the Operator);
- b) the operator's past experience and compliance record is satisfactory and the operator establishes the processes necessary for successful and reliable extended diversion time operations and shows that such processes can be successfully applied throughout such operations;
- c) the operator's procedures are acceptable based on certified aeroplane capability and adequate to address continued safe operation in the event of degraded aeroplane systems;
- d) the operator's crew training programme is adequate for the proposed operation;

- e) documentation accompanying the authorization covers all relevant aspects; and
- f) it has been shown (e.g. during the EDTO certification of the aeroplane) that the flight can continue to a safe landing under the anticipated degraded operating conditions which would arise from:
  - 1) the most limiting EDTO significant system time limitation, if any, for extended diversion time operations identified in the Aeroplane's Flight Manual directly or by reference; or
  - 2) total loss of engine generated electric power; or
  - 3) total loss of thrust from one engine; or
  - 4) any other condition which the State of the Operator considers to be equivalent in airworthiness and performance risk.

3.3.8 *Conditions to be used when converting diversion times to distances for the determination of the geographical area beyond threshold and within maximum diversion distances*

3.3.8.1 For the purpose of this guidance, an "approved one-engine-inoperative (OEI) speed" is any one-engine-inoperative speed within the certified flight envelope of the aeroplane.

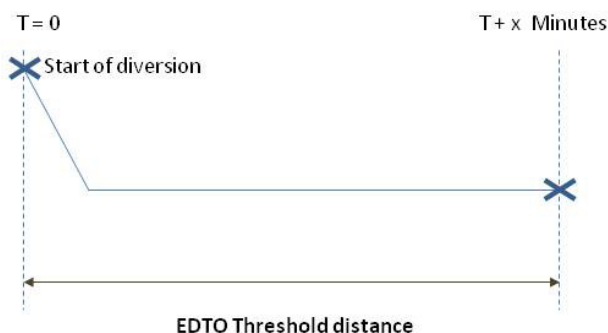
*Note.— See Section 3.3.5.2.2 of this Attachment for operational considerations.*

3.3.8.2 When applying for EDTO an operator should identify, and the State of the Operator should approve the OEI speed(s) that will be used to calculate the threshold and maximum diversion distances considering ISA and still air conditions. The identified speed that will be used to calculate the maximum diversion distance should be the same one used to determine fuel reserves for OEI diversions. This speed may be different from the speed used to determine the 60 minutes and EDTO thresholds.

3.3.8.3 *Determination of the EDTO threshold*

3.3.8.3.1 For determining whether a point of the route is beyond the EDTO threshold to an en-route alternate, the operator should use the approved speed (see 3.3.8.1 and 3.3.8.2). The distance is calculated from the point of the diversion followed by cruise for the threshold time as determined by the State of the Operator as shown on the figure 8 below. For the purposes of computing distances, credit for driftdown may be taken.

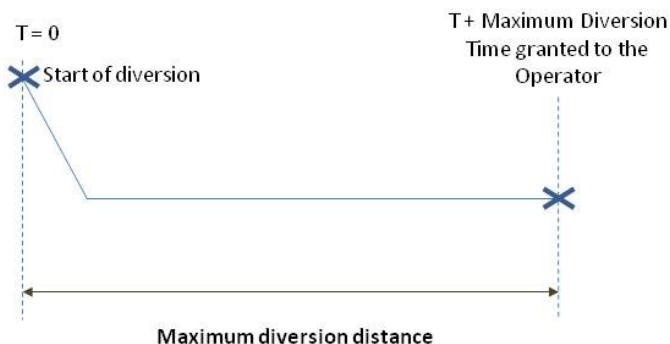
Figure 8: Threshold distance - Aeroplanes with two turbine engines



#### 3.3.8.4 Determination of the maximum diversion time distance

3.3.8.4.1 For determining the maximum diversion time distance to an en-route alternate, the operator should use the approved speed (see 3.3.8.1 and 3.3.8.2). The distance is calculated from the point of the diversion followed by cruise for the maximum diversion time as approved by the State of the Operator, as shown in the figure 9 below. For the purposes of computing distances, credit for driftdown may be taken.

Figure 9: Maximum diversion distance - Aeroplanes with two turbine engines



#### 3.3.9 Airworthiness certification requirements for extended diversion time operations beyond the threshold time

3.3.9.1 During the airworthiness certification procedure for an aeroplane type intended for extended diversion time operations, special attention should be paid to ensure that the required level of safety will be maintained under conditions which may be encountered during such operations, e.g. flight for extended periods following failure of an engine and/or aeroplanes EDTO significant systems. Information or procedures specifically related to extended diversion time operations should be incorporated into the Aeroplane's Flight Manual, Maintenance Manual, EDTO CMP (configuration, maintenance and procedure) document or other appropriate document.

3.3.9.2 Aeroplane manufacturers should supply data specifying the aeroplanes EDTO significant systems and where appropriate, any time-limiting factors associated with those systems.

*Note 1.— Criteria for aeroplane systems performance and reliability for extended diversion time operations are contained in the Airworthiness Manual (Doc 9760).*

*Note 2.— EDTO may be referred to as ETOPS in some documents.*

### 3.3.10 *Maintaining operational approval*

3.3.10.1 In order to maintain the required level of safety on routes where these aeroplanes are permitted to operate beyond the established threshold time, it is necessary that:

- a) the airworthiness certification of the aeroplane type specifically permits operations beyond the threshold time, taking into account the aeroplane system design and reliability aspects;
- b) the reliability of the propulsion system is such that the risk of double engine failures from independent causes is extremely remote, assessed as provided in the *Airworthiness Manual* (Doc 9760) and found acceptable to support the diversion time being approved;
- c) any necessary special maintenance requirements are fulfilled;
- d) specific flight dispatch requirements are met;
- e) necessary in-flight operational procedures are established; and
- f) specific operational approval is granted by the State of the Operator.

*Note 1.— The airworthiness considerations applicable to extended diversion time operations are provided in the Airworthiness Manual (Doc 9760) Part IV, Chapter 2.*

*Note 2.— EDTO may be referred to as ETOPS in some documents.*

### 3.3.11 *Airworthiness modifications and maintenance programme requirements*

3.3.11.1 Each operator's maintenance programme should ensure that:

- a) the titles and numbers of all airworthiness modifications, additions and changes which were made to qualify aeroplane systems for extended diversion time operations are provided to the State of Registry and, where applicable, to the State of the Operator;
- b) any changes to maintenance and training procedures, practices or limitations established in the qualification for extended diversion time operations are submitted to the State of the Operator and, where applicable, to the State of Registry before such changes are adopted;
- c) a reliability monitoring and reporting programme is developed and implemented prior to approval and continued after approval;
- d) prompt implementation of required modifications and inspections which could affect propulsion system reliability is undertaken;
- e) procedures are established which prevent an aeroplane from being dispatched for an extended diversion time operation after engine shutdown or EDTO significant system failure on a previous flight until the cause of such failure has been positively identified and the necessary corrective action is completed.

Confirmation that such corrective action has been effective may, in some cases, require the successful completion of a subsequent flight prior to dispatch on an extended diversion time operation;

- f) a procedure is established to ensure that the airborne equipment will continue to be maintained at the level of performance and reliability required for extended diversion time operations; and
- g) a procedure is established to minimize scheduled or unscheduled maintenance during the same maintenance visit on more than one parallel or similar EDTO-significant system. Minimization can be accomplished by staggering of maintenance tasks, performing and/or supervising maintenance by a different technician, or verifying maintenance correction actions prior to the airplane entering an EDTO threshold.

*Note.— The maintenance considerations applicable to extended diversion time operations are provided in the Airworthiness Manual (Doc 9760).*

### 3.3.12 *Examples*

3.3.12.1 On establishing the appropriate threshold and approved maximum diversion time for an operator with a particular aeroplane type, the State of the Operator should consider, but not be limited to, the following; the airworthiness certification of the aeroplane, the operator's experience in conducting operations beyond the 60-minute threshold, flight deck crew experience in conducting such operations, the maturity of that operator's flight dispatch system, the communication capability with the operator's operational control centre (ACARS, SATCOM, HF, etc.), the robustness of both the operator's standard operating procedures and the familiarity of the crews with those procedures, the maturity of the operator's Safety Management System, the crew training programme and the reliability of the propulsion system. The following examples are based on those considerations and are taken from actual State requirements:

- a) State A: This State has established the threshold time based on the capability of the operator and the aeroplane type for a twin engine aeroplane at 60 minutes and approved a maximum diversion time of 180 minutes. That operator will need to have specific approval to be further than 60 minutes to an en-route alternate aerodrome (calculated in ISA conditions and still air at the one-engine inoperative cruise speed), remain within 180 minutes to an en-route alternate airport and meet the requirements in Chapter 4, 4.7.1 to 4.7.2.6.

If that operator with the particular aeroplane type plans a route within the threshold time established by the State of the Operator (in the above example this is 60 minutes) to an en-route alternate airport, that operator by definition would not be conducting an extended diversion time operation and thus would not need to meet any of the provisions in Chapter 4, Section 4.7.

- b) State B: This State has established the threshold time based on the capability of the operator and the aeroplane type for a twin engine aeroplane at 90 minutes and approved a maximum diversion time of 180 minutes, that operator will need to have specific approval to be further than 90 minutes to an en-route alternate aerodrome (calculated in ISA conditions and still air at the one-engine inoperative cruise speed), remain within 180 minutes to an en-route alternate airport and meet the requirements in Chapter 4, 4.7.1 to 4.7.2.6.

If that operator with the particular aeroplane type plans a route within the threshold time established by the State of the Operator (in the above example this is 90 minutes) to an en-route alternate airport, that operator would not require any

additional approval from the State of the Operator and only need to comply with the requirements in Chapter 4, 4.7.1 and in particular 4.7.1.1 c).

- c) The same State B; This State is approached by an operator who is in a process of expansion, having acquired twin engine aeroplane(s) capable of EDTO. The operator submits an application to amend its AOC to include this new aeroplane type on newly granted routes. These routes take the flight beyond 60 minutes to an en-route alternate, thus requiring the establishment of a threshold time and approval of a maximum diversion time. Taking into account:
- 1) that the operator has not had previous experience with the routes and area of operation;
  - 2) the new aeroplane type;
  - 3) the inexperience of the company and its flight operations/operations control department at planning and dispatching such flights; and
  - 4) the new operating procedures to be established.

State B determines that the threshold time for this operator should be limited to 60 minutes and approves a maximum diversion time of 120 minutes.

As this operator gains experience with the operation and the procedures over time, the State may amend the initially established threshold time and approved maximum diversion time.

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End of new Attachment D.

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