



International
Civil Aviation
Organization

Organisation
de l'aviation civile
internationale

Organización
de Aviación Civil
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Международная
организация
гражданской
авиации

منظمة الطيران
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Ref.: AN 11/6.3.27-14/10

7 April 2014

Subject: Adoption of Amendment 33 to Annex 6, Part II

Action required: a) Notify any disapproval before 14 July 2014; b) Notify any differences and compliance before 13 October 2014; 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 33 to the *International Standards and Recommended Practices, Operation of Aircraft — International General Aviation — Aeroplanes* (Annex 6, Part II to the Convention on International Civil Aviation) was adopted by the Council at the fourth meeting of its 201st Session on 3 March 2014. 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>) where you can access all other relevant documentation.

2. When adopting the amendment, the Council prescribed 14 July 2014 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 33, to the extent it becomes effective, will become applicable on 13 November 2014.

3. Amendment 33 arises from:

- a) recommendations of the seventh, eighth, ninth, tenth and eleventh meetings of the Instrument Flight Procedures Panel Working Group of the Whole (IFPP/WG/WHL/7, 8, 9, 10 and 11) relating to procedure design criteria and charting requirements to support performance-based navigation (PBN) approach and departure operations;
- b) recommendations of the fifteenth meeting of the Operations Panel Working Group of the Whole (OPSP/WG/WHL/15) relating to harmonization of provisions in Part I with Part II, electronic flight bags (EFB), head-up displays (HUD) and visions systems, and fuel use provisions; and

- c) recommendations of the fifth meeting of the Flight Recorder Panel Working Group of the Whole (FLIRECP/WG/WHL/5) relating to various issues associated with the carriage requirements for flight recorders.

4. The amendment on charting requirements to support PBN is to avoid confusion regarding inconsistencies with the aeronautical charts, the PBN operational approvals and the avionics displays. The amendment identifies the need for pilots to receive training in chart depiction standards.

5. The amendment concerning harmonization of provisions, EFBs, dangerous goods, HUDs and vision systems, and fuel use provisions address the following:

- a) *Harmonization of applicability, terms and language across Annex 6, Parts I and II.* A side-by-side comparison of Annex 6, Parts I and II provisions was completed by the Operations Panel (OPSP) in which editorial and contextual differences were identified. The provisions with embedded dates that are no longer relevant and those needing minor wording or format changes have been addressed and are presented in this amendment. Provisions that require further analysis will be presented in the next amendment cycle to Annex 6 together with the revision of Annex 6, Part III which is still on-going;
- b) *Electronic flight bags (EFB).* The SARPs for the use of electronic flight bags are based on best practices in States and industry. They are divided into three areas relating to equipment (hardware), functions (software) and criteria for operational approval. Furthermore, a clear distinction is made between the EFB functions that may be used to supplement requirements and those that may replace them. It is envisaged that these provisions will be the baseline for the transition to a paperless environment on the flight deck;
- c) *Head-up displays/enhanced/synthetic/combined vision systems (HUDs/EVS/SVS/CVS).* A review of existing operational provisions for enhanced vision system (EVS) and emerging similar systems, like the synthetic vision system (SVS) and combinations called combined vision systems (CVS) was directed at addressing how capabilities on-board aircraft could compensate for fewer facilities on the ground.

The amendment addresses the criteria for States to use in granting operational credit approvals to operators that have aircraft equipped with capabilities which compensate for fewer ground facilities. A new attachment to Annex 6, Part II which uses, to a great extent, the text from the existing Attachment I to Annex 6, Part I, is to facilitate the operational approval process for States. Additional guidance material will be included in the fourth edition of the *Manual of All-Weather Operations* (Doc 9365);

- d) *Fuel use.* The amendments regarding fuel use for Annex 6, Part II consist in adapting the Amendment 36 to Annex 6, Part I fuel use, alternates aerodrome and extended diversion time operations (EDTO) provisions to ensure consistency across all Parts of Annex 6. The provisions were carefully reviewed to retain the same intent but making them appropriate for the type of operation.

6. The amendment concerning flight recorders is to address problems experienced with the availability and recovery of flight data during investigation of recent accidents taking the latest technology into consideration.

7. The subjects are given in the amendment to the Foreword of Annex 6, Part II, a copy of which is in Attachment A.

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

- a) that before 14 July 2014 you inform me if there is any part of the adopted Standards and Recommended Practices (SARPs) amendments in Amendment 33 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 13 October 2014 you inform me of the following, using the form in Attachment C for this purpose:
 - 1) any differences that will exist on 13 November 2014 between the national regulations or practices of your Government and the provisions of the whole of Annex 6, Part II, as amended by all amendments up to and including Amendment 33, 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 II, as amended by all amendments up to and including Amendment 33.

9. With reference to the request in paragraph 8 a) above, it should be noted that a registration of disapproval of Amendment 33 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 14 July 2014, replacement pages incorporating Amendment 33 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 II
- B — Form on notification of disapproval of all or part of Amendment 33 to Annex 6, Part II
- C — Form on notification of compliance with or differences from Annex 6, Part II, Amendment 33
- D — Note on the Notification of Differences

ATTACHMENT A to State letter AN 11/6.3.27-14/10

AMENDMENT TO THE FOREWORD OF ANNEX 6, PART II

Add the following at the end of Table A:

<i>Amendment</i>	<i>Source(s)</i>	<i>Subject</i>	<i>Adopted/Approved Effective Applicable</i>
33	Seventh, eighth, ninth, tenth and eleventh meetings of the Instrument Flight Procedures Panel Working Group of the Whole (IFPP/WG-WHL/7, 8, 9, 10 and 11); fifteenth meeting of the Operations Panel Working Group of the Whole (OPSP/WG/WHL/15); fifth meeting of the Flight Recorder Panel Working Group of the Whole (FLIRECP/WG/WHL/5)	Amendment concerning: a) procedure design criteria and charting requirements to support PBN approach and departure operations; b) harmonization of provisions, EFBs, HUDs and visions systems, and fuel use provisions. Introduction of a reference to general aviation guidance for fatigue management programmes; c) flight recorder requirements to: reference updated EUROCAE Minimum Operational Performance Specifications (MOPS); include the use of Class C lightweight airborne image recording systems (AIRS); include a seating configuration limitation for the carriage of lightweight flight recorders in small aeroplanes; align underwater location devices (ULD) requirements with Annex 6, Part I; and include less stringent inspection requirements of flight recorder systems.	3 March 2014 14 July 2014 13 November 2014

ATTACHMENT B to State letter AN 11/6.3.27-14/10

**NOTIFICATION OF DISAPPROVAL OF ALL OR PART OF
AMENDMENT 33 TO ANNEX 6, PART II**

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 33 to Annex 6, Part II:

Signature _____

Date _____

NOTES

- 1) If you wish to disapprove all or part of Amendment 33 to Annex 6, Part II, please dispatch this notification of disapproval to reach ICAO Headquarters by 14 July 2014. 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 33, 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 II. Separate notifications on this are necessary. (See Attachment C.)
- 3) Please use extra sheets as required.

ATTACHMENT C to State letter AN 11/6.3.27-14/10

**NOTIFICATION OF COMPLIANCE WITH OR DIFFERENCES FROM
ANNEX 6, PART II**

(Including all amendments up to and including Amendment 33)

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 II, including all amendments up to and including Amendment 33.

2. The following differences will exist on _____ between the regulations and/or practices of **(State)** _____ and the provisions of Annex 6, Part II, including Amendment 33 (Please see Note 3) below.)

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

3. By the dates indicated below, **(State)** _____ will have complied with the provisions of Annex 6, Part II, including all amendments up to and including Amendment 33 for which differences have been notified in 2 above.

a) Annex Provision (Please give exact paragraph reference)	b) Date	c) Comments
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(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 13 October 2014.
- 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 II 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 II
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 13 October 2014 of differences with respect to Standards in Annex 6, Part II. 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 II, including Amendment 33*

2.1 Past experience has indicated that the reporting of differences to Annex 6, Part II 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 II 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 II 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 II 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;

* 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. 33

TO THE

**INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES**

OPERATION OF AIRCRAFT

ANNEX 6

TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

**PART II
INTERNATIONAL GENERAL AVIATION — AEROPLANES**

The amendment to Annex 6, Part II, contained in this document was adopted by the Council of ICAO on **3 March 2014**. Such parts of this amendment as have not been disapproved by more than half of the total number of Contracting States on or before **14 July 2014** will become effective on that date and will become applicable on **13 November 2014** as specified in the Resolution of Adoption. (State letter AN 11/6.3.27-14/10 refers.)

MARCH 2014

INTERNATIONAL CIVIL AVIATION ORGANIZATION

**AMENDMENT 33 TO THE INTERNATIONAL STANDARDS AND
RECOMMENDED PRACTICES**

**ANNEX 6 — OPERATION OF AIRCRAFT
PART II — INTERNATIONAL GENERAL AVIATION — 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 3 March 2014 Amendment 33 to the International Standards and Recommended Practices contained in the document entitled *International Standards and Recommended Practices, Operation of Aircraft, International General Aviation — Aeroplanes* which for convenience is designated Annex 6, Part II to the Convention;

2. *Prescribes* 14 July 2014 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 13 November 2014;

4. *Requests the Secretary General:*

a) to notify each Contracting State immediately of the above action and immediately after 14 July 2014 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 13 November 2014 between its national regulations or practices and the provisions of the Standards in the Annex as hereby amended, such notification to be made before 13 October 2014, and thereafter to notify the Organization of any further differences that arise;

2) to notify the Organization before 13 October 2014 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.

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

NOTES ON THE PRESENTATION OF THE AMENDMENT

1. 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:

~~Text to be deleted is shown with a line through it.~~

text to be deleted

New text to be inserted is highlighted with grey shading.

new text to be inserted

~~Text to be deleted is shown with a line through it~~ followed by the replacement text which is highlighted with grey shading.

new text to replace existing text

TEXT OF AMENDMENT 33

TO THE

INTERNATIONAL STANDARDS
AND RECOMMENDED PRACTICES

OPERATION OF AIRCRAFT

ANNEX 6

TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

PART II

INTERNATIONAL GENERAL AVIATION — AEROPLANES

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ABBREVIATIONS AND SYMBOLS
(used in this Annex)

Abbreviations

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CVS	Combined vision system
EFB	Electronic flight bag
EUROCAE	European Organisation for Civil Aviation Equipment
LED	Light emitting diode
NVIS	Night vision imaging systems
RTCA	Radio Technical Commission for Aeronautics
SVS	Synthetic vision system

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PUBLICATIONS
(referred to in this Annex)

...

Manual on Electronic Flight Bags (Doc xxxx)

...

SECTION 1. GENERAL

CHAPTER 1.1 DEFINITIONS

...

Combined vision system (CVS). A system to display images from a combination of an enhanced vision system (EVS) and a synthetic vision system (SVS).

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Electronic flight bag (EFB). An electronic information system, comprised of equipment and applications, for flight crew which allows for storing, updating, displaying and processing of EFB functions to support flight operations or duties.

...

Enhanced vision system (EVS). A system to display electronic real-time images of the external scene achieved through the use of image sensors.

Note.— EVS does not include night vision imaging systems (NVIS).

...

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

...

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.

...

State of the Aerodrome. The State in whose territory the aerodrome is located.

...

Synthetic vision system (SVS). A system to display data-derived synthetic images of the external scene from the perspective of the flight deck.

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SECTION 2 GENERAL AVIATION OPERATIONS

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CHAPTER 2.2 FLIGHT OPERATIONS

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2.2.2 Operational management

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2.2.2.2 Aerodrome operating minima

~~The pilot in command shall not operate to or from an aerodrome using operating minima lower than those which may be established for that aerodrome by the State in which it is located, except with the specific approval of that State.~~

~~— Note 1. — It is the practice in some States to declare, for flight planning purposes, higher minima for an aerodrome when nominated as an alternate, than for the same aerodrome when planned as that of intended landing.~~

~~— Note 2. — The use of head up displays (HUD) or enhanced vision systems (EVS) may allow operations with lower visibilities than normally associated with the aerodrome operating minima.~~

2.2.2.2.1 The pilot-in-command shall establish aerodrome operating minima in accordance with criteria specified by the State of Registry, for each aerodrome to be used in operations. Such minima shall not be lower than any that may be established for such aerodromes by the State of the Aerodrome, except when specifically approved by that State.

Note.— This Standard does not require the State of the Aerodrome to establish aerodrome operating minima.

2.2.2.2.1.1 The State of Registry may approve operational credit(s) for operations with aeroplanes equipped with HUD or equivalent displays, EVS, SVS or CVS. Such approvals shall not affect the classification of the instrument approach procedure.

Note 1.— Operational credit includes:

a) *for the purposes of an approach ban (2.2.4.1.2), a minima below the aerodrome operating minima;*

b) *reducing or satisfying the visibility requirements; or*

c) *requiring fewer ground facilities as compensated for by airborne capabilities.*

Note 2.— Guidance on operational credit for aircraft equipped with a HUD or equivalent displays, EVS, SVS and CVS is contained in Attachment 2.B and in the Manual of All-Weather Operations (Doc 9365).

Note 3.— Information regarding a HUD or equivalent displays, including references to RTCA and EUROCAE documents, is contained in the Manual of All-Weather Operations (Doc 9365).

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2.2.2.3 Passengers

2.2.2.3.1 The pilot-in-command shall ensure that passengers are made familiar with the location and use of:

...

d) oxygen dispensing equipment if the use of oxygen is anticipated; and

...

2.2.3 Flight preparation

...

2.2.3.3 Flight planning

Before commencing a flight the pilot-in-command shall be familiar with all available meteorological information appropriate to the intended flight. Preparation for a flight away from the vicinity of the place of departure, and for every flight under the instrument flight rules, shall include:

- a) a study of available current weather reports and forecasts; and
- b) the planning of an alternative course of action to provide for the eventuality that the flight cannot be completed as planned, because of weather conditions.

Note 1.— It is the practice in some States to declare, for flight planning purposes, higher minima for an aerodrome when nominated as an alternate, than for the same aerodrome when planned as that of intended landing.

Note 2.— The requirements for flight plans are contained in Annex 2 — Rules of the Air and Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM, Doc 4444).

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2.2.3.4 ~~Weather~~ Meteorological conditions

2.2.3.4.1 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.

~~2.2.3.4.2 A flight to be conducted in accordance with the 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.~~

2.2.3.4.2 A flight to be conducted in accordance with the instrument flight rules shall not:

- a) take off from the departure aerodrome unless the meteorological conditions, at the time of use, are at or above the aerodrome operating minima for that operation; and
- b) 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 2.2.3.5, 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 aerodrome operating minima for that operation.

2.2.3.4.3 The State of Registry shall establish criteria to be used for the estimated time of use of an aerodrome including a margin of time.

Note.— A widely accepted time margin for “estimated time of use” is one hour before and after the earliest and latest time of arrival. Additional considerations can be found in the Flight Planning and Fuel Management Manual (Doc 9976).

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2.2.3.5 Alternate aerodromes

Destination alternate aerodromes

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 flight plans, unless:

- a) the duration of the flight ~~and the~~ from the departure aerodrome, or from the point of in-flight re-planning, to the destination aerodrome is such that, taking into account all meteorological conditions ~~prevailing are such that there is~~ and operational information relevant to the flight, at the estimated time of use, a 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) 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 of intended landing is isolated ~~and there is no suitable destination alternate aerodrome;~~ and:
 - 1) a standard instrument approach procedure is prescribed for the aerodrome of intended landing; ~~and~~
 - 2) a point of no return has been determined; and
 - 2-3) a flight shall not be continued past the point of no return unless available current meteorological information indicates that the following meteorological conditions will exist ~~from two hours before time of arrival~~ at the estimate time of use:
 - ii) visibility of at least 5.5 km (3 NM) or of 4 km (2 NM) more than the minimum associated with the instrument approach procedure.

Note.— 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.

2.2.3.6 Fuel and oil-supply requirements

2.2.3.6.1 A flight shall not be commenced unless, taking into account both the meteorological conditions and any delays that are expected in flight, the aeroplane carries sufficient fuel and oil to ensure that it can safely complete the flight. The amount of fuel to be carried must permit:

- a) when the flight is conducted in accordance with the instrument flight rules and a destination alternate aerodrome is not required in accordance with 2.2.3.5, or when the flight is to an isolated aerodrome, flight to the aerodrome of intended landing, and after that, have a final reserve fuel for at least 45 minutes at normal cruising altitude; or
- b) when the flight is conducted in accordance with the instrument flight rules and a destination alternate aerodrome is required, flight ~~from~~ to the aerodrome of intended landing then to an alternate aerodrome, and after that, have a final reserve fuel for at least 45 minutes at normal cruising altitude; or
- c) when the flight is conducted in accordance with the visual flight rules by day, flight to the aerodrome of intended landing, and after that, have a final reserve fuel for at least 30 minutes at normal cruising altitude; or
- d) when the flight is conducted in accordance with the visual flight rules by night, flight to the aerodrome of intended landing and thereafter have a final reserve fuel for at least 45 minutes at normal cruising altitude.

Note 1.— Nothing in 2.2.3.6 precludes amendment of a flight plan in flight in order to replan the flight to another aerodrome, provided that the requirements of 2.2.3.6 can be complied with from the point where the flight is replanned.

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

2.2.3.6.2 The use of fuel after flight commencement for purposes other than originally intended during pre-flight planning shall require a re-analysis and, if applicable, adjustment of the planned operation.

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2.2.4 In-flight procedures

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Editorial note.— Insert new paragraph 2.2.4.7 as follows and re-number subsequent paragraphs accordingly.

2.2.4.7 In-flight fuel management

2.2.4.7.1 The pilot-in-command shall monitor the amount of usable fuel remaining on board to ensure it 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.

2.2.4.7.2 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, or other air traffic delays, may result in landing with less than the planned final reserve fuel.

Note.— 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, or air traffic delays, may result in landing with less than the planned final reserve fuel. This is not an emergency situation but an indication that an emergency situation is possible should any additional delay occur.

2.2.4.7.3 The pilot-in-command shall declare a situation of fuel emergency by broadcasting MAYDAY MAYDAY MAYDAY FUEL, when the calculated usable fuel estimated 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 2.2.3.6 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.

End of new text.

...

2.2.4.7-8 Instrument approach procedures

...

~~2.2.4.7.2~~ 2.2.4.8.2 Aeroplanes operated in accordance with the instrument flight rules shall comply with the instrument approach procedures approved by the State in which the aerodrome is located.

Note 1.— Definitions for the classification of instrument approach and landing operations are in Chapter 1.1.

Note 2.— Information for pilots on flight procedure parameters and operational procedures is contained in PANS-OPS, Volume I. Criteria for the construction of visual and instrument flight procedures are contained in PANS-OPS, Volume II. Obstacle clearance criteria and procedures used in certain States may differ from PANS-OPS, and knowledge of these differences is important for safety reasons (see Chapter 2.1, 2.1.1.1).

...

CHAPTER 2.4 AEROPLANE INSTRUMENTS, EQUIPMENT AND FLIGHT DOCUMENTS

...

2.4.3 Aeroplanes operated as VFR flights

2.4.3.1 Aeroplanes when operated as VFR flights shall be equipped with:

- a) a means of measuring and displaying:

...

3) ~~pressure~~-barometric altitude;

...

2.4.7 Aeroplanes operated in accordance with the instrument flight rules

Aeroplanes when operated in accordance with the instrument flight rules, or when the aeroplane cannot be maintained in a desired attitude without reference to one or more flight instruments, shall be equipped with:

a) a means of measuring and displaying:

...

3) ~~pressure~~-barometric altitude;

...

2.4.12 Emergency locator transmitter (ELT)

...

2.4.12.2 Except as provided for in 2.4.12.3, ~~from 1 July 2008~~, all aeroplanes shall be equipped with at least one ELT of any type.

...

2.4.15 Aeroplanes equipped with a head-up displays (HUD) and/or or equivalent displays, enhanced vision systems (EVS), synthetic vision systems (SVS) and/or combined vision systems (CVS)

2.4.15.1 Where aeroplanes are equipped with a HUD ~~and/or or equivalent displays~~,-EVS, SVS or CVS, or any combination of those systems into a hybrid system, criteria for the use of such systems ~~to gain operational benefits~~ for the safe operation of an aeroplane shall be ~~approved~~ established by the State of Registry.

Note.—Guidance on HUD and EVS is contained in Attachment J to Annex 6, Part I.

Note.— Information regarding a HUD or equivalent displays, including references to RTCA and EUROCAE documents, is contained in the Manual of All-Weather Operations (Doc 9365).

2.4.15.2 In approving the operational use of a HUD or equivalent displays, EVS, SVS or CVS, the State of Registry shall ensure that:

a) the equipment meets the appropriate airworthiness certification requirements;

b) the operator has carried out a safety risk assessment of the operations supported by the HUD or equivalent displays, EVS, SVS or CVS;

c) the operator has established and documented the procedures for the use of, and training requirements for, a HUD or equivalent displays, EVS, SVS or CVS.

Note 1.— Guidance on safety risk assessments is contained in the Safety Management Manual (SMM) (Doc 9859).

Note 2.— Guidance on operational approvals is contained in Attachment 2.B.

...

2.4.16 Flight recorders

...

Note 4.— For aeroplanes for which the application for type certification is submitted to a Contracting State before 1 January 2016, specifications applicable to flight recorders may be found in EUROCAE ED-112, ED-56A, ED-55, Minimum Operational Performance Specifications (MOPS), or earlier equivalent documents.

Note 5.— For aeroplanes for which the application for type certification is submitted to a Contracting State on or after 1 January 2016, specifications applicable to flight recorders may be found in EUROCAE ED-112A, Minimum Operational Performance Specification (MOPS), or equivalent documents.

Note 6.— Specifications applicable to lightweight flight recorders may be found in EUROCAE ED 155, Minimum Operational Performance Specification (MOPS), or equivalent documents.

...

2.4.16.1 Flight data recorders and aircraft data recording systems

~~*Note 1.— FDR and AIR performance requirements are as contained in the EUROCAE ED 112, Minimum Operational Performance Specification (MOPS) for Crash Protected Airborne Recorder Systems, or equivalent documents.*~~

~~*Note 2.— ADRS performance requirements are as contained in the EUROCAE ED 155, Minimum Operational Performance Specification (MOPS) for Lightweight Flight Recording Systems, or equivalent documents.*~~

Editorial Note.— Renumber subsequent Note.

...

2.4.16.1.2 Operation

Editorial Note.— The following *Note* has been amended and relocated after item c).

Note.— ~~Airborne image recorders classification is defined in 4.1 of Appendix 2.3.~~

2.4.16.1.2.1 **Recommendation.**— All turbine-engined aeroplanes with a seating configuration of more than five passenger seats and 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 should be equipped with:

- a) a Type II FDR; or
- b) a Class C AIR or AIRS capable of recording flight path and speed parameters displayed to the pilot(s); or
- c) an ADRS capable of recording the essential parameters defined in Table 2.3-3 of Appendix 2.3.

Note.— ~~Airborne image recorders AIR or AIRS classification is defined in 4.1 of Appendix 2.3.~~

...

2.4.16.1.3 Discontinuation

...

~~2.4.16.1.3.2 **Recommendation.**— The use of analogue FDRs using frequency modulation (FM) should be discontinued.~~

2.4.16.1.3.23 The use of analogue FDRs using frequency modulation (FM) shall be discontinued by 1 January 2012.

2.4.16.1.3.34 The use of photographic film FDRs shall be discontinued.

2.4.16.1.3.45 **Recommendation.**— ~~The use of magnetic tape FDRs should be discontinued by 1 January 2011.~~

2.4.16.1.3.56 The use of magnetic tape FDRs shall be discontinued by 1 January 2016.

...

2.4.16.2 Cockpit voice recorders and cockpit audio recording systems

...

2.4.16.2 Cockpit voice recorders and cockpit audio recording systems

Note 1.— ~~CVR performance requirements are as contained in the EUROCAE ED-112, Minimum Operational Performance Specification (MOPS) for Crash Protected Airborne Recorder Systems, or equivalent documents.~~

Note 2.—CARS performance requirements are as contained in the EUROCAE ED-155, Minimum Operational Performance Specification (MOPS) for Lightweight Flight Recording Systems, or equivalent documents.

...

2.4.16.2.1 Operation

...

2.4.16.2.1.1 Recommendation.— All turbine-engined aeroplanes with a seating configuration of more than five passenger seats and 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.

...

2.4.16.2.2 Discontinuation

...

2.4.16.2.2.2 Recommendation.— The use of magnetic tape and wire CVRs should be discontinued by 1 January 2011.

...

2.4.16.3 Data link recorders

Note.—Data link recorders performance requirements are as contained in the EUROCAE ED-112, Minimum Operational Performance Specifications (MOPS) for Crash Protected Airborne Recorder Systems, or equivalent documents.

...

2.4.16.4 Flight recorders — general

2.4.16.4.1 Construction and installation

Flight recorders shall be constructed, located and installed so as to provide maximum practical protection for the recordings in order that the recorded information may be preserved, recovered and transcribed. Flight recorders shall meet the prescribed crashworthiness and fire protection specifications.

Note 1.—Industry crashworthiness and fire protection specifications for FDR, CVR, AIR and DLR are as contained in the EUROCAE ED-112, Minimum Operational Performance Specifications (MOPS) for Crash Protected Airborne Recorder Systems, or equivalent documents.

Note 2.—Industry crashworthiness and fire protection specifications for ADRS and CARS are as contained in the EUROCAE ED-155, Minimum Operational Performance Specifications (MOPS) for Lightweight Flight Recording Systems, or equivalent documents.

...

Editorial note.— Insert new paragraph 2.4.17 as follows:

2.4.17 Electronic flight bags (EFBs)

Note. — *Guidance on EFB equipment, functions and establishing criteria for the operational use is contained in the Manual on Electronic Flight Bags (Doc xxxx).*

2.4.17.1 EFB equipment

2.4.17.1.1 Where portable EFBs are used on board, the pilot-in-command and/or the operator/owner shall ensure that they do not affect the performance of the aeroplane systems, equipment or the ability to operate the aeroplane.

2.4.17.2 EFB functions

2.4.17.2.1 Where EFBs are used on board an aeroplane the pilot-in-command and/or the owner/operator shall:

- a) assess the safety risk(s) associated with each EFB function;
- b) establish the procedures for the use of, and training requirements for, the device and each EFB function; and
- c) ensure that, in the event of an EFB failure, sufficient information is readily available to the flight crew for the flight to be conducted safely.

Note.— Guidance on safety risk assessments is contained in the Safety Management Manual (SMM) (Doc 9859).

2.4.17.2.2 The State of Registry shall establish criteria for the operational use of EFB functions to be used for the safe operations of aeroplanes.

2.4.17.3 EFB operational criteria

2.4.17.3.1 In establishing operational criteria for the use of EFBs, the State of Registry shall ensure that:

- a) the EFB equipment and its associated installation hardware, including interaction with aeroplane systems if applicable, meet the appropriate airworthiness certification requirements;
- b) the operator/owner has assessed the risks associated with the operations supported by the EFB function(s);
- c) the operator/owner has established requirements for redundancy of the information (if appropriate) contained in and displayed by the EFB function(s);
- d) the operator/owner has established and documented procedures for the management of the EFB function(s) including any databases it may use; and

- e) the operator/owner has established and documented the procedures for the use of, and training requirements for, the EFB function(s).

Note.— Guidance on safety risk assessments is contained in the Safety Management Manual (SMM) (Doc 9859).

End of new text

...

CHAPTER 2.5 AEROPLANE COMMUNICATION AND NAVIGATION EQUIPMENT

...

2.5.1 Communication equipment

...

2.5.1.6 For ~~flight operations~~ flights in defined portions of airspace or on routes where an RCP type has been prescribed, an aeroplane shall, in addition to the requirements specified in 2.5.1.1 to 2.5.1.5:

...

APPENDIX 2.3 FLIGHT RECORDERS

(Note. — See Chapter 2.4, 2.4.16)

...

1. General requirements

1.1 ~~The Non-deployable 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 practical date but not later than 1 January 2018, this device shall operate for a minimum of ninety days.

Note.— Current industry practice is to phase out yellow flight recorder containers at the end of the service life of the flight recorders.

...

2. Flight data recorder (FDR)

...

2.2.2.5 The following parameters shall satisfy the requirements for operation:

...

~~— Note 1.— Parameter guidance for range, sampling, accuracy and resolution are as contained in the EUROCAE ED 112, Minimum Operational Performance Specification (MOPS) for Crash Protected Airborne Recorder Systems, or equivalent documents.~~

Editorial Note.— Renumber subsequent Note.

...

4. Airborne image recorder (AIR) and airborne image recording system (AIRS)

4.1 Classes

4.1.1 A Class A AIR or AIRS captures the general cockpit area in order to provide data supplemental to conventional flight recorders.

...

Note 2.— There are no provisions for Class A AIRs AIR or AIRS in this document.

4.1.2 A Class B AIR or AIRS captures data link message displays.

4.1.3 A Class C AIR or AIRS captures instruments and control panels.

Note.— A Class C AIR or AIRS may be considered as a means for recording flight data where it is not practical or is prohibitively expensive to record on an FDR or an ADRS, or where an FDR is not required.

4.1.4 The AIR or AIRS must start to record prior to the aeroplane moving under its own power and record continuously until the termination of the flight when the aeroplane is no longer capable of moving under its own power. In addition, depending on the availability of electrical power, the AIR or AIRS must start to record as early as possible during the cockpit checks prior to engine start at the beginning of the flight until the cockpit checks immediately following engine shutdown at the end of the flight.

...

7. Inspections of flight recorder systems

7.1 Prior to the first flight of the day, the built-in test features for the flight recorders and flight data acquisition unit (FDAU), when installed, shall be monitored by manual and/or automatic checks.

7.2 FDR systems or ADRS, CVR systems or CARS and AIR systems or AIRS shall have recording system inspection intervals of one year; subject to the approval from the appropriate regulatory authority, this period may be extended to two years provided these systems have demonstrated a high integrity of serviceability and self-monitoring. DLR systems or DLRS shall have recording system inspection intervals of two years; subject to the approval from the appropriate regulatory authority, this period may be extended to four years provided these systems have demonstrated high integrity of serviceability and self-monitoring.

7.23 ~~Annual~~ Recording system inspections shall be carried out as follows:

- a) an analysis of the recorded data from the flight recorders shall ensure that the recorder operates correctly for the nominal duration of the recording;
- b) the analysis of the FDR or the ADRS shall evaluate the quality of the recorded data to determine if the bit error rate (including those errors introduced by recorder, the acquisition unit, the source of the data on the aeroplane and by the tools used to extract the data from the recorder) is within acceptable limits and to determine the nature and distribution of the errors;
- c) a complete flight from the FDR or the ADRS shall be examined in engineering units to evaluate the validity of all recorded parameters. Particular attention shall be given to parameters from sensors dedicated to the FDR or the ADRS. Parameters taken from the aircraft's electrical bus system need not be checked if their serviceability can be detected by other aircraft systems;
- d) the readout facility shall have the necessary software to accurately convert the recorded values to engineering units and to determine the status of discrete signals;
- e) an ~~annual~~ examination of the recorded signal on the CVR or the CARS shall be carried out by replay of the CVR or CARS recording. While installed in the aircraft, the CVR or CARS shall record test signals from each aircraft source and from relevant external sources to ensure that all required signals meet intelligibility standards;
- f) where practicable, during the ~~annual~~ examination, a sample of in-flight recordings of the CVR or CARS shall be examined for evidence that the intelligibility of the signal is acceptable; and
- g) an ~~annual~~ examination of the recorded images on the AIR or AIRS shall be carried out by replay of the AIR or AIRS recording. While installed in the aircraft, the AIR or AIRS shall record test images from each aircraft source and from relevant external sources to ensure that all required images meet recording quality standards;

7.34 ~~Flight~~ A flight recorder systems-system shall be considered unserviceable if there is a significant period of poor quality data, unintelligible signals, or if one or more of the mandatory parameters is not recorded correctly.

7.45 A report of the ~~annual~~ recording system inspection shall be made available on request to regulatory authorities for monitoring purposes.

7.56 Calibration of the FDR system:

...

Editorial note.— Insert new Attachment 2.B as follows:

ATTACHMENT 2.B. HEAD-UP DISPLAY (HUD), EQUIVALENT DISPLAYS AND VISION SYSTEMS

*Supplementary to
Section 2, Chapter 2.2, 2.2.2.2, and Chapter 2.4, 2.4.15.1
Section 3, Chapter 3.4, 3.4.2.7, and Chapter 3.6, 3.6.3.6.13*

Introduction

The material in this attachment provides guidance for certified HUD and vision systems intended for operational use in aircraft engaged in international air navigation. A HUD, vision systems and hybrid systems may be installed and operated to provide guidance, enhance situational awareness and/or to obtain an operational credit by establishing minima below the aerodrome operating minima, for approach ban purposes, or reducing the visibility requirements or requiring fewer ground facilities as compensated for by airborne capabilities. HUD and vision systems may be installed separately or together as part of a hybrid system. Any operational credit to be obtained from their use require approval from the State of Registry.

Note 1.— “Vision systems” is a generic term referring to the existing systems designed to provide images, i.e. enhanced vision systems (EVS), synthetic vision systems (SVS) and combined vision systems (CVS).

Note 2.— Operational credit can be granted only within the limits of the design approval.

Note 3.— Currently, operational credit has been given only to vision systems containing an image sensor providing a real-time image of the actual external scene on the HUD.

1. HUD and equivalent displays

1.1 General

1.1.1 A HUD presents flight information into the pilot’s forward external field of view without significantly restricting that external view.

1.1.2 A variety of flight information may be presented on a HUD depending on the intended flight operation, flight conditions, systems capabilities and operational approval. A HUD may include, but is not limited to, the following:

- a) airspeed;
- b) altitude;
- c) heading;
- d) vertical speed;
- e) angle of attack;

- f) flight path or velocity vector;
- g) attitude with bank and pitch references;
- h) course and glide path with deviation indications;
- i) status indications (e.g. navigation sensor, autopilot, flight director); and
- j) alerts and warning displays (e.g. ACAS, wind shear, ground proximity warning).

1.2 Operational applications

1.2.1 Flight operations with a HUD can improve situational awareness by combining flight information located on head-down displays with the external view to provide pilots with more immediate awareness of relevant flight parameters and situation information while they continuously view the external scene. This improved situational awareness can also reduce errors in flight operations and improve the pilot's ability to transition between instrument and visual references as meteorological conditions change. Flight operations applications may include the following:

- a) enhanced situational awareness during all flight operations, but especially during taxi, take-off, approach and landing;
- b) reduced flight technical error during take-off, approach and landing; and
- c) improvements in performance due to precise prediction of touchdown area, tail strike awareness/warning and rapid recognition of and recovery from unusual attitudes.

1.2.2 A HUD may be used for the following purposes:

- a) to supplement conventional flight deck instrumentation in the performance of a particular task or operation. The primary cockpit instruments remain the primary means for manually controlling or manoeuvring the aircraft; and
- b) as a primary flight display;
 - i) information presented by the HUD may be used by the pilot in lieu of scanning head-down displays. Operational approval of a HUD for such use allows the pilot to control the aircraft by reference to the HUD for approved ground or flight operations; and
 - ii) information presented by the HUD may be used as a means to achieve additional navigation or control performance. The required information is displayed on the HUD. Operational credit, in the form of lower minima, for a HUD used for this purpose may be approved for a particular aircraft or automatic flight control system. Additional credit may also be allowed when conducting HUD operations in situations where automated systems are otherwise used.

1.2.3 A HUD, as a stand-alone system, may qualify for operations with reduced visibility or RVR or replace some parts of the ground facilities such as touchdown zone and/or centre line lights. Examples and references to publications in this regard can be found in the *Manual of All-Weather Operations* (Doc 9365).

1.2.4 A HUD equivalent display is one that has at least the following characteristics; a head-up presentation not requiring transition of visual attention from head down to head up; displays sensor-derived imagery conformal with the pilots external view; permits simultaneous view of the EVS sensor imagery, required aircraft flight symbology, and the external view; and display characteristics and dynamics are suitable for manual control of the aircraft. Before such systems can be used, the appropriate airworthiness and operational approvals should be obtained.

1.3 HUD training

1.3.1 Training requirements should be established, monitored and approved by the State of the Operator or the State of Registry for general aviation. Training requirements should include requirements for recent experience if the State determines that these requirements are significantly different than the current requirements for the use of conventional head-down instrumentation.

1.3.2 HUD training should address all flight operations for which the HUD is designed and operationally approved. Some training elements may require adjustments based on whether the aeroplane has a single or dual HUD installation. Training should include contingency procedures required in the event of head-up display degradation or failure. HUD training should include the following elements as applicable to the intended use:

- a) an understanding of the HUD, its flight path, energy management concepts and symbology. This should include operations during critical flight events (e.g. ACAS Traffic Advisory/Resolution Advisory upset and wind shear recovery, engine or system failure);
- b) HUD limitations and normal procedures, including maintenance and operational checks performed to ensure normal system function prior to use. These checks include pilot seat adjustment to attain and maintain appropriate viewing angles and verification of HUD operating modes;
- c) HUD use during low visibility operations, including taxi, take-off, instrument approach and landing in both day and night conditions. This training should include the transition from head-down to head-up and head-up to head-down operations;
- d) failure modes of the HUD and the impact of the failure modes or limitations on crew performance;
- e) crew coordination, monitoring and verbal call-out procedures for single HUD installations with head-down monitoring for the pilot not equipped with a HUD and head-up monitoring for the pilot equipped with a HUD;
- f) crew coordination, monitoring and verbal call-out procedures for dual HUD installations with use of a HUD by the pilot flying the aircraft and either head-up or head-down monitoring by the other pilot;
- g) consideration of the potential for loss of situational awareness due to "tunnel vision" (also known as cognitive tunnelling or attention tunnelling);
- h) any effects that weather, such as low ceilings and visibilities, may have on the performance of a HUD; and
- i) HUD airworthiness requirements.

2. Vision systems

2.1 General

2.1.1 Vision systems can display electronic real-time images of the actual external scene achieved through the use of image sensors (EVS) or display synthetic images, which are derived from the on-board avionic systems (SVS). Vision systems can also consist of a combination of these two systems or combined vision systems (CVS). Such a system may display electronic real-time images of the external scene using the EVS component of the system. However, the merging of EVS and SVS into a CVS is dependent on the intended function (e.g. whether or not there is intent to achieve operational credit).

2.1.2 The information from vision systems may be displayed on a head-up or head-down display. When enhanced vision imagery is displayed on a HUD, it should be presented to the pilot's forward external field of view without significantly restricting that external view.

2.1.3 The enhanced position fixing and guidance provided by SVS may provide additional safety for all phases of flight especially low visibility taxi, take-off, approach and landing operations.

2.1.4 Light emitting diode (LED) lights may not be visible to infrared-based vision systems due to the fact that LED lights are not incandescent and they do not have a significant heat signature. Operators of such vision systems will need to acquire information about the LED implementation programmes at aerodromes where they operate.

2.2 Operational applications

2.2.1 Flight operations with enhanced vision image sensors allow the pilot to view an image of the external scene obscured by darkness or other visibility restrictions. When the external scene is partially obscured, enhanced vision imaging may allow the pilot to acquire an image of the external scene earlier than with natural or unaided vision. The improved acquisition of an image of the external scene may improve situational awareness.

2.2.2 Vision system imagery may also allow pilots to detect terrain or obstructions on the runway or taxiways. A vision system image can also provide visual cues to enable earlier runway alignment and a more stabilized approach.

2.2.3 The combined display of aircraft performance, guidance and imagery may allow the pilot to maintain a more stabilized approach and smoothly transition from enhanced visual references to natural visual references.

2.3 Vision systems training

2.3.1 Training requirements should be established, monitored and approved by the State of the Operator. Training requirements should include recency of experience requirements if the State of the Operator determines that these requirements are significantly different than the current requirements for the use of a HUD without enhanced vision imagery or conventional head-down instrumentation.

2.3.2 Training should address all flight operations for which the vision system is approved. This training should include contingency procedures required in the event of system degradation or failure. Training for situational awareness should not interfere with other required operations. Training for operational credit should also require training on the applicable HUD used to present the enhanced visual imagery. Training should include the following elements as applicable:

- a) an understanding of the system characteristics and operational constraints;
- b) normal procedures, controls, modes and system adjustments (e.g. sensor theory including radiant versus thermal energy and resulting images);
- c) operational constraints, normal procedures, controls, modes and system adjustments;
- d) limitations;
- e) airworthiness requirements;
- f) vision system display during low visibility operations, including taxi, take-off, instrument approach and landing; system use for instrument approach procedures in both day and night conditions;
- g) failure modes and the impact of failure modes or limitations upon crew performance, in particular, for two-pilot operations;
- h) crew coordination and monitoring procedures and pilot call-out responsibilities;
- i) transition from enhanced imagery to visual conditions during runway visual acquisition;
- j) rejected landing: with the loss of visual cues of the landing area, touchdown zone or rollout area;
- k) any effects that weather, such as low ceilings and visibilities, may have on the performance of the vision system; and
- l) effects of aerodrome lighting using LED lights.

2.4 Operational concepts

2.4.1 Instrument approach operations that involve the use of vision systems include the instrument phase and the visual phase. The instrument phase ends at the published MDA/H or DA/H unless a missed approach is initiated. The continued approach to landing from MDA/H or DA/H will be conducted using visual references. The visual references will be acquired by use of an EVS or CVS, natural vision or a combination of the two.

2.4.2 Down to a defined height, typically 30 m (100 ft), the visual references will be acquired by means of the vision system. Below this height the visual references should be solely based on natural vision. In the most advanced applications, the vision system is expected to be able to be used down to touchdown without the requirement for natural vision acquisition of visual references. Using the EVS or CVS does not change the classification of an instrument approach procedure, since the published DA/H remains unchanged and manoeuvring below DA/H is conducted by visual references acquired by means of the an EVS or CVS.

2.4.3 In addition to the operational credit that EVS/ CVS is able to provide, these systems may also provide an operational and safety advantage through improved situational awareness, earlier acquisition of visual references and smoother transition to references by natural vision. These advantages are more pronounced for Type A approach operations than for Type B approach operations.

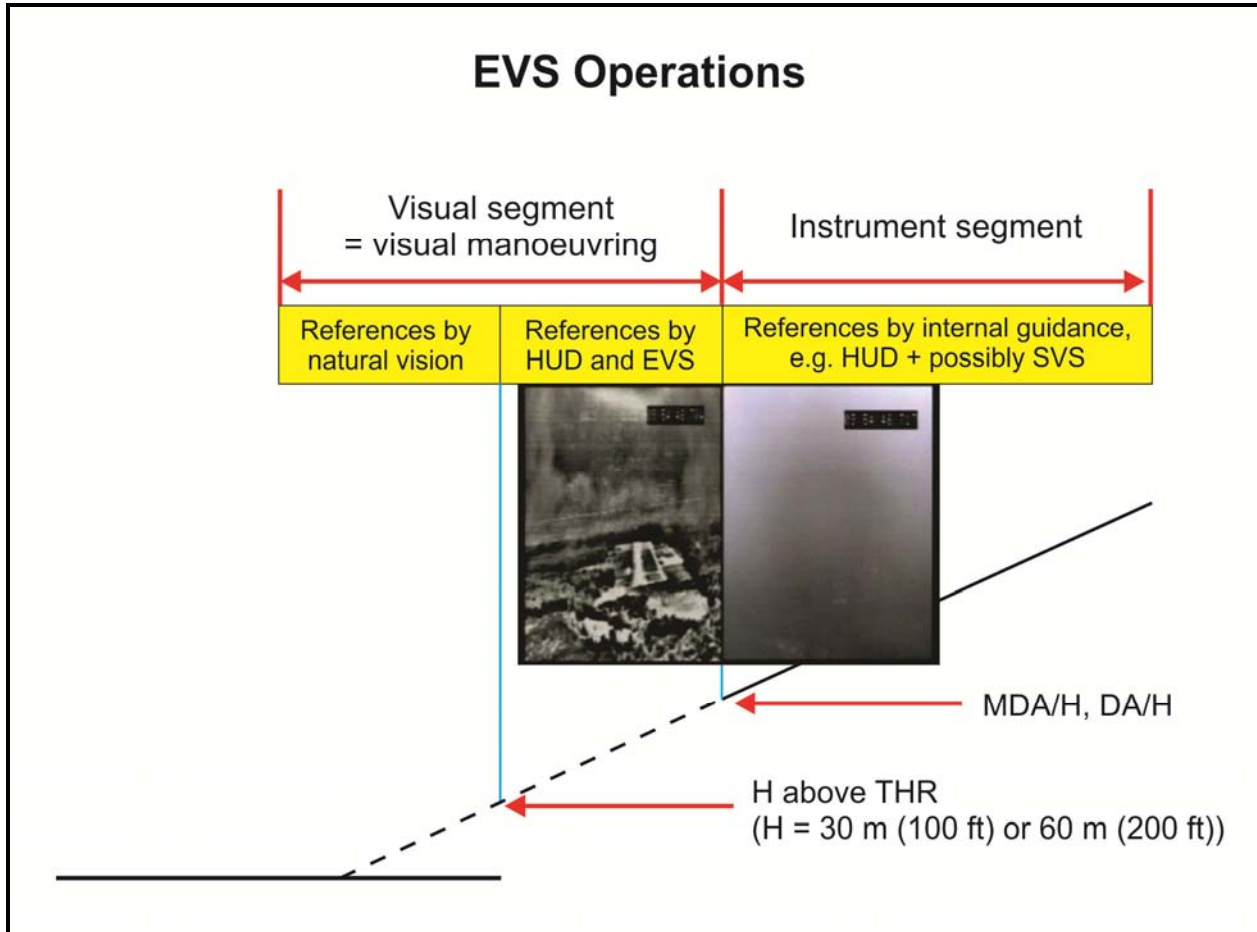


Figure 2.B-1. EVS operations — transition from instrument to visual references

2.5 Visual references

2.5.1 The required visual references do not change due to the use of an EVS or CVS, but those references are allowed to be acquired by means of either vision system until a certain height during the approach.

2.5.2 In regions that have developed requirements for operations with vision systems, the visual references are indicated in Figure 2.B-1.

Table 2.B-1.

OPERATIONS BELOW DA/DH OR MDA/MDH	
Example 1	Example 2
<p>For procedures designed to support Type A operations, the following visual references for the intended runway should be distinctly visible and identifiable:</p> <ul style="list-style-type: none"> • the approach lighting system; or • the runway threshold, identified by at least one of the following: <ul style="list-style-type: none"> – the beginning of the runway landing surface; – threshold lights; or – runway end identifier lights; and • the touchdown zone, identified by at least one of the following: <ul style="list-style-type: none"> – the runway touchdown zone landing surface; – touchdown zone lights; – touchdown zone markings; or – runway lights. 	<p>For procedures designed to support 3D Type A and Type B Cat I operations, the following visual references should be displayed and identifiable to the pilot on the EVS image:</p> <ul style="list-style-type: none"> • elements of the approach lighting system; or • the runway threshold, identified by at least one of the following: <ul style="list-style-type: none"> – the beginning of the runway landing surface; – threshold lights; – threshold identification lights; or – the touchdown zone, identified by at least one of the following: <ul style="list-style-type: none"> ▪ the runway touchdown zone landing surface; ▪ touchdown zone lights; ▪ touchdown zone markings; or ▪ runway lights
<p>Operations below 60 m (200 ft) above touchdown zone elevation –</p>	<p>Operations below 60 m (200 ft) above threshold elevation –</p>
<p>No additional requirements apply at 60 m (200 ft)</p>	<p>For procedures designed to support 3D Type A operations, the visual references are the same as those specified below for Type B Cat I operations.</p>
<p>Operations below 30 m (100 ft) above touchdown zone elevation –</p>	<p>Operations below 30 m (100 ft) above threshold elevation –</p>
<p>The visibility should be sufficient for the following to be distinctly visible and identifiable to the pilot without reliance on the EVS:</p> <ul style="list-style-type: none"> • the lights or markings of the threshold; or • the lights or markings of the touchdown zone. 	<p>For procedures designed to support Type B Cat II operations, at least one of the visual references specified below should be distinctly visible and identifiable to the pilot without reliance on the EVS:</p> <ul style="list-style-type: none"> • the lights or markings of the threshold; or • the lights or markings of the touchdown zone.

3. Hybrid systems

3.1 A hybrid system generically means that two or more systems are combined. The hybrid system typically has improved performance compared to each of the component systems, which in turn may qualify for operational credit. Vision systems are normally part of a hybrid system, e.g. EVS is typically combined with a HUD. Including more components in the hybrid system normally enhances the performance of the system.

3.2 Table 2.B-2 provides some examples of hybrid system components. Any combination of the listed systems may constitute a hybrid system. The degree of operational credit that may be given to a hybrid system depends on its performance (accuracy, integrity and availability) as assessed and determined by the certification and operational approval processes.

Table 2.B-2. Examples of hybrid system components

Systems based on image sensors	Systems not based on image sensors
EVS	SVS
<ul style="list-style-type: none"> • Passive infrared sensors • Active infrared sensors • Passive millimetre wave radiometer • Active millimetre wave radar 	Autoflight systems, flight control computers, automatic landing systems
	Systems for position fixing
CVS (where the EVS component as above qualifies for operational credit)	CVS (the SVS component)
	HUD, equivalent display
	ILS, GNSS

4. Operational credits

4.1 Aerodrome operating minima are expressed in terms of minimum visibility/RVR and MDA/H or DA/H. With respect to operational credit this means that the visibility/RVR requirements, established in the instrument approach procedure, may be reduced or satisfied for aircraft equipped with appropriately approved vision systems such as EVS. Reasons for granting operational credit may be when aircraft are better equipped than what was originally considered when designing the instrument approach procedure or when runway visual aids considered in the design of the procedure are not available but can be compensated by on-board equipment.

4.2 Credits related to visibility/RVR can be given using at least three concepts. The first concept is to reduce the required RVR which will allow the aircraft to continue the approach beyond the approach ban point with a reported RVR lower than what was established for the approach procedure. Where a minimum visibility is prescribed, a second concept to grant operational credit may be used. In this case, the required minimum visibility is kept unchanged, but it is satisfied by means of the on-board equipment, typically an EVS. The result of both these concepts is that operations are allowed in meteorological conditions where otherwise they would not be possible. A third concept is to give operational credit by allowing operations in visibility/RVR which are not lower than those established for the approach procedure, but the approach operation is conducted with less facilities on the ground. One example of the latter is to allow category II operations without touchdown and/or centre line lights, compensated by additional on-board equipment, e.g. a HUD.

4.3 Granting operational credits does not affect the classification of an instrument approach procedure since, as described in Standard 4.2.8.3, instrument approach procedures are designed to support a given instrument approach operation (i.e. Type, Category). However, the design of those procedures may not take into consideration on-board equipment that may compensate for facilities on the ground.

4.4 In order to provide optimum service, the ATS may have to be informed about the capabilities of the better-equipped aircraft, e.g. which is the minimum RVR required.

4.5 In addition to the operational credit that HUD, vision systems and hybrid systems are able to provide, these systems will also provide an operational and safety advantage through improved situational awareness, earlier acquisition of visual references and smoother transition to references by natural vision. These advantages are more pronounced for 3D Type A approach operations than for Type B approach operations.

5. Operational procedures

5.1 It is not prohibited to use vision systems in connection with circling. However, due to the system layout of a vision system and the nature of a circling procedure, key visual references can be obtained only by natural vision, and operational credit is not feasible for existing vision systems. The vision system may provide additional situational awareness.

5.2 The operational procedures associated with the use of a HUD, vision systems and hybrid systems should be included in the operations manual. The instructions in the operations manual should include:

- a) any limitation that is imposed by the airworthiness or operational approvals;
- b) how operational credit affects:
 - 1) flight planning with respect to destination and alternate aerodromes;
 - 2) ground operations;
 - 3) flight execution, e.g. approach ban and minimum visibility;
 - 4) crew resource management that takes into account the equipment configuration, e.g. the pilots may have different presentation equipment;
 - 5) standard operating procedures, e.g. use of autoflight systems, call-outs that may be particular to the vision system or hybrid system, criteria for stabilized approach;
 - 6) ATS flight plans and radio communication.

6. Approvals

6.1 General

6.1.1 An operator that wishes to conduct operations with a HUD or equivalent display, vision system or hybrid system will need to obtain certain approvals (see Annex 6, Part I, 4.2.8.1.1 and 6.23, and the corresponding requirements in Annex 6, Parts II and III). The extent of the approvals will depend on the intended operation and the complexity of the equipment.

6.1.2 Enhanced vision imagery may be used to improve situational awareness without a specific operational approval. However, the standard operating procedures for these types of operations need to be specified in the operations manual. An example of this type of operation may include an EVS or an SVS on a head-down display that is used only for situational awareness of the surrounding area of the aircraft during ground operations where the display is not in the pilot's primary field of view. For enhanced situational awareness, the installation and operational procedures need to ensure that the operation of the vision system does not interfere with normal procedures or the operation or use of other aircraft systems. In some cases, modifications to these normal procedures for other aircraft systems or equipment may be necessary to ensure compatibility.

6.1.3 When a vision system or a hybrid system with vision systems imagery is used for operational credit, operational approvals will typically require that the imagery be combined with flight guidance and presented on a HUD. Operational approvals may require that this information also be presented on a head-down display. Operational credit may be applied for any flight operation, but credit for instrument approach and take-off operations is most common.

6.1.4 When the application for approval relates to operational credits for systems not including a vision system, the guidance in this attachment may be used to the extent applicable as determined by the State of the Operator or the State of Registry for general aviation.

6.1.5 Operators should be aware that some States may require some information about the operational credit(s) which has been granted by the State of the Operator or the State of Registry for general aviation. Typically the approval from that State will have to be presented, and in some cases the State of the Aerodrome may wish to issue an approval or to validate the original approval.

6.2 Approvals for operational credit

To obtain operational credit the operator will need to specify the desired operational credit and submit a suitable application. The content of a suitable application should include:

- a) *Applicant details* — *required for all approval requests.* The official name and business or trading name(s), address, mailing address, e-mail address and contact telephone/fax numbers of the applicant.

Note.— For AOC holders, the company name, AOC number and e-mail address should be required.

- b) *Aircraft details* — *required for all approval requests.* Aircraft make(s), model(s) and registration mark(s).
- c) *Operator's vision system compliance list.* The contents of the compliance list are included in Table 2.B-3. The compliance list should include the information that is relevant to the approval requested and the registration marks of the aircraft involved. If more than one type of aircraft/fleet is included in a single application a completed compliance list should be included for each aircraft/fleet.
- d) *Documents to be included with the application.* Copies of all documents referred to in column 4 of the operator's vision system compliance list (Table 2.B-3) should be included when returning

the completed application form to the civil aviation authority. There should no need to send complete manuals; only the relevant sections/pages should be required.

e) *Name, title and signature.*

Table 2.B-3. Example of an AOC vision system compliance list

<i>Main heading</i>	<i>Expanded areas to be addressed by the application</i>	<i>Sub-requirements</i>	<i>Operator's operations manual reference or document reference</i>
1.0 Reference documents used in compiling the submission	The submission should be based on current up-to-date regulatory material. A compliance statement showing how the criteria of the applicable regulations and requirements have been satisfied.		
2.0 Aircraft flight manual (AFM)	A copy of the relevant AFM entry showing the aircraft certification basis for the vision system and any operational conditions.		
3.0 Feedback and reporting of significant problems	An outline of the process for the reporting of failures in the operational use of procedures. <i>Note.— In particular, significant problems with the vision system/ HUD systems, reporting on circumstances/locations where the vision system was unsatisfactory.</i>		
4.0 Instrument approach chart provider and operating minima	The name of the provider of the relevant instrument approach charts. Confirmation that all aerodrome operating minima are established in accordance with criteria specified by the relevant authority.		
5.0 Operations manual entries and standard operating procedures	Manufacturer/operator developed. Manufacturer's procedures are recommended as a starting point and should include at least the items in the sub-requirements column.	Definitions. Check that crew members are qualified for vision system/ HUD operations. MEL handling. Equipment required for vision system operations. Types of approach where vision systems can be used. Statement that the autopilot/flight director should be used whenever possible. Minimum visual references for landing. Approach ban and RVR. Stabilized approach criteria. Correct seating and eye position. Crew coordination, e.g. duties of the pilot flying and the pilot not flying: <ul style="list-style-type: none"> • limitations; • designation of handling and non-handling pilots; • use of automatic flight control 	

<i>Main heading</i>	<i>Expanded areas to be addressed by the application</i>	<i>Sub-requirements</i>	<i>Operator's operations manual reference or document reference</i>
		system; <ul style="list-style-type: none"> • checklist handling; • approach briefing; • radio communications handling; • monitoring and cross-checking of instruments and radio aids; and • use of the repeater display by the pilot not flying. Contingency procedures including: <ul style="list-style-type: none"> • failures above and below decision height; • ILS deviation warnings; • autopilot disconnect; • auto-throttle disconnect; • electrical failures; • engine failure; • failures and loss of visual references at or below decision height; • vision system/HUD failure below normal decision height; • wind shear; • ACAS warnings; • EGPWS warnings. 	
6.0 Safety risk assessment		Operator's safety risk assessment.	

End of new text.

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**SECTION 3
LARGE AND TURBOJET AEROPLANES**

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CHAPTER 3.4 FLIGHT OPERATIONS

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3.4.2 Operational management

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3.4.2.3 Operating instructions — general

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3.4.2.3.2 **Recommendation.**— *An operator should issue operating instructions and provide information on aeroplane climb performance with all engines operating to enable the pilot-in-command to determine the climb gradient that can be achieved during the departure phase for the existing take-off*

conditions and intended take-off technique. This information should be included in the operations manual.

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3.4.2.7 Aerodrome operating minima

~~An operator shall ensure that no pilot in command operates to or from an aerodrome using operating minima lower than those which may be established for that aerodrome by the State in which it is located, except with the specific approval of that State.~~

~~— Note 1.— It is the practice in some States to declare, for flight planning purposes, higher minima for an aerodrome when nominated as an alternate, than for the same aerodrome when planned as that of intended landing.~~

~~— Note 2.— The use of head up displays (HUD) or enhanced vision systems (EVS) may allow operations with lower visibilities than normally associated with the aerodrome operating minima.~~

3.4.2.7.1 An operator shall establish aerodrome operating minima in accordance with criteria specified by the State of Registry, for each aerodrome to be used in operations. Such minima shall not be lower than any that may be established for such aerodromes by the State of the Aerodrome, except when specifically approved by that State.

Note.— This Standard does not require the State of the Aerodrome to establish aerodrome operating minima.

3.4.2.7.2 The State of Registry may approve operational credit(s) for operations with aeroplanes equipped with automatic landing systems, a HUD or equivalent displays, EVS, SVS or CVS. Such approvals shall not affect the classification of the instrument approach procedure.

Note 1.— Operational credit includes:

a) for the purposes of an approach ban (2.2.4.1.2), a minima below the aerodrome operating minima;

b) reducing or satisfying the visibility requirements; or

c) requiring fewer ground facilities as compensated for by airborne capabilities.

Note 2.— Guidance on operational credit for aircraft equipped with automatic landing systems, a HUD or equivalent displays, EVS, SVS and CVS is contained in Attachment 2.B and in the Manual of All-Weather Operations (Doc 9365).

Note 3.— Information regarding a HUD or equivalent displays, including references to RTCA and EUROCAE documents, is contained in the Manual of All-Weather Operations (Doc 9365).

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3.4.2.8 Fatigue management programme

An operator shall establish and implement a fatigue management programme that ensures that all operator personnel involved in the operation and maintenance of aircraft do not carry out their duties when fatigued. The programme shall address flight and duty times and be included in the operations manual.

Note.— Guidance on fatigue management programmes can be found in the Fatigue Management Manual for General Aviation (Doc XXXX).

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3.4.3 Flight preparation

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3.4.3.3 Operational flight planning

An operator shall specify flight planning procedures to provide for the safe conduct of the flight based on considerations of aeroplane performance, other operating limitations and relevant expected conditions on the route to be followed and at the aerodromes concerned. These procedures shall be included in the operations manual.

Note 1.— It is the practice in some States to declare, for flight planning purposes, higher minima for an aerodrome nominated as an alternate, than for the same aerodrome planned as that of intended landing.

Note 2.— The requirements for flight plans are contained in Annex 2 — Rules of the Air and Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM, Doc 4444).

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3.4.3.4 Alternate aerodromes

3.4.3.4.1 Take-off alternate aerodrome

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

3.4.3.4.1.2 The take-off alternate aerodrome shall be located within the following distance-flight time 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 engines operating cruising speed, determined from the aircraft operating manual, calculated in ISA and still-air conditions using the actual take-off mass.

3.4.3.4.1.3 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 applicable aerodrome operating minima for that operation.

Editorial note.— Insert new paragraphs 3.4.3.5, 3.4.3.6 and 3.4.3.7 as follows and re-number subsequent paragraphs accordingly.

3.4.3.5 Fuel requirements

3.4.3.5.1 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.

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

- a) fuel consumption data:
 - 1) provided by the aeroplane manufacturer; or
 - 2) if available, current aeroplane-specific data derived from a fuel consumption monitoring system; 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.

Note.— Where no specific fuel consumption data exists for the precise conditions of the flight, the aircraft may be operated in accordance with estimated fuel consumption data.

3.4.3.5.3 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 taking into account local conditions at the departure aerodrome and auxiliary power unit (APU) fuel consumption;
- b) *trip fuel*, which shall be the amount of fuel required to enable the aeroplane to fly from take-off until landing at the destination aerodrome taking into account the operating conditions of 3.4.3.5.2 b);
- c) *contingency fuel*, which shall be the amount of fuel required to compensate for unforeseen factors. It shall be not less than five per cent of the planned trip fuel;

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 delays 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 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
 - 3) 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-engined 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 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; or
 - 2) for a turbine-engined 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 to enable the aircraft to descend as necessary and proceed to land at an alternate aerodrome in the event of engine failure or loss of pressurization based on the assumption that such a failure occurs at the most critical point along the route;
- g) *discretionary fuel*, which shall be the extra amount of fuel to be carried at the discretion of the pilot-in-command.

3.4.3.5.4 **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.

3.4.3.5.5 The use of fuel after flight commencement for purposes other than originally intended during pre-flight planning shall require a re-analysis and, if applicable, adjustment of the planned operation.

Note.— Nothing in 3.4.3.5 precludes the in-flight amendment of a flight plan to re-plan that flight to another aerodrome, provided that the requirements of 3.4.3.5 can be complied with from the point where the flight is re-planned.

3.4.3.6 In-flight fuel management

3.4.3.6.1 An operator shall establish policies and procedures to ensure that in-flight fuel checks and fuel management are performed.

3.4.3.6.2 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.

Note.— The protection of final reserve fuel is intended to ensure a safe landing at any aerodrome when unforeseen occurrences may not permit safe completion of an operation as originally planned. Guidance on flight planning including the circumstances that may require re-analysis, adjustment and/or re-planning of the planned operation before take-off or en-route, is contained in the Flight Planning and Fuel Management Manual (Doc 9976).

3.4.3.6.3 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.

3.4.3.6.4 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 the planned final reserve fuel.

Note.— 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 the planned final reserve fuel. This is not an emergency situation but an indication that an emergency situation is possible should any additional delay occur.

3.4.3.6.5 The pilot-in-command shall declare a situation of fuel emergency by broadcasting MAYDAY MAYDAY MAYDAY FUEL, when the calculated usable fuel estimated 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 3.4.3.5.3 e) 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.

3.4.3.7 Additional requirements for operations beyond 60 minutes to an en-route alternate aerodrome

Recommendation.— When conducting operations beyond 60 minutes from a point on a route to an en-route alternate aerodrome operators should ensure that:

- a) en-route alternate aerodromes are identified; and
- b) the pilot-in-command has access to current information on the identified en-route alternate aerodromes, including operational status and meteorological conditions.

End of new text.

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CHAPTER 3.6 AEROPLANE INSTRUMENTS, EQUIPMENT AND FLIGHT DOCUMENTS

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Editorial note.— Delete paragraph 3.6.8 in toto and re-number subsequent paragraphs accordingly.

~~3.6.8— Aeroplanes required to be equipped with ground proximity warning systems (GPWS)~~

All aeroplanes shall be equipped in accordance with 2.4.11.

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3.6.13 Aeroplanes equipped with automatic landing systems, a head-up displays (HUD) or equivalent displays, enhanced vision systems (EVS), synthetic vision systems (SVS) and/or combined vision systems (CVS)

3.6.13.1 Where aeroplanes are equipped with automatic landing systems, a HUD or equivalent displays, or EVS, SVS or CVS, or any combination of those systems into a hybrid system, the use of such systems for the safe operation of an aeroplane shall be approved by the State of Registry.

Note.— Information regarding a HUD or equivalent displays, including references to RTCA and EUROCAE documents, is contained in the Manual of All-Weather Operations (Doc 9365).

3.6.13.2 In approving the operational use of automatic landing systems, HUD or equivalent displays, EVS, SVS or CVS, the State of Registry shall ensure that:

- a) the equipment meets the appropriate airworthiness certification requirements;
- b) the operator has carried out a safety risk assessment associated with the operations supported by the automatic landing systems, a HUD or equivalent displays, EVS, SVS or CVS;
- c) the operator has established and documented the procedures for the use of, and training requirements for, automatic landing systems, a HUD or equivalent displays, EVS, SVS or CVS.

Note 1.— Guidance on safety risk assessments is contained in the Safety Management Manual (SMM) (Doc 9859).

Note 2.— Guidance on operational approvals is contained in Attachment 2.B.

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CHAPTER 3.8 AEROPLANE MAINTENANCE

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3.8.2 Operator's maintenance control manual

Recommendation.— *An operator should provide a maintenance control manual, as specified in 3.11.1, for the use and guidance of maintenance and operations personnel. The design of the manual should observe Human Factors principles.*

Note 1.— Guidance material on the application of Human Factors principles can be found in the Human Factors Training Manual (Doc 9683).

Note 2.— States may provide guidance material as outlined in 3.11.2 or reference accepted industry codes of practice.

3.8.3 Maintenance programme

3.8.3.1 An operator shall provide, for the use and guidance of maintenance and operational personnel concerned, a maintenance programme, acceptable to the State of Registry, containing the information required by 3.11.2. The design and application of the operator's maintenance programme shall observe Human Factors principles ~~according to the State of Registry's guidance material.~~

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CHAPTER 3.9 AEROPLANE FLIGHT CREW

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3.9.3 Flight crew member training programmes

3.9.3.1 An operator shall establish and maintain a training programme that is designed to ensure that a person who receives training acquires and maintains the competency to perform assigned duties, including skills related to human performance. ~~Ground and flight training programmes shall be established, either through internal programmes or through a training services provider, and shall include or make reference to a syllabus for those training programmes in the company operations manual. The training programme shall include training to competency for all equipment installed.~~

3.9.3.2 Ground and flight training programmes shall be established, either through internal programmes or through a training services provider, and shall include or make reference to a syllabus for those training programmes in the company operations manual.

3.9.3.3 The training programme shall include training to competency for all equipment installed.

3.9.3.2-4 **Recommendation.**— *Flight simulators should be used to the maximum extent practicable for initial and annual recurrent training.*

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