

Subpart B – Operating procedures

Section 1 – Motor-powered aircraft

GM1 CAT.OP.MPA.100(a)(2) Use of air traffic services

IN-FLIGHT OPERATIONAL INSTRUCTIONS

When coordination with an appropriate air traffic service (ATS) unit has not been possible, in-flight operational instructions do not relieve a commander of responsibility for obtaining an appropriate clearance from an ATS unit, if applicable, before making a change in flight plan.

AMC1 CAT.OP.MPA.105 Use of aerodromes and operating sites

DEFINING OPERATING SITES - HELICOPTERS

When defining operating sites (including infrequent or temporary sites) for the type(s) of helicopter(s) and operation(s) concerned, the operator should take account of the following:

- (a) An adequate site is a site that the operator considers to be satisfactory, taking account of the applicable performance requirements and site characteristics (guidance on standards and criteria are contained in ICAO Annex 14 Volume 2 and in the ICAO *Heliport Manual* (Doc 9261-AN/903)).
- (b) The operator should have in place a procedure for the survey of sites by a competent person. Such a procedure should take account for possible changes to the site characteristics which may have taken place since last surveyed.
- (c) Sites that are pre-surveyed should be specifically specified in the operations manual. The operations manual should contain diagrams or/and ground and aerial photographs, and depiction (pictorial) and description of:
 - (1) the overall dimensions of the site;
 - (2) location and height of relevant obstacles to approach and take-off profiles, and in the manoeuvring area;
 - (3) approach and take-off flight paths;
 - (4) surface condition (blowing dust/snow/sand);
 - (5) helicopter types authorised with reference to performance requirements;
 - (6) provision of control of third parties on the ground (if applicable);
 - (7) procedure for activating site with land owner or controlling authority;
 - (8) other useful information, for example appropriate ATS agency and frequency; and
 - (9) lighting (if applicable).

- (d) For sites that are not pre-surveyed, the operator should have in place a procedure that enables the pilot to make, from the air, a judgment on the suitability of a site. (c)(1) to (c)(6) should be considered.
- (e) Operations to non-pre-surveyed sites by night (except in accordance with SPA.HERMS.125 (b)(4)) should not be permitted.

AMC2 CAT.OP.MPA.105 Use of aerodromes and operating sites

HELIDECK

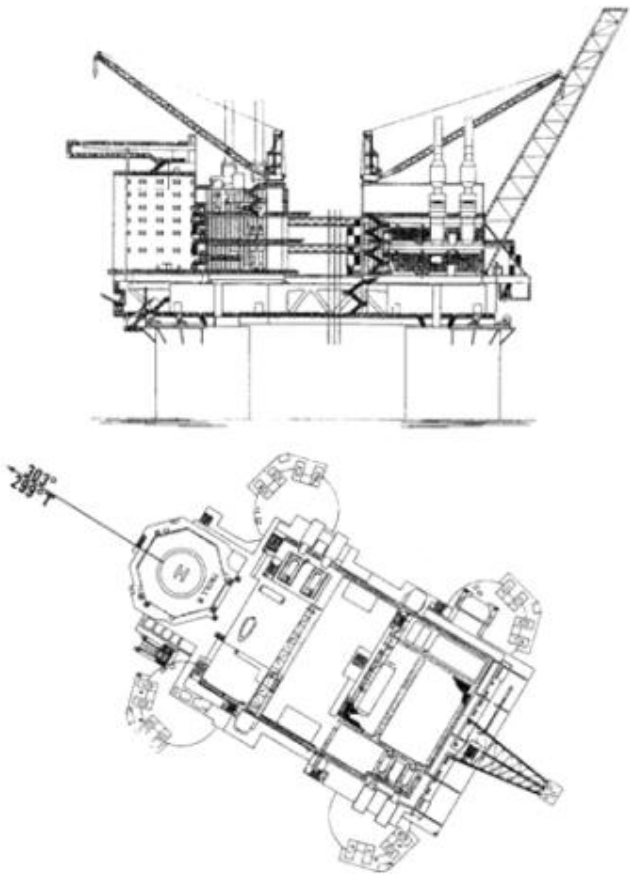
- (a) The content of Part C of the operations manual relating to the specific usage of helidecks should contain both the listing of helideck limitations in a helideck limitations list (HLL) and a pictorial representation (template) of each helideck showing all necessary information of a permanent nature. The HLL should show, and be amended as necessary to indicate, the most recent status of each helideck concerning non-compliance with ICAO Annex 14 Volume 2, limitations, warnings, cautions or other comments of operational importance. An example of a typical template is shown in Figure 1 below.
- (b) In order to ensure that the safety of flights is not compromised, the operator should obtain relevant information and details for compilation of the HLL, and the pictorial representation, from the owner/operator of the helideck.
- (c) When listing helidecks, if more than one name of the helideck exists, the most common name should be used and other names should also be included. After renaming a helideck, the old name should be included in the HLL for the ensuing 6 months.
- (d) All helideck limitations should be included in the HLL. Helidecks without limitations should also be listed. With complex installations and combinations of installations (e.g. co-locations), a separate listing in the HLL, accompanied by diagrams where necessary, may be required.
- (e) Each helideck should be assessed based on limitations, warnings, cautions or comments to determine its acceptability with respect to the following that, as a minimum, should cover the factors listed below:
 - (1) The physical characteristics of the helideck.
 - (2) The preservation of obstacle-protected surfaces is the most basic safeguard for all flights.
 These surfaces are:
 - (i) the minimum 210° obstacle-free surface (OFS);
 - (ii) the 150° limited obstacle surface (LOS); and
 - (iii) the minimum 180° falling '5:1' - gradient with respect to significant obstacles. If this is infringed or if an adjacent installation or vessel infringes the obstacle clearance surfaces or criteria related to a helideck, an assessment should be made to determine any possible negative effect that may lead to operating restrictions.

- (3) Marking and lighting:
 - (i) adequate perimeter lighting;
 - (ii) adequate floodlighting;
 - (iii) status lights (for night and day operations e.g. signalling lamp);
 - (iv) dominant obstacle paint schemes and lighting;
 - (v) helideck markings; and
 - (vi) general installation lighting levels. Any limitations in this respect should be annotated 'daylight only operations' on the HLL.
- (4) Deck surface:
 - (i) surface friction;
 - (ii) helideck net;
 - (iii) drainage system;
 - (iv) deck edge netting;
 - (v) tie down system; and
 - (vi) cleaning of all contaminants.
- (5) Environment:
 - (i) foreign object damage;
 - (ii) physical turbulence generators;
 - (iii) bird control;
 - (iv) air quality degradation due to exhaust emissions, hot gas vents or cold gas vents; and
 - (v) adjacent helideck may need to be included in air quality assessment.
- (6) Rescue and fire fighting:
 - (i) primary and complementary media types, quantities, capacity and systems personal protective equipment and clothing, breathing apparatus; and
 - (ii) crash box.
- (7) Communications & navigation:
 - (i) aeronautical radio(s);
 - (ii) radio/telephone (R/T) call sign to match helideck name and side identification which should be simple and unique;
 - (iii) Non-directional beacon (NDB) or equivalent (as appropriate);
 - (iv) radio log; and
 - (v) light signal (e.g. signalling lamp).
- (8) Fuelling facilities:
 - (i) in accordance with the relevant national guidance and regulations.

- (9) Additional operational and handling equipment:
 - (i) windsock;
 - (ii) wind recording;
 - (iii) deck motion recording and reporting where applicable;
 - (iv) passenger briefing system;
 - (v) chocks;
 - (vi) tie downs; and
 - (vii) weighing scales.
- (10) Personnel:
 - (i) trained helideck staff (e.g. helicopter landing officer/helicopter deck assistant and fire fighters etc.).
- (11) Other:
 - (i) as appropriate.
- (f) For helidecks about which there is incomplete information, 'limited' usage based on the information available may be specified by the operator prior to the first helicopter visit. During subsequent operations and before any limit on usage is lifted, information should be gathered and the following should apply:
 - (1) Pictorial (static) representation:
 - (i) template (see figure 1) blanks should be available, to be filled out during flight preparation on the basis of the information given by the helideck owner/operator and flight crew observations;
 - (ii) where possible, suitably annotated photographs may be used until the HLL and template have been completed;
 - (iii) until the HLL and template have been completed, operational restrictions (e.g. performance, routing etc.) may be applied;
 - (iv) any previous inspection reports should be obtained by the operator; and
 - (v) an inspection of the helideck should be carried out to verify the content of the completed HLL and template, following which the helideck may be considered as fully adequate for operations.
 - (2) With reference to the above, the HLL should contain at least the following:
 - (i) HLL revision date and number;
 - (ii) generic list of helideck motion limitations;
 - (iii) name of helideck;
 - (iv) 'D' value; and
 - (v) limitations, warnings, cautions and comments.

- (3) The template should contain at least the following (see example below):
- (i) installation/vessel name;
 - (ii) R/T call sign;
 - (iii) helideck identification marking;
 - (iv) side panel identification marking;
 - (v) helideck elevation;
 - (vi) maximum installation/vessel height;
 - (vii) 'D' value;
 - (viii) type of installation/vessel:
 - fixed manned
 - fixed unmanned
 - ship type (e.g. diving support vessel)
 - semi-submersible
 - jack-up
 - (ix) name of owner/operator;
 - (x) geographical position;
 - (xi) communication and navigation (Com/Nav) frequencies and ident;
 - (xii) general drawing preferably looking into the helideck with annotations showing location of derrick, masts, cranes, flare stack, turbine and gas exhausts, side identification panels, windsock etc.;
 - (xiii) plan view drawing, chart orientation from the general drawing, to show the above. The plan view will also show the 210° orientation in degrees true;
 - (xiv) type of fuelling:
 - pressure and gravity
 - pressure only
 - gravity only
 - none
 - (xv) type and nature of fire fighting equipment;
 - (xvi) availability of ground power unit (GPU);
 - (xvii) deck heading;
 - (xviii) maximum allowable mass;
 - (xix) status light (Yes/No); and
 - (xx) revision date of publication.

Figure 1 Helideck template

Installation/vessel name		R/T callsign :	Helideck identification :		
...		...	...		
Helideck elevation : 200 ft		Maximum height : 350 ft	Side identification : ...		
Type of installation : ... ¹			D value : 22 m		
Position : ² N ... W ...			Operator ³		
			ATIS : VHF 123.45		
COM	LOG :	VHF 123.45	NAV	NBD :	123 (ident)
	Traffic :	VHF 123.45		DME :	123
	Deck :	VHF 123.45		VOR/DME :	123
				VOR :	123
					
Fuelling : ... ⁴		GPU : ... ⁵		Deck heading : ...	
MTOM : ... T		Status light : ... ⁶		Fire fighting equipment : ... ⁷	
				Revision date:	
				...	

- 1 Fixed manned, fixed unmanned; ship type (e.g. diving support vessel); semi-submersible; jack-up.
- 2 WGS84 grid.
- 3 NAM, AMOCO, etc.
- 4 Pressure/gravity; pressure; gravity; no.
- 5 Yes; no; 28V DC.
- 6 Yes; no.
- 7 Type (e.g. aqueous film forming foams (AFFF)) and nature (e.g. deck integrated fire fighting system (DIFFS)).

AMC1 CAT.OP.MPA.110 Aerodrome operating minima

TAKE-OFF OPERATIONS - AEROPLANES

(a) General

- (1) Take-off minima should be expressed as visibility or runway visual range (RVR) limits, taking into account all relevant factors for each aerodrome planned to be used and aircraft characteristics. Where there is a specific need to see and avoid obstacles on departure and/or for a forced landing, additional conditions, e.g. ceiling, should be specified.
- (2) The commander should not commence take-off unless the weather conditions at the aerodrome of departure are equal to or better than applicable minima for landing at that aerodrome unless a weather-permissible take-off alternate aerodrome is available.
- (3) When the reported meteorological visibility (VIS) is below that required for take-off and RVR is not reported, a take-off should only be commenced if the commander can determine that the visibility along the take-off runway is equal to or better than the required minimum.
- (4) When no reported meteorological visibility or RVR is available, a take-off should only be commenced if the commander can determine that the visibility along the take-off runway is equal to or better than the required minimum.

(b) Visual reference

- (1) The take-off minima should be selected to ensure sufficient guidance to control the aircraft in the event of both a rejected take-off in adverse circumstances and a continued take-off after failure of the critical engine.
- (2) For night operations, ground lights should be available to illuminate the runway and any obstacles.

(c) Required RVR/VIS – aeroplanes

- (1) For multi-engined aeroplanes, with performance such that in the event of a critical engine failure at any point during take-off the aeroplane can either stop or continue the take-off to a height of 1 500 ft above the aerodrome while clearing obstacles by the required margins, the take-off minima

specified by the operator should be expressed as RVR/CMV (converted meteorological visibility) values not lower than those specified in Table 1.A.

- (2) For multi-engined aeroplanes without the performance to comply with the conditions in (c)(1) in the event of a critical engine failure, there may be a need to re-land immediately and to see and avoid obstacles in the take-off area. Such aeroplanes may be operated to the following take-off minima provided they are able to comply with the applicable obstacle clearance criteria, assuming engine failure at the height specified. The take-off minima specified by the operator should be based upon the height from which the one-engine-inoperative (OEI) net take-off flight path can be constructed. The RVR minima used should not be lower than either of the values specified in Table 1.A or Table 2.A.
- (3) When RVR or meteorological visibility is not available, the commander should not commence take-off unless he/she can determine that the actual conditions satisfy the applicable take-off minima.

**Table 1.A: Take-off – aeroplanes (without an approval for low visibility take-off (LVTO))
RVR/VIS**

Facilities	RVR/VIS (m) *
Day only: Nil**	500
Day: at least runway edge lights or runway centreline markings Night: at least runway edge lights and runway end lights or runway centreline lights and runway end lights	400

*: The reported RVR/VIS value representative of the initial part of the take-off run can be replaced by pilot assessment.

**: The pilot is able to continuously identify the take-off surface and maintain directional control.

**Table 2.A: Take-off - aeroplanes
Assumed engine failure height above the runway versus RVR/VIS**

Assumed engine failure height above the take-off runway (ft)	RVR/VIS (m) **
<50	400 (200 with LVTO approval)
51 – 100	400 (300 with LVTO approval)
101 – 150	400
151 – 200	500
201 – 300	1 000
>300 *	1 500

*: 1 500 m is also applicable if no positive take-off flight path can be constructed.

**: The reported RVR/VIS value representative of the initial part of the take-off run can be replaced by pilot assessment.

AMC2 CAT.OP.MPA.110 Aerodrome operating minima

TAKE-OFF OPERATIONS - HELICOPTERS

(a) General

- (1) Take-off minima should be expressed as visibility or runway visual range (RVR) limits, taking into account all relevant factors for each aerodrome planned to be used and aircraft characteristics. Where there is a specific need to see and avoid obstacles on departure and/or for a forced landing, additional conditions, e.g. ceiling, should be specified.
 - (2) The commander should not commence take-off unless the weather conditions at the aerodrome of departure are equal to or better than applicable minima for landing at that aerodrome unless a weather-permissible take-off alternate aerodrome is available.
 - (3) When the reported meteorological visibility (VIS) is below that required for take-off and RVR is not reported, a take-off should only be commenced if the commander can determine that the visibility along the take-off runway/area is equal to or better than the required minimum.
 - (4) When no reported meteorological visibility or RVR is available, a take-off should only be commenced if the commander can determine that the visibility along the take-off runway/area is equal to or better than the required minimum.
- (b) Visual reference
- (1) The take-off minima should be selected to ensure sufficient guidance to control the aircraft in the event of both a rejected take-off in adverse circumstances and a continued take-off after failure of the critical engine.
 - (2) For night operations, ground lights should be available to illuminate the runway/final approach and take-off area (FATO) and any obstacles.
- (c) Required RVR/VIS – helicopters:
- (1) For performance class 1 operations, the operator should specify an RVR/VIS as take-off minima in accordance with Table 1.H.
 - (2) For performance class 2 operations onshore, the commander should operate to take-off minima of 800 m RVR/VIS and remain clear of cloud during the take-off manoeuvre until reaching performance class 1 capabilities.
 - (3) For performance class 2 operations offshore, the commander should operate to minima not less than that for performance class 1 and remain clear of cloud during the take-off manoeuvre until reaching performance class 1 capabilities.
 - (4) Table 8 for converting reported meteorological visibility to RVR should not be used for calculating take-off minima.

**Table 1.H: Take-off – helicopters (without LVTO approval)
RVR/VIS**

Onshore aerodromes with instrument flight rules (IFR) departure procedures	RVR/VIS (m)
No light and no markings (day only)	400 or the rejected take-off distance, whichever is the greater
No markings (night)	800
Runway edge/FATO light and centreline marking	400
Runway edge/FATO light, centreline marking and relevant RVR information	400
Offshore helideck *	
Two-pilot operations	400
Single-pilot operations	500

*: The take-off flight path to be free of obstacles.

AMC3 CAT.OP.MPA.110 Aerodrome operating minima

NPA, APV, CAT I OPERATIONS

- (a) The decision height (DH) to be used for a non-precision approach (NPA) flown with the continuous descent final approach (CDFA) technique, approach procedure with vertical guidance (APV) or CAT I operation should not be lower than the highest of:
- (1) the minimum height to which the approach aid can be used without the required visual reference;
 - (2) the obstacle clearance height (OCH) for the category of aircraft;
 - (3) the published approach procedure DH where applicable;
 - (4) the system minimum specified in Table 3; or
 - (5) the minimum DH specified in the aircraft flight manual (AFM) or equivalent document, if stated.
- (b) The minimum descent height (MDH) for an NPA operation flown without the CDFA technique should not be lower than the highest of:
- (1) the OCH for the category of aircraft;
 - (2) the system minimum specified in Table 3; or

(3) the minimum MDH specified in the AFM, if stated.

Table 3: System minima

Facility	Lowest DH/MDH (ft)
ILS/MLS/GLS	200
GNSS/SBAS (LPV)	200
GNSS (LNAV)	250
GNSS/Baro-VNAV (LNAV/ VNAV)	250
LOC with or without DME	250
SRA (terminating at ½ NM)	250
SRA (terminating at 1 NM)	300
SRA (terminating at 2 NM or more)	350
VOR	300
VOR/DME	250
NDB	350
NDB/DME	300
VDF	350

DME: distance measuring equipment;

GNSS: global navigation satellite system;

ILS: instrument landing system;

LNAV: lateral navigation;

LOC: localiser;

LPV: localiser performance with vertical guidance

SBAS: satellite-based augmentation system;

SRA: surveillance radar approach;

VDF: VHF direction finder;

VNAV: vertical navigation;

VOR: VHF omnidirectional radio range.

AMC4 CAT.OP.MPA.110 Aerodrome operating minima**CRITERIA FOR ESTABLISHING RVR/CMV****(a) Aeroplanes**

The following criteria for establishing RVR/CMV should apply:

- (1) In order to qualify for the lowest allowable values of RVR/CMV specified in Table 6.A the instrument approach should meet at least the following facility specifications and associated conditions:
 - (i) Instrument approaches with designated vertical profile up to and including 4.5° for category A and B aeroplanes, or 3.77° for category C and D aeroplanes where the facilities are:
 - (A) ILS / microwave landing system (MLS) / GBAS landing system (GLS) / precision approach radar (PAR); or
 - (B) APV; and

where the final approach track is offset by not more than 15° for category A and B aeroplanes or by not more than 5° for category C and D aeroplanes.
 - (ii) Instrument approach operations flown using the CDFA technique with a nominal vertical profile, up to and including 4.5° for category A and B aeroplanes, or 3.77° for category C and D aeroplanes, where the facilities are NDB, NDB/DME, VOR, VOR/DME, LOC, LOC/DME, VDF, SRA or GNSS/LNAV, with a final approach segment of at least 3 NM, which also fulfil the following criteria:
 - (A) the final approach track is offset by not more than 15° for category A and B aeroplanes or by not more than 5° for category C and D aeroplanes;
 - (B) the final approach fix (FAF) or another appropriate fix where descent is initiated is available, or distance to threshold (THR) is available by flight management system / GNSS (FMS/GNSS) or DME; and
 - (C) if the missed approach point (MAPt) is determined by timing, the distance from FAF or another appropriate fix to THR is ≤ 8 NM.
 - (iii) Instrument approaches where the facilities are NDB, NDB/DME, VOR, VOR/DME, LOC, LOC/DME, VDF, SRA or GNSS/LNAV, not fulfilling the criteria in (a)(1)(ii), or with an MDH $\geq 1\,200$ ft.
- (2) The missed approach operation, after an approach operation has been flown using the CDFA technique, should be executed when reaching the DA/H or the MAPt, whichever occurs first. The lateral part of the missed approach procedure should be flown via the MAPt unless otherwise stated on the approach chart.

AMC5 CAT.OP.MPA.110 Aerodrome operating minima**DETERMINATION OF RVR/CMV/VIS MINIMA FOR NPA, APV, CAT I - AEROPLANES****(a) Aeroplanes**

The RVR/CMV/VIS minima for NPA, APV and CAT I operations should be determined as follows:

- (1) The minimum RVR/CMV/VIS should be the highest of the values specified in Table 5 or Table 6.A but not greater than the maximum values specified in Table 6.A, where applicable.
- (2) The values in Table 5 should be derived from the formula below,

$$\text{Required RVR/VIS (m)} = [(DH/MDH \text{ (ft)} \times 0.3048) / \tan \alpha] - \text{length of approach lights (m)}$$

where α is the calculation angle, being a default value of 3.00° increasing in steps of 0.10° for each line in Table 5 up to 3.77° and then remaining constant.
- (3) If the approach is flown with a level flight segment at or above MDA/H, 200 m should be added for category A and B aeroplanes and 400 m for category C and D aeroplanes to the minimum RVR/CMV/VIS value resulting from the application of Tables 5 and 6.A.
- (4) An RVR of less than 750 m as indicated in Table 5 may be used:
 - (i) for CAT I operations to runways with full approach lighting system (FALS), runway touchdown zone lights (RTZL) and runway centreline lights (RCLL);
 - (ii) for CAT I operations to runways without RTZL and RCLL when using an approved head-up guidance landing system (HUDLS), or equivalent approved system, or when conducting a coupled approach or flight-director-flown approach to a DH. The ILS should not be published as a restricted facility; and
 - (iii) for APV operations to runways with FALS, RTZL and RCLL when using an approved head-up display (HUD).
- (5) Lower values than those specified in Table 5, for HUDLS and auto-land operations may be used if approved in accordance with Annex V (Part-SPA), Subpart E (SPA.LVO).
- (6) The visual aids should comprise standard runway day markings and approach and runway lights as specified in Table 4. The competent authority may approve that RVR values relevant to a basic approach lighting system (BALS) are used on runways where the approach lights are restricted in length below 210 m due to terrain or water, but where at least one cross-bar is available.
- (7) For night operations or for any operation where credit for runway and approach lights is required, the lights should be on and serviceable except as provided for in Table 9.

- (8) For single-pilot operations, the minimum RVR/VIS should be calculated in accordance with the following additional criteria:
- (i) an RVR of less than 800 m as indicated in Table 5 may be used for CAT I approaches provided any of the following is used at least down to the applicable DH:
 - (A) a suitable autopilot, coupled to an ILS, MLS or GLS that is not published as restricted; or
 - (B) an approved HUDLS, including, where appropriate, enhanced vision system (EVS), or equivalent approved system;
 - (ii) where RTZL and/or RCLL are not available, the minimum RVR/CMV should not be less than 600 m; and
 - (iii) an RVR of less than 800 m as indicated in Table 5 may be used for APV operations to runways with FALS, RTZL and RCLL when using an approved HUDLS, or equivalent approved system, or when conducting a coupled approach to a DH equal to or greater than 250 ft.

Table 4: Approach lighting systems

Class of lighting facility	Length, configuration and intensity of approach lights
FALS	CAT I lighting system (HIALS ≥ 720 m) distance coded centreline, Barrette centreline
IALS	Simple approach lighting system (HIALS 420 – 719 m) single source, Barrette
BALS	Any other approach lighting system (HIALS, MALS or ALS 210 - 419 m)
NALS	Any other approach light system (HIALS, MALS or ALS <210 m) or no approach lights

Note: HIALS: high intensity approach lighting system;
 MALS: medium intensity approach lighting system.

Table 5: RVR/CMV vs. DH/MDH

DH or MDH			Class of lighting facility			
			FALS	IALS	BALS	NALS
			See (a)(4),(5),(8) above for RVR <750/800 m			
ft			RVR/CMV (m)			
200	-	210	550	750	1 000	1 200
211	-	220	550	800	1 000	1 200
221	-	230	550	800	1 000	1 200
231	-	240	550	800	1 000	1 200
241	-	250	550	800	1 000	1 300
251	-	260	600	800	1 100	1 300
261	-	280	600	900	1 100	1 300
281	-	300	650	900	1 200	1 400
301	-	320	700	1 000	1 200	1 400
321	-	340	800	1 100	1 300	1 500
341	-	360	900	1 200	1 400	1 600
361	-	380	1 000	1 300	1 500	1 700
381	-	400	1 100	1 400	1 600	1 800
401	-	420	1 200	1 500	1 700	1 900
421	-	440	1 300	1 600	1 800	2 000
441	-	460	1 400	1 700	1 900	2 100
461	-	480	1 500	1 800	2 000	2 200
481		500	1 500	1 800	2 100	2 300
501	-	520	1 600	1 900	2 100	2 400
521	-	540	1 700	2 000	2 200	2 400

541	-	560	1 800	2 100	2 300	2 500
561	-	580	1 900	2 200	2 400	2 600
581	-	600	2 000	2 300	2 500	2 700
601	-	620	2 100	2 400	2 600	2 800
621	-	640	2 200	2 500	2 700	2 900
641	-	660	2 300	2 600	2 800	3 000
661	-	680	2 400	2 700	2 900	3 100
681	-	700	2 500	2 800	3 000	3 200
701	-	720	2 600	2 900	3 100	3 300
721	-	740	2 700	3 000	3 200	3 400
741	-	760	2 700	3 000	3 300	3 500
761	-	800	2 900	3 200	3 400	3 600
801	-	850	3 100	3 400	3 600	3 800
851	-	900	3 300	3 600	3 800	4 000
901	-	950	3 600	3 900	4 100	4 300
951	-	1 000	3 800	4 100	4 300	4 500
1 001	-	1 100	4 100	4 400	4 600	4 900
1 101	-	1 200	4 600	4 900	5 000	5 000
1 201 and above			5 000	5 000	5 000	5 000

Table 6.A: CAT I, APV, NPA - aeroplanes
Minimum and maximum applicable RVR/CMV (lower and upper cut-off limits)

Facility/conditions	RVR/CMV (m)	Aeroplane category			
		A	B	C	D
ILS, MLS, GLS, PAR, GNSS/SBAS, GNSS/VNAV	Min	According to Table 5			
	Max	1 500	1 500	2 400	2 400
NDB, NDB/DME, VOR, VOR/DME, LOC, LOC/DME, VDF, SRA, GNSS/LNAV with a procedure that fulfils the criteria in AMC4 CAT.OP.MPA.110, (a)(1)(ii)	Min	750	750	750	750
	Max	1 500	1 500	2 400	2 400
For NDB, NDB/DME, VOR, VOR/DME, LOC, LOC/DME, VDF, SRA, GNSS/LNAV: - not fulfilling the criteria in in AMC4 CAT.OP.MPA.110, (a)(1)(ii), or - with a DH or MDH $\geq 1\,200$ ft	Min	1 000	1 000	1 200	1 200
	Max	According to Table 5 if flown using the CDFA technique, otherwise an add-on of 200 m for Category A and B aeroplanes and 400 m for Category C and D aeroplanes applies to the values in Table 5 but not to result in a value exceeding 5 000 m.			

AMC6 CAT.OP.MPA.110 Aerodrome operating minima

DETERMINATION OF RVR/CMV/VIS MINIMA FOR NPA, CAT I — HELICOPTERS

(a) Helicopters

The RVR/CMV/VIS minima for NPA, APV and CAT I operations should be determined as follows:

- (1) For NPA operations operated in performance class 1 (PC1) or performance class 2 (PC2), the minima specified in Table 6.1.H should apply:
 - (i) where the missed approach point is within $\frac{1}{2}$ NM of the landing threshold, the approach minima specified for FALS may be used regardless of the length of approach lights available. However, FATO/runway edge lights, threshold lights, end lights and FATO/runway markings are still required;

- (ii) for night operations, ground lights should be available to illuminate the FATO/runway and any obstacles; and
 - (iii) for single-pilot operations, the minimum RVR is 800 m or the minima in Table 6.1.H, whichever is higher.
- (2) For CAT I operations operated in PC1 or PC2, the minima specified in Table 6.2.H should apply:
- (i) for night operations, ground light should be available to illuminate the FATO/runway and any obstacles;
 - (ii) for single-pilot operations, the minimum RVR/VIS should be calculated in accordance with the following additional criteria:
 - (A) an RVR of less than 800 m should not be used except when using a suitable autopilot coupled to an ILS, MLS or GLS, in which case normal minima apply; and
 - (B) the DH applied should not be less than 1.25 times the minimum use height for the autopilot.

Table 6.1.H: Onshore NPA minima

MDH (ft) *	Facilities vs. RVR/CMV (m) **, ***			
	FALS	IALS	BALS	NALS
250 – 299	600	800	1 000	1 000
300 – 449	800	1 000	1 000	1 000
450 and above	1 000	1 000	1 000	1 000

*: The MDH refers to the initial calculation of MDH. When selecting the associated RVR, there is no need to take account of a rounding up to the nearest 10 ft, which may be done for operational purposes, e.g. conversion to MDA.

**: The tables are only applicable to conventional approaches with a nominal descent slope of not greater than 4°. Greater descent slopes will usually require that visual glide slope guidance (e.g. precision approach path indicator (PAPI)) is also visible at the MDH.

***: FALS comprise FATO/runway markings, 720 m or more of high intensity/medium intensity (HI/MI) approach lights, FATO/runway edge lights, threshold lights and FATO/runway end lights. Lights to be on.

IALS comprise FATO/runway markings, 420 - 719 m of HI/MI approach lights, FATO/runway edge lights, threshold lights and FATO/runway end lights. Lights to be on.

BALS comprise FATO/runway markings, <420 m of HI/MI approach lights, any length of low intensity (LI) approach lights, FATO/runway edge lights, threshold lights and FATO/runway end lights. Lights to be on.

NALS comprise FATO/runway markings, FATO/runway edge lights, threshold lights, FATO/runway end lights or no lights at all.

Table 6.2.H: Onshore CAT I minima

DH (ft) *	Facilities vs. RVR/CMV (m) **, ***			
	FALS	IALS	BALS	NALS
200	500	600	700	1 000
201 – 250	550	650	750	1 000
251 – 300	600	700	800	1 000
301 and above	750	800	900	1 000

*: The DH refers to the initial calculation of DH. When selecting the associated RVR, there is no need to take account of a rounding up to the nearest 10 ft, which may be done for operational purposes, e.g. conversion to DA.

**: The table is applicable to conventional approaches with a glide slope up to and including 4°.

***: FALS comprise FATO/runway markings, 720 m or more of HI/MI approach lights, FATO/runway edge lights, threshold lights and FATO/runway end lights. Lights to be on.

IALS comprise FATO/runway markings, 420 - 719 m of HI/MI approach lights, FATO/runway edge lights, threshold lights and FATO/runway end lights. Lights to be on.

BALS comprise FATO/runway markings, <420 m of HI/MI approach lights, any length of LI approach lights, FATO/runway edge lights, threshold lights and FATO/runway end lights. Lights to be on.

NALS comprise FATO/runway markings, FATO/runway edge lights, threshold lights, FATO/runway end lights or no lights at all.

AMC7 CAT.OP.MPA.110 Aerodrome operating minima

CIRCLING OPERATIONS - AEROPLANES

(a) Circling minima

The following standards should apply for establishing circling minima for operations with aeroplanes:

(1) the MDH for circling operation should not be lower than the highest of:

- (i) the published circling OCH for the aeroplane category;
- (ii) the minimum circling height derived from Table 7; or

- (iii) the DH/MDH of the preceding instrument approach procedure;
- (2) the MDA for circling should be calculated by adding the published aerodrome elevation to the MDH, as determined by (a)(1); and
- (3) the minimum visibility for circling should be the highest of:
 - (i) the circling visibility for the aeroplane category, if published;
 - (ii) the minimum visibility derived from Table 7; or
 - (iii) the RVR/CMV derived from Tables 5 and 6.A for the preceding instrument approach procedure.

Table 7: Circling - aeroplanes
MDH and minimum visibility vs. aeroplane category

	Aeroplane category			
	A	B	C	D
MDH (ft)	400	500	600	700
Minimum meteorological visibility (m)	1 500	1 600	2 400	3 600

- (b) Conduct of flight – general:
 - (1) the MDH and OCH included in the procedure are referenced to aerodrome elevation;
 - (2) the MDA is referenced to mean sea level;
 - (3) for these procedures, the applicable visibility is the meteorological visibility; and
 - (4) operators should provide tabular guidance of the relationship between height above threshold and the in-flight visibility required to obtain and sustain visual contact during the circling manoeuvre.
- (c) Instrument approach followed by visual manoeuvring (circling) without prescribed tracks
 - (1) When the aeroplane is on the initial instrument approach, before visual reference is stabilised, but not below MDA/H, the aeroplane should follow the corresponding instrument approach procedure until the appropriate instrument MAPt is reached.
 - (2) At the beginning of the level flight phase at or above the MDA/H, the instrument approach track determined by radio navigation aids, RNAV, RNP, ILS, MLS or GLS should be maintained until the pilot:
 - (i) estimates that, in all probability, visual contact with the runway of intended landing or the runway environment will be maintained during the entire circling procedure;
 - (ii) estimates that the aeroplane is within the circling area before commencing circling; and

- (iii) is able to determine the aeroplane's position in relation to the runway of intended landing with the aid of the appropriate external references.
- (3) When reaching the published instrument MAPt and the conditions stipulated in (c)(2) are unable to be established by the pilot, a missed approach should be carried out in accordance with that instrument approach procedure.
- (4) After the aeroplane has left the track of the initial instrument approach, the flight phase outbound from the runway should be limited to an appropriate distance, which is required to align the aeroplane onto the final approach. Such manoeuvres should be conducted to enable the aeroplane:
 - (i) to attain a controlled and stable descent path to the intended landing runway; and
 - (ii) to remain within the circling area and in such way that visual contact with the runway of intended landing or runway environment is maintained at all times.
- (5) Flight manoeuvres should be carried out at an altitude/height that is not less than the circling MDA/H.
- (6) Descent below MDA/H should not be initiated until the threshold of the runway to be used has been appropriately identified. The aeroplane should be in a position to continue with a normal rate of descent and land within the touchdown zone.
- (d) Instrument approach followed by a visual manoeuvring (circling) with prescribed track
 - (1) The aeroplane should remain on the initial instrument approach procedure until one of the following is reached:
 - (i) the prescribed divergence point to commence circling on the prescribed track; or
 - (ii) the MAPt.
 - (2) The aeroplane should be established on the instrument approach track determined by the radio navigation aids, RNAV, RNP, ILS, MLS or GLS in level flight at or above the MDA/H at or by the circling manoeuvre divergence point.
 - (3) If the divergence point is reached before the required visual reference is acquired, a missed approach should be initiated not later than the MAPt and completed in accordance with the instrument approach procedure.
 - (4) When commencing the prescribed circling manoeuvre at the published divergence point, the subsequent manoeuvres should be conducted to comply with the published routing and published heights/altitudes.
 - (5) Unless otherwise specified, once the aeroplane is established on the prescribed track(s), the published visual reference does not need to be maintained unless:
 - (i) required by the State of the aerodrome; or
 - (ii) the circling MAPt (if published) is reached.

- (6) If the prescribed circling manoeuvre has a published MAPt and the required visual reference has not been obtained by that point, a missed approach should be executed in accordance with (e)(2) and (e)(3).
 - (7) Subsequent further descent below MDA/H should only commence when the required visual reference has been obtained.
 - (8) Unless otherwise specified in the procedure, final descent should not be commenced from MDA/H until the threshold of the intended landing runway has been identified and the aeroplane is in a position to continue with a normal rate of descent to land within the touchdown zone.
- (e) Missed approach
- (1) Missed approach during the instrument procedure prior to circling:
 - (i) if the missed approach procedure is required to be flown when the aeroplane is positioned on the instrument approach track defined by radio-navigation aids RNAV, RNP, or ILS, MLS, and before commencing the circling manoeuvre, the published missed approach for the instrument approach should be followed; or
 - (ii) if the instrument approach procedure is carried out with the aid of an ILS, MLS or an stabilised approach (SAp), the MAPt associated with an ILS, MLS procedure without glide path (GP-out procedure) or the SAp, where applicable, should be used.
 - (2) If a prescribed missed approach is published for the circling manoeuvre, this overrides the manoeuvres prescribed below.
 - (3) If visual reference is lost while circling to land after the aeroplane has departed from the initial instrument approach track, the missed approach specified for that particular instrument approach should be followed. It is expected that the pilot will make an initial climbing turn toward the intended landing runway to a position overhead the aerodrome where the pilot will establish the aeroplane in a climb on the instrument missed approach segment.
 - (4) The aeroplane should not leave the visual manoeuvring (circling) area, which is obstacle protected, unless:
 - (i) established on the appropriate missed approach procedure; or
 - (ii) at minimum sector altitude (MSA).
 - (5) All turns should be made in the same direction and the aeroplane should remain within the circling protected area while climbing either:
 - (i) to the altitude assigned to any published circling missed approach manoeuvre if applicable;
 - (ii) to the altitude assigned to the missed approach of the initial instrument approach;
 - (iii) to the MSA;
 - (iv) to the minimum holding altitude (MHA) applicable for transition to a holding facility or fix, or continue to climb to an MSA; or

(v) as directed by ATS.

When the missed approach procedure is commenced on the 'downwind' leg of the circling manoeuvre, an 'S' turn may be undertaken to align the aeroplane on the initial instrument approach missed approach path, provided the aeroplane remains within the protected circling area.

The commander should be responsible for ensuring adequate terrain clearance during the above-stipulated manoeuvres, particularly during the execution of a missed approach initiated by ATS.

- (6) Because the circling manoeuvre may be accomplished in more than one direction, different patterns will be required to establish the aeroplane on the prescribed missed approach course depending on its position at the time visual reference is lost. In particular, all turns are to be in the prescribed direction if this is restricted, e.g. to the west/east (left or right hand) to remain within the protected circling area.
- (7) If a missed approach procedure is published for a particular runway onto which the aeroplane is conducting a circling approach and the aeroplane has commenced a manoeuvre to align with the runway, the missed approach for this direction may be accomplished. The ATS unit should be informed of the intention to fly the published missed approach procedure for that particular runway.
- (8) The commander should advise ATS when any missed approach procedure has been commenced, the height/altitude the aeroplane is climbing to and the position the aeroplane is proceeding towards and / or heading the aeroplane is established on.

AMC8 CAT.OP.MPA.110 Aerodrome operating minima

ONSHORE CIRCLING OPERATIONS - HELICOPTERS

For circling the specified MDH should not be less than 250 ft, and the meteorological visibility not less than 800 m.

AMC9 CAT.OP.MPA.110 Aerodrome operating minima

VISUAL APPROACH OPERATIONS

The operator should not use an RVR of less than 800 m for a visual approach operation.

AMC10 CAT.OP.MPA.110 Aerodrome operating minima

CONVERSION OF REPORTED METEOROLOGICAL VISIBILITY TO RVR

- (a) A conversion from meteorological visibility to RVR/CMV should not be used:
 - (1) when reported RVR is available;
 - (2) for calculating take-off minima; and

- (3) for any RVR minima less than 800 m.
- (b) If the RVR is reported as being above the maximum value assessed by the aerodrome operator, e.g. 'RVR more than 1 500 m', it should not be considered as a reported value for (a)(1).
- (c) When converting meteorological visibility to RVR in circumstances other than those in (a) , the conversion factors specified in Table 8 should be used.

Table 8: Conversion of reported meteorological visibility to RVR/CMV

Light elements in operation	RVR/CMV = reported meteorological visibility x	
	Day	Night
HI approach and runway lights	1.5	2.0
Any type of light installation other than above	1.0	1.5
No lights	1.0	not applicable

AMC11 CAT.OP.MPA.110 Aerodrome operating minima**EFFECT ON LANDING MINIMA OF TEMPORARILY FAILED OR DOWNGRADED GROUND EQUIPMENT**

(a) General

These instructions are intended for use both pre-flight and in-flight. It is however not expected that the commander would consult such instructions after passing 1 000 ft above the aerodrome. If failures of ground aids are announced at such a late stage, the approach could be continued at the commander's discretion. If failures are announced before such a late stage in the approach, their effect on the approach should be considered as described in Table 9, and the approach may have to be abandoned.

(b) Conditions applicable to Tables 9:

- (1) multiple failures of runway/FATO lights other than indicated in Table 9 should not be acceptable;
- (2) deficiencies of approach and runway/FATO lights are treated separately; and
- (3) failures other than ILS, MLS affect RVR only and not DH.

**Table 9: Failed or downgraded equipment – effect on landing minima
Operations without a low visibility operations (LVO) approval**

Failed or downgraded equipment	Effect on landing minima	
	CAT I	APV, NPA
ILS/MLS stand-by transmitter	No effect	
Outer Marker	Not allowed except if replaced by height check at 1 000 ft	APV – not applicable
		NPA with FAF: no effect unless used as FAF
		If the FAF cannot be identified (e.g. no method available for timing of descent), non-precision operations cannot be conducted
Middle marker	No effect	No effect unless used as MAPt
RVR Assessment Systems	No effect	
Approach lights	Minima as for NALS	
Approach lights except the last 210 m	Minima as for BALS	
Approach lights except the last 420 m	Minima as for IALS	
Standby power for approach lights	No effect	
Edge lights, threshold lights and runway end lights	Day: no effect; Night: not allowed	
Centreline lights	No effect if F/D, HUDLS or auto-land	No effect
	otherwise RVR 750 m	
Centreline lights spacing increased to 30 m	No effect	
Touchdown zone lights	No effect if F/D, HUDLS or auto-land; otherwise RVR 750 m	No effect

Failed or downgraded equipment	Effect on landing minima	
	CAT I	APV, NPA
Taxiway lighting system	No effect	

GM1 CAT.OP.MPA.110 Aerodrome operating minima

ONSHORE AERODROME DEPARTURE PROCEDURES – HELICOPTERS

The cloud base and visibility should be such as to allow the helicopter to be clear of cloud at take-off decision point (TDP), and for the pilot flying to remain in sight of the surface until reaching the minimum speed for flight in instrument meteorological conditions (IMC) given in the AFM.

GM2 CAT.OP.MPA.110 Aerodrome operating minima

APPROACH LIGHTING SYSTEMS – ICAO, FAA

The following table provides a comparison of ICAO and FAA specifications.

Table 1: Approach lighting systems

Class of lighting facility	Length, configuration and intensity of approach lights
FALS	ICAO: CAT I lighting system (HIALS ≥ 900 m) distance coded centreline, Barrette centreline FAA: ALSF1, ALSF2, SSALR, MALSR, high or medium intensity and/or flashing lights, 720 m or more
IALS	ICAO: simple approach lighting system (HIALS 420 – 719 m) single source, Barrette FAA: MALSF, MALS, SALS/SALSF, SSALF, SSALS, high or medium intensity and/or flashing lights, 420 – 719 m
BALS	Any other approach lighting system (HIALS, MALS or ALS 210-419 m) FAA: ODALS, high or medium intensity or flashing lights 210 - 419 m
NALS	Any other approach lighting system (HIALS, MALS or ALS <210 m) or no approach lights

Note: ALSF: approach lighting system with sequenced flashing lights;
MALS: medium intensity approach lighting system;
MALSF: medium intensity approach lighting system with sequenced flashing lights;
MALSR: medium intensity approach lighting system with runway alignment indicator lights;
ODALS: omnidirectional approach lighting system;
SALS: simple approach lighting system;
SALSF: short approach lighting system with sequenced flashing lights;
SSALF: simplified short approach lighting system with sequenced flashing lights;
SSALR: simplified short approach lighting system with runway alignment indicator lights;
SSALS: simplified short approach lighting system.

GM3 CAT.OP.MPA.110 Aerodrome operating minima

SBAS OPERATIONS

- (a) SBAS CAT I operations with a DH of 200 ft depend on an SBAS system approved for operations down to a DH of 200 ft.
- (b) The following systems are in operational use or in a planning phase:
 - (1) European geostationary navigation overlay service (EGNOS) operational in Europe;
 - (2) wide area augmentation system (WAAS) operational in the USA;
 - (3) multi-functional satellite augmentation system (MSAS) operational in Japan;
 - (4) system of differential correction and monitoring (SDCM) planned by Russia;
 - (5) GPS aided geo augmented navigation (GAGAN) system, planned by India; and
 - (6) satellite navigation augmentation system (SNAS), planned by China.

GM1 CAT.OP.MPA.110(a) Aerodrome operating minima

INCREMENTS SPECIFIED BY THE COMPETENT AUTHORITY

Additional increments to the published minima may be specified by the competent authority to take into account certain operations, such as downwind approaches and single-pilot operations.

AMC1 CAT.OP.MPA.115 Approach flight technique - aeroplanes

CONTINUOUS DESCENT FINAL APPROACH (CDFA)

- (a) Flight techniques:
 - (1) The CDFA technique should ensure that an approach can be flown on the desired vertical path and track in a stabilised manner, without significant vertical path changes during the final segment descent to the runway. This technique applies to an approach with no vertical guidance and controls the descent path until the DA/DH. This descent path can be either:
 - (i) a recommended descent rate, based on estimated ground speed;
 - (ii) a descent path depicted on the approach chart; or
 - (iii) a descent path coded in the flight management system in accordance with the approach chart descent path.
 - (2) The operator should either provide charts which depict the appropriate cross check altitudes/heights with the corresponding appropriate range information, or such information should be calculated and provided to the flight crew in an appropriate and usable format. Generally, the MAPt is published on the chart.
 - (3) The approach should be flown as an SAP.

- (4) The required descent path should be flown to the DA/H, observing any step-down crossing altitudes if applicable.
 - (5) This DA/H should take into account any add-on to the published minima as identified by the operator's management system and should be specified in the OM (aerodrome operating minima).
 - (6) During the descent the pilot monitoring should announce crossing altitudes as published fixes and other designated points are crossed, giving the appropriate altitude or height for the appropriate range as depicted on the chart. The pilot flying should promptly adjust the rate of descent as appropriate.
 - (7) The operator should establish a procedure to ensure that an appropriate callout is made when the aeroplane is approaching DA/H. If the required visual references are not established at DA/H, the missed approach procedure is to be executed promptly.
 - (8) The descent path should ensure that little or no adjustment of attitude or thrust/power is needed after the DA/H to continue the landing in the visual segment.
 - (9) The missed approach should be initiated no later than reaching the MAPt or at the DA/H, whichever comes first. The lateral part of the missed approach should be flown via the MAPt unless otherwise stated on the approach chart.
- (b) Flight techniques conditions:
- (1) The approach should be considered to be fully stabilised when the aeroplane is:
 - (i) tracking on the required approach path and profile;
 - (ii) in the required configuration and attitude;
 - (iii) flying with the required rate of descent and speed; and
 - (iv) flying with the appropriate thrust/power and trim.
 - (2) The aeroplane is considered established on the required approach path at the appropriate energy for stable flight using the CDFA technique when:
 - (i) it is tracking on the required approach path with the correct track set, approach aids tuned and identified as appropriate to the approach type flown and on the required vertical profile; and
 - (ii) it is at the appropriate attitude and speed for the required target rate of descent (ROD) with the appropriate thrust/power and trim.
 - (3) Stabilisation during any straight-in approach without visual reference to the ground should be achieved at the latest when passing 1 000 ft above runway threshold elevation. For approaches with a designated vertical profile applying the CDFA technique, a later stabilisation in speed may be acceptable if higher than normal approach speeds are required by ATC procedures or allowed by the OM. Stabilisation should, however, be achieved not later than 500 ft above runway threshold elevation.

- (4) For approaches where the pilot has visual reference with the ground, stabilisation should be achieved not later than 500 ft above aerodrome elevation. However, the aeroplane should be stabilised when passing 1 000 ft above runway threshold elevation; in the case of circling approaches flown after a CDFA, the aircraft should be stabilised in the circling configuration not later than passing 1 000 ft above the runway elevation.
- (5) To ensure that the approach can be flown in a stabilised manner, the bank angle, rate of descent and thrust/power management should meet the following performances:
 - (i) The bank angle should be less than 30 degrees.
 - (ii) The target rate of descent (ROD) should not exceed 1 000 fpm and the ROD deviations should not exceed ± 300 fpm, except under exceptional circumstances which have been anticipated and briefed prior to commencing the approach; for example, a strong tailwind. Zero ROD may be used when the descent path needs to be regained from below the profile. The target ROD may need to be initiated prior to reaching the required descent point, typically 0.3 NM before the descent point, dependent upon ground speed, which may vary for each type/class of aeroplane.
 - (iii) The limits of thrust/power and the appropriate range should be specified in the OM Part B or equivalent document.
 - (iv) The optimum angle for the approach slope is 3° and should not exceed 4.5° .
 - (v) The CDFA technique should be applied only to approach procedures based on NDB, NDB/DME, VOR, VOR/DME, LOC, LOC/DME, VDF, SRA, GNSS/LNAV and fulfil the following criteria:
 - (A) the final approach track off-set $\leq 5^\circ$ except for Category A and B aeroplanes, where the approach-track off-set is $\leq 15^\circ$; and
 - (B) a FAF, or another appropriate fix, e.g., final approach point, where descent initiated is available; and
 - (C) the distance from the FAF or another appropriate fix to the threshold (THR) is less than or equal to 8 NM in the case of timing; or
 - (D) the distance to the THR is available by FMS/GNSS or DME; or
 - (E) the minimum final-segment of the designated constant angle approach path should not be less than 3 NM from the THR unless approved by the authority.
- (7) The CDFA techniques support a common method for the implementation of flight-director-guided or auto-coupled RNAV approaches.

AMC2 CAT.OP.MPA.115 Approach flight technique - aeroplanes

NPA OPERATIONS WITHOUT APPLYING THE CDFA TECHNIQUE

- (a) In case the CDFA technique is not used the approach should be flown to an altitude/height at or above the MDA/H where a level flight segment at or above MDA/H may be flown to the MAPt.
- (b) Even when the approach procedure is flown without the CDFA technique the relevant procedures for ensuring a controlled and stable path to MDA/H should be followed.
- (c) In case the CDFA technique is not used when flying an approach, the operator should implement procedures to ensure that early descent to the MDA/H will not result in a subsequent flight below MDA/H without adequate visual reference. These procedures could include:
 - (1) awareness of radio altimeter information with reference to the approach profile;
 - (2) terrain awareness warning system (TAWS);
 - (3) limitation of rate of descent;
 - (4) limitation of the number of repeated approaches;
 - (5) safeguards against too early descents with prolonged flight at MDA/H; and
 - (6) specification of visual requirements for the descent from the MDA/H.
- (d) In case the CDFA technique is not used and when the MDA/H is high, it may be appropriate to make an early descent to MDA/H with appropriate safeguards such as the application of a significantly higher RVR/VIS.
- (e) The procedures that are flown with level flight at/or above MDA/H should be listed in the OM.
- (f) Operators should categorise aerodromes where there are approaches that require level flight at/or above MDA/H as B and C. Such aerodrome categorisation will depend upon the operator's experience, operational exposure, training programme(s) and flight crew qualification(s).

AMC3 CAT.OP.MPA.115 Approach flight technique - aeroplanes

OPERATIONAL PROCEDURES AND INSTRUCTIONS AND TRAINING

- (a) The operator should establish procedures and instructions for flying approaches using the CDFA technique and not using it. These procedures should be included in the OM and should include the duties of the flight crew during the conduct of such operations.
- (b) The operator should at least specify in the OM the maximum ROD for each aeroplane type/class operated and the required visual reference to continue the approach below:
 - (1) the DA/H, when applying the CDFA technique; and

- (2) the MDA/H, when not applying the CDFA technique.
- (c) The operator should establish procedures which prohibit level flight at MDA/H without the flight crew having obtained the required visual references. It is not the intention to prohibit level flight at MDA/H when conducting a circling approach, which does not come within the definition of the CDFA technique.
- (d) The operator should provide the flight crew with unambiguous details of the technique used (CDFA or not). The corresponding relevant minima should include:
 - (1) type of decision, whether DA/H or MDA/H;
 - (2) MAPt as applicable; and
 - (3) appropriate RVR/VIS for the approach operation and aeroplane category.
- (e) Training
 - (1) Prior to using the CDFA technique, each flight crew member should undertake appropriate training and checking as required by Subpart FC of Annex III (ORO.FC). The operator's proficiency check should include at least one approach to a landing or missed approach as appropriate using the CDFA technique or not. The approach should be operated to the lowest appropriate DA/H or MDA/H, as appropriate; and, if conducted in a FSTD, the approach should be operated to the lowest approved RVR. The approach is not in addition to any manoeuvre currently required by either Part-FCL or Part-CAT. The provision may be fulfilled by undertaking any currently required approach, engine out or otherwise, other than a precision approach (PA), whilst using the CDFA technique.
 - (2) The policy for the establishment of constant predetermined vertical path and approach stability is to be enforced both during initial and recurrent pilot training and checking. The relevant training procedures and instructions should be documented in the operations manual.
 - (3) The training should emphasise the need to establish and facilitate joint crew procedures and crew resource management (CRM) to enable accurate descent path control and the provision to establish the aeroplane in a stable condition as required by the operator's operational procedures.
 - (4) During training, emphasis should be placed on the flight crew's need to:
 - (i) maintain situational awareness at all times, in particular with reference to the required vertical and horizontal profile;
 - (ii) ensure good communication channels throughout the approach;
 - (iii) ensure accurate descent-path control particularly during any manually-flown descent phase. The monitoring pilot should facilitate good flight path control by:
 - (A) communicating any altitude/height crosschecks prior to the actual passing of the range/altitude or height crosscheck;
 - (B) prompting, as appropriate, changes to the target ROD; and
 - (C) monitoring flight path control below DA/MDA;

- (iv) understand the actions to be taken if the MAPt is reached prior to the MDA/H;
 - (v) ensure that the decision for a missed approach is taken no later than when reaching the DA/H or MDA/H;
 - (vi) ensure that prompt action for a missed approach is taken immediately when reaching DA/H if the required visual reference has not been obtained as there may be no obstacle protection if the missed approach procedure manoeuvre is delayed;
 - (vii) understand the significance of using the CDFA technique to a DA/H with an associated MAPt and the implications of early missed approach manoeuvres; and
 - (viii) understand the possible loss of the required visual reference due to pitch-change/climb when not using the CDFA technique for aeroplane types or classes that require a late change of configuration and/or speed to ensure the aeroplane is in the appropriate landing configuration.
- (5) Additional specific training when not using the CDFA technique with level flight at or above MDA/H
- (i) The training should detail:
 - (A) the need to facilitate CRM with appropriate flight crew communication in particular;
 - (B) the additional known safety risks associated with the 'dive-and-drive' approach philosophy which may be associated with non-CDFA;
 - (C) the use of DA/H during approaches flown using the CDFA technique;
 - (D) the significance of the MDA/H and the MAPt where appropriate;
 - (E) the actions to be taken at the MAPt and the need to ensure that the aeroplane remains in a stable condition and on the nominal and appropriate vertical profile until the landing;
 - (F) the reasons for increased RVR/Visibility minima when compared to the application of CDFA;
 - (G) the possible increased obstacle infringement risk when undertaking level flight at MDA/H without the required visual references;
 - (H) the need to accomplish a prompt missed approach manoeuvre if the required visual reference is lost;
 - (I) the increased risk of an unstable final approach and an associated unsafe landing if a rushed approach is attempted either from:

- (a) inappropriate and close-in acquisition of the required visual reference; or
- (b) unstable aeroplane energy and or flight path control; and
- (J) the increased risk of controlled flight into terrain (CFIT).

GM1 CAT.OP.MPA.115 Approach flight technique - aeroplanes

CONTINUOUS DESCENT FINAL APPROACH (CDFA)

(a) Introduction

- (1) Controlled flight into terrain (CFIT) is a major hazard in aviation. Most CFIT accidents occur in the final approach segment of non-precision approaches; the use of stabilised-approach criteria on a continuous descent with a constant, predetermined vertical path is seen as a major improvement in safety during the conduct of such approaches. Operators should ensure that the following techniques are adopted as widely as possible, for all approaches.
- (2) The elimination of level flight segments at MDA close to the ground during approaches, and the avoidance of major changes in attitude and power/thrust close to the runway that can destabilise approaches, are seen as ways to reduce operational risks significantly.
- (3) The term CDFA has been selected to cover a flight technique for any type of NPA operation.
- (4) The advantages of CDFA are as follows:
 - (i) the technique enhances safe approach operations by the utilisation of standard operating practices;
 - (ii) the technique is similar to that used when flying an ILS approach, including when executing the missed approach and the associated missed approach procedure manoeuvre;
 - (iii) the aeroplane attitude may enable better acquisition of visual cues;
 - (iv) the technique may reduce pilot workload;
 - (v) the approach profile is fuel-efficient;
 - (vi) the approach profile affords reduced noise levels;
 - (vii) the technique affords procedural integration with APV operations; and
 - (viii) when used and the approach is flown in a stabilised manner, CDFA is the safest approach technique for all NPA operations.

(b) CDFA

- (1) Continuous descent final approach is defined in Annex I to this Regulation.
- (2) An approach is only suitable for application of a CDFA technique when it is flown along a nominal vertical profile: a nominal vertical profile is not forming part of the approach procedure design, but can be flown as a continuous descent. The nominal vertical profile information may be published or

displayed on the approach chart to the pilot by depicting the nominal slope or range/distance vs. height. Approaches with a nominal vertical profile are considered to be:

- (i) NDB, NDB/DME;
- (ii) VOR, VOR/DME;
- (iii) LOC, LOC/DME;
- (iv) VDF, SRA; or
- (v) GNSS/LNAV.

(3) Stabilised approach (SAP) is defined in Annex I to this Regulation.

- (i) The control of the descent path is not the only consideration when using the CDFA technique. Control of the aeroplane's configuration and energy is also vital to the safe conduct of an approach.
- (ii) The control of the flight path, described above as one of the specifications for conducting an SAP, should not be confused with the path specifications for using the CDFA technique. The predetermined path specification for conducting an SAP are established by the operator and published in the operations manual part B.
- (iii) The predetermined approach slope specifications for applying the CDFA technique are established by the following:
 - (A) the published 'nominal' slope information when the approach has a nominal vertical profile; and
 - (B) the designated final-approach segment minimum of 3 NM, and maximum, when using timing techniques, of 8 NM.
- (iv) An SAP will never have any level segment of flight at DA/H or MDA/H as applicable. This enhances safety by mandating a prompt missed approach procedure manoeuvre at DA/H or MDA/H.
- (v) An approach using the CDFA technique will always be flown as an SAP, since this is a specification for applying CDFA. However, an SAP does not have to be flown using the CDFA technique, for example a visual approach.

AMC1 CAT.OP.MPA.120 Airborne radar approaches (ARAs) for overwater operations - helicopters

GENERAL

- (a) Before commencing the final approach the commander should ensure that a clear path exists on the radar screen for the final and missed approach segments. If lateral clearance from any obstacle will be less than 1 NM, the commander should:
 - (1) approach to a nearby target structure and thereafter proceed visually to the destination structure; or
 - (2) make the approach from another direction leading to a circling manoeuvre.

- (b) The cloud ceiling should be sufficiently clear above the helideck to permit a safe landing.
- (c) MDH should not be less than 50 ft above the elevation of the helideck.
 - (1) The MDH for an airborne radar approach should not be lower than:
 - (i) 200 ft by day; or
 - (ii) 300 ft by night.
 - (2) The MDH for an approach leading to a circling manoeuvre should not be lower than:
 - (i) 300 ft by day; or
 - (ii) 500 ft by night.
- (d) MDA may only be used if the radio altimeter is unserviceable. The MDA should be a minimum of MDH +200 ft and should be based on a calibrated barometer at the destination or on the lowest forecast QNH for the region.
- (e) The decision range should not be less than $\frac{3}{4}$ NM.
- (f) The MDA/H for a single-pilot ARA should be 100 ft higher than that calculated using (c) and (d) above. The decision range should not be less than 1 NM.

GM1 CAT.OP.MPA.120 Airborne radar approaches (ARAs) for overwater operations - helicopters

GENERAL

- (a) General
 - (1) The helicopter ARA procedure may have as many as five separate segments. These are the arrival, initial, intermediate, final and missed approach segments. In addition, the specifications of the circling manoeuvre to a landing under visual conditions should be considered. The individual approach segments can begin and end at designated fixes. However, the segments of an ARA may often begin at specified points where no fixes are available.
 - (2) The fixes, or points, are named to coincide with the associated segment. For example, the intermediate segment begins at the intermediate fix (IF) and ends at the final approach fix (FAF). Where no fix is available or appropriate, the segments begin and end at specified points; for example, intermediate point (IP) and final approach point (FAP). The order in which this GM discusses the segments is the order in which the pilot would fly them in a complete procedure: that is, from the arrival through initial and intermediate to a final approach and, if necessary, the missed approach.
 - (3) Only those segments that are required by local conditions applying at the time of the approach need be included in a procedure. In constructing the procedure, the final approach track, which should be orientated so as to be substantially into wind should be identified first as it is the least flexible and most critical of all the segments. When the origin and the orientation of the final approach have been determined, the other necessary segments should

be integrated with it to produce an orderly manoeuvring pattern that does not generate an unacceptably high work-load for the flight crew.

- (4) Examples of ARA procedures, vertical profile and missed approach procedures are contained in Figures 1 to 5.

(b) Obstacle environment

- (1) Each segment of the ARA is located in an overwater area that has a flat surface at sea level. However, due to the passage of large vessels which are not required to notify their presence, the exact obstacle environment cannot be determined. As the largest vessels and structures are known to reach elevations exceeding 500 ft above mean sea level (AMSL), the uncontrolled offshore obstacle environment applying to the arrival, initial and intermediate approach segments can reasonably be assumed to be capable of reaching to at least 500 ft AMSL. But, in the case of the final approach and missed approach segments, specific areas are involved within which no radar returns are allowed. In these areas the height of wave crests and the possibility that small obstacles may be present that are not visible on radar results in an uncontrolled surface environment that extends to an elevation of 50 ft AMSL.
- (2) Under normal circumstances, the relationship between the approach procedure and the obstacle environment is governed according to the concept that vertical separation is very easy to apply during the arrival, initial and intermediate segments, while horizontal separation, which is much more difficult to guarantee in an uncontrolled environment, is applied only in the final and missed approach segments.

(c) Arrival segment

The arrival segment commences at the last en-route navigation fix, where the aircraft leaves the helicopter route, and it ends either at the initial approach fix (IAF) or, if no course reversal, or similar manoeuvre is required, it ends at the IF. Standard en-route obstacle clearance criteria should be applied to the arrival segment.

(d) Initial approach segment

The initial approach segment is only required if a course reversal, race track, or arc procedure is necessary to join the intermediate approach track. The segment commences at the IAF and on completion of the manoeuvre ends at the IP. The minimum obstacle clearance (MOC) assigned to the initial approach segment is 1 000 ft.

(e) Intermediate approach segment

The intermediate approach segment commences at the IP, or in the case of straight-in approaches, where there is no initial approach segment, it commences at the IF. The segment ends at the FAP and should not be less than 2 NM in length. The purpose of the intermediate segment is to align and prepare the helicopter for the final approach. During the intermediate segment the helicopter should be lined up with the final approach track, the speed should be stabilised, the destination should be identified on the radar, and the final approach and missed approach

areas should be identified and verified to be clear of radar returns. The MOC assigned to the intermediate segment is 500 ft.

(f) Final approach segment

- (1) The final approach segment commences at the FAP and ends at the missed approach point (MAPt). The final approach area, which should be identified on radar, takes the form of a corridor between the FAP and the radar return of the destination. This corridor should not be less than 2 NM wide in order that the projected track of the helicopter does not pass closer than 1 NM to the obstacles lying outside the area.
- (2) On passing the FAP, the helicopter will descend below the intermediate approach altitude, and follow a descent gradient which should not be steeper than 6.5 %. At this stage vertical separation from the offshore obstacle environment will be lost. However, within the final approach area the MDA/H will provide separation from the surface environment. Descent from 1 000 ft AMSL to 200 ft AMSL at a constant 6.5 % gradient will involve a horizontal distance of 2 NM. In order to follow the guideline that the procedure should not generate an unacceptably high work-load for the flight crew, the required actions of levelling at MDH, changing heading at the offset initiation point (OIP), and turning away at MAPt should not be planned to occur at the same NM time from the destination.
- (3) During the final approach, compensation for drift should be applied and the heading which, if maintained, would take the helicopter directly to the destination, should be identified. It follows that, at an OIP located at a range of 1.5 NM, a heading change of 10° is likely to result in a track offset of 15° at 1 NM, and the extended centreline of the new track can be expected to have a mean position lying some 300 - 400 m to one side of the destination structure. The safety margin built in to the 0.75 NM decision range (DR) is dependent upon the rate of closure with the destination. Although the airspeed should be in the range 60 - 90 kt during the final approach, the ground speed, after due allowance for wind velocity, should be no greater than 70 kt.

(g) Missed approach segment

- (1) The missed approach segment commences at the MAPt and ends when the helicopter reaches minimum en-route altitude. The missed approach manoeuvre is a 'turning missed approach' which should be of not less than 30° and should not, normally, be greater than 45°. A turn away of more than 45° does not reduce the collision risk factor any further, nor will it permit a closer DR. However, turns of more than 45° may increase the risk of pilot disorientation and, by inhibiting the rate of climb (especially in the case of an OEI missed approach procedure), may keep the helicopter at an extremely low level for longer than is desirable.
- (2) The missed approach area to be used should be identified and verified as a clear area on the radar screen during the intermediate approach segment. The base of the missed approach area is a sloping surface at 2.5 % gradient starting from MDH at the MAPt. The concept is that a helicopter executing a

turning missed approach will be protected by the horizontal boundaries of the missed approach area until vertical separation of more than 130 ft is achieved between the base of the area, and the offshore obstacle environment of 500 ft AMSL which prevails outside the area.

- (3) A missed approach area, taking the form of a 45° sector orientated left or right of the final approach track, originating from a point 5 NM short of the destination, and terminating on an arc 3 NM beyond the destination, will normally satisfy the specifications of a 30° turning missed approach.
- (h) The required visual reference
- The visual reference required is that the destination should be in view in order that a safe landing may be carried out.
- (i) Radar equipment

During the ARA procedure, colour mapping radar equipment with a 120° sector scan and 2.5 NM range scale selected, may result in dynamic errors of the following order:

- (1) bearing/tracking error $\pm 4.5^\circ$ with 95 % accuracy;
- (2) mean ranging error -250 m; or
- (3) random ranging error ± 250 m with 95 % accuracy.

Figure 1: Arc procedure

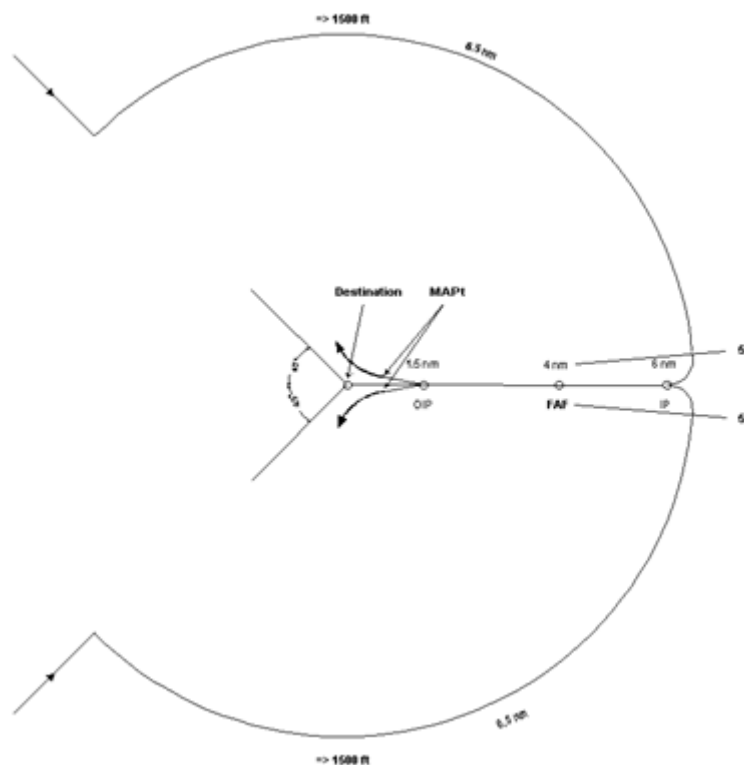


Figure 2: Base turn procedure – direct approach

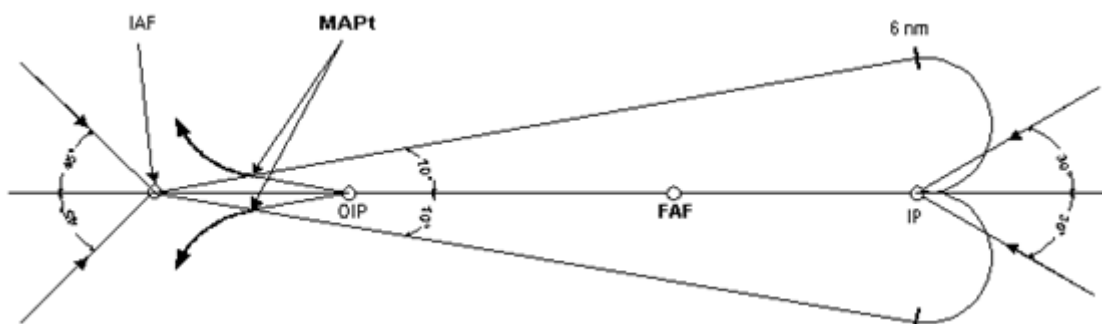


Figure 3: Holding pattern & race track procedure

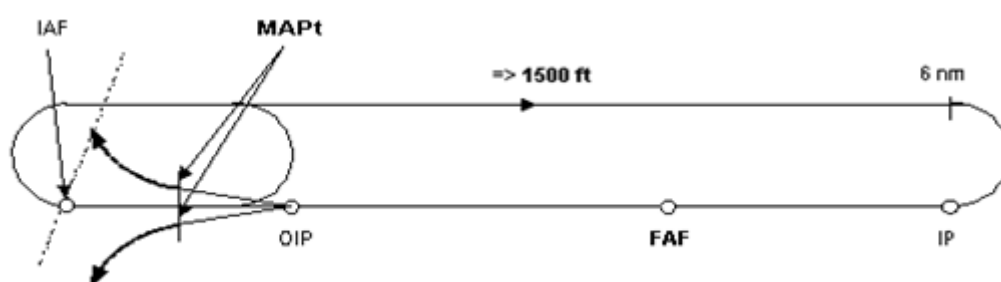


Figure 4: Vertical profile

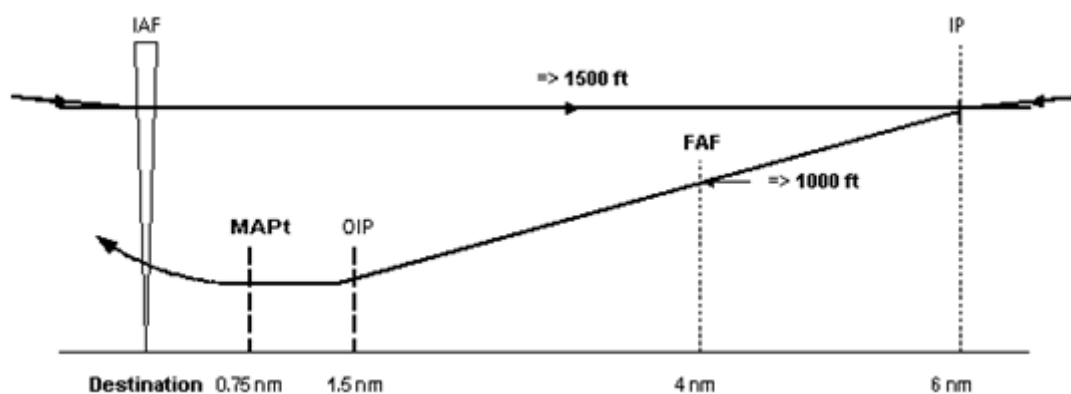
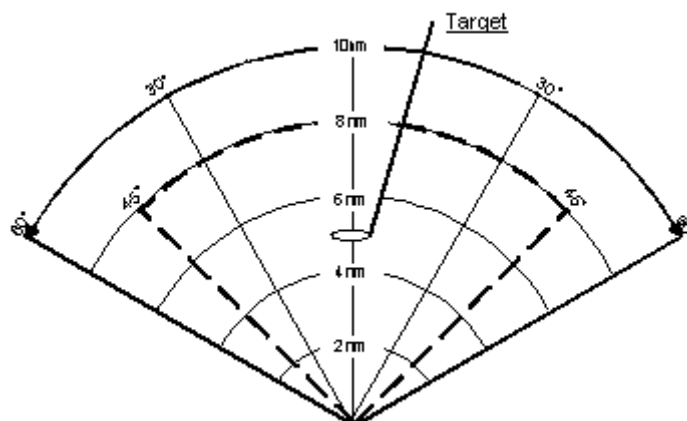


Figure 5: Missed approach area left & right



AMC1 CAT.OP.MPA.130 Noise abatement procedures - aeroplanes

NADP DESIGN

- (a) For each aeroplane type two departure procedures should be defined, in accordance with ICAO Doc. 8168 (Procedures for Air Navigation Services, 'PANS-OPS'), Volume I:
 - (1) noise abatement departure procedure one (NADP 1), designed to meet the close-in noise abatement objective; and
 - (2) noise abatement departure procedure two (NADP 2), designed to meet the distant noise abatement objective.
- (b) For each type of NADP (1 and 2), a single climb profile should be specified for use at all aerodromes, which is associated with a single sequence of actions. The NADP 1 and NADP 2 profiles may be identical.

GM1 CAT.OP.MPA.130 Noise abatement procedures - aeroplanes

TERMINOLOGY

- (a) 'Climb profile' means in this context the vertical path of the NADP as it results from the pilot's actions (engine power reduction, acceleration, slats/flaps retraction).
- (b) 'Sequence of actions' means the order in which these pilot's actions are done and their timing.

GENERAL

- (c) The rule addresses only the vertical profile of the departure procedure. Lateral track has to comply with the standard instrument departure (SID).

EXAMPLE

- (d) For a given aeroplane type, when establishing the distant NADP, the operator should choose either to reduce power first and then accelerate, or to accelerate first and then wait until slats/flaps are retracted before reducing power. The two methods constitute two different sequences of actions.
- (e) For an aeroplane type, each of the two departure climb profiles may be defined by one sequence of actions (one for close-in, one for distant) and two above aerodrome level (AAL) altitudes/heights. These are:
 - (1) the altitude of the first pilot's action (generally power reduction with or without acceleration). This altitude should not be less than 800 ft AAL; or
 - (2) the altitude of the end of the noise abatement procedure. This altitude should usually not be more than 3 000 ft AAL.

These two altitudes may be runway specific when the aeroplane flight management system (FMS) has the relevant function which permits the crew to change thrust reduction and/or acceleration altitude/height. If the aeroplane is not FMS equipped or the FMS is not fitted with the relevant function, two fixed heights should be defined and used for each of the two NADPs.

GM1 CAT.OP.MPA.137(b) Routes and areas of operation - helicopters

COASTAL TRANSIT

- (a) General
 - (1) Helicopters operating overwater in performance class 3 have to have certain equipment fitted. This equipment varies with the distance from land that the helicopter is expected to operate. The aim of this GM is to discuss that distance, bring into focus what fit is required and to clarify the operator's responsibility, when a decision is made to conduct coastal transit operations.
 - (2) In the case of operations north of 45N or south of 45S, the coastal corridor facility may or may not be available in a particular state, as it is related to the State definition of open sea area as described in the definition of hostile environment.
 - (3) Where the term 'coastal transit' is used, it means the conduct of operations overwater within the coastal corridor in conditions where there is reasonable expectation that:
 - (i) the flight can be conducted safely in the conditions prevailing;
 - (ii) following an engine failure, a safe forced landing and successful evacuation can be achieved; and
 - (iii) survival of the crew and passengers can be assured until rescue is effected.
 - (4) Coastal corridor is a variable distance from the coastline to a maximum distance corresponding to three minutes' flying at normal cruising speed.

(b) Establishing the width of the coastal corridor

- (1) The maximum distance from land of coastal transit, is defined as the boundary of a corridor that extends from the land, to a maximum distance of up to 3 minutes at normal cruising speed (approximately 5 - 6 NM). Land in this context includes sustainable ice (see (i) to (iii) below) and, where the coastal region includes islands, the surrounding waters may be included in the corridor and aggregated with the coast and each other. Coastal transit need not be applied to inland waterways, estuary crossing or river transit.
 - (i) In some areas, the formation of ice is such that it can be possible to land, or force land, without hazard to the helicopter or occupants. Unless the competent authority considers that operating to, or over, such ice fields is unacceptable, the operator may regard the definition of the 'land' extends to these areas.
 - (ii) The interpretation of the following rules may be conditional on (i) above:
 - CAT.OP.MPA.137(a)(2)
 - CAT.IDE.H.290
 - CAT.IDE.H.295
 - CAT.IDE.H.300
 - CAT.IDE.H.320.
 - (iii) In view of the fact that such featureless and flat white surfaces could present a hazard and could lead to white-out conditions, the definition of land does not extend to flights over ice fields in the following rules:
 - CAT.IDE.H.125 (d)
 - CAT.IDE.H.145.
- (2) The width of the corridor is variable from not safe to conduct operations in the conditions prevailing, to the maximum of 3 minutes wide. A number of factors will, on the day, indicate if it can be used - and how wide it can be. These factors will include but not be restricted to the following:
 - (i) meteorological conditions prevailing in the corridor;
 - (ii) instrument fit of the aircraft;
 - (iii) certification of the aircraft - particularly with regard to floats;
 - (iv) sea state;
 - (v) temperature of the water;
 - (vi) time to rescue; and
 - (vii) survival equipment carried.
- (3) These can be broadly divided into three functional groups:
 - (i) those that meet the provisions for safe flying;

- (ii) those that meet the provisions for a safe forced landing and evacuation; and
- (iii) those that meet the provisions for survival following a forced landing and successful evacuation.

(c) Provision for safe flying

- (1) It is generally recognised that when flying out of sight of land in certain meteorological conditions, such as occur in high pressure weather patterns (goldfish bowl - no horizon, light winds and low visibility), the absence of a basic panel (and training) can lead to disorientation. In addition, lack of depth perception in these conditions demands the use of a radio altimeter with an audio voice warning as an added safety benefit - particularly when autorotation to the surface of the water may be required.
- (2) In these conditions the helicopter, without the required instruments and radio altimeter, should be confined to a corridor in which the pilot can maintain reference using the visual cues on the land.

(d) Provision for a safe forced landing and evacuation

- (1) Weather and sea state both affect the outcome of an autorotation following an engine failure. It is recognised that the measurement of sea state is problematical and when assessing such conditions, good judgement has to be exercised by the operator and the commander.
- (2) Where floats have been certificated only for emergency use (and not for ditching), operations should be limited to those sea states that meet the provisions for such use - where a safe evacuation is possible.

Ditching certification requires compliance with a comprehensive number of requirements relating to rotorcraft water entry, flotation and trim, occupant egress and occupant survival. Emergency flotation systems, generally fitted to smaller CS-27 rotorcraft, are approved against a broad specification that the equipment should perform its intended function and not hazard the rotorcraft or its occupants. In practice, the most significant difference between ditching and emergency flotation systems is substantiation of the water entry phase. Ditching rules call for water entry procedures and techniques to be established and promulgated in the AFM. The fuselage/flotation equipment should thereafter be shown to be able to withstand loads under defined water entry conditions which relate to these procedures. For emergency flotation equipment, there is no specification to define the water entry technique and no specific conditions defined for the structural substantiation.

(e) Provisions for survival

- (1) Survival of crew members and passengers, following a successful autorotation and evacuation, is dependent on the clothing worn, the equipment carried and worn, the temperature of the sea and the sea state. Search and rescue (SAR) response/capability consistent with the anticipated exposure should be available before the conditions in the corridor can be considered non-hostile.
- (2) Coastal transit can be conducted (including north of 45N and south of 45S - when the definition of open sea areas allows) providing the provisions of (c)

and (d) are met, and the conditions for a non-hostile coastal corridor are satisfied.

AMC1 CAT.OP.MPA.140(c) Maximum distance from an adequate aerodrome for two-engined aeroplanes without an ETOPS approval

OPERATION OF NON-ETOPS COMPLIANT TWIN TURBO-JET AEROPLANES WITH MOPSC OF 19 OR LESS AND MCTOM LESS THAN 45 360 KG BETWEEN 120 AND 180 MINUTES FROM AN ADEQUATE AERODROME

(a) For operations between 120 and 180 minutes, due account should be taken of the aeroplane's design and capabilities as outlined below and the operator's experience related to such operations. Relevant information should be included in the operations manual and the operator's maintenance procedures. The term 'the aeroplane's design' in this AMC does not imply any additional type design approval specifications beyond the applicable original type certificate (TC) specifications.

(b) Systems capability

Aeroplanes should be certified to CS-25 as appropriate or equivalent (e.g. FAR-25). With respect to the capability of the aeroplane systems, the objective is that the aeroplane is capable of a safe diversion from the maximum diversion distance with particular emphasis on operations with OEI or with degraded system capability. To this end, the operator should give consideration to the capability of the following systems to support such a diversion:

- (1) Propulsion systems: the aeroplane engine should meet the applicable specifications prescribed in CS-25 and CS-E or equivalent (e.g. FAR-25, FAR-E), concerning engine TC, installation and system operation. In addition to the performance standards established by the Agency or competent authority at the time of engine certification, the engines should comply with all subsequent mandatory safety standards specified by the Agency or competent authority, including those necessary to maintain an acceptable level of reliability. In addition, consideration should be given to the effects of extended duration single-engine operation (e.g. the effects of higher power demands such as bleed and electrical).
- (2) Airframe systems: with respect to electrical power, three or more reliable as defined by CS-25 or equivalent (e.g. FAR-25) and independent electrical power sources should be available, each of which should be capable of providing power for all essential services which should at least include the following:
 - (i) sufficient instruments for the flight crew providing, as a minimum, attitude, heading, airspeed and altitude information;
 - (ii) appropriate pitot heating;
 - (iii) adequate navigation capability;
 - (iv) adequate radio communication and intercommunication capability;
 - (v) adequate flight deck and instrument lighting and emergency lighting;

- (vi) adequate flight controls;
- (vii) adequate engine controls and restart capability with critical type fuel (from the stand-point of flame-out and restart capability) and with the aeroplane initially at the maximum relight altitude;
- (viii) adequate engine instrumentation;
- (ix) adequate fuel supply system capability including such fuel boost and fuel transfer functions that may be necessary for extended duration single or dual-engine operation;
- (x) such warnings, cautions and indications as are required for continued safe flight and landing;
- (xi) fire protection (engines and auxiliary power unit (APU));
- (xii) adequate ice protection including windshield de-icing; and
- (xiii) adequate control of the flight crew compartment and cabin environment including heating and pressurisation.

The equipment including avionics necessary for extended diversion times should have the ability to operate acceptably following failures in the cooling system or electrical power systems.

For single-engine operations, the remaining power electrical, hydraulic, and pneumatic should continue to be available at levels necessary to permit continued safe flight and landing, and to provide those services necessary for the overall safety of the passengers and crew. As a minimum, following the failure of any two of the three electrical power sources, the remaining source should be capable of providing power for all of the items necessary for the duration of any diversion. If one or more of the required electrical power sources are provided by an APU, hydraulic system or air driven generator/ram air turbine (ADG/RAT), the following criteria should apply as appropriate:

- (A) to ensure hydraulic power (hydraulic motor generator) reliability, it may be necessary to provide two or more independent energy sources;
 - (B) the ADG/RAT, if fitted, should not require engine dependent power for deployment; and
 - (C) the APU should meet the criteria in (b)(3).
- (3) APU: the APU, if required for extended range operations, should be certified as an essential APU and should meet the applicable CS-25 and CS-APU provisions or equivalent (e.g. FAR-25).
 - (4) Fuel supply system: consideration should include the capability of the fuel supply system to provide sufficient fuel for the entire diversion taking account of aspects such as fuel boost and fuel transfer.
- (c) Engine events and corrective action
- (1) All engine events and operating hours should be reported by the operator to the airframe and engine supplemental type certificate (STC) holders as well as to the competent authority.

- (2) These events should be evaluated by the operator in consultation with the competent authority and with the engine and airframe (S)TC holders. The competent authority may consult the Agency to ensure that world wide data are evaluated.
- (3) Where statistical assessment alone is not applicable, e.g. where the fleet size or accumulated flight hours are small, individual engine events should be reviewed on a case-by-case basis.
- (4) The evaluation or statistical assessment, when available, may result in corrective action or the application of operational restrictions.
- (5) Engine events could include engine shutdowns, both on ground and in-flight, excluding normal training events, including flameout, occurrences where the intended thrust level was not achieved or where crew action was taken to reduce thrust below the normal level for whatever reason, and unscheduled removals.
- (6) Arrangements to ensure that all corrective actions required by the Agency are implemented.

(d) Maintenance

The maintenance programme in accordance with Annex I to Regulation (EC) No 2042/2003⁵ (Part-M) should be based upon reliability programmes including, but not limited to, the following elements:

- (1) engine oil consumption programmes: such programmes are intended to support engine condition trend monitoring; and
- (2) engine condition monitoring programme: a programme for each engine that monitors engine performance parameters and trends of degradation that provides for maintenance actions to be undertaken prior to significant performance loss or mechanical failure.

(e) Flight crew training

Flight crew training for this type of operation should include, in addition to the requirements of Subpart FC of Annex III (ORO.FC), particular emphasis on the following:

- (1) Fuel management: verifying required fuel on board prior to departure and monitoring fuel on board en-route including calculation of fuel remaining. Procedures should provide for an independent cross-check of fuel quantity indicators, e.g. fuel flow used to calculate fuel burned compared to indicate fuel remaining. Confirmation that the fuel remaining is sufficient to satisfy the critical fuel reserves.
- (2) Procedures for single and multiple failures in-flight that may give rise to go/no-go and diversion decisions - policy and guidelines to aid the flight crew

⁵ OJ L 315, 28.11.2003, p. 1.

in the diversion decision making process and the need for constant awareness of the closest weather-permissible alternate aerodrome in terms of time.

- (3) OEI performance data: drift down procedures and OEI service ceiling data.
- (4) Weather reports and flight requirements: meteorological aerodrome reports (METARs) and aerodrome forecast (TAF) reports and obtaining in-flight weather updates on the en-route alternate (ERA), destination and destination alternate aerodromes. Consideration should also be given to forecast winds including the accuracy of the forecast compared to actual wind experienced during flight and meteorological conditions along the expected flight path at the OEI cruising altitude and throughout the approach and landing.

(f) Pre-departure check

A pre-departure check, additional to the pre-flight inspection required by Part-M should be reflected in the operations manual. Flight crew members who are responsible for the pre-departure check of an aeroplane should be fully trained and competent to do it. The training programme required should cover all relevant tasks with particular emphasis on checking required fluid levels.

(g) MEL

The MEL should take into account all items specified by the manufacturer relevant to operations in accordance with this AMC.

(h) Dispatch/flight planning rules

The operator's dispatch rules should address the following:

- (1) Fuel and oil supply: an aeroplane should not be dispatched on an extended range flight unless it carries sufficient fuel and oil to comply with the applicable operational requirements and any additional reserves determined in accordance with the following:
 - (i) Critical fuel scenario - the critical point is the furthest point from an alternate aerodrome assuming a simultaneous failure of an engine and the pressurisation system. For those aeroplanes that are type certificated to operate above flight level 450, the critical point is the furthest point from an alternate aerodrome assuming an engine failure. The operator should carry additional fuel for the worst case fuel burn condition (one engine vs. two engines operating), if this is greater than the additional fuel calculated in accordance with the fuel requirements in CAT.OP.MPA, as follows:
 - (A) fly from the critical point to an alternate aerodrome:
 - (a) at 10 000 ft;
 - (b) at 25 000 ft or the single-engine ceiling, whichever is lower, provided that all occupants can be supplied with and use oxygen for the time required to fly from the critical point to an alternate aerodrome; or

- (c) at the single-engine ceiling, provided that the aeroplane is type certified to operate above flight level 450;
 - (B) descend and hold at 1 500 ft for 15 minutes in international standard atmosphere (ISA) conditions;
 - (C) descend to the applicable MDA/DH followed by a missed approach (taking into account the complete missed approach procedure); followed by
 - (D) a normal approach and landing.
- (ii) Ice protection: additional fuel used when operating in icing conditions (e.g. operation of ice protection systems (engine/airframe as applicable)) and, when manufacturer's data are available, take account of ice accumulation on unprotected surfaces if icing conditions are likely to be encountered during a diversion.
- (iii) APU operation: if an APU has to be used to provide additional electrical power, consideration should be given to the additional fuel required.
- (2) Communication facilities: the availability of communications facilities in order to allow reliable two-way voice communications between the aeroplane and the appropriate ATC unit at OEI cruise altitudes.
- (3) Aircraft technical log review to ensure proper MEL procedures, deferred items, and required maintenance checks completed.
- (4) ERA aerodrome(s): ensuring that ERA aerodromes are available for the intended route, within the distance flown in 180 minutes based upon the OEI cruising speed which is a speed within the certificated limits of the aeroplane, selected by the operator and approved by the competent authority, confirming that, based on the available meteorological information, the weather conditions at ERA aerodromes are at or above the applicable minima for the period of time during which the aerodrome(s) may be used.

Table 1: Planning minima

Approach facility	Alternate aerodrome ceiling	Weather minima RVR/VIS
PA	DA/H +200 ft	RVR/VIS +800 m
NPA Circling approach	MDA/H +400 ft	RVR/VIS +1 500 m

GM1 CAT.OP.MPA.140(c) Maximum distance from an adequate aerodrome for two-engined aeroplanes without an ETOPS approval

ONE-ENGINE-INOPERATIVE (OEI) CRUISING SPEED

The OEI cruising speed is intended to be used solely for establishing the maximum distance from an adequate aerodrome.

AMC1 CAT.OP.MPA.145(a) Establishment of minimum flight altitudes

CONSIDERATIONS FOR ESTABLISHING MINIMUM FLIGHT ALTITUDES

- (a) The operator should take into account the following factors when establishing minimum flight altitudes:
- (1) the accuracy with which the position of the aircraft can be determined;
 - (2) the probable inaccuracies in the indications of the altimeters used;
 - (3) the characteristics of the terrain, such as sudden changes in the elevation, along the routes or in the areas where operations are to be conducted;
 - (4) the probability of encountering unfavourable meteorological conditions, such as severe turbulence and descending air currents; and
 - (5) possible inaccuracies in aeronautical charts.
- (b) The operator should also consider:
- (1) corrections for temperature and pressure variations from standard values;
 - (2) ATC requirements; and
 - (3) any foreseeable contingencies along the planned route.

AMC1.1 CAT.OP.MPA.145(a) Establishment of minimum flight altitudes

CONSIDERATIONS FOR ESTABLISHING MINIMUM FLIGHT ALTITUDES

This AMC provides another means of complying with the rule for VFR operations of other-than-complex motor-powered aircraft by day, compared to that presented in

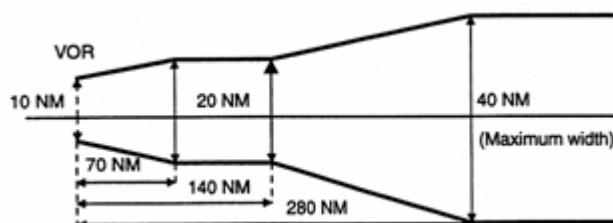
AMC1 CAT.OP.MPA.145(a). The safety objective should be satisfied if the operator ensures that operations are only conducted along such routes or within such areas for which a safe terrain clearance can be maintained and take account of such factors as temperature, terrain and unfavourable meteorological conditions.

GM1 CAT.OP.MPA.145(a) Establishment of minimum flight altitudes

MINIMUM FLIGHT ALTITUDES

- (a) The following are examples of some of the methods available for calculating minimum flight altitudes.
- (b) KSS formula:
 - (1) Minimum obstacle clearance altitude (MOCA)
 - (i) MOCA is the sum of:
 - (A) the maximum terrain or obstacle elevation, whichever is higher; plus
 - (B) 1 000 ft for elevation up to and including 6 000 ft; or
 - (C) 2 000 ft for elevation exceeding 6 000 ft rounded up to the next 100 ft.
 - (ii) The lowest MOCA to be indicated is 2 000 ft.
 - (iii) From a VOR station, the corridor width is defined as a borderline starting 5 NM either side of the VOR, diverging 4° from centreline until a width of 20 NM is reached at 70 NM out, thence paralleling the centreline until 140 NM out, thence again diverging 4° until a maximum width of 40 NM is reached at 280 NM out. Thereafter the width remains constant (see Figure 1).

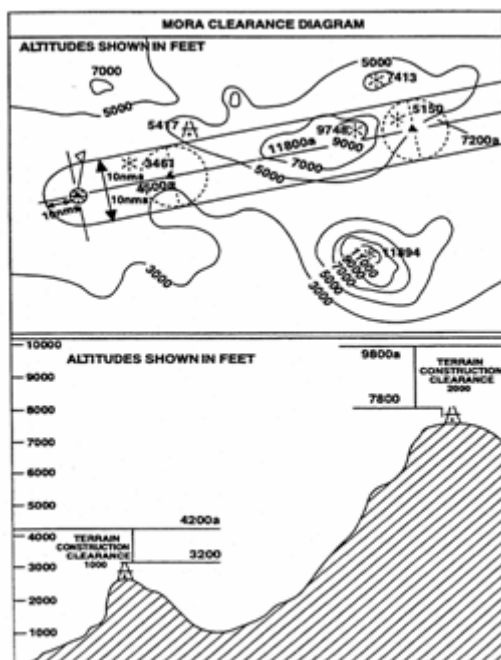
Figure 1: Corridor width from a VOR station



- (iv) From a non-directional beacon (NDB), similarly, the corridor width is defined as a borderline starting 5 NM either side of the NDB diverging 7° until a width of 20 NM is reached 40 NM out, thence paralleling the centreline until 80 NM out, thence again diverging 7° until a maximum width of 60 NM is reached 245 NM out. Thereafter the width remains constant (see Figure 2).

Figure 2: Corridor width from an NDB

- (v) MOCA does not cover any overlapping of the corridor.
- (2) Minimum off-route altitude (MORA). MORA is calculated for an area bounded by each or every second LAT/LONG square on the route facility chart (RFC) / terminal approach chart (TAC) and is based on a terrain clearance as follows:
 - (i) terrain with elevation up to 6 000 ft (2 000 m) – 1 000 ft above the highest terrain and obstructions;
 - (ii) terrain with elevation above 6 000 ft (2 000 m) – 2 000 ft above the highest terrain and obstructions.
- (c) Jeppesen formula (see Figure 3)
 - (1) MORA is a minimum flight altitude computed by Jeppesen from current operational navigation charts (ONCs) or world aeronautical charts (WACs). Two types of MORAs are charted which are:
 - (i) route MORAs e.g. 9800a; and
 - (ii) grid MORAs e.g. 98.
 - (2) Route MORA values are computed on the basis of an area extending 10 NM to either side of route centreline and including a 10 NM radius beyond the radio fix/reporting point or mileage break defining the route segment.
 - (3) MORA values clear all terrain and man-made obstacles by 1 000 ft in areas where the highest terrain elevation or obstacles are up to 5 000 ft. A clearance of 2 000 ft is provided above all terrain or obstacles that are 5 001 ft and above.
 - (4) A grid MORA is an altitude computed by Jeppesen and the values are shown within each grid formed by charted lines of latitude and longitude. Figures are shown in thousands and hundreds of feet (omitting the last two digits so as to avoid chart congestion). Values followed by $\pm$ are believed not to exceed the altitudes shown. The same clearance criteria as explained in (c)(3) apply.

Figure 3: Jeppesen formula

(d) ATLAS formula

- (1) Minimum en-route altitude (MEA). Calculation of the MEA is based on the elevation of the highest point along the route segment concerned (extending from navigational aid to navigational aid) within a distance on either side of track as specified in Table 1 below:

Table 1: Minimum safe en-route altitude

Segment length	Distance either side of track
Up to 100 NM	10 NM *
More than 100 NM	10 % of segment length up to a maximum of 60 NM **

*: This distance may be reduced to 5 NM within terminal control areas (TMAs) where, due to the number and type of available navigational aids, a high degree of navigational accuracy is warranted.

**: In exceptional cases, where this calculation results in an operationally impracticable value, an additional special MEA may be calculated based on a distance of not less than 10 NM either side of track. Such special MEA will be shown together with an indication of the actual width of protected airspace.

- (2) The MEA is calculated by adding an increment to the elevation specified above as appropriate, following Table 2 below. The resulting value is adjusted to the nearest 100 ft.

Table 2: Increment added to the elevation *

Elevation of highest point	Increment
Not above 5 000 ft	1 500 ft
Above 5 000 ft but not above 10 000 ft	2 000 ft
Above 10 000 ft	10 % of elevation plus 1 000 ft

*: For the last route segment ending over the initial approach fix, a reduction to 1 000 ft is permissible within TMAs where, due to the number and type of available navigation aids, a high degree of navigational accuracy is warranted.

- (3) Minimum safe grid altitude (MGA). Calculation of the MGA is based on the elevation of the highest point within the respective grid area.

The MGA is calculated by adding an increment to the elevation specified above as appropriate, following Table 3 below. The resulting value is adjusted to the nearest 100 ft.

Table 3: Minimum safe grid altitude

Elevation of highest point	Increment
Not above 5 000 ft	1 500 ft
Above 5 000 ft but not above 10 000 ft	2 000 ft
Above 10 000 ft	10 % of elevation plus 1 000 ft

(e) Lido formula

(1) Minimum terrain clearance altitude (MTCA)

The MTCA represents an altitude providing terrain and obstacle clearance for all airways/ATS routes, all standard terminal arrival route (STAR) segments up to IAF or equivalent end point and for selected standard instrument departures (SIDs).

The MTCA is calculated by Lido and covers terrain and obstacle clearance relevant for air navigation with the following buffers:

(i) Horizontal:

- (A) for SID and STAR procedures 5 NM either side of centre line; and
- (B) for airways/ATS routes 10 NM either side of centre line.

(ii) Vertical:

- (A) 1 000 ft up to 6 000 ft; and
- (B) 2 000 ft above 6 000 ft.

MTCAs are always shown in feet. The lowest indicated MTCA is 3 100 ft.

(2) Minimum grid altitude (MGA)

MGA represents the lowest safe altitude which can be flown off-track. The MGA is calculated by rounding up the elevation of the highest obstruction within the respective grid area to the next 100 ft and adding an increment of

- (i) 1 000 ft for terrain or obstructions up to 6 000 ft; and
- (ii) 2 000 ft for terrain or obstructions above 6 000 ft.

MGA is shown in hundreds of feet. The lowest indicated MGA is 2 000 ft. This value is also provided for terrain and obstacles that would result in an MGA below 2 000 ft. An exception is over water areas where the MGA can be omitted.

AMC1 CAT.OP.MPA.150(b) Fuel policy

PLANNING CRITERIA - AEROPLANES

The operator should base the defined fuel policy, including calculation of the amount of fuel to be on board for departure, on the following planning criteria:

(a) Basic procedure

The usable fuel to be on board for departure should be the sum of the following:

- (1) Taxi fuel, which should not be less than the amount, expected to be used prior to take-off. Local conditions at the departure aerodrome and auxiliary power unit (APU) consumption should be taken into account.
- (2) Trip fuel, which should include:
 - (i) fuel for take-off and climb from aerodrome elevation to initial cruising level/altitude, taking into account the expected departure routing;
 - (ii) fuel from top of climb to top of descent, including any step climb/descent;
 - (iii) fuel from top of descent to the point where the approach is initiated, taking into account the expected arrival procedure; and
 - (iv) fuel for approach and landing at the destination aerodrome.
- (3) Contingency fuel, except as provided for in (b), which should be the higher of:
 - (i) Either:
 - (A) 5 % of the planned trip fuel or, in the event of in-flight replanning, 5 % of the trip fuel for the remainder of the flight;
 - (B) not less than 3 % of the planned trip fuel or, in the event of in-flight replanning, 3 % of the trip fuel for the remainder of the flight, provided that an en-route alternate (ERA) aerodrome is available;
 - (C) an amount of fuel sufficient for 20 minutes flying time based upon the planned trip fuel consumption, provided that the operator has established a fuel consumption monitoring programme for individual aeroplanes and uses valid data determined by means of such a programme for fuel calculation; or
 - (D) an amount of fuel based on a statistical method that ensures an appropriate statistical coverage of the deviation from the planned to the actual trip fuel. This method is used to monitor the fuel consumption on each city pair/aeroplane combination and the operator uses this data for a statistical analysis to calculate contingency fuel for that city pair/aeroplane combination;
 - (ii) or an amount to fly for 5 minutes at holding speed at 1 500 ft (450 m), above the destination aerodrome in standard conditions.
- (4) Alternate fuel, which should:
 - (i) include:
 - (A) fuel for a missed approach from the applicable DA/H or MDA/H at the destination aerodrome to missed approach altitude, taking into account the complete missed approach procedure;

- (B) fuel for climb from missed approach altitude to cruising level/altitude, taking into account the expected departure routing;
 - (C) fuel for cruise from top of climb to top of descent, taking into account the expected routing;
 - (D) fuel for descent from top of descent to the point where the approach is initiated, taking into account the expected arrival procedure; and
 - (E) fuel for executing an approach and landing at the destination alternate aerodrome;
 - (ii) where two destination alternate aerodromes are required, be sufficient to proceed to the alternate aerodrome that requires the greater amount of alternate fuel.
- (5) Final reserve fuel, which should be:
- (i) for aeroplanes with reciprocating engines, fuel to fly for 45 minutes; or
 - (ii) for aeroplanes with turbine engines, fuel to fly for 30 minutes at holding speed at 1 500 ft (450 m) above aerodrome elevation in standard conditions, calculated with the estimated mass on arrival at the destination alternate aerodrome or the destination aerodrome, when no destination alternate aerodrome is required.
- (6) The minimum additional fuel, which should permit:
- (i) the aeroplane to descend as necessary and proceed to an adequate alternate aerodrome in the event of engine failure or loss of pressurisation, whichever requires the greater amount of fuel based on the assumption that such a failure occurs at the most critical point along the route, and
 - (A) hold there for 15 minutes at 1 500 ft (450 m) above aerodrome elevation in standard conditions; and
 - (B) make an approach and landing,
 except that additional fuel is only required if the minimum amount of fuel calculated in accordance with (a)(2) to (a)(5) is not sufficient for such an event; and
 - (ii) holding for 15 minutes at 1 500 ft (450 m) above destination aerodrome elevation in standard conditions, when a flight is operated without a destination alternate aerodrome.
- (7) Extra fuel, which should be at the discretion of the commander.
- (b) Reduced contingency fuel (RCF) procedure
- If the operator's fuel policy includes pre-flight planning to a destination 1 aerodrome (commercial destination) with an RCF procedure using a decision point along the route and a destination 2 aerodrome (optional refuel destination), the amount of usable fuel, on board for departure, should be the greater of (b)(1) or (b)(2):

(1) The sum of:

- (i) taxi fuel;
- (ii) trip fuel to the destination 1 aerodrome, via the decision point;
- (iii) contingency fuel equal to not less than 5 % of the estimated fuel consumption from the decision point to the destination 1 aerodrome;
- (iv) alternate fuel or no alternate fuel if the decision point is at less than six hours from the destination 1 aerodrome and the requirements of CAT.OP.MPA.180(b)(2), are fulfilled;
- (v) final reserve fuel;
- (vi) additional fuel; and
- (vii) extra fuel if required by the commander.

(2) The sum of:

- (i) taxi fuel;
- (ii) trip fuel to the destination 2 aerodrome, via the decision point;
- (iii) contingency fuel equal to not less than the amount calculated in accordance with (a)(3) above from departure aerodrome to the destination 2 aerodrome;
- (iv) alternate fuel, if a destination 2 alternate aerodrome is required;
- (v) final reserve fuel;
- (vi) additional fuel; and
- (vii) extra fuel if required by the commander.

(c) Predetermined point (PDP) procedure

If the operator's fuel policy includes planning to a destination alternate aerodrome where the distance between the destination aerodrome and the destination alternate aerodrome is such that a flight can only be routed via a predetermined point to one of these aerodromes, the amount of usable fuel, on board for departure, should be the greater of (c)(1) or (c)(2):

(1) The sum of:

- (i) taxi fuel;
- (ii) trip fuel from the departure aerodrome to the destination aerodrome, via the predetermined point;
- (iii) contingency fuel calculated in accordance with (a)(3);
- (iv) additional fuel if required, but not less than:
 - (A) for aeroplanes with reciprocating engines, fuel to fly for 45 minutes plus 15 % of the flight time planned to be spent at cruising level or 2 hours, whichever is less; or
 - (B) for aeroplanes with turbine engines, fuel to fly for 2 hours at normal cruise consumption above the destination aerodrome,

this should not be less than final reserve fuel; and

(v) extra fuel if required by the commander.

(2) The sum of:

(i) taxi fuel;

(ii) trip fuel from the departure aerodrome to the destination alternate aerodrome, via the predetermined point;

(iii) contingency fuel calculated in accordance with (a)(3);

(iv) additional fuel if required, but not less than:

(A) for aeroplanes with reciprocating engines: fuel to fly for 45 minutes; or

(B) for aeroplanes with turbine engines: fuel to fly for 30 minutes at holding speed at 1 500 ft (450 m) above the destination alternate aerodrome elevation in standard conditions,

this should not be less than final reserve fuel; and

(v) extra fuel if required by the commander.

(d) Isolated aerodrome procedure

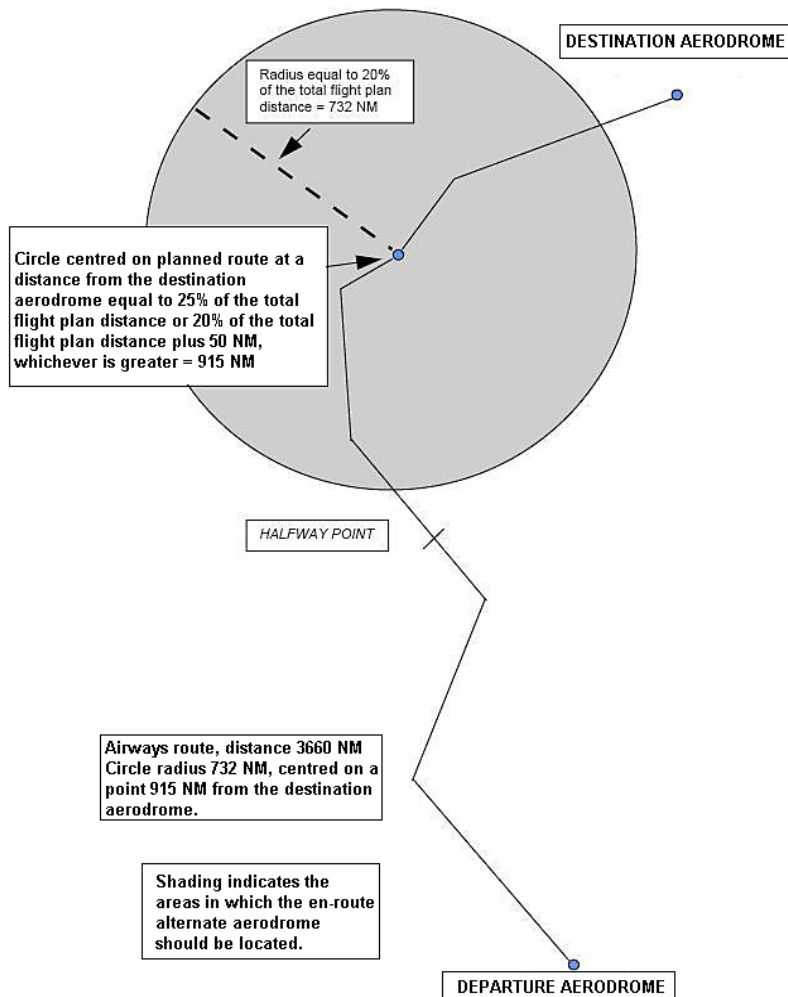
If the operator's fuel policy includes planning to an isolated aerodrome, the last possible point of diversion to any available en-route alternate (ERA) aerodrome should be used as the predetermined point.

AMC2 CAT.OP.MPA.150(b) Fuel policy

LOCATION OF THE FUEL EN-ROUTE ALTERNATE (FUEL ERA) AERODROME

(a) The fuel ERA aerodrome should be located within a circle having a radius equal to 20 % of the total flight plan distance, the centre of which lies on the planned route at a distance from the destination aerodrome of 25 % of the total flight plan distance, or at least 20 % of the total flight plan distance plus 50 NM, whichever is greater. All distances should be calculated in still air conditions (see Figure 1).

Figure 1: Location of the fuel ERA aerodrome for the purposes of reducing contingency fuel to 2.8%



AMC3 CAT.OP.MPA.150(b) Fuel policy**PLANNING CRITERIA - HELCIOPTERS**

The operator should base the company fuel policy, including calculation of the amount of fuel to be carried, on the following planning criteria:

- (a) The amount of:
 - (1) taxi fuel, which should not be less than the amount expected to be used prior to take-off. Local conditions at the departure site and APU consumption should be taken into account;
 - (2) trip fuel, which should include fuel:
 - (i) for take-off and climb from aerodrome elevation to initial cruising level/altitude, taking into account the expected departure routing;
 - (ii) from top of climb to top of descent, including any step climb/descent;
 - (iii) from top of descent to the point where the approach procedure is initiated, taking into account the expected arrival procedure; and
 - (iv) for approach and landing at the destination site;
 - (3) contingency fuel, which should be:
 - (i) for IFR flights, or for VFR flights in a hostile environment, 10 % of the planned trip fuel; or
 - (ii) for VFR flights in a non-hostile environment, 5 % of the planned trip fuel;
 - (4) alternate fuel, which should be:
 - (i) fuel for a missed approach from the applicable MDA/DH at the destination aerodrome to missed approach altitude, taking into account the complete missed approach procedure;
 - (ii) fuel for a climb from missed approach altitude to cruising level/altitude;
 - (iii) fuel for the cruise from top of climb to top of descent;
 - (iv) fuel for descent from top of descent to the point where the approach is initiated, taking into account the expected arrival procedure;
 - (v) fuel for executing an approach and landing at the destination alternate selected in accordance with CAT.OP.MPA.181; and
 - (vi) or for helicopters operating to or from helidecks located in a hostile environment, 10 % of (a)(4)(i) to (v);
 - (5) final reserve fuel, which should be:
 - (i) for VFR flights navigating by day with reference to visual landmarks, 20 minutes' fuel at best range speed; or
 - (ii) for IFR flights or when flying VFR and navigating by means other than by reference to visual landmarks or at night, fuel to fly for 30 minutes

at holding speed at 1 500 ft (450 m) above the destination aerodrome in standard conditions calculated with the estimated mass on arrival above the alternate, or the destination, when no alternate is required;

and

(6) extra fuel, which should be at the discretion of the commander.

(b) Isolated aerodrome IFR procedure

If the operator's fuel policy includes planning to an isolated aerodrome flying IFR, or when flying VFR and navigating by means other than by reference to visual landmarks, for which a destination alternate does not exist, the amount of fuel at departure should include:

- (1) taxi fuel;
- (2) trip fuel;
- (3) contingency fuel calculated in accordance with (a)(3);
- (4) additional fuel to fly for 2 hours at holding speed, including final reserve fuel; and
- (5) extra fuel at the discretion of the commander.

(c) Sufficient fuel should be carried at all times to ensure that following the failure of an engine occurring at the most critical point along the route, the helicopter is able to:

- (1) descend as necessary and proceed to an adequate aerodrome;
- (2) hold there for 15 minutes at 1 500 ft (450 m) above aerodrome elevation in standard conditions; and
- (3) make an approach and landing.

GM1 CAT.OP.MPA.150(b) Fuel policy

CONTINGENCY FUEL STATISTICAL METHOD - AEROPLANES

(a) As an example, the following values of statistical coverage of the deviation from the planned to the actual trip fuel provide appropriate statistical coverage.

- (1) 99 % coverage plus 3 % of the trip fuel, if the calculated flight time is less than 2 hours, or more than 2 hours and no weather-permissible ERA aerodrome is available.
- (2) 99 % coverage if the calculated flight time is more than 2 hours and a weather-permissible ERA aerodrome is available.
- (3) 90 % coverage if:
 - (i) the calculated flight time is more than 2 hours;
 - (ii) a weather-permissible ERA aerodrome is available; and
 - (iii) at the destination aerodrome two separate runways are available and usable, one of which is equipped with an ILS/MLS, and the weather

conditions are in compliance with CAT.OP.MPA.180(b)(2), or the ILS/MLS is operational to CAT II/III operating minima and the weather conditions are at or above 500 ft.

- (b) The fuel consumption database used in conjunction with these values should be based on fuel consumption monitoring for each route/aeroplane combination over a rolling 2 year period.

GM1 CAT.OP.MPA.150(c)(3)(i) Fuel policy

CONTINGENCY FUEL

Factors that may influence fuel required on a particular flight in an unpredictable way include deviations of an individual aeroplane from the expected fuel consumption data, deviations from forecast meteorological conditions and deviations from planned routings and/or cruising levels/altitudes.

GM1 CAT.OP.MPA.150(c)(3)(ii) Fuel policy

DESTINATION ALTERNATE AERODROME

The departure aerodrome may be selected as the destination alternate aerodrome.

AMC1 CAT.OP.MPA.155(b) Carriage of special categories of passengers (SCPs)

PROCEDURES

When establishing the procedures for the carriage of special categories of passengers, the operator should take into account the following factors:

- (a) the aircraft type and cabin configuration;
- (b) the total number of passengers carried on board;
- (c) the number and categories of SCPs, which should not exceed the number of passengers capable of assisting them in case of an emergency evacuation; and
- (d) any other factor(s) or circumstances possibly impacting on the application of emergency procedures by the operating crew members.

AMC1 CAT.OP.MPA.160 Stowage of baggage and cargo

STOWAGE PROCEDURES

Procedures established by the operator to ensure that hand baggage and cargo are adequately and securely stowed should take account of the following:

- (a) each item carried in a cabin should be stowed only in a location that is capable of restraining it;
- (b) weight limitations placarded on or adjacent to stowages should not be exceeded;

- (c) under seat stowages should not be used unless the seat is equipped with a restraint bar and the baggage is of such size that it may adequately be restrained by this equipment;
- (d) items should not be stowed in lavatories or against bulkheads that are incapable of restraining articles against movement forwards, sideways or upwards and unless the bulkheads carry a placard specifying the greatest mass that may be placed there;
- (e) baggage and cargo placed in lockers should not be of such size that they prevent latched doors from being closed securely;
- (f) baggage and cargo should not be placed where it can impede access to emergency equipment; and
- (g) checks should be made before take-off, before landing and whenever the fasten seat belts signs are illuminated or it is otherwise so ordered to ensure that baggage is stowed where it cannot impede evacuation from the aircraft or cause injury by falling (or other movement) as may be appropriate to the phase of flight.

AMC2 CAT.OP.MPA.160 Stowage of baggage and cargo

CARRIAGE OF CARGO IN THE PASSENGER COMPARTMENT

The following should be observed before carrying cargo in the passenger compartment:

- (a) for aeroplanes:
 - (1) dangerous goods should not be allowed; and
 - (2) a mix of passengers and live animals should only be allowed for pets weighing not more than 8 kg and guide dogs;
- (b) for aeroplanes and helicopters:
 - (1) the mass of cargo should not exceed the structural loading limits of the floor or seats;
 - (2) the number/type of restraint devices and their attachment points should be capable of restraining the cargo in accordance with applicable certification specifications; and
 - (3) the location of the cargo should be such that, in the event of an emergency evacuation, it will not hinder egress nor impair the crew's view.

AMC1 CAT.OP.MPA.165 Passenger seating

PROCEDURES

The operator should make provision so that:

- (a) those passengers who are allocated seats that permit direct access to emergency exits appear to be reasonably fit, strong and able to assist the rapid evacuation of the aircraft in an emergency after an appropriate briefing by the crew;

- (b) in all cases, passengers who, because of their condition, might hinder other passengers during an evacuation or who might impede the crew in carrying out their duties, should not be allocated seats that permit direct access to emergency exits. If procedures cannot be reasonably implemented at the time of passenger 'check-in', the operator should establish an alternative procedure which ensures that the correct seat allocations will, in due course, be made.

AMC2 CAT.OP.MPA.165 Passenger seating

ACCESS TO EMERGENCY EXITS

The following categories of passengers are among those who should not be allocated to, or directed to, seats that permit direct access to emergency exits:

- (a) passengers suffering from obvious physical or mental disability to the extent that they would have difficulty in moving quickly if asked to do so;
- (b) passengers who are either substantially blind or substantially deaf to the extent that they might not readily assimilate printed or verbal instructions given;
- (c) passengers who because of age or sickness are so frail that they have difficulty in moving quickly;
- (d) passengers who are so obese that they would have difficulty in moving quickly or reaching and passing through the adjacent emergency exit;
- (e) children (whether accompanied or not) and infants;
- (f) deportees, inadmissible passengers or persons in custody; and
- (g) passengers with animals.

GM1 CAT.OP.MPA.165 Passenger seating

DIRECT ACCESS

'Direct access' means a seat from which a passenger can proceed directly to the exit without entering an aisle or passing around an obstruction.

AMC1 CAT.OP.MPA.170 Passenger briefing

PASSENGER BRIEFING

Passenger briefings should contain the following:

- (a) Before take-off
 - (1) passengers should be briefed on the following items if applicable:
 - (i) smoking regulations;
 - (ii) back of the seat to be in the upright position and tray table stowed;
 - (iii) location of emergency exits;
 - (iv) location and use of floor proximity escape path markings;

- (v) stowage of hand baggage;
 - (vi) restrictions on the use of portable electronic devices; and
 - (vii) the location and the contents of the safety briefing card;
- and
- (2) passengers should receive a demonstration of the following:
 - (i) the use of safety belts or restraint systems, including how to fasten and unfasten the safety belts or restraint systems;
 - (ii) the location and use of oxygen equipment, if required. Passengers should also be briefed to extinguish all smoking materials when oxygen is being used; and
 - (iii) the location and use of life-jackets, if required.
- (b) After take-off
 - (1) passengers should be reminded of the following, if applicable:
 - (i) smoking regulations; and
 - (ii) use of safety belts or restraint systems including the safety benefits of having safety belts fastened when seated irrespective of seat belt sign illumination.
- (c) Before landing
 - (1) passengers should be reminded of the following, if applicable:
 - (i) smoking regulations;
 - (ii) use of safety belts or restraint systems;
 - (iii) back of the seat to be in the upright position and tray table stowed;
 - (iv) re-stowage of hand baggage; and
 - (v) restrictions on the use of portable electronic devices.
- (d) After landing
 - (1) passengers should be reminded of the following:
 - (i) smoking regulations; and
 - (ii) use of safety belts and/or restraint systems.
- (e) Emergency during flight
 - (1) passengers should be instructed as appropriate to the circumstances.

AMC1.1 CAT.OP.MPA.170 Passenger briefing

PASSENGER BRIEFING

- (a) The operator may replace the briefing/demonstration as set out in AMC1 CAT.OP.MPA.170 with a passenger training programme covering all safety and emergency procedures for a given type of aircraft.

- (b) Only passengers who have been trained according to this programme and have flown on the aircraft type within the last 90 days may be carried on board without receiving a briefing/demonstration.

AMC1 CAT.OP.MPA.175(a) Flight preparation

OPERATIONAL FLIGHT PLAN – COMPLEX MOTOR-POWERED AIRCRAFT

- (a) The operational flight plan used and the entries made during flight should contain the following items:
 - (1) aircraft registration;
 - (2) aircraft type and variant;
 - (3) date of flight;
 - (4) flight identification;
 - (5) names of flight crew members;
 - (6) duty assignment of flight crew members;
 - (7) place of departure;
 - (8) time of departure (actual off-block time, take-off time);
 - (9) place of arrival (planned and actual);
 - (10) time of arrival (actual landing and on-block time);
 - (11) type of operation (ETOPS, VFR, ferry flight, etc.);
 - (12) route and route segments with checkpoints/waypoints, distances, time and tracks;
 - (13) planned cruising speed and flying times between check-points/waypoints (estimated and actual times overhead);
 - (14) safe altitudes and minimum levels;
 - (15) planned altitudes and flight levels;
 - (16) fuel calculations (records of in-flight fuel checks);
 - (17) fuel on board when starting engines;
 - (18) alternate(s) for destination and, where applicable, take-off and en-route, including information required in (a)(12) to (15);
 - (19) initial ATS flight plan clearance and subsequent reclearance;
 - (20) in-flight replanning calculations; and
 - (21) relevant meteorological information.
- (b) Items that are readily available in other documentation or from another acceptable source or are irrelevant to the type of operation may be omitted from the operational flight plan.
- (c) The operational flight plan and its use should be described in the operations manual.

- (d) All entries on the operational flight plan should be made concurrently and be permanent in nature.

OPERATIONAL FLIGHT PLAN - OTHER-THAN-COMPLEX MOTOR-POWERED AIRCRAFT OPERATIONS AND LOCAL OPERATIONS

An operational flight plan may be established in a simplified form relevant to the kind of operation for operations with other-than-complex motor-powered aircraft as well as local operations with any aircraft.

GM1 CAT.OP.MPA.175(b)(5) Flight preparation

CONVERSION TABLES

The documentation should include any conversion tables necessary to support operations where metric heights, altitudes and flight levels are used.

AMC1 CAT.OP.MPA.181(b)(1) Selection of aerodromes and operating sites - helicopters

COASTAL AERODROME

- (a) Any alleviation from the requirement to select an alternate aerodrome for a flight to a coastal aerodrome under IFR routing from offshore should be based on an individual safety case assessment.
- (b) The following should be taken into account:
 - (1) suitability of the weather based on the landing forecast for the destination;
 - (2) the fuel required to meet the IFR requirements of CAT.OP.MPA.150 less alternate fuel;
 - (3) where the destination coastal aerodrome is not directly on the coast it should be:
 - (i) within a distance that, with the fuel specified in (b)(2), the helicopter can, at any time after crossing the coastline, return to the coast, descend safely and carry out a visual approach and landing with VFR fuel reserves intact; and
 - (ii) geographically sited so that the helicopter can, within the rules of the air, and within the landing forecast:
 - (A) proceed inbound from the coast at 500 ft AGL and carry out a visual approach and landing; or
 - (B) proceed inbound from the coast on an agreed route and carry out a visual approach and landing;
 - (4) procedures for coastal aerodromes should be based on a landing forecast no worse than:

- (i) by day, a cloud base of DH/MDH +400 ft, and a visibility of 4 km, or, if descent over the sea is intended, a cloud base of 600 ft and a visibility of 4 km; or
- (ii) by night, a cloud base of 1 000 ft and a visibility of 5 km;
- (5) the descent to establish visual contact with the surface should take place over the sea or as part of the instrument approach;
- (6) routings and procedures for coastal aerodromes nominated as such should be included in the operations manual, Part C;
- (7) the MEL should reflect the requirement for airborne radar and radio altimeter for this type of operation; and
- (8) operational limitations for each coastal aerodrome should be specified in the operations manual.

GM1 CAT.OP.MPA.181 Selection of aerodromes and operating sites - helicopters

OFFSHORE ALTERNATES

When operating offshore, any spare payload capacity should be used to carry additional fuel if it would facilitate the use of an onshore alternate aerodrome.

LANDING FORECAST

- (a) Meteorological data have been specified that conform to the standards contained in the Regional Air Navigation Plan and ICAO Annex 3. As the following meteorological data is point-specific, caution should be exercised when associating it with nearby aerodromes (or helidecks).
- (b) Meteorological reports (METARs)
 - (1) Routine and special meteorological observations at offshore installations should be made during periods and at a frequency agreed between the meteorological authority and the operator concerned. They should comply with the provisions contained in the meteorological section of the ICAO Regional Air Navigation Plan, and should conform to the standards and recommended practices, including the desirable accuracy of observations, promulgated in ICAO Annex 3.
 - (2) Routine and selected special reports are exchanged between meteorological offices in the METAR or SPECI (aviation selected special weather report) code forms prescribed by the World Meteorological Organisation.
- (c) Aerodrome forecasts (TAFs)
 - (1) The aerodrome forecast consists of a concise statement of the mean or average meteorological conditions expected at an aerodrome or aerodrome during a specified period of validity, which is normally not less than 9 hours, or more than 24 hours in duration. The forecast includes surface wind, visibility, weather and cloud, and expected changes of one or more of these

elements during the period. Additional elements may be included as agreed between the meteorological authority and the operators concerned. Where these forecasts relate to offshore installations, barometric pressure and temperature should be included to facilitate the planning of helicopter landing and take-off performance.

- (2) Aerodrome forecasts are most commonly exchanged in the TAF code form, and the detailed description of an aerodrome forecast is promulgated in the ICAO Regional Air Navigation Plan and also in ICAO Annex 3, together with the operationally desirable accuracy elements. In particular, the observed cloud height should remain within $\pm 30\%$ of the forecast value in 70 % of cases, and the observed visibility should remain within $\pm 30\%$ of the forecast value in 80 % of cases.
- (d) Landing forecasts (TRENDS)
- (1) The landing forecast consists of a concise statement of the mean or average meteorological conditions expected at an aerodrome or aerodrome during the two-hour period immediately following the time of issue. It contains surface wind, visibility, significant weather and cloud elements and other significant information, such as barometric pressure and temperature, as may be agreed between the meteorological authority and the operators concerned.
 - (2) The detailed description of the landing forecast is promulgated in the ICAO Regional Air Navigation Plan and also in ICAO Annex 3, together with the operationally desirable accuracy of the forecast elements. In particular, the value of the observed cloud height and visibility elements should remain within $\pm 30\%$ of the forecast values in 90 % of the cases.
 - (3) Landing forecasts most commonly take the form of routine or special selected meteorological reports in the METAR code, to which either the code words 'NOSIG', i.e. no significant change expected; 'BECMG' (becoming), or 'TEMPO' (temporarily), followed by the expected change, are added. The 2-hour period of validity commences at the time of the meteorological report.

AMC1 CAT.OP.MPA.181(d) Selection of aerodromes and operating sites - helicopters

OFFSHORE ALTERNATES

(a) Offshore alternate helideck landing environment

The landing environment of a helideck that is proposed for use as an offshore alternate should be presurveyed and, as well as the physical characteristics, the effect of wind direction and strength, and turbulence established. This information, which should be available to the commander at the planning stage and in flight, should be published in an appropriate form in the operations manual Part C (including the orientation of the helideck) such that the suitability of the helideck for use as an offshore alternate aerodrome can be assessed. The alternate helideck should meet the criteria for size and obstacle clearance appropriate to the performance requirements of the type of helicopter concerned.

(b) Performance considerations

The use of an offshore alternate is restricted to helicopters which can achieve OEI in ground effect (IGE) hover at an appropriate power rating at the offshore alternate aerodrome. Where the surface of the offshore alternate helideck, or prevailing conditions (especially wind velocity), precludes an OEI IGE, OEI out of ground effect (OGE) hover performance at an appropriate power rating should be used to compute the landing mass. The landing mass should be calculated from graphs provided in the relevant Part B of the operations manual. When arriving at this landing mass, due account should be taken of helicopter configuration, environmental conditions and the operation of systems that have an adverse effect on performance. The planned landing mass of the helicopter including crew, passengers, baggage, cargo plus 30 minutes final reserve fuel, should not exceed the OEI landing mass at the time of approach to the offshore alternate aerodrome.

(c) Weather considerations

(1) Meteorological observations

When the use of an offshore alternate helideck is planned, the meteorological observations at the destination and alternate aerodrome should be taken by an observer acceptable to the authority responsible for the provision of meteorological services. Automatic meteorological observations stations may be used.

(2) Weather minima

When the use of an offshore alternate helideck is planned, the operator should not select a helideck as a destination or offshore alternate helideck unless the aerodrome forecast indicates that, during a period commencing 1 hour before and ending 1 hour after the expected time of arrival at the destination and offshore alternate aerodrome, the weather conditions will be at or above the planning minima shown in Table 1 below.

Table 1: Planning minima

	Day	Night
Cloud Base	600 ft	800 ft
Visibility	4 km	5 km

(3) Conditions of fog

Where fog is forecast, or has been observed within the last 2 hours within 60 NM of the destination or alternate aerodrome, offshore alternate aerodromes should not be used.

(d) Actions at point of no return

Before passing the point of no return - which should not be more than 30 minutes from the destination - the following actions should have been completed:

- (1) confirmation that navigation to the destination and offshore alternate helideck can be assured;

- (2) radio contact with the destination and offshore alternate helideck (or master station) has been established;
 - (3) the landing forecast at the destination and offshore alternate helideck have been obtained and confirmed to be at or above the required minima;
 - (4) the requirements for OEI landing (see (b)) have been checked in the light of the latest reported weather conditions to ensure that they can be met; and
 - (5) to the extent possible, having regard to information on current and forecast use of the offshore alternate helideck and on conditions prevailing, the availability of the offshore alternate helideck should be guaranteed by the duty holder (the rig operator in the case of fixed installations and the owner in the case of mobiles) until the landing at the destination, or the offshore alternate aerodrome, has been achieved or until offshore shuttling has been completed.
- (e) Offshore shuttling
- Provided that the actions in (d) have been completed, offshore shuttling, using an offshore alternate aerodrome, may be carried out.

GM1 CAT.OP.MPA.185 Planning minima for IFR flights - aeroplanes

PLANNING MINIMA FOR ALTERNATE AERODROMES

Non-precision minima (NPA) in Table 1 of CAT.OP.MPA.185 mean the next highest minima that apply in the prevailing wind and serviceability conditions. Localiser only approaches, if published, are considered to be non-precision in this context. It is recommended that operators wishing to publish tables of planning minima choose values that are likely to be appropriate on the majority of occasions (e.g. regardless of wind direction). Unserviceabilities should, however, be fully taken into account.

As Table 1 does not include planning minima requirements for APV, LTS CAT I and OTS CAT II operations, the operator may use the following minima:

- (a) for APV operations – NPA or CAT I minima, depending on the DH/MDH;
- (b) for LTS CAT I operations – CAT I minima; and
- (c) for OTS CAT II operations – CAT II minima.

GM2 CAT.OP.MPA.185 Planning minima for IFR flights – aeroplanes

AERODROME WEATHER FORECASTS

APPLICATION OF AERODROME FORECASTS (TAF & TREND) TO PRE-FLIGHT PLANNING (ICAO Annex 3 refers)							
1. APPLICATION OF INITIAL PART OF TAF a) Application time period: From the start of the TAF validity period up to the time of applicability of the first subsequent 'FM...*' or 'BECMG', or if no 'FM' or 'BECMG' is given, up to the end of the validity period of the TAF. b) Application of forecast: The prevailing weather conditions forecast in the initial part of the TAF should be fully applied with the exception of the mean wind and gusts (and crosswind) which should be applied in accordance with the policy in the column 'BECMG AT and FM' in the table below. This may however be overdue temporarily by a 'TEMPO' or 'PROB**' if applicable according to the table below.							
2. APPLICATION OF FORECAST FOLLOWING CHANGE INDICATION IN TAF AND TREND							
TAF or TREND for AERODROME PLANNED AS:	FM (alone) and BECMG AT:	BECMG (alone), BECMG FM, BECMG TL, BECMG FM...*TL, in case of :		TEMPO (alone), TEMPO FM, TEMPO FM...TL, PROB30/40(alone)		PROB TEMPO	Deterioration and Improvement
	Deterioration and Improvement	Deterioration	Improvement	Deterioration Transient/Shower Conditions in connection with short – lived weather phenomena, e.g. thunderstorms, showers	Improvement Persistent Conditions in connection with e.g. haze, mist, fog, dust/sandstorm, continuous precipitations	In any case	
DESTINATION at ETA ± 1 HR TAKE – OFF ALTERNATE at ETA ± 1 HR DEST. ALTERNATE at ETA ± 1 HR ENROUTE ALTERNATE at ETA ± 1 HR	Applicable from the start of the change; Mean wind: Should be within required limits; Gusts: May be disregarded.	Applicable from the time of the start of the change; Mean wind: Should be within required limits; Gusts: May be disregarded.	Applicable from the time of the end of the change; Mean wind: Should be within required limits; Gusts: May be disregarded.	Not applicable Mean wind and gusts exceeding required limits may be disregarded.	Applicable Mean wind: Should be within required limits; Gusts: May be disregarded;	Should be disregarded.	Deterioration may be disregarded; Improvement should be disregarded including mean wind and gusts.
ETOPS ENRT ALTN at earliest/latest ETA ± 1 HR	Applicable from the time of start of change; Mean wind: should be within required limits; Gusts exceeding crosswind limits should be fully applied.	Applicable from the time of start of change; Mean wind: should be within required limits; Gusts exceeding crosswind limits should be fully applied.	Applicable from the time of end of change; Mean wind: should be within required limits; Gusts exceeding crosswind limits should be fully applied.	Applicable if below applicable landing minima; Mean wind: Should be within required limits; Gusts exceeding crosswind limits should be fully applied.	Applicable if below applicable landing minima; Mean wind: Should be within required limits; Gusts exceeding crosswind limits should be fully applied.		
Note 1: 'Required limits' are those contained in the Operations Manual. Note 2: If promulgated aerodrome forecasts do not comply with the requirements of ICAO Annex 3, operators should ensure that guidance in the application of these reports is provided. * The space following 'FM' should always include a time group e.g. 'FM1030'.							

GM1 CAT.OP.MPA.186 Planning minima for IFR flights - helicopters**PLANNING MINIMA FOR ALTERNATE AERODROMES**

Non-precision minima (NPA) in Table 1 of CAT.OP.MPA.186 mean the next highest minima that apply in the prevailing wind and serviceability conditions. Localiser only approaches, if published, are considered to be non-precision in this context. It is recommended that operators wishing to publish tables of planning minima choose values that are likely to be appropriate on the majority of occasions (e.g. regardless of wind direction). Unserviceabilities should, however, be fully taken into account.

As Table 1 does not include planning minima requirements for APV, LTS CAT I and OTS CAT II operations, the operator may use the following minima:

- (a) for APV operations – NPA or CAT I minima, depending on the DH/MDH;
- (b) for LTS CAT I operations – CAT I minima; and
- (c) for OTS CAT II operations – CAT II minima.

AMC1 CAT.OP.MPA.190 Submission of the ATS flight plan**FLIGHTS WITHOUT ATS FLIGHT PLAN**

- (a) When unable to submit or to close the ATS flight plan due to lack of ATS facilities or any other means of communications to ATS, the operator should establish procedures, instructions and a list of nominated persons to be responsible for alerting search and rescue services.
- (b) To ensure that each flight is located at all times, these instructions should:
 - (1) provide the nominated person with at least the information required to be included in a VFR flight plan, and the location, date and estimated time for re-establishing communications;
 - (2) if an aircraft is overdue or missing, provide for notification to the appropriate ATS or search and rescue facility; and
 - (3) provide that the information will be retained at a designated place until the completion of the flight.

AMC1 CAT.OP.MPA.195 Refuelling/defuelling with passengers embarking, on board or disembarking**OPERATIONAL PROCEDURES - GENERAL**

- (a) When refuelling/defuelling with passengers on board, ground servicing activities and work inside the aircraft, such as catering and cleaning, should be conducted in such a manner that they do not create a hazard and allow emergency evacuation to take place through those aisles and exits intended for emergency evacuation.
- (b) The deployment of integral aircraft stairs or the opening of emergency exits as a prerequisite to refuelling is not necessarily required.

OPERATIONAL PROCEDURES - AEROPLANES

(c) Operational procedures should specify that at least the following precautions are taken:

- (1) one qualified person should remain at a specified location during fuelling operations with passengers on board. This qualified person should be capable of handling emergency procedures concerning fire protection and fire-fighting, handling communications and initiating and directing an evacuation;
- (2) two-way communication should be established and should remain available by the aeroplane's inter-communication system or other suitable means between the ground crew supervising the refuelling and the qualified personnel on board the aeroplane; the involved personnel should remain within easy reach of the system of communication;
- (3) crew, personnel and passengers should be warned that re/defuelling will take place;
- (4) 'Fasten Seat Belts' signs should be off;
- (5) 'NO SMOKING' signs should be on, together with interior lighting to enable emergency exits to be identified;
- (6) passengers should be instructed to unfasten their seat belts and refrain from smoking;
- (7) the minimum required number of cabin crew should be on board and be prepared for an immediate emergency evacuation;
- (8) if the presence of fuel vapour is detected inside the aeroplane, or any other hazard arises during re/defuelling, fuelling should be stopped immediately;
- (9) the ground area beneath the exits intended for emergency evacuation and slide deployment areas should be kept clear at doors where stairs are not in position for use in the event of evacuation; and
- (10) provision is made for a safe and rapid evacuation.

OPERATIONAL PROCEDURES - HELICOPTERS

(d) Operational procedures should specify that at least the following precautions are taken:

- (1) door(s) on the refuelling side of the helicopter remain closed;
- (2) door(s) on the non-refuelling side of the helicopter remain open, weather permitting;
- (3) fire-fighting facilities of the appropriate scale be positioned so as to be immediately available in the event of a fire;
- (4) sufficient personnel be immediately available to move passengers clear of the helicopter in the event of a fire;
- (5) sufficient qualified personnel be on board and be prepared for an immediate emergency evacuation;
- (6) if the presence of fuel vapour is detected inside the helicopter, or any other hazard arises during refuelling/defuelling, fuelling be stopped immediately;

- (7) the ground area beneath the exits intended for emergency evacuation be kept clear; and
- (8) provision is made for a safe and rapid evacuation.

GM1 CAT.OP.MPA.200 Refuelling/defuelling with wide-cut fuel

PROCEDURES

- (a) 'Wide cut fuel' (designated JET B, JP-4 or AVTAG) is an aviation turbine fuel that falls between gasoline and kerosene in the distillation range and consequently, compared to kerosene (JET A or JET A1), it has the properties of higher volatility (vapour pressure), lower flash point and lower freezing point.
- (b) Wherever possible, the operator should avoid the use of wide-cut fuel types. If a situation arises such that only wide-cut fuels are available for refuelling/defuelling, operators should be aware that mixtures of wide-cut fuels and kerosene turbine fuels can result in the air/fuel mixture in the tank being in the combustible range at ambient temperatures. The extra precautions set out below are advisable to avoid arcing in the tank due to electrostatic discharge. The risk of this type of arcing can be minimised by the use of a static dissipation additive in the fuel. When this additive is present in the proportions stated in the fuel specification, the normal fuelling precautions set out below are considered adequate.
- (c) Wide-cut fuel is considered to be 'involved' when it is being supplied or when it is already present in aircraft fuel tanks.
- (d) When wide-cut fuel has been used, this should be recorded in the technical log. The next two uplifts of fuel should be treated as though they too involved the use of wide-cut fuel.
- (e) When refuelling/defuelling with turbine fuels not containing a static dissipator, and where wide-cut fuels are involved, a substantial reduction on fuelling flow rate is advisable. Reduced flow rate, as recommended by fuel suppliers and/or aeroplane manufacturers, has the following benefits:
 - (1) it allows more time for any static charge build-up in the fuelling equipment to dissipate before the fuel enters the tank;
 - (2) it reduces any charge which may build up due to splashing; and
 - (3) until the fuel inlet point is immersed, it reduces misting in the tank and consequently the extension of the flammable range of the fuel.
- (f) The flow rate reduction necessary is dependent upon the fuelling equipment in use and the type of filtration employed on the aeroplane fuelling distribution system. It is difficult, therefore, to quote precise flow rates. Reduction in flow rate is advisable whether pressure fuelling or over-wing fuelling is employed.
- (g) With over-wing fuelling, splashing should be avoided by making sure that the delivery nozzle extends as far as practicable into the tank. Caution should be exercised to avoid damaging bag tanks with the nozzle.

AMC1 CAT.OP.MPA.205 Push back and towing - aeroplanes

BARLESS TOWING

- (a) Barless towing should be based on the applicable SAE ARP (Aerospace Recommended Practices), i.e. 4852B/4853B/5283/5284/5285 (as amended).
- (b) Pre- or post-taxi positioning of the aeroplanes should only be executed by barless towing if one of the following conditions are met:
 - (1) an aeroplane is protected by its own design from damage to the nose wheel steering system;
 - (2) a system/procedure is provided to alert the flight crew that damage referred to in (b)(1) may have or has occurred;
 - (3) the towing vehicle is designed to prevent damage to the aeroplane type; or
 - (4) the aeroplane manufacturer has published procedures and these are included in the operations manual.

AMC1 CAT.OP.MPA.210(b) Crew members at stations

CABIN CREW SEATING POSITIONS

- (a) When determining cabin crew seating positions, the operator should ensure that they are:
 - (1) close to a floor level door/exit;
 - (2) provided with a good view of the area(s) of the passenger cabin for which the cabin crew member is responsible; and
 - (3) evenly distributed throughout the cabin, in the above order of priority.
- (b) Item (a) should not be taken as implying that, in the event of there being more cabin crew stations than required cabin crew, the number of cabin crew members should be increased.

GM1 CAT.OP.MPA.210 Crew members at stations

MITIGATING MEASURES – CONTROLLED REST

- (a) This GM addresses controlled rest taken by the minimum certified flight crew. It is not related to planned in-flight rest by members of an augmented crew.
- (b) Although flight crew members should stay alert at all times during flight, unexpected fatigue can occur as a result of sleep disturbance and circadian disruption. To cover for this unexpected fatigue, and to regain a high level of alertness, a controlled rest procedure in the flight crew compartment, organised by the commander may be used, if workload permits and a controlled rest procedure is described in the operations manual. 'Controlled rest' means a period of time 'off task' that may include actual sleep. The use of controlled rest has been shown to significantly increase the levels of alertness during the later phases of flight, particularly after the top of descent, and is considered to be good use of crew resource management (CRM) principles. Controlled rest should be used in

conjunction with other on-board fatigue management countermeasures such as physical exercise, bright cockpit illumination at appropriate times, balanced eating and drinking, and intellectual activity.

- (c) Controlled rest taken in this way should not be considered to be part of a rest period for the purposes of calculating flight time limitations, nor used to justify any duty period. Controlled rest may be used to manage both sudden unexpected fatigue and fatigue that is expected to become more severe during higher workload periods later in the flight. Controlled rest is not related to fatigue management, which is planned before flight.
- (d) Controlled rest periods should be agreed according to individual needs and the accepted principles of CRM; where the involvement of the cabin crew is required, consideration should be given to their workload.
- (e) When applying controlled rest procedures, the commander should ensure that:
 - (1) the other flight crew member(s) is/are adequately briefed to carry out the duties of the resting flight crew member;
 - (2) one flight crew member is fully able to exercise control of the aircraft at all times; and
 - (3) any system intervention that would normally require a cross-check according to multi-crew principles is avoided until the resting flight crew member resumes his/her duties.
- (f) Controlled rest procedures should satisfy all of the following criteria:
 - (1) Only one flight crew member at a time should take rest at his/her station; the restraint device should be used and the seat positioned to minimise unintentional interference with the controls.
 - (2) The rest period should be no longer than 45 minutes (in order to limit any actual sleep to approximately 30 minutes) to limit deep sleep and associated long recovery time (sleep inertia).
 - (3) After this 45-minute period, there should be a recovery period of 20 minutes to overcome sleep inertia during which control of the aircraft should not be entrusted to the flight crew member. At the end of this recovery period an appropriate briefing should be given.
 - (4) In the case of two-crew operations, means should be established to ensure that the non-resting flight crew member remains alert. This may include:
 - (i) appropriate alarm systems;
 - (ii) on-board systems to monitor flight crew activity; and
 - (iii) frequent cabin crew checks. In this case, the commander should inform the senior cabin crew member of the intention of the flight crew member to take controlled rest, and of the time of the end of that rest; frequent contact should be established between the non-resting flight crew member and the cabin crew by communication means, and the cabin crew should check that the resting flight crew member is awake at the end of the period.

- (5) There should be a minimum of 20 minutes between two subsequent controlled rest periods in order to overcome the effects of sleep inertia and allow for adequate briefing.
- (6) If necessary, a flight crew member may take more than one rest period, if time permits, on longer sectors, subject to the restrictions above.
- (7) Controlled rest periods should terminate at least 30 minutes before the top of descent.

GM1 CAT.OP.MPA.250 Ice and other contaminants – ground procedures

TERMINOLOGY

Terms used in the context of de-icing/anti-icing have the meaning defined in the following subparagraphs.

(a) 'Anti-icing fluid' includes, but is not limited to, the following:

- (1) Type I fluid if heated to min 60 °C at the nozzle;
- (2) mixture of water and Type I fluid if heated to min 60 °C at the nozzle;
- (3) Type II fluid;
- (4) mixture of water and Type II fluid;
- (5) Type III fluid;
- (6) mixture of water and Type III fluid;
- (7) Type IV fluid;
- (8) mixture of water and Type IV fluid.

On uncontaminated aircraft surfaces Type II, III and IV anti-icing fluids are normally applied unheated.

- (b) 'Clear ice': a coating of ice, generally clear and smooth, but with some air pockets. It forms on exposed objects, the temperatures of which are at, below or slightly above the freezing temperature, by the freezing of super-cooled drizzle, droplets or raindrops.
- (c) Conditions conducive to aircraft icing on the ground (e.g. freezing fog, freezing precipitation, frost, rain or high humidity (on cold soaked wings), snow or mixed rain and snow).
- (d) 'Contamination', in this context, is understood as being all forms of frozen or semi-frozen moisture, such as frost, snow, slush or ice.
- (e) 'Contamination check': a check of aircraft for contamination to establish the need for de-icing.
- (f) 'De-icing fluid': such fluid includes, but is not limited to, the following:
 - (1) heated water;
 - (2) Type I fluid;
 - (3) mixture of water and Type I fluid;
 - (4) Type II fluid;

- (5) mixture of water and Type II fluid;
- (6) Type III fluid;
- (7) mixture of water and Type III fluid;
- (8) Type IV fluid;
- (9) mixture of water and Type IV fluid.

De-icing fluid is normally applied heated to ensure maximum efficiency.

- (g) 'De-icing/anti-icing': this is the combination of de-icing and anti-icing performed in either one or two steps.
- (h) 'Ground ice detection system (GIDS)': system used during aircraft ground operations to inform the personnel involved in the operation and/or the flight crew about the presence of frost, ice, snow or slush on the aircraft surfaces.
- (i) 'Lowest operational use temperature (LOUT)': the lowest temperature at which a fluid has been tested and certified as acceptable in accordance with the appropriate aerodynamic acceptance test whilst still maintaining a freezing point buffer of not less than:
 - (1) 10°C for a Type I de-icing/anti-icing fluid; or
 - (2) 7°C for Type II, III or IV de-icing/anti-icing fluids.
- (j) 'Post-treatment check': an external check of the aircraft after de-icing and/or anti-icing treatment accomplished from suitably elevated observation points (e.g. from the de-icing/anti-icing equipment itself or other elevated equipment) to ensure that the aircraft is free from any frost, ice, snow, or slush.
- (k) 'Pre take-off check': an assessment normally performed by the flight crew, to validate the applied HoT.
- (l) 'Pre take-off contamination check': a check of the treated surfaces for contamination, performed when the HoT has been exceeded or if any doubt exists regarding the continued effectiveness of the applied anti-icing treatment. It is normally accomplished externally, just before commencement of the take-off run.

ANTI-ICING CODES

- (m) The following are examples of anti-icing codes:
 - (1) 'Type I' at (start time) – to be used if anti-icing treatment has been performed with a Type I fluid;
 - (2) 'Type II/100' at (start time) – to be used if anti-icing treatment has been performed with undiluted Type II fluid;
 - (3) 'Type II/75' at (start time) – to be used if anti-icing treatment has been performed with a mixture of 75 % Type II fluid and 25 % water;
 - (4) 'Type IV/50' at (start time) – to be used if anti-icing treatment has been performed with a mixture of 50 % Type IV fluid and 50 % water.
- (n) When a two-step de-icing/anti-icing operation has been carried out, the anti-icing code should be determined by the second step fluid. Fluid brand names may be included, if desired.

GM2 CAT.OP.MPA.250 Ice and other contaminants – ground procedures

DE-ICING/ANTI-ICING - PROCEDURES

- (a) De-icing and/or anti-icing procedures should take into account manufacturer's recommendations, including those that are type-specific and cover:
 - (1) contamination checks, including detection of clear ice and under-wing frost; limits on the thickness/area of contamination published in the AFM or other manufacturers' documentation should be followed;
 - (2) procedures to be followed if de-icing and/or anti-icing procedures are interrupted or unsuccessful;
 - (3) post-treatment checks;
 - (4) pre-take-off checks;
 - (5) pre-take-off contamination checks;
 - (6) the recording of any incidents relating to de-icing and/or anti-icing; and
 - (7) the responsibilities of all personnel involved in de-icing and/or anti-icing.
- (b) Operator's procedures should ensure the following:
 - (1) When aircraft surfaces are contaminated by ice, frost, slush or snow, they are de-iced prior to take-off, according to the prevailing conditions. Removal of contaminants may be performed with mechanical tools, fluids (including hot water), infra-red heat or forced air, taking account of aircraft type-specific provisions.
 - (2) Account is taken of the wing skin temperature versus outside air temperature (OAT), as this may affect:
 - (i) the need to carry out aircraft de-icing and/or anti-icing; and/or
 - (ii) the performance of the de-icing/anti-icing fluids.
 - (3) When freezing precipitation occurs or there is a risk of freezing precipitation occurring that would contaminate the surfaces at the time of take-off, aircraft surfaces should be anti-iced. If both de-icing and anti-icing are required, the procedure may be performed in a one- or two-step process, depending upon weather conditions, available equipment, available fluids and the desired hold-over time (HoT). One-step de-icing/anti-icing means that de-icing and anti-icing are carried out at the same time, using a mixture of de-icing/anti-icing fluid and water. Two-step de-icing/anti-icing means that de-icing and anti-icing are carried out in two separate steps. The aircraft is first de-iced using heated water only or a heated mixture of de-icing/anti-icing fluid and water. After completion of the de-icing operation a layer of a mixture of de-icing/anti-icing fluid and water, or of de-icing/anti-icing fluid only, is sprayed over the aircraft surfaces. The second step will be applied before the first step fluid freezes, typically within three minutes and, if necessary, area by area.
 - (4) When an aircraft is anti-iced and a longer HoT is needed/desired, the use of a less diluted Type II or Type IV fluid should be considered.
 - (5) All restrictions relative to OAT and fluid application (including, but not necessarily limited to, temperature and pressure) published by the fluid

manufacturer and/or aircraft manufacturer, are followed and procedures, limitations and recommendations to prevent the formation of fluid residues are followed.

- (6) During conditions conducive to aircraft icing on the ground or after de-icing and/or anti-icing, an aircraft is not dispatched for departure unless it has been given a contamination check or a post-treatment check by a trained and qualified person. This check should cover all treated surfaces of the aircraft and be performed from points offering sufficient accessibility to these parts. To ensure that there is no clear ice on suspect areas, it may be necessary to make a physical check (e.g. tactile).
 - (7) The required entry is made in the technical log.
 - (8) The commander continually monitors the environmental situation after the performed treatment. Prior to take-off he/she performs a pre-take-off check, which is an assessment of whether the applied HoT is still appropriate. This pre-take-off check includes, but is not limited to, factors such as precipitation, wind and OAT.
 - (9) If any doubt exists as to whether a deposit may adversely affect the aircraft's performance and/or controllability characteristics, the commander should arrange for a pre take-off contamination check to be performed in order to verify that the aircraft's surfaces are free of contamination. Special methods and/or equipment may be necessary to perform this check, especially at night time or in extremely adverse weather conditions. If this check cannot be performed just before take-off, re-treatment should be applied.
 - (10) When retreatment is necessary, any residue of the previous treatment should be removed and a completely new de-icing/anti-icing treatment should be applied.
 - (11) When a ground ice detection system (GIDS) is used to perform an aircraft surfaces check prior to and/or after a treatment, the use of GIDS by suitably trained personnel should be part of the procedure.
- (c) Special operational considerations
- (1) When using thickened de-icing/anti-icing fluids, the operator should consider a two-step de-icing/anti-icing procedure, the first step preferably with hot water and/or un-thickened fluids.
 - (2) The use of de-icing/anti-icing fluids should be in accordance with the aircraft manufacturer's documentation. This is particularly important for thickened fluids to assure sufficient flow-off during take-off.
 - (3) The operator should comply with any type-specific operational provision(s), such as an aircraft mass decrease and/or a take-off speed increase associated with a fluid application.
 - (4) The operator should take into account any flight handling procedures (stick force, rotation speed and rate, take-off speed, aircraft attitude etc.) laid down by the aircraft manufacturer when associated with a fluid application.
 - (5) The limitations or handling procedures resulting from (c)(3) and/or (c)(4) above should be part of the flight crew pre take-off briefing.

(d) Communications

- (1) Before aircraft treatment. When the aircraft is to be treated with the flight crew on board, the flight and personnel involved in the operation should confirm the fluid to be used, the extent of treatment required and any aircraft type-specific procedure(s) to be used. Any other information needed to apply the HoT tables should be exchanged.
- (2) Anti-icing code. The operator's procedures should include an anti-icing code, which indicates the treatment the aircraft has received. This code provides the flight crew with the minimum details necessary to estimate a HoT and confirms that the aircraft is free of contamination.
- (3) After treatment. Before reconfiguring or moving the aircraft, the flight crew should receive a confirmation from the personnel involved in the operation that all de-icing and/or anti-icing operations are complete and that all personnel and equipment are clear of the aircraft.

(e) Hold-over protection

The operator should publish in the operations manual, when required, the HoTs in the form of a table or a diagram, to account for the various types of ground icing conditions and the different types and concentrations of fluids used. However, the times of protection shown in these tables are to be used as guidelines only and are normally used in conjunction with the pre take-off check.

(f) Training

The operator's initial and recurrent de-icing and/or anti-icing training programmes (including communication training) for flight crew and those of its personnel involved in the operation who are involved in de-icing and/or anti-icing should include additional training if any of the following is introduced:

- (1) a new method, procedure and/or technique;
- (2) a new type of fluid and/or equipment; or
- (3) a new type of aircraft.

(g) Contracting

When the operator contracts training on de-icing/anti-icing, the operator should ensure that the contractor complies with the operator's training/qualification procedures, together with any specific procedures in respect of:

- (1) de-icing and/or anti-icing methods and procedures;
- (2) fluids to be used, including precautions for storage and preparation for use;
- (3) specific aircraft provisions (e.g. no-spray areas, propeller/engine de-icing, APU operation etc.); and
- (4) checking and communications procedures.

(h) Special maintenance considerations

(1) General

The operator should take proper account of the possible side-effects of fluid use. Such effects may include, but are not necessarily limited to, dried and/or re-hydrated residues, corrosion and the removal of lubricants.

(2) Special considerations regarding residues of dried fluids

The operator should establish procedures to prevent or detect and remove residues of dried fluid. If necessary the operator should establish appropriate inspection intervals based on the recommendations of the airframe manufacturers and/or the operator's own experience:

(i) Dried fluid residues

Dried fluid residues could occur when surfaces have been treated and the aircraft has not subsequently been flown and has not been subject to precipitation. The fluid may then have dried on the surfaces.

(ii) Re-hydrated fluid residues

Repetitive application of thickened de-icing/anti-icing fluids may lead to the subsequent formation/build-up of a dried residue in aerodynamically quiet areas, such as cavities and gaps. This residue may re-hydrate if exposed to high humidity conditions, precipitation, washing, etc., and increase to many times its original size/volume. This residue will freeze if exposed to conditions at or below 0 °C. This may cause moving parts, such as elevators, ailerons, and flap actuating mechanisms to stiffen or jam in-flight. Re-hydrated residues may also form on exterior surfaces, which can reduce lift, increase drag and stall speed. Re-hydrated residues may also collect inside control surface structures and cause clogging of drain holes or imbalances to flight controls. Residues may also collect in hidden areas, such as around flight control hinges, pulleys, grommets, on cables and in gaps.

(iii) Operators are strongly recommended to obtain information about the fluid dry-out and re-hydration characteristics from the fluid manufacturers and to select products with optimised characteristics.

(iv) Additional information should be obtained from fluid manufacturers for handling, storage, application and testing of their products.

GM3 CAT.OP.MPA.250 Ice and other contaminants – ground procedures**DE-ICING/ANTI-ICING BACKGROUND INFORMATION**

Further guidance material on this issue is given in the ICAO *Manual of Aircraft Ground De-icing/Anti-icing Operations* (Doc 9640) (hereinafter referred to as the ICAO *Manual of Aircraft Ground De-icing/Anti-icing Operations*).

(a) General

- (1) Any deposit of frost, ice, snow or slush on the external surfaces of an aircraft may drastically affect its flying qualities because of reduced aerodynamic lift, increased drag, modified stability and control characteristics. Furthermore, freezing deposits may cause moving parts, such as elevators, ailerons, flap actuating mechanism etc., to jam and create a potentially hazardous condition. Propeller/engine/auxiliary power unit (APU)/systems performance may deteriorate due to the presence of frozen contaminants on blades, intakes and components. Also, engine operation may be seriously affected by the

ingestion of snow or ice, thereby causing engine stall or compressor damage. In addition, ice/frost may form on certain external surfaces (e.g. wing upper and lower surfaces, etc.) due to the effects of cold fuel/structures, even in ambient temperatures well above 0 °C.

- (2) Procedures established by the operator for de-icing and/or anti-icing are intended to ensure that the aircraft is clear of contamination so that degradation of aerodynamic characteristics or mechanical interference will not occur and, following anti-icing, to maintain the airframe in that condition during the appropriate HoT.
- (3) Under certain meteorological conditions, de-icing and/or anti-icing procedures may be ineffective in providing sufficient protection for continued operations. Examples of these conditions are freezing rain, ice pellets and hail, heavy snow, high wind velocity, fast dropping OAT or any time when freezing precipitation with high water content is present. No HoT guidelines exist for these conditions.
- (4) Material for establishing operational procedures can be found, for example, in:
 - (i) ICAO Annex 3, Meteorological Service for International Air Navigation;
 - (ii) ICAO Manual of Aircraft Ground De-icing/Anti-icing Operations;
 - (iii) ISO 11075 Aircraft - De-icing/anti-icing fluids - ISO type I;
 - (iv) ISO 11076 Aircraft - De-icing/anti-icing methods with fluids;
 - (v) ISO 11077 Aerospace - Self propelled de-icing/anti-icing vehicles - Functional requirements;
 - (vi) ISO 11078 Aircraft - De-icing/anti-icing fluids -- ISO types II, III and IV;
 - (vii) AEA 'Recommendations for de-icing/anti-icing of aircraft on the ground';
 - (viii) AEA 'Training recommendations and background information for de-icing/anti-icing of aircraft on the ground';
 - (ix) EUROCAE ED-104A Minimum Operational Performance Specification for Ground Ice Detection Systems;
 - (x) SAE AS5681 Minimum Operational Performance Specification for Remote On-Ground Ice Detection Systems;
 - (xi) SAE ARP4737 Aircraft - De-icing/anti-icing methods;
 - (xii) SAE AMS1424 De-icing/anti-Icing Fluid, Aircraft, SAE Type I;
 - (xiii) SAE AMS1428 Fluid, Aircraft De-icing/anti-Icing, Non-Newtonian, (Pseudoplastic), SAE Types II, III, and IV;
 - (xiv) SAE ARP1971 Aircraft De-icing Vehicle - Self-Propelled, Large and Small Capacity;
 - (xv) SAE ARP5149 Training Programme Guidelines for De-icing/anti-icing of Aircraft on Ground; and
 - (xvi) SAE ARP5646 Quality Program Guidelines for De-icing/anti-icing of Aircraft on the Ground.

(b) Fluids

- (1) Type I fluid: Due to its properties, Type I fluid forms a thin, liquid-wetting film on surfaces to which it is applied which, under certain weather conditions, gives a very limited HoT. With this type of fluid, increasing the concentration of fluid in the fluid/water mix does not provide any extension in HoT.
- (2) Type II and Type IV fluids contain thickeners which enable the fluid to form a thicker liquid-wetting film on surfaces to which it is applied. Generally, this fluid provides a longer HoT than Type I fluids in similar conditions. With this type of fluid, the HoT can be extended by increasing the ratio of fluid in the fluid/water mix.
- (3) Type III fluid is a thickened fluid especially intended for use on aircraft with low rotation speeds.
- (4) Fluids used for de-icing and/or anti-icing should be acceptable to the operator and the aircraft manufacturer. These fluids normally conform to specifications such as SAE AMS1424, SAE AMS1428 or equivalent. Use of non-conforming fluids is not recommended due to their characteristics being unknown. The anti-icing and aerodynamic properties of thickened fluids may be seriously degraded by, for example, inappropriate storage, treatment, application, application equipment and age.

(c) Hold-over protection

- (1) Hold-over protection is achieved by a layer of anti-icing fluid remaining on and protecting aircraft surfaces for a period of time. With a one-step de-icing/anti-icing procedure, the HoT begins at the commencement of de-icing/anti-icing. With a two-step procedure, the HoT begins at the commencement of the second (anti-icing) step. The hold-over protection runs out:
 - (i) at the commencement of the take-off roll (due to aerodynamic shedding of fluid); or
 - (ii) when frozen deposits start to form or accumulate on treated aircraft surfaces, thereby indicating the loss of effectiveness of the fluid.
- (2) The duration of hold-over protection may vary depending on the influence of factors other than those specified in the HoT tables. Guidance should be provided by the operator to take account of such factors, which may include:
 - (i) atmospheric conditions, e.g. exact type and rate of precipitation, wind direction and velocity, relative humidity and solar radiation; and
 - (ii) the aircraft and its surroundings, such as aircraft component inclination angle, contour and surface roughness, surface temperature, operation in close proximity to other aircraft (jet or propeller blast) and ground equipment and structures.
- (3) HoTs are not meant to imply that flight is safe in the prevailing conditions if the specified HoT has not been exceeded. Certain meteorological conditions, such as freezing drizzle or freezing rain, may be beyond the certification envelope of the aircraft.
- (4) References to usable HoT tables may be found in the AEA 'Recommendations for de-icing/anti-icing of aircraft on the ground'.

AMC1 CAT.OP.MPA.255 Ice and other contaminants – flight procedures**FLIGHT IN EXPECTED OR ACTUAL ICING CONDITIONS - AEROPLANES**

- (a) In accordance with Article 2(a)5. of Annex IV to Regulation (EC) No 216/2008 (Essential requirements for air operations), in case of flight into known or expected icing conditions, the aircraft must be certified, equipped and/or treated to operate safely in such conditions. The procedures to be established by the operator should take account of the design, the equipment, the configuration of the aircraft and the necessary training. For these reasons, different aircraft types operated by the same company may require the development of different procedures. In every case the relevant limitations are those which are defined in the AFM and other documents produced by the manufacturer.
- (b) The operator should ensure that the procedures take account of the following:
 - (1) the equipment and instruments which must be serviceable for flight in icing conditions;
 - (2) the limitations on flight in icing conditions for each phase of flight. These limitations may be imposed by the aircraft's de-icing or anti-icing equipment or the necessary performance corrections that have to be made;
 - (3) the criteria the flight crew should use to assess the effect of icing on the performance and/or controllability of the aircraft;
 - (4) the means by which the flight crew detects, by visual cues or the use of the aircraft's ice detection system, that the flight is entering icing conditions; and
 - (5) the action to be taken by the flight crew in a deteriorating situation (which may develop rapidly) resulting in an adverse affect on the performance and/or controllability of the aircraft, due to:
 - (i) the failure of the aircraft's anti-icing or de-icing equipment to control a build-up of ice; and/or
 - (ii) ice build-up on unprotected areas.
- (c) Training for dispatch and flight in expected or actual icing conditions. The content of the operations manual should reflect the training, both conversion and recurrent, which flight crew, cabin crew and all other relevant operational personnel require in order to comply with the procedures for dispatch and flight in icing conditions:
 - (1) For the flight crew, the training should include:
 - (i) instruction on how to recognise, from weather reports or forecasts which are available before flight commences or during flight, the risks of encountering icing conditions along the planned route and on how to modify, as necessary, the departure and in-flight routes or profiles;
 - (ii) instruction on the operational and performance limitations or margins;
 - (iii) the use of in-flight ice detection, anti-icing and de-icing systems in both normal and abnormal operation; and
 - (iv) instruction on the differing intensities and forms of ice accretion and the consequent action which should be taken.
 - (2) For the cabin crew, the training should include;

- (i) awareness of the conditions likely to produce surface contamination; and
- (ii) the need to inform the flight crew of significant ice accretion.

AMC2 CAT.OP.MPA.255 Ice and other contaminants – flight procedures

FLIGHT IN EXPECTED OR ACTUAL ICING CONDITIONS - HELICOPTERS

- (a) The procedures to be established by the operator should take account of the design, the equipment or the configuration of the helicopter and also of the training which is needed. For these reasons, different helicopter types operated by the same company may require the development of different procedures. In every case, the relevant limitations are those that are defined in the AFM and other documents produced by the manufacturer.
- (b) For the required entries in the operations manual, the procedural principles that apply to flight in icing conditions are referred to under Subpart MLR of Annex III (ORO.MLR) and should be cross-referenced, where necessary, to supplementary, type-specific data.
- (c) Technical content of the procedures

The operator should ensure that the procedures take account of the following:

- (1) CAT.IDE.H.165;
- (2) the equipment and instruments that should be serviceable for flight in icing conditions;
- (3) the limitations on flight in icing conditions for each phase of flight. These limitations may be specified by the helicopter's de-icing or anti-icing equipment or the necessary performance corrections which have to be made;
- (4) the criteria the flight crew should use to assess the effect of icing on the performance and/or controllability of the helicopter;
- (5) the means by which the flight crew detects, by visual cues or the use of the helicopter's ice detection system, that the flight is entering icing conditions; and
- (6) the action to be taken by the flight crew in a deteriorating situation (which may develop rapidly) resulting in an adverse effect on the performance and/or controllability of the helicopter, due to either:
 - (i) the failure of the helicopter's anti-icing or de-icing equipment to control a build-up of ice; and/or
 - (ii) ice build-up on unprotected areas.
- (d) Training for dispatch and flight in expected or actual icing conditions

The content of the operations manual, Part D, should reflect the training, both conversion and recurrent, which flight crew, and all other relevant operational personnel will require in order to comply with the procedures for dispatch and flight in icing conditions.

- (1) For the flight crew, the training should include:

- (i) instruction on how to recognise, from weather reports or forecasts that are available before flight commences or during flight, the risks of encountering icing conditions along the planned route and on how to modify, as necessary, the departure and in-flight routes or profiles;
 - (ii) instruction on the operational and performance limitations or margins;
 - (iii) the use of in-flight ice detection, anti-icing and de-icing systems in both normal and abnormal operation; and
 - (iv) instruction on the differing intensities and forms of ice accretion and the consequent action which should be taken.
- (2) For crew members other than flight crew, the training should include;
- (i) awareness of the conditions likely to produce surface contamination; and
 - (ii) the need to inform the flight crew of significant ice accretion.

AMC1 CAT.OP.MPA.281 In-flight fuel management - helicopters

COMPLEX MOTOR-POWERED HELICOPTERS, OTHER THAN LOCAL OPERATIONS

The operator should base in-flight fuel management procedures on the following criteria:

- (a) In-flight fuel checks
 - (1) The commander should ensure that fuel checks are carried out in-flight at regular intervals. The remaining fuel should be recorded and evaluated to:
 - (i) compare actual consumption with planned consumption;
 - (ii) check that the remaining fuel is sufficient to complete the flight; and
 - (iii) determine the expected fuel remaining on arrival at the destination.
 - (2) The relevant fuel data should be recorded.
- (b) In-flight fuel management
 - (1) If, as a result of an in-flight fuel check, the expected fuel remaining on arrival at the destination is less than the required alternate fuel plus final reserve fuel, the commander should:
 - (i) divert; or
 - (ii) replan the flight in accordance with CAT.OP.MPA.181 (d)(1) unless he/she considers it safer to continue to the destination.
 - (2) At an onshore destination, when two suitable, separate touchdown and lift-off areas are available and the weather conditions at the destination comply with those specified for planning in CAT.OP.MPA.245 (a)(2), the commander may permit alternate fuel to be used before landing at the destination.
- (c) If, as a result of an in-flight fuel check on a flight to an isolated destination, planned in accordance with (b), the expected fuel remaining at the point of last possible diversion is less than the sum of:
 - (1) fuel to divert to an operating site selected in accordance with CAT.OP.MPA.181 (a);

- (2) contingency fuel; and
- (3) final reserve fuel,

the commander should:

- (i) divert; or
- (ii) proceed to the destination provided that at onshore destinations, two suitable, separate touchdown and lift-off areas are available at the destination and the expected weather conditions at the destination comply with those specified for planning in CAT.OP.MPA.245 (a)(2).

GM1 CAT.OP.MPA.290 Ground proximity detection

TERRAIN AWARENESS WARNING SYSTEM (TAWS) FLIGHT CREW TRAINING PROGRAMMES

(a) Introduction

- (1) This GM contains performance-based training objectives for TAWS flight crew training.
- (2) The training objectives cover five areas: theory of operation; pre-flight operations; general in-flight operations; response to TAWS cautions; and response to TAWS warnings.
- (3) The term 'TAWS' in this GM means a ground proximity warning system (GPWS) enhanced by a forward-looking terrain avoidance function. Alerts include both cautions and warnings.
- (4) The content of this GM is intended to assist operators who are producing training programmes. The information it contains has not been tailored to any specific aircraft or TAWS equipment, but highlights features which are typically available where such systems are installed. It is the responsibility of the individual operator to determine the applicability of the content of this guidance material to each aircraft and TAWS equipment installed and their operation. Operators should refer to the AFM and/or aircraft/flight crew operating manual (A/FCOM), or similar documents, for information applicable to specific configurations. If there should be any conflict between the content of this guidance material and that published in the other documents described above, then information contained in the AFM or A/FCOM will take precedence.

(b) Scope

- (1) The scope of this GM is designed to identify training objectives in the areas of: academic training; manoeuvre training; initial evaluation; and recurrent qualification. Under each of these four areas, the training material has been separated into those items which are considered essential training items and those that are considered to be desirable. In each area, objectives and acceptable performance criteria are defined.
- (2) No attempt is made to define how the training programme should be implemented. Instead, objectives are established to define the knowledge that a pilot operating a TAWS is expected to possess and the performance expected from a pilot who has completed TAWS training. However, the guidelines do

indicate those areas in which the pilot receiving the training should demonstrate his/her understanding, or performance, using a real-time, interactive training device, i.e. a flight simulator. Where appropriate, notes are included within the performance criteria which amplify or clarify the material addressed by the training objective.

(c) Performance-based training objectives

(1) TAWS academic training

- (i) This training is typically conducted in a classroom environment. The knowledge demonstrations specified in this section may be completed through the successful completion of written tests or by providing correct responses to non-real-time computer-based training (CBT) questions.
- (ii) Theory of operation. The pilot should demonstrate an understanding of TAWS operation and the criteria used for issuing cautions and warnings. This training should address system operation. Objective: To demonstrate knowledge of how a TAWS functions. Criteria: The pilot should demonstrate an understanding of the following functions:

(A) Surveillance

- (a) The GPWS computer processes data supplied from an air data computer, a radio altimeter, an instrument landing system (ILS)/microwave landing system (MLS)/multi-mode (MM) receiver, a roll attitude sensor, and actual position of the surfaces and of the landing gear.
 - (b) The forward looking terrain avoidance function utilises an accurate source of known aircraft position, such as that which may be provided by a flight management system (FMS) or GPS, or an electronic terrain database. The source and scope of the terrain, obstacle and airport data, and features such as the terrain clearance floor, the runway picker, and geometric altitude (where provided) should all be described.
 - (c) Displays required to deliver TAWS outputs include a loudspeaker for voice announcements, visual alerts (typically amber and red lights), and a terrain awareness display (that may be combined with other displays). In addition, means should be provided for indicating the status of the TAWS and any partial or total failures that may occur.
- (B) Terrain avoidance. Outputs from the TAWS computer provide visual and audio synthetic voice cautions and warnings to alert the flight crew about potential conflicts with terrain and obstacles.
- (C) Alert thresholds. Objective: To demonstrate knowledge of the criteria for issuing cautions and warnings. Criteria: The pilot

should be able to demonstrate an understanding of the methodology used by a TAWS to issue cautions and alerts and the general criteria for the issuance of these alerts, including:

- (a) basic GPWS alerting modes specified in the ICAO Standard:
 - Mode 1: excessive sink rate;
 - Mode 2: excessive terrain closure rate;
 - Mode 3: descent after take-off or go-around;
 - Mode 4: unsafe proximity to terrain;
 - Mode 5: descent below ILS glide slope (caution only); and
 - (b) an additional, optional alert mode- Mode 6: radio altitude call-out (information only); TAWS cautions and warnings which alert the flight crew to obstacles and terrain ahead of the aircraft in line with or adjacent to its projected flight path (forward-looking terrain avoidance (FLTA) and premature descent alert (PDA) functions).
- (D) TAWS limitations. Objective: To verify that the pilot is aware of the limitations of TAWS. Criteria: The pilot should demonstrate knowledge and an understanding of TAWS limitations identified by the manufacturer for the equipment model installed, such as:
- (a) navigation should not be predicated on the use of the terrain display;
 - (b) unless geometric altitude data is provided, use of predictive TAWS functions is prohibited when altimeter subscale settings display 'QFE';
 - (c) nuisance alerts can be issued if the aerodrome of intended landing is not included in the TAWS airport database;
 - (d) in cold weather operations, corrective procedures should be implemented by the pilot unless the TAWS has in-built compensation, such as geometric altitude data;
 - (e) loss of input data to the TAWS computer could result in partial or total loss of functionality. Where means exist to inform the flight crew that functionality has been degraded, this should be known and the consequences understood;
 - (f) radio signals not associated with the intended flight profile (e.g. ILS glide path transmissions from an adjacent runway) may cause false alerts;

- (g) inaccurate or low accuracy aircraft position data could lead to false or non-annunciation of terrain or obstacles ahead of the aircraft; and
 - (h) minimum equipment list (MEL) restrictions should be applied in the event of the TAWS becoming partially or completely unserviceable. (It should be noted that basic GPWS has no forward-looking capability.)
- (E) TAWS inhibits. Objective: To verify that the pilot is aware of the conditions under which certain functions of a TAWS are inhibited. Criteria: The pilot should demonstrate knowledge and an understanding of the various TAWS inhibits, including the following means of:
 - (a) silencing voice alerts;
 - (b) inhibiting ILS glide path signals (as may be required when executing an ILS back beam approach);
 - (c) inhibiting flap position sensors (as may be required when executing an approach with the flaps not in a normal position for landing);
 - (d) inhibiting the FLTA and PDA functions; and
 - (e) selecting or deselecting the display of terrain information, together with appropriate annunciation of the status of each selection.
- (2) Operating procedures. The pilot should demonstrate the knowledge required to operate TAWS avionics and to interpret the information presented by a TAWS. This training should address the following topics:
 - (i) Use of controls. Objective: To verify that the pilot can properly operate all TAWS controls and inhibits. Criteria: The pilot should demonstrate the proper use of controls, including the following means by which:
 - (A) before flight, any equipment self-test functions can be initiated;
 - (B) TAWS information can be selected for display; and
 - (C) all TAWS inhibits can be operated and what the consequent annunciations mean with regard to loss of functionality.
 - (ii) Display interpretation. Objective: To verify that the pilot understands the meaning of all information that can be annunciated or displayed by a TAWS. Criteria: The pilot should demonstrate the ability to properly interpret information annunciated or displayed by a TAWS, including the following:
 - (A) knowledge of all visual and aural indications that may be seen or heard;
 - (B) response required on receipt of a caution;
 - (C) response required on receipt of a warning; and

- (D) response required on receipt of a notification that partial or total failure of the TAWS has occurred (including annunciation that the present aircraft position is of low accuracy).
- (iii) Use of basic GPWS or use of the FLTA function only. Objective: To verify that the pilot understands what functionality will remain following loss of the GPWS or of the FLTA function. Criteria: The pilot should demonstrate knowledge of how to recognise the following:
 - (A) un-commanded loss of the GPWS function, or how to isolate this function and how to recognise the level of the remaining controlled flight into terrain (CFIT) protection (essentially, this is the FLTA function); and
 - (B) un-commanded loss of the FLTA function, or how to isolate this function and how to recognise the level of the remaining CFIT protection (essentially, this is the basic GPWS).
- (iv) Crew coordination. Objective: To verify that the pilot adequately briefs other flight crew members on how TAWS alerts will be handled. Criteria: The pilot should demonstrate that the pre-flight briefing addresses procedures that will be used in preparation for responding to TAWS cautions and warnings, including the following:
 - (A) the action to be taken, and by whom, in the event that a TAWS caution and/or warning is issued; and
 - (B) how multi-function displays will be used to depict TAWS information at take-off, in the cruise and for the descent, approach, landing (and any go-around). This will be in accordance with procedures specified by the operator, who will recognise that it may be more desirable that other data is displayed at certain phases of flight and that the terrain display has an automatic 'pop-up' mode in the event that an alert is issued.
- (v) Reporting rules. Objective: To verify that the pilot is aware of the rules for reporting alerts to the controller and other authorities. Criteria: The pilot should demonstrate knowledge of the following:
 - (A) when, following recovery from a TAWS alert or caution, a transmission of information should be made to the appropriate ATC unit; and
 - (B) the type of written report that is required, how it is to be compiled, and whether any cross reference should be made in the aircraft technical log and/or voyage report (in accordance with procedures specified by the operator), following a flight in which the aircraft flight path has been modified in response to a TAWS alert, or if any part of the equipment appears not to have functioned correctly.
- (vi) Alert thresholds. Objective: To demonstrate knowledge of the criteria for issuing cautions and warnings. Criteria: The pilot should be able to demonstrate an understanding of the methodology used by a TAWS to

issue cautions and warnings and the general criteria for the issuance of these alerts, including awareness of the following:

- (A) modes associated with basic GPWS, including the input data associated with each; and
 - (B) visual and aural annunciations that can be issued by TAWS and how to identify which are cautions and which are warnings.
- (3) TAWS manoeuvre training. The pilot should demonstrate the knowledge required to respond correctly to TAWS cautions and warnings. This training should address the following topics:
- (i) Response to cautions:
 - (A) Objective: To verify that the pilot properly interprets and responds to cautions. Criteria: The pilot should demonstrate an understanding of the need, without delay:
 - (a) to initiate action required to correct the condition which has caused the TAWS to issue the caution and to be prepared to respond to a warning, if this should follow; and
 - (b) if a warning does not follow the caution, to notify the controller of the new position, heading and/or altitude/flight level of the aircraft, and what the commander intends to do next.
 - (B) The correct response to a caution might require the pilot to:
 - (a) reduce a rate of descent and/or to initiate a climb;
 - (b) regain an ILS glide path from below, or to inhibit a glide path signal if an ILS is not being flown;
 - (c) select more flap, or to inhibit a flap sensor if the landing is being conducted with the intent that the normal flap setting will not be used;
 - (d) select gear down; and/or
 - (e) initiate a turn away from the terrain or obstacle ahead and towards an area free of such obstructions if a forward-looking terrain display indicates that this would be a good solution and the entire manoeuvre can be carried out in clear visual conditions.
 - (ii) Response to warnings. Objective: To verify that the pilot properly interprets and responds to warnings. Criteria: The pilot should demonstrate an understanding of the following:
 - (A) The need, without delay, to initiate a climb in the manner specified by the operator.
 - (B) The need, without delay, to maintain the climb until visual verification can be made that the aircraft will clear the terrain or

obstacle ahead or until above the appropriate sector safe altitude (if certain about the location of the aircraft with respect to terrain) even if the TAWS warning stops. If, subsequently, the aircraft climbs up through the sector safe altitude, but the visibility does not allow the flight crew to confirm that the terrain hazard has ended, checks should be made to verify the location of the aircraft and to confirm that the altimeter subscale settings are correct.

- (C) When the workload permits, that the flight crew should notify the air traffic controller of the new position and altitude/flight level, and what the commander intends to do next.
- (D) That the manner in which the climb is made should reflect the type of aircraft and the method specified by the aircraft manufacturer (which should be reflected in the operations manual) for performing the escape manoeuvre. Essential aspects will include the need for an increase in pitch attitude, selection of maximum thrust, confirmation that external sources of drag (e.g. spoilers/speed brakes) are retracted, and respect of the stick shaker or other indication of eroded stall margin.
- (E) That TAWS warnings should never be ignored. However, the pilot's response may be limited to that which is appropriate for a caution, only if:
 - (a) the aircraft is being operated by day in clear, visual conditions; and
 - (b) it is immediately clear to the pilot that the aircraft is in no danger in respect of its configuration, proximity to terrain or current flight path.

(4) TAWS initial evaluation:

- (i) The flight crew member's understanding of the academic training items should be assessed by means of a written test.
- (ii) The flight crew member's understanding of the manoeuvre training items should be assessed in a FSTD equipped with TAWS visual and aural displays and inhibit selectors similar in appearance and operation to those in the aircraft which the pilot will fly. The results should be assessed by a synthetic flight instructor, synthetic flight examiner, type rating instructor or type rating examiner.
- (iii) The range of scenarios should be designed to give confidence that proper and timely responses to TAWS cautions and warnings will result in the aircraft avoiding a CFIT accident. To achieve this objective, the pilot should demonstrate taking the correct action to prevent a caution developing into a warning and, separately, the escape manoeuvre needed in response to a warning. These demonstrations should take place when the external visibility is zero, though there is much to be learnt if, initially, the training is given in 'mountainous' or 'hilly' terrain with clear visibility. This training should comprise a sequence of

scenarios, rather than be included in line oriented flight training (LOFT).

- (iv) A record should be made, after the pilot has demonstrated competence, of the scenarios that were practised.
- (5) TAWS recurrent training:
 - (i) TAWS recurrent training ensures that pilots maintain the appropriate TAWS knowledge and skills. In particular, it reminds pilots of the need to act promptly in response to cautions and warnings, and of the unusual attitude associated with flying the escape manoeuvre.
 - (ii) An essential item of recurrent training is the discussion of any significant issues and operational concerns that have been identified by the operator. Recurrent training should also address changes to TAWS logic, parameters or procedures and to any unique TAWS characteristics of which pilots should be aware.
- (6) Reporting procedures:
 - (i) Verbal reports. Verbal reports should be made promptly to the appropriate air traffic control unit:
 - (A) whenever any manoeuvre has caused the aircraft to deviate from an air traffic clearance;
 - (B) when, following a manoeuvre which has caused the aircraft to deviate from an air traffic clearance, the aircraft has returned to a flight path which complies with the clearance; and/or
 - (C) when an air traffic control unit issues instructions which, if followed, would cause the pilot to manoeuvre the aircraft towards terrain or obstacle or it would appear from the display that a potential CFIT occurrence is likely to result.
 - (ii) Written reports. Written reports should be submitted in accordance with the operator's occurrence reporting scheme and they also should be recorded in the aircraft technical log:
 - (A) whenever the aircraft flight path has been modified in response to a TAWS alert (false, nuisance or genuine);
 - (B) whenever a TAWS alert has been issued and is believed to have been false; and/or
 - (C) if it is believed that a TAWS alert should have been issued, but was not.
 - (iii) Within this GM and with regard to reports:
 - (A) the term 'false' means that the TAWS issued an alert which could not possibly be justified by the position of the aircraft in respect to terrain and it is probable that a fault or failure in the system (equipment and/or input data) was the cause;
 - (B) the term 'nuisance' means that the TAWS issued an alert which was appropriate, but was not needed because the flight crew

could determine by independent means that the flight path was, at that time, safe;

- (C) the term 'genuine' means that the TAWS issued an alert which was both appropriate and necessary; and
- (D) the report terms described in (c)(6)(iii) are only meant to be assessed after the occurrence is over, to facilitate subsequent analysis, the adequacy of the equipment and the programmes it contains. The intention is not for the flight crew to attempt to classify an alert into any of these three categories when visual and/or aural cautions or warnings are annunciated.

GM1 CAT.OP.MPA.295 Use of airborne collision avoidance system (ACAS)

GENERAL

- (a) The ACAS operational procedures and training programmes established by the operator should take into account this GM. It incorporates advice contained in:
 - (1) ICAO Annex 10, Volume IV;
 - (2) ICAO PANS-OPS, Volume 1;
 - (3) ICAO PANS-ATM; and
 - (4) ICAO guidance material 'ACAS Performance-Based Training Objectives' (published under Attachment E of State Letter AN 7/1.3.7.2-97/77).
- (b) Additional guidance material on ACAS may be referred to, including information available from such sources as EUROCONTROL.

ACAS FLIGHT CREW TRAINING PROGRAMMES

- (c) During the implementation of ACAS, several operational issues were identified which had been attributed to deficiencies in flight crew training programmes. As a result, the issue of flight crew training has been discussed within the ICAO, which has developed guidelines for operators to use when designing training programmes.
- (d) This GM contains performance-based training objectives for ACAS II flight crew training. Information contained in this paper related to traffic advisories (TAs) is also applicable to ACAS I and ACAS II users. The training objectives cover five areas: theory of operation; pre-flight operations; general in-flight operations; response to TAs; and response to resolution advisories (RAs).
- (e) The information provided is valid for version 7 and 7.1 (ACAS II). Where differences arise, these are identified.
- (f) The performance-based training objectives are further divided into the areas of: academic training; manoeuvre training; initial evaluation and recurrent qualification. Under each of these four areas, the training material has been separated into those items which are considered essential training items and those which are considered desirable. In each area, objectives and acceptable performance criteria are defined.
- (g) ACAS academic training

- (1) This training is typically conducted in a classroom environment. The knowledge demonstrations specified in this section may be completed through the successful completion of written tests or through providing correct responses to non-real-time computer-based training (CBT) questions.

- (2) Essential items

- (i) Theory of operation. The flight crew member should demonstrate an understanding of ACAS II operation and the criteria used for issuing TAs and RAs. This training should address the following topics:

- (A) System operation

Objective: to demonstrate knowledge of how ACAS functions.

Criteria: the flight crew member should demonstrate an understanding of the following functions:

- (a) Surveillance

- (1) ACAS interrogates other transponder-equipped aircraft within a nominal range of 14 NM.
 - (2) ACAS surveillance range can be reduced in geographic areas with a large number of ground interrogators and/or ACAS II-equipped aircraft.
 - (3) If the operator's ACAS implementation provides for the use of the Mode S extended squitter, the normal surveillance range may be increased beyond the nominal 14 NM. However, this information is not used for collision avoidance purposes.

- (b) Collision avoidance

- (1) TAs can be issued against any transponder-equipped aircraft which responds to the ICAO Mode C interrogations, even if the aircraft does not have altitude reporting capability.
 - (2) RAs can be issued only against aircraft that are reporting altitude and in the vertical plane only.
 - (3) RAs issued against an ACAS-equipped intruder are co-ordinated to ensure complementary RAs are issued.
 - (4) Failure to respond to an RA deprives own aircraft of the collision protection provided by own ACAS.
 - (5) Additionally, in ACAS-ACAS encounters, failure to respond to an RA also restricts the choices available to the other aircraft's ACAS and thus renders the other aircraft's ACAS less effective than if own aircraft were not ACAS equipped.

- (B) Advisory thresholds

Objective: to demonstrate knowledge of the criteria for issuing TAs and RAs.

Criteria: the flight crew member should demonstrate an understanding of the methodology used by ACAS to issue TAs and RAs and the general criteria for the issuance of these advisories, including the following:

- (a) ACAS advisories are based on time to closest point of approach (CPA) rather than distance. The time should be short and vertical separation should be small, or projected to be small, before an advisory can be issued. The separation standards provided by ATS are different from the miss distances against which ACAS issues alerts.
 - (b) Thresholds for issuing a TA or an RA vary with altitude. The thresholds are larger at higher altitudes.
 - (c) A TA occurs from 15 to 48 seconds and an RA from 15 to 35 seconds before the projected CPA.
 - (d) RAs are chosen to provide the desired vertical miss distance at CPA. As a result, RAs can instruct a climb or descent through the intruder aircraft's altitude.
- (C) ACAS limitations

Objective: to verify that the flight crew member is aware of the limitations of ACAS.

Criteria: the flight crew member should demonstrate knowledge and understanding of ACAS limitations, including the following:

- (a) ACAS will neither track nor display non-transponder-equipped aircraft, nor aircraft not responding to ACAS Mode C interrogations.
- (b) ACAS will automatically fail if the input from the aircraft's barometric altimeter, radio altimeter or transponder is lost.
 - (1) In some installations, the loss of information from other on board systems such as an inertial reference system (IRS) or attitude heading reference system (AHRS) may result in an ACAS failure. Individual operators should ensure that their flight crews are aware of the types of failure that will result in an ACAS failure.
 - (2) ACAS may react in an improper manner when false altitude information is provided to own ACAS or transmitted by another aircraft. Individual operators should ensure that their flight crew are aware of the types of unsafe conditions that can arise. Flight crew members should ensure that when they are advised,

if their own aircraft is transmitting false altitude reports, an alternative altitude reporting source is selected, or altitude reporting is switched off.

- (c) Some aeroplanes within 380 ft above ground level (AGL) (nominal value) are deemed to be 'on ground' and will not be displayed. If ACAS is able to determine an aircraft below this altitude is airborne, it will be displayed.
- (d) ACAS may not display all proximate transponder-equipped aircraft in areas of high density traffic.
- (e) The bearing displayed by ACAS is not sufficiently accurate to support the initiation of horizontal manoeuvres based solely on the traffic display.
- (f) ACAS will neither track nor display intruders with a vertical speed in excess of 10 000 ft/min. In addition, the design implementation may result in some short-term errors in the tracked vertical speed of an intruder during periods of high vertical acceleration by the intruder.
- (g) Ground proximity warning systems/ground collision avoidance systems (GPWSs/GCASs) warnings and wind shear warnings take precedence over ACAS advisories. When either a GPWS/GCAS or wind shear warning is active, ACAS aural annunciations will be inhibited and ACAS will automatically switch to the 'TA only' mode of operation.

(D) ACAS inhibits

Objective: to verify that the flight crew member is aware of the conditions under which certain functions of ACAS are inhibited.

Criteria: the flight crew member should demonstrate knowledge and understanding of the various ACAS inhibits, including the following:

- (a) 'Increase Descent' RAs are inhibited below 1 450 ft AGL;
- (b) 'Descend' RAs are inhibited below 1 100 ft AGL;
- (c) all RAs are inhibited below 1 000 ft AGL;
- (d) all TA aural annunciations are inhibited below 500 ft AGL; and
- (e) altitude and configuration under which 'Climb' and 'Increase Climb' RAs are inhibited. ACAS can still issue 'Climb' and 'Increase Climb' RAs when operating at the aeroplane's certified ceiling. (In some aircraft types, 'Climb' or 'Increase Climb' RAs are never inhibited.)

(ii) Operating procedures

The flight crew member should demonstrate the knowledge required to operate the ACAS avionics and interpret the information presented by ACAS. This training should address the following:

(A) Use of controls

Objective: to verify that the pilot can properly operate all ACAS and display controls.

Criteria: demonstrate the proper use of controls including:

- (a) aircraft configuration required to initiate a self-test;
- (b) steps required to initiate a self-test;
- (c) recognising when the self-test was successful and when it was unsuccessful. When the self-test is unsuccessful, recognising the reason for the failure and, if possible, correcting the problem;
- (d) recommended usage of range selection. Low ranges are used in the terminal area and the higher display ranges are used in the en-route environment and in the transition between the terminal and en-route environment;
- (e) recognising that the configuration of the display does not affect the ACAS surveillance volume;
- (f) selection of lower ranges when an advisory is issued, to increase display resolution;
- (g) proper configuration to display the appropriate ACAS information without eliminating the display of other needed information;
- (h) if available, recommended usage of the above/below mode selector. The above mode should be used during climb and the below mode should be used during descent; and
- (i) if available, proper selection of the display of absolute or relative altitude and the limitations of using this display if a barometric correction is not provided to ACAS.

(B) Display interpretation

Objective: to verify that the flight crew member understands the meaning of all information that can be displayed by ACAS. The wide variety of display implementations require the tailoring of some criteria. When the training programme is developed, these criteria should be expanded to cover details for the operator's specific display implementation.

Criteria: the flight crew member should demonstrate the ability to properly interpret information displayed by ACAS, including the following:

- (a) other traffic, i.e. traffic within the selected display range that is not proximate traffic, or causing a TA or RA to be issued;
- (b) proximate traffic, i.e. traffic that is within 6 NM and ± 1 200 ft;
- (c) non-altitude reporting traffic;
- (d) no bearing TAs and RAs;
- (e) off-scale TAs and RAs: the selected range should be changed to ensure that all available information on the intruder is displayed;
- (f) TAs: the minimum available display range which allows the traffic to be displayed should be selected, to provide the maximum display resolution;
- (g) RAs (traffic display): the minimum available display range of the traffic display which allows the traffic to be displayed should be selected, to provide the maximum display resolution;
- (h) RAs (RA display): flight crew members should demonstrate knowledge of the meaning of the red and green areas or the meaning of pitch or flight path angle cues displayed on the RA display. Flight crew members should also demonstrate an understanding of the RA display limitations, i.e. if a vertical speed tape is used and the range of the tape is less than 2 500 ft/min, an increase rate RA cannot be properly displayed; and
- (i) if appropriate, awareness that navigation displays oriented on 'Track-Up' may require a flight crew member to make a mental adjustment for drift angle when assessing the bearing of proximate traffic.

(C) Use of the TA only mode

Objective: to verify that a flight crew member understands the appropriate times to select the TA only mode of operation and the limitations associated with using this mode.

Criteria: the flight crew member should demonstrate the following:

- (a) Knowledge of the operator's guidance for the use of TA only.
- (b) Reasons for using this mode. If TA only is not selected when an airport is conducting simultaneous operations from parallel runways separated by less than 1 200 ft, and to

some intersecting runways, RAs can be expected. If for any reason TA only is not selected and an RA is received in these situations, the response should comply with the operator's approved procedures.

- (c) All TA aural annunciations are inhibited below 500 ft AGL. As a result, TAs issued below 500 ft AGL may not be noticed unless the TA display is included in the routine instrument scan.

(D) Crew coordination

Objective: to verify that the flight crew member understands how ACAS advisories will be handled.

Criteria: the flight crew member should demonstrate knowledge of the crew procedures that should be used when responding to TAs and RAs, including the following:

- (a) task sharing between the pilot flying and the pilot monitoring;
- (b) expected call-outs; and
- (c) communications with ATC.

(E) Phraseology rules

Objective: to verify that the flight crew member is aware of the rules for reporting RAs to the controller.

Criteria: the flight crew member should demonstrate the following:

- (a) the use of the phraseology contained in ICAO PANS-OPS;
- (b) an understanding of the procedures contained in ICAO PANS-ATM and ICAO Annex 2; and
- (c) the understanding that verbal reports should be made promptly to the appropriate ATC unit:
 - (1) whenever any manoeuvre has caused the aeroplane to deviate from an air traffic clearance;
 - (2) when, subsequent to a manoeuvre that has caused the aeroplane to deviate from an air traffic clearance, the aeroplane has returned to a flight path that complies with the clearance; and/or
 - (3) when air traffic issue instructions that, if followed, would cause the crew to manoeuvre the aircraft contrary to an RA with which they are complying.

(F) Reporting rules

Objective: to verify that the flight crew member is aware of the rules for reporting RAs to the operator.

Criteria: the flight crew member should demonstrate knowledge of where information can be obtained regarding the need for making written reports to various states when an RA is issued. Various States have different reporting rules and the material available to the flight crew member should be tailored to the operator's operating environment. For operators involved in commercial operations, this responsibility is satisfied by the flight crew member reporting to the operator according to the applicable reporting rules.

(3) Non-essential items: advisory thresholds

Objective: to demonstrate knowledge of the criteria for issuing TAs and RAs.

Criteria: the flight crew member should demonstrate an understanding of the methodology used by ACAS to issue TAs and RAs and the general criteria for the issuance of these advisories, including the following:

- (i) the minimum and maximum altitudes below/above which TAs will not be issued;
- (ii) when the vertical separation at CPA is projected to be less than the ACAS-desired separation, a corrective RA which requires a change to the existing vertical speed will be issued. This separation varies from 300 ft at low altitude to a maximum of 700 ft at high altitude;
- (iii) when the vertical separation at CPA is projected to be just outside the ACAS-desired separation, a preventive RA that does not require a change to the existing vertical speed will be issued. This separation varies from 600 to 800 ft; and
- (iv) RA fixed range thresholds vary between 0.2 and 1.1 NM.

(h) ACAS manoeuvre training

- (1) Demonstration of the flight crew member's ability to use ACAS displayed information to properly respond to TAs and RAs should be carried out in a full flight simulator equipped with an ACAS display and controls similar in appearance and operation to those in the aircraft. If a full flight simulator is utilised, CRM should be practised during this training.
- (2) Alternatively, the required demonstrations can be carried out by means of an interactive CBT with an ACAS display and controls similar in appearance and operation to those in the aircraft. This interactive CBT should depict scenarios in which real-time responses should be made. The flight crew member should be informed whether or not the responses made were correct. If the response was incorrect or inappropriate, the CBT should show what the correct response should be.
- (3) The scenarios included in the manoeuvre training should include: corrective RAs; initial preventive RAs; maintain rate RAs; altitude crossing RAs; increase rate RAs; RA reversals; weakening RAs; and multi-aircraft encounters. The consequences of failure to respond correctly should be demonstrated by

reference to actual incidents such as those publicised in EUROCONTROL ACAS II Bulletins (available on the EUROCONTROL website).

(i) TA responses

Objective: to verify that the pilot properly interprets and responds to TAs.

Criteria: the pilot should demonstrate the following:

- (A) Proper division of responsibilities between the pilot flying and the pilot monitoring. The pilot flying should fly the aircraft using any type-specific procedures and be prepared to respond to any RA that might follow. For aircraft without an RA pitch display, the pilot flying should consider the likely magnitude of an appropriate pitch change. The pilot monitoring should provide updates on the traffic location shown on the ACAS display, using this information to help visually acquire the intruder.
- (B) Proper interpretation of the displayed information. Flight crew members should confirm that the aircraft they have visually acquired is that which has caused the TA to be issued. Use should be made of all information shown on the display, note being taken of the bearing and range of the intruder (amber circle), whether it is above or below (data tag) and its vertical speed direction (trend arrow).
- (C) Other available information should be used to assist in visual acquisition, including ATC 'party-line' information, traffic flow in use, etc.
- (D) Because of the limitations described, the pilot flying should not manoeuvre the aircraft based solely on the information shown on the ACAS display. No attempt should be made to adjust the current flight path in anticipation of what an RA would advise, except that if own aircraft is approaching its cleared level at a high vertical rate with a TA present, vertical rate should be reduced to less than 1 500 ft/min.
- (E) When visual acquisition is attained, and as long as no RA is received, normal right of way rules should be used to maintain or attain safe separation. No unnecessary manoeuvres should be initiated. The limitations of making manoeuvres based solely on visual acquisition, especially at high altitude or at night, or without a definite horizon should be demonstrated as being understood.

(ii) RA responses

Objective: to verify that the pilot properly interprets and responds to RAs.

Criteria: the pilot should demonstrate the following:

- (A) Proper response to the RA, even if it is in conflict with an ATC instruction and even if the pilot believes that there is no threat present.

- (B) Proper task sharing between the pilot flying and the pilot monitoring. The pilot flying should respond to a corrective RA with appropriate control inputs. The pilot monitoring should monitor the response to the RA and should provide updates on the traffic location by checking the traffic display. Proper crew resource management (CRM) should be used.
- (C) Proper interpretation of the displayed information. The pilot should recognise the intruder causing the RA to be issued (red square on display). The pilot should respond appropriately.
- (D) For corrective RAs, the response should be initiated in the proper direction within five seconds of the RA being displayed. The change in vertical speed should be accomplished with an acceleration of approximately $\frac{1}{4}$ g (gravitational acceleration of 9.81 m/sec^2).
- (E) Recognition of the initially displayed RA being modified. Response to the modified RA should be properly accomplished, as follows:
 - (a) For increase rate RAs, the vertical speed change should be started within two and a half seconds of the RA being displayed. The change in vertical speed should be accomplished with an acceleration of approximately $\frac{1}{3}$ g.
 - (b) For RA reversals, the vertical speed reversal should be started within two and a half seconds of the RA being displayed. The change in vertical speed should be accomplished with an acceleration of approximately $\frac{1}{3}$ g.
 - (c) For RA weakenings, the vertical speed should be modified to initiate a return towards the original clearance.
 - (d) An acceleration of approximately $\frac{1}{4}$ g will be achieved if the change in pitch attitude corresponding to a change in vertical speed of 1 500 ft/min is accomplished in approximately 5 seconds, and of $\frac{1}{3}$ g if the change is accomplished in approximately three seconds. The change in pitch attitude required to establish a rate of climb or descent of 1 500 ft/min from level flight will be approximately 6° when the true airspeed (TAS) is 150 kt, 4° at 250 kt, and 2° at 500 kt. (These angles are derived from the formula: 1 000 divided by TAS.).
- (F) Recognition of altitude crossing encounters and the proper response to these RAs.
- (G) For preventive RAs, the vertical speed needle or pitch attitude indication should remain outside the red area on the RA display.
- (H) For maintain rate RAs, the vertical speed should not be reduced. Pilots should recognise that a maintain rate RA may result in crossing through the intruder's altitude.

- (I) When the RA weakens, or when the green 'fly to' indicator changes position, the pilot should initiate a return towards the original clearance and when 'clear of conflict' is annunciated, the pilot should complete the return to the original clearance.
- (J) The controller should be informed of the RA as soon as time and workload permit, using the standard phraseology.
- (K) When possible, an ATC clearance should be complied with while responding to an RA. For example, if the aircraft can level at the assigned altitude while responding to RA (an 'adjust vertical speed' RA (version 7) or 'level off' (version 7.1)) it should be done; the horizontal (turn) element of an ATC instruction should be followed.
- (L) Knowledge of the ACAS multi-aircraft logic and its limitations, and that ACAS can optimise separations from two aircraft by climbing or descending towards one of them. For example, ACAS only considers intruders that it considers to be a threat when selecting an RA. As such, it is possible for ACAS to issue an RA against one intruder that results in a manoeuvre towards another intruder which is not classified as a threat. If the second intruder becomes a threat, the RA will be modified to provide separation from that intruder.

(i) ACAS initial evaluation

- (1) The flight crew member's understanding of the academic training items should be assessed by means of a written test or interactive CBT that records correct and incorrect responses to phrased questions.
- (2) The flight crew member's understanding of the manoeuvre training items should be assessed in a full flight simulator equipped with an ACAS display and controls similar in appearance and operation to those in the aircraft the flight crew member will fly, and the results assessed by a qualified instructor, inspector, or check airman. The range of scenarios should include: corrective RAs; initial preventive RAs; maintain rate RAs; altitude crossing RAs; increase rate RAs; RA reversals; weakening RAs; and multi-threat encounters. The scenarios should also include demonstrations of the consequences of not responding to RAs, slow or late responses, and manoeuvring opposite to the direction called for by the displayed RA.
- (3) Alternatively, exposure to these scenarios can be conducted by means of an interactive CBT with an ACAS display and controls similar in appearance and operation to those in the aircraft the pilot will fly. This interactive CBT should depict scenarios in which real-time responses should be made and a record made of whether or not each response was correct.

(j) ACAS recurrent training

- (1) ACAS recurrent training ensures that flight crew members maintain the appropriate ACAS knowledge and skills. ACAS recurrent training should be integrated into and/or conducted in conjunction with other established recurrent training programmes. An essential item of recurrent training is the discussion of any significant issues and operational concerns that have been

identified by the operator. Recurrent training should also address changes to ACAS logic, parameters or procedures and to any unique ACAS characteristics which flight crew members should be made aware of.

- (2) It is recommended that the operator's recurrent training programmes using full flight simulators include encounters with conflicting traffic when these simulators are equipped with ACAS. The full range of likely scenarios may be spread over a 2-year period. If a full flight simulator, as described above, is not available, use should be made of interactive CBT that is capable of presenting scenarios to which pilot responses should be made in real-time.

AMC1 CAT.OP.MPA.300 Approach and landing conditions

IN-FLIGHT DETERMINATION OF THE LANDING DISTANCE

The in-flight determination of the landing distance should be based on the latest available meteorological or runway state report, preferably not more than 30 minutes before the expected landing time.

AMC1 CAT.OP.MPA.305(e) Commencement and continuation of approach

VISUAL REFERENCES FOR INSTRUMENT APPROACH OPERATIONS

(a) NPA, APV and CAT I operations

At DH or MDH, at least one of the visual references specified below should be distinctly visible and identifiable to the pilot:

- (1) elements of the approach lighting system;
- (2) the threshold;
- (3) the threshold markings;
- (4) the threshold lights;
- (5) the threshold identification lights;
- (6) the visual glide slope indicator;
- (7) the touchdown zone or touchdown zone markings;
- (8) the touchdown zone lights;
- (9) FATO/runway edge lights; or
- (10) other visual references specified in the operations manual.

(b) Lower than standard category I (LTS CAT I) operations

At DH, the visual references specified below should be distinctly visible and identifiable to the pilot:

- (1) a segment of at least three consecutive lights, being the centreline of the approach lights, or touchdown zone lights, or runway centreline lights, or runway edge lights, or a combination of these;
- (2) this visual reference should include a lateral element of the ground pattern, such as an approach light crossbar or the landing threshold or a barrette of the

touchdown zone light unless the operation is conducted utilising an approved HUDLS usable to at least 150 ft.

(c) CAT II or OTS CAT II operations

At DH, the visual references specified below should be distinctly visible and identifiable to the pilot:

- (1) a segment of at least three consecutive lights being the centreline of the approach lights, or touchdown zone lights, or runway centreline lights, or runway edge lights, or a combination of these;
- (2) this visual reference should include a lateral element of the ground pattern, such as an approach light crossbar or the landing threshold or a barrette of the touchdown zone light unless the operation is conducted utilising an approved HUDLS to touchdown.

(d) CAT III operations

- (1) For CAT IIIA operations and for CAT IIIB operations conducted either with fail-passive flight control systems or with the use of an approved HUDLS: at DH, a segment of at least three consecutive lights being the centreline of the approach lights, or touchdown zone lights, or runway centreline lights, or runway edge lights, or a combination of these is attained and can be maintained by the pilot.
- (2) For CAT IIIB operations conducted either with fail-operational flight control systems or with a fail-operational hybrid landing system using a DH: at DH, at least one centreline light is attained and can be maintained by the pilot.
- (3) For CAT IIIB operations with no DH there is no specification for visual reference with the runway prior to touchdown.

(e) Approach operations utilising EVS – CAT I operations

- (1) At DH, the following visual references should be displayed and identifiable to the pilot on the EVS image:
 - (i) elements of the approach light; or
 - (ii) the runway threshold, identified by at least one of the following:
 - (A) the beginning of the runway landing surface,
 - (B) the threshold lights, the threshold identification lights; or
 - (C) the touchdown zone, identified by at least one of the following: the runway touchdown zone landing surface, the touchdown zone lights, the touchdown zone markings or the runway lights.
- (2) At 100 ft above runway threshold elevation at least one of the visual references specified below should be distinctly visible and identifiable to the pilot without reliance on the EVS:
 - (i) the lights or markings of the threshold; or
 - (ii) the lights or markings of the touchdown zone.

(f) Approach operations utilising EVS – APV and NPA operations flown with the CDFA technique

- (1) At DH/MDH, visual references should be displayed and identifiable to the pilot on the EVS image as specified under (a).
- (2) At 200 ft above runway threshold elevation, at least one of the visual references specified under (a) should be distinctly visible and identifiable to the pilot without reliance on the EVS.

GM1 CAT.OP.MPA.305(f) Commencement and continuation of approach

EXPLANATION OF THE TERM 'RELEVANT'

'Relevant' in this context means that part of the runway used during the high-speed phase of the landing down to a speed of approximately 60 kt.

GM1 CAT.OP.MPA.315 Flight hours reporting - helicopters

FLIGHT HOURS REPORTING

- (a) The requirement in CAT.OP.MPA.315 may be achieved by making available either:
 - (1) the flight hours flown by each helicopter – identified by its serial number and registration mark - during the previous calendar year; or
 - (2) the total flight hours of each helicopter – identified by its serial number and registration mark – on the 31st of December of the previous calendar year.
- (b) Where possible, the operator should have available, for each helicopter, the breakdown of hours for commercial air transport operations. If the exact hours for the functional activity cannot be established, the estimated proportion will be sufficient.