Annex V to ED Decision 2022/012/R

'AMC & GM to Annex V (Part-SPA) to Commission Regulation (EU) No 965/2012 — Issue 1, Amendment 12'

The text of the amendment is arranged to show deleted, new or amended text as shown below:

(a) deleted text is ~~struck through~~;

(b) new or amended text is highlighted in blue;

(c) an ellipsis '[…]' indicates that the rest of the text is unchanged.

Note to the reader

In amended, and in particular in existing (that is, unchanged) text, 'Agency' is used interchangeably with 'EASA'. The interchangeable use of these two terms is more apparent in the consolidated versions. Therefore, please note that both terms refer to the 'European Union Aviation Safety Agency (EASA)'.

The Annex to Decision N° 2012/019/Directorate R of 24 October 2012 of the Executive Director of the Agency is amended as follows:

~~AMC1 SPA.LVO.100 Low visibility operations~~

~~LVTO OPERATIONS – AEROPLANES~~

~~AMC3 SPA.LVO.100 Low visibility operations~~

~~LTS CAT I OPERATIONS~~

~~AMC4 SPA.LVO.100 Low visibility operations~~

~~CAT II AND OTS CAT II OPERATIONS~~

~~AMC6 SPA.LVO.100 Low visibility operations~~

~~OPERATIONS UTILISING EVS~~

GM1 SPA.LVO.100 Low-visibility operations and operations with operational credits

DOCUMENTS CONTAINING INFORMATION RELATED TO ~~LOW VISIBILITY OPERATIONS~~ LVOs AND OPERATIONS WITH OPERATIONAL CREDITS

The following documents provide further information related to low-visibility operations (LVOs):

(a) ICAO Annex 2 — Rules of the Air;

(b) ICAO Annex 6 — Operation of Aircraft;

(c) ICAO Annex 10 — Aeronautical Telecommunications ~~Vol. 1~~ (Volume I — Radio Navigation Aids);

(d) ICAO Annex 14 —Aerodromes ~~Vol. 1~~ (Volume I — Aerodrome Design and Operations);

(e) ICAO Doc 8168 — PANS-OPS — Procedures For Air Navigation Services — Aircraft Operations;

(f) ICAO Doc 9365 — ~~AWO~~ Manual of All-Weather Operations;

(g) ICAO Doc 9476 — Manual of surface movement guidance and control systems (SMGCS);

(h) ICAO Doc 9157 — Aerodrome Design Manual;

(i) ICAO Doc 9328 — Manual of RVR Observing and Reporting Practices;

(j) ICAO EUR Doc 013 — European Guidance Material on All Weather Operations at Aerodromes ~~European Guidance Material on Aerodrome Operations under Limited Visibility Conditions~~;

(k) ECAC Doc 17, Issue 3; and

(l) CS-AWO All-weather operations.

GM2 SPA.LVO.100 Low-visibility operations and operations with operational credits

ILS AND GLS CLASSIFICATION

(a) The ILS and GBAS classification systems are ~~is~~ specified in ICAO Annex 10 and GM2 SPA.LVO.110

LOW-VISIBILITY CONDITIONS

(b) Low visibility conditions means meteorological conditions with a runway visual range (RVR) less than 550 m.

AMC1 SPA.LVO.100(a) Low-visibility operations and operations with operational credits

LOW-VISIBILITY TAKE-OFF (LVTO) OPERATIONS — AEROPLANES IN AN RVR OF LESS THAN 400 M

(a) Required RVR

(1) For multi-engined aeroplanes which, in the event of a critical engine failure at any point during take-off, 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 criteria in Table 1 should apply:

Table 1

LVTO operations with aeroplanes — RVR versus facilities

Minimum RVR	Facilities
300 m (day)	Centre line markings; and Runway edge lights.
300 m (night)	Centre line markings; and Runway edge lights; and Runway end lights or centre line lights.
150 m	Centre line markings; and Runway end lights; and Runway edge lights; and Runway centre line lights.
125 m	Centre line markings; and Runway end lights; and Runway edge lights (spaced 60 m or less); and Runway centre line lights (spaced 15 m or less).

(2) For multi-engined aeroplanes not complying with the conditions in (a)(1), there may be a need to land immediately and to see and avoid obstacles. Such aeroplanes may be

operated to the take-off minima shown in Table 2 and the marking and lighting criteria shown in Table 1, provided that they are able to comply with the applicable obstacle clearance criteria, assuming engine failure at the height specified:

Table 2

LVTO operations with aeroplanes — assumed engine failure height versus RVR

Assumed engine failure height above the take-off runway (ft) versus RVR (m)	
Less than 50	Not less than 200
More than 50 but less than 100	Not less than 300

(b) The reported RVR value representative of the initial part of the take-off run can be replaced by pilot assessment.

(c) The minimum RVR value specified in Table 1 or 2 should be achieved for all reporting points representative of the parts of the runway from the point at which the aircraft commences the take-off until the calculated accelerate-stop distance from that point.

LVTO OPERATIONS — AEROPLANES IN AN RVR OF LESS THAN 125 M

(e) For LVTO operations with an RVR of less than 125 m, the following additional elements should apply:

(1) The runway has centre line lights spaced at intervals of 15 m or less;

(2) If an ILS signal is used for lateral guidance, the ILS localiser signal meets the requirements for category III operations, unless otherwise stated in the AFM;

(3) If an ILS signal is to be used, low-visibility procedures (LVPs) include protection of the runway and, where an ILS localiser signal is used, it should include protection of the ILS-sensitive area unless otherwise stated in the AFM; and

(4) If a GLS signal is used for lateral guidance, the GLS performance type meets the requirements for category III operations (GAST D and to GBAS point to which guidance is required), unless otherwise stated in the AFM.

(f) For LVTO operations with an RVR of less than 125 m, the reported RVR should be not less than the minimum specified in the AFM or, if no such minimum is specified, not less than 75 m.

(g) The minimum required RVR should be achieved for all reporting points representative of the parts of the runway from the point at which the aircraft commences the take-off until the greater of the calculated take-off distance or accelerate-stop distance from that point.

(h) The reported RVR value representative of the initial part of the take-off run can be replaced by pilot assessment.

AMC2 SPA.LVO.100(a) Low-visibility operations and operations with operational credits

LVTO OPERATIONS — HELICOPTERS

~~For LVTOs with helicopters the provisions specified in Table 1.H should apply.~~

~~Table 1.H: LVTO – helicopters~~

~~RVR vs. facilities~~

~~**Facilities**~~	~~**RVR (m)**~~
~~**Onshore aerodromes with IFR departure procedures**~~	
~~No light and no markings (day only)~~	~~250 or the rejected take-off distance, whichever is the greater~~
~~No markings (night)~~	~~800~~
~~Runway edge/FATO light and centre line marking~~	~~200~~
~~Runway edge/FATO light, centre line marking and relevant RVR information~~	~~150~~
~~**Offshore helideck ***~~	
~~Two-pilot operations~~	~~250~~
~~Single-pilot operations~~	~~500~~

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

~~FATO: final approach and take-off area~~

The following should apply to LVTOs for helicopters with an RVR of less than 400 m:

(a) For take-off from onshore aerodromes or operating sites with IFR departure procedures, the criteria in Table 3 should apply:

Table 3

LVTO operations with helicopters — RVR versus facilities onshore

RVR or VIS (m) *	**Facilities**
Not less than 250 m or the rejected take-off distance, whichever is the greater	No light and no markings (day only)
Not less than 800 m	No markings (night)
Not less than 200 m	Runway edge/FATO light and centre line marking
Not less than 150 m	Runway edge/FATO light, centre line marking and relevant RVR information

* On PinS departures to IDF, VIS should not be less than 800 m and ceiling should not be less than 250 ft.

(b) For take-off from offshore helidecks where the take-off flight path is free of obstacles, the minimum RVR for take-off should not be less than:

— 500 m for single-pilot operations; or

— 250 m for two-pilot operations.

GM1 SPA.LVO.100(a) Low-visibility operations and operations with operational credits

CLASSIFICATION OF LVTO OPERATIONS

Take-off operations are classified as 'normal take-off operations' with an RVR at or above 550 m and 'LVTO operations' with an RVR below 550 m. Only LVTO operations in an RVR of less than 400 m require a specific approval.

GM2 SPA.LVO.100(a) Low-visibility operations and operations with operational credits

VISUAL SEGMENT FOR TAKE-OFF

The value of 125 m RVR for take-off with 15 m centre line light spacing has been selected because flight deck geometry means that this will provide at least a 90-m visual segment for the large majority of aircraft types. In a 90-m visual segment the pilot is expected to be able to see six centre line light intervals (seven centre line lights) at 15 m spacing once lined up on the runway centre line.

AMC1 SPA.LVO.100(b) Low-visibility operations and operations with operational credits

INSTRUMENT APPROACH OPERATIONS IN LOW-VISIBILITY CONDITIONS — CAT II OPERATIONS

For CAT II operations, the following should apply:

(a) The DH should be determined by the use of a radio altimeter or other device capable of providing equivalent performance and be not lower than the highest of:

  (1) the minimum DH specified in the AFM, if stated;

  (2) the applicable obstacle clearance height (OCH) for the category of aircraft;

  (3) the DH to which the flight crew is qualified to operate; or

  (4) 100 ft.

(b) The lowest RVR minima to be used are specified in Table 4:

Table 4

CAT II operation minima: RVR (m) versus DH (ft)

Aircraft categories		**Auto-coupled or HUD to below DH***	
		A, B, C	**D**
DH (ft)	100–120	300	300/350*
	121–140	400	400
	141–199	450	450

*: An RVR of 300 m may be used for a Category D aeroplane conducting an autoland or using HUDLS to touchdown.

AMC2 ~~AMC5~~ SPA.LVO.100(b) Low-visibility operations and operations with operational credits

INSTRUMENT APPROACH OPERATIONS IN LOW-VISIBILITY CONDITIONS — CAT III OPERATIONS

~~The following provisions should apply to~~ For CAT III operations, the following should apply:

(a) ~~Where the DH and RVR do not fall within the same category, the RVR should determine in which category the operation is to be considered.~~

~~(b)~~ For operations in which a DH is used, the DH should be determined by the use of a radio altimeter or other device capable of providing equivalent performance and be not lower than:

(1) the minimum DH specified in the AFM, if stated;

(2) the DH to which the flight crew is qualified to operate. ~~the minimum height to which the precision approach aid can be used without the specified visual reference; or~~

~~(3) the DH to which the flight crew is qualified to operate.~~

(b)~~(c)~~ Operations with no DH should only be conducted if:

(1) ~~the~~ operation with no DH is specified in the AFM;

(2) there is no published information indicating that the approach aid or aerodrome facilities cannot support operations with no DH; and ~~the approach aid and the aerodrome facilities can support operations with no DH; and~~

(3) the flight crew is qualified to operate with no DH.

(c)~~(d)~~ The lowest RVR ~~minima~~ to be used ~~are specified in Table 5.~~ should be determined in accordance with Table 5:

~~***Table 5: CAT III operations minima***~~

~~***RVR vs. DH and rollout control/guidance system***~~

~~CAT~~	~~DH (ft) *~~	~~Rollout control/guidance system~~	~~RVR (m)~~
~~IIIA~~	~~Less than 100~~	~~Not required~~	~~200~~
~~IIIB~~	~~Less than 100~~	~~Fail-passive~~	~~150**~~
~~IIIB~~	~~Less than 50~~	~~Fail-passive~~	~~125~~
~~IIIB~~	~~Less than 50 or no DH~~	~~Fail-operational ***~~	~~75~~

~~*: Flight control system redundancy is determined under CS-AWO by the minimum certified DH.~~

~~**: For aeroplanes certified in accordance with CS-AWO 321(b)(3) or equivalent.~~

~~***: The fail-operational system referred to may consist of a fail-operational hybrid system.~~

Table 5

CAT III operation minima: RVR (m) versus DH (ft)

DH (ft)	Roll-out control/guidance system	RVR (m)*
50-99	Not required	175
0-49 or no DH	Fail-passive	125
	Fail-operational	75

* Note: For a fail-passive or HUD roll-out control system, a lower RVR value (no lower than 75 m) can be used if stated in the AFM provided that the equipment demonstrated such capability as part of the certification process. This is provided that the operator has implemented the appropriate operating procedures and training.

~~AMC7~~ AMC3 SPA.LVO.100(b) Low-visibility operations and operations with operational credits

INSTRUMENT APPROACH OPERATIONS IN LOW-VISIBILITY CONDITIONS — EFFECT ON LANDING MINIMA OF TEMPORARILY FAILED OR DOWNGRADED EQUIPMENT FOR APPROACH OPERATIONS WITH A DH BELOW 200 ft

(a) ~~General~~

~~These instructions are intended for use both pre-flight and in-flight. It is however not expected that the pilot-in-command/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 pilot-in-command/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 7, and the approach may have to be abandoned.~~

Only those facilities mentioned in Table 6 should be acceptable to be used to determine the effect of temporarily failed of downgraded equipment on the required RVR for CAT II/III approach operations.

(b) The following conditions should be ~~applicable to the tables below~~ applied to Table 6:

(1) multiple failures of runway/FATO lights other than those indicated in Table 6~~7~~ are not acceptable;

(2) deficiencies of both the approach and runway/FATO lights ~~are treated separately;~~ are acceptable at the same time and the most demanding consequence should be applied;

(3) for ~~CAT II and CAT III~~approach operations with a DH below 200 ft, a combination of deficiencies in runway/FATO lights and RVR assessment equipment are not permitted; and

(4) failures other than ILS, GLS and MLS affect the RVR only and not the DH.

Table ~~7~~ 6

Failed or downgraded equipment — ~~affect~~ effect on landing minima
~~Operations with an LVO approval~~ CAT II/III operations

Failed or downgraded equipment		Effect on landing minima			
		CAT III~~B~~ ~~(~~no DH~~)~~	CAT III~~B~~ DH<50 ft	CAT III~~A~~ DH>=50 ft	CAT II
Failed or downgraded equipment	~~ILS/MLS~~ Navaid stand-by transmitter	Not allowed	RVR 200 m	No effect	
	Outer marker (ILS)	No effect if ~~replaced by height check at 1 000 ft~~ the required height versus glide path can be checked using other means, e.g. DME fix			
	Middle marker (ILS)	No effect			
	DME	No effect if replaced by RNAV (GNSS) information or the outer marker.			
	RVR assessment systems	At least one RVR value to be available on the aerodrome	On runways equipped with two or more RVR assessment units, one may be inoperative		
	Approach lights	No effect	Not allowed for operations with DH >50 ft		Not allowed
	Approach lights except the last 210 m	No effect			Not allowed
	Approach lights except the last 420 m	No effect			
	Standby power for approach lights	No effect			
	Standby power for runway lights with 1-second switchover time	**No effect** **No effect**	Not allowed	**Day:** RVR 550 m **Night:** RVR 550 m	**Day:** RVR 550 m **Night:** RVR 550 m
	~~Edge lights, threshold lights and runway end lights~~	~~No effect~~		~~**Day:** no effect~~ ~~**Night:** RVR 550 m~~	~~**Day:** no effect~~ ~~**Night:** not allowed~~
	Edge lights	No effect	**Day:** no effect **Night:** RVR 550 m	**Day:** no effect **Night:** RVR 550 m	**Day:** no effect **Night:** not allowed

Failed or downgraded equipment	Effect on landing minima			
	CAT III~~B~~ ~~(~~no DH~~)~~	**CAT III~~B~~ DH<50 ft**	**CAT III~~A~~ DH>=50 ft**	**CAT II**
Threshold lights	No effect	No effect	**Day:** no effect	**Day:** no effect
			Night: RVR 550 m	**Night:** not allowed
Runway end lights	No effect if centre line lights are serviceable			
Centre line lights	**Day:** RVR 200 m	Not allowed	**Day:** RVR 300 m	**Day:** RVR 350 m
	Night: not allowed		**Night:** RVR 400 m	**Night:** RVR 550 m (400 m with HUD~~LS~~ or autoland)
Centre line lights spacing increased to 30 m	RVR 150 m		No effect	
~~Touchdown~~ TDZ lights	No effect	**Day:** RVR 200 m	**Day:** RVR 300 m	
		Night: RVR 300 m	**Night:** RVR 550 m, 350 m with HUD~~LS~~ or autoland	
Taxiway light system	No effect			

Table 7

Failed or downgraded equipment —effect on landing minima
Operational credits

Failed or downgraded equipment		Effect on landing minima			
		SA CAT I	**SA CAT II**	**EFVS-A**	**EFVS-L**
Failed or downgraded equipment	Navaid stand-by transmitter	No effect			
	Outer marker (ILS)	No effect if replaced by height check at 1 000 ft			
	Middle marker (ILS)	No effect			
	RVR assessment systems	On runways equipped with two or more RVR assessment units, one may be inoperative			
	Approach lights	Not allowed	Not allowed	As per IAP	As per IAP
	Approach lights except the last 210 m	Not allowed	No effect	As per IAP	As per IAP

Failed or downgraded equipment		Effect on landing minima			
		SA CAT I	SA CAT II	EFVS-A	EFVS-L
	Approach lights except the last 420 m	No effect	No effect	As per IAP	As per IAP
	Standby power for approach lights	No effect			
	Edge lights, Threshold lights	Day: No effect	**Day:** no effect	As per IAP	As per IAP
		Night: not allowed	**Night:** RVR 550 m	As per IAP	As per IAP
	Runway end lights	No effect if centre line lights are serviceable		As per IAP	
	Centre line lights	**Day:** RVR 400 m	**Day:** RVR 300 m	As per IAP	As per IAP
		Night: RVR 550 m	**Night:** RVR 400 m	As per IAP	As per IAP
	Centre line lights spacing increased to 30 m	No effect	No effect	As per IAP	As per IAP
	TDZ lights	**Day:** no effect	**Day:** RVR 300 m	As per IAP	
		Night: no effect	**Night:** RVR 350 m	As per IAP	
	Taxiway light system	No effect			

GM1 SPA.LVO.100(b) Low-visibility operations and operations with operational credits

INSTRUMENT APPROACH OPERATIONS IN LOW-VISIBILITY CONDITIONS — CLASSIFICATION OF STANDARD APPROACH OPERATIONS

The different types of approach and landing operations are classified according to the lowest DH (or MDH) and RVR applicable to the approach type. The classification of approach types does not depend on the technology used for the approach. The lowest minima specified do not take account of 'operational credits' that may allow for lower operating minima.

The classification does not subdivide CAT III operations into CAT IIIA, IIIB, and IIIC. The actual minima applicable to any operation depends on the aircraft equipment and the specific LVO approval held by the air operator.

The AFM for aircraft certified for CAT III operations will state the lowest usable DH, or no DH. Some AFMs may refer to the previous ICAO classifications as follows:

— CAT IIIA: a DH lower than 30 m (100 ft) or no DH and an RVR not less than 175 m;

— CAT IIIB: a DH lower than 15 m (50 ft) or no DH and an RVR less than 175 m but not less than 50 m; and

— CAT IIIC: no DH and no RVR limitations.

CAT IIIC has not been used in Europe and the minimum RVR in the EU regulations is 75 m.

Where an operational credit allows operation to lower-than-standard minima, this is not considered a separate approach classification.

GM2 SPA.LVO.100(b) Low-visibility operations and operations with operational credits

INSTRUMENT APPROACH OPERATIONS IN LOW-VISIBILITY CONDITIONS — EQUIPMENT CERTIFICATION FOR LOW-VISIBILITY APPROACH OPERATIONS OTHER THAN EFVS

This GM describes the certification requirements of CS-AWO. Operators should always refer to CS-AWO for the actual requirements.

Aircraft suitable for low-visibility approach operations are certified according to the minimum usable DH which is stated in the AFM.

Certification specifications (CS-AWO) allow for systems to be certified for SA CAT I, CAT II or CAT III operations. Systems certified for CAT III operations may specify:

— a lowest usable DH of:

  — less than 100 ft but not less than 50 ft;

  — less than 50 ft; or

— no DH.

Legacy systems may be described as capable of ‘CAT 3A’ or ‘CAT IIIA' operations. This implies a minimum DH of less than 100 ft but not less than 50 ft. Systems described as capable of ‘CAT 3B’ or ‘CAT IIIB’ may be certified for a DH of less than 50 ft or no DH.

Operations to a DH of less than 100 ft but not less than 50 ft will typically require a fail-passive automatic landing system or a HUDLS or equivalent system. Operations to a DH of less than 50 ft will require a fail-operational landing system, a fail-passive go-around system, automatic thrust control and either automatic ground roll control or ground roll guidance using a HUDLS. For no DH operations, a fail-passive or fail-operational ground roll control system is required.

The RVR required for SA CAT I, CAT II and SA CAT II approach operations is determined by the DH and the aircraft approach speed category. The RVR required for CAT III approach operations is determined by the DH and the capability of the ground-roll control system. Operations with fail-passive roll control systems require a greater RVR than operations with fail-operational ground control systems because the pilots would need to have sufficient visibility to maintain lateral control in the event of a system failure.

GM3 SPA.LVO.100(b) ~~GM1 SPA.LVO.100(c),(e)~~Low-visibility operations and operations with operational credits

INSTRUMENT APPROACH OPERATIONS IN LOW-VISIBILITY CONDITIONS — ESTABLISHMENT OF MINIMUM RVR FOR ~~CAT II AND CAT III~~ APPROACH OPERATIONS WITH A DH BELOW 200 ft

(…)

(c) CAT III fail-passive operations

(1) (…)

(2) During an automatic landing the pilot needs to monitor the performance of the aircraft system, not in order to detect a failure that is better done by the monitoring devices built into the system, but so as to know precisely the flight situation. In the final stages the pilot should establish visual contact and, by the time the pilot reaches the DH, the pilot should have checked the aircraft position relative to the approach or runway ~~centreline~~ centre line lights. For this the pilot will need sight of horizontal elements (for roll reference) and part of the touchdown area. The pilot should check for lateral position and cross-track velocity and, if not within the pre-stated lateral limits, the pilot should carry out a missed approach procedure. The pilot should also check longitudinal progress and sight of the landing threshold is useful for this purpose, as is sight of the TDZ lights.

Where a fail-operational automatic landing and roll-out system is used, it is not considered necessary for the pilot to check the lateral position and cross-track velocity, and thus it is not necessary for the visual reference requirements to include horizontal elements of the lighting system.

[…]

GM4 SPA.LVO.100(b) Low-visibility operations and operations with operational credits

INSTRUMENT APPROACH OPERATIONS IN LOW-VISIBILITY CONDITIONS — EFFECT ON LANDING MINIMA OF TEMPORARILY FAILED OR DOWNGRADED EQUIPMENT FOR APPROACH OPERATIONS WITH A DH BELOW 200 ft

The instructions for the effect on landing minima of temporarily failed or downgraded equipment are intended for use both before flight and during flight. It is, however, not expected that the pilot-in-command/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 pilot-in-command/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 6, and the approach may have to be abandoned.

AMC1 SPA.LVO.100(c) Low-visibility operations and operations with operational credits

OPERATIONS WITH OPERATIONAL CREDITS — SPECIAL AUTHORISATION CATEGORY I (SA CAT I)

For special authorisation category I (SA CAT I) operations, the following should apply:

(a) The DH of an SA CAT I operation should not be lower than the highest of:

(1) the minimum DH specified in the AFM, if stated;

(2) the applicable OCH for the category of aeroplane;

(3) the DH to which the flight crew is qualified to operate; or

(4) 150 ft.

(b) Where the DH for an SA CAT I operation is less than 200 ft, it should be determined by the use of a radio altimeter or other device capable of providing equivalent performance.

(c) The following visual aids should be available:

(1) approach lights as specified in Table 8;

(2) precision approach (PA) runway markings;

(3) category I runway lights.

(d) The lowest RVR should not be lower than the higher of:

(1) the minimum RVR specified in the AFM, if stated; or

(2) the RVR specified in Table 8.

Table 8

SA CAT I operation minima RVR (m) versus approach lighting system

Class of light facility		FALS	IALS	BALS	NALS
DH (ft)	150–160	400	500	600	700
	161–200	450	550	650	750
	201–210	450	550	650	750
	211–220	500	550	650	800
	221–230	500	600	700	900
	231–240	500	650	750	1 000
	241–249	550	700	800	1 100

Note: For class of approach lighting facility, see GM2 CAT.OP.MPA.110.

AMC2 SPA.LVO.100(c) Low-visibility operations and operations with operational credits

OPERATIONS WITH OPERATIONAL CREDITS — SPECIAL AUTHORISATION CATEGORY II (SA CAT II)

For special authorisation category II (SA CAT II) operations, the following should apply:

(a) The DH should be determined by the use of a radio altimeter or other device capable of providing equivalent performance, if so determined by the aircraft certification process, and be not lower than the highest of:

(1) the minimum DH specified in the AFM, if stated;

(2) the applicable OCH for the category of aeroplane;

(3) the DH to which the flight crew is qualified to operate; or

(4) 100 ft.

(b) The following visual aids should be available:

(1) approach lights as specified in Table 9;

(2) precision approach runway markings;

(3) category I runway lights.

(c) The lowest RVR minima to be used are specified in Table 9:

Table 9

SA CAT II operation minima: RVR (m) versus DH (ft)

	Class of light facility	FALS	IALS	BALS	NALS
DH (ft)	100–120	350	450	600	700
	121–140	400	500	600	700
	141–160	400	500	600	750
	161–199	400	550	650	750

AMC3 SPA.LVO.100(c) Low-visibility operations and operations with operational credits

OPERATIONS WITH OPERATIONAL CREDITS — EFVS OPERATIONS TO A RUNWAY

When conducting EFVS operations to a runway:

(a) the DA/H used should be the same as for operations without EFVS;

(b) the lowest RVR minima to be used should be determined:

(1) in accordance with criteria specified in the AFM for the expected weather conditions; or

(2) if no such criteria are specified, by reducing the RVR determined for operation without the use of EFVS/CVS in accordance with Table 10;

(c) where the lowest RVR to be used, determined in accordance with (b), is less than 550 m, then this should be increased to 550 m unless LVPs are established at the aerodrome of intended landing;

(d) where the EFVS is part of a CVS, it is only the EFVS element that should provide the operational credits. The other part of the CVS, the synthetic vision system (SVS), should not provide operational credits.

Table 10

Operations using EFVS/CVS — RVR/CMV reduction

RVR/CMV (m) required without the use of EFVS	RVR/CMV (m) with the use of EFVS
550	350*
600	400*
650	450*
700	450*
750	500*
800	550
900	600
1 000	650
1 100	750
1 200	800
1 300	900
1 400	900
1 500	1 000
1 600	1 100
1 700	1 100
1 800	1 200
1 900	1 300
2 000	1 300
2 100	1 400
2 200	1 500
2 300	1 500
2 400	1 600
* Reported RVR should be available (no CMV conversion).	

AMC4 SPA.LVO.100(c) Low-visibility operations and operations with operational credits

OPERATIONS WITH OPERATIONAL CREDITS — HELICOPTER SPECIAL AUTHORISATION CATEGORY I (HELI SA CAT I) OPERATIONS

For HELI SA CAT I operations, the following should apply:

(a) HELI SA CAT I operations should only be conducted to a runway with an approach lighting system. The following visual aids should be available:

(1) standard runway day markings, approach lights, runway edge lights, threshold lights, and runway end lights;

(2) for operations with an RVR below 450 m, runway centre line markings.

(b) An ILS/MLS that supports a HELI SA CAT I operation should be an unrestricted facility.

(c) The helicopter should be:

(1) equipped with a 3-axis autopilot capable of flying the approach to the minima;

(2) able to maintain Vy in IMC on a coupled Type B approach;

(3) equipped with a radio altimeter or other device capable of providing equivalent performance; and

(4) equipped with two independent navigation aids capable of Type B CAT I approaches and certified for CAT I.

(d) The DH of a HELI SA CAT I operation should not be lower than the highest of:

(1) the minimum DH specified in the AFM, if stated;

(2) the minimum height to which the PA aid can be used without the specified visual reference;

(3) the applicable OCH for Category A aeroplanes or the OCH for Category H if available;

(4) the DH to which the flight crew is qualified to operate;

(5) 130 ft on a CAT II landing system;

(6) 150 ft on a CAT I ILS certified to Class I/C/1 or MLS certified to 100 ft/E/1; or

(7) 200 ft on other landing systems;

(8) 200 ft unless the autopilot is a 4-axis autopilot with automatic level-off capability.

(e) The lowest RVR minima to be used are specified in Table 11.

Table 11

HELI SA CAT I operation minima

RVR versus approach lighting system				
DH (ft)	**Class of light facility**			
	FALS	**IALS**	**BALS**	**NALS**
201–250	450	650	750	1 000
181–200	300	450	650	900
151–180	300	350	550	750
130–150	300	300	400	600

(f) Operations

(1) The minimum crew should be two pilots or one pilot and a technical crew member. The technical crew member should be seated in the front seat and be allocated no other task than assisting the pilot, from the initial approach fix (IAF) onwards.

(2) On a CAT II landing system, the flight crew should use the radio altimeter or other equivalent device for the determination of the DH.

(3) On a CAT I ILS, the flight crew should use the altimeter for the determination of the DH. The crew should cross-check the altitude with the radio altimeter or equivalent device, considering the local geography.

(4) The AFCS and radio altimeter should be serviceable prior to commencing the approach.

(5) The approach should be flown in coupled 4-axis mode down to minima or below.

(6) The flight crew should promptly initiate a go-around if any of the following conditions are met below a 1 000-ft height:

(i) discrepancy in altitude/radio altitude information;

(ii) discrepancy in navigation information;

(iii) partial or total failure of an AFCS system or navigation system;

(iv) deviation of ¼ scale or more on the landing system navigation display.

(7) The planning minima at the alternate where a HELI SA CAT I approach is envisaged should be as defined in Table 12.

Table 12

Planning minima at the alternate with HELI SA CAT I operations

Type of approach	**Aerodrome ceiling**	**Weather minima RVR/VIS**
Two or more usable Type B instrument approach operations* **	DA/H* + 100 ft	RVR** + 300 m
One usable Type B instrument approach operation	DA/H + 150 ft	RVR + 450 m

* The higher of the usable DA/H or MDA/H.

** The higher of the usable RVR or VIS.

*** Compliance with CAT.OP.MPA.192(d) should be ensured.

(8) Under commercial air transport, if no other alternate is selected and the weather forecast at destination is not based on Part-MET of Regulation (EU) 2017/373, the planning minima at the alternate where a HELI SA CAT I approach is envisaged should be as defined in Table 13.

Table 13

Planning minima at the alternate with HELI SA CAT I operations with alternative weather source at destination

Type of approach	**Aerodrome ceiling**	**Weather minima RVR/VIS**
Two or more usable Type B instrument approach operations ***	DA/H * + 200 ft	RVR** + 600 m
One usable Type B instrument approach operation	DA/H + 300 ft	RVR + 900 m

* The higher of the usable DA/H or MDA/H.

** The higher of the usable RVR or VIS.

*** Compliance with CAT.OP.MPA.192(d) should be ensured.

(g) Crew training and competency

(1) Under CAT, NCC and SPO, the aerodrome used for HELI SA CAT I operations should be considered as a Category C aerodrome under ORO.FC.105.

(2) A crew member should undergo training to determine the eligibility of a HELI SA CAT I approach as determined under points (a) to (c), and to determine the applicable minima under points (d) and (e).

(3) A crew member should have the relevant knowledge to implement the operating procedures described in point (f)

(4) A crew member that is involved in HELI SA CAT I operations should undergo initial and recurrent training to proficiency using a suitable FSTD, including one approach and landing and one go-around using the lowest minima defined in points (d) and (e).

(5) The recurrent training should have a validity of 6 calendar months. The validity period should be counted from the end of the month when the check was taken. When the training is undertaken within the last 3 months of the validity period, the new validity period should be counted from the previous expiry date.

(6) In addition to (5), a technical crew member that is involved in HELI SA CAT I operations should be trained to perform navigation and monitoring functions under IFR, as described under AMC3 SPA.NVIS.130(f). The training and checking should include all of the following on the given helicopter type:

- (i) initial and recurrent general training;
- (ii) initial and recurrent monitoring training;
- (iii) initial and recurrent navigation training;
- (iv) initial and recurrent aircraft/FSTD training focusing on crew cooperation with the pilot;
- (v) line flying under supervision (LIFUS);
- (vi) initial and recurrent operator proficiency checks, which should meet all of the following criteria:
  - (A) the technical crew member should complete an operator proficiency check to demonstrate competence in carrying out normal, abnormal and emergency procedures, covering the relevant aspects associated with the flight operational tasks described in the operations manual and not covered in the line check;
  - (B) the initial training course should include an operator proficiency check;
  - (C) the operator proficiency check should be valid for a given helicopter type. In order to consider an operator proficiency check to be valid for several helicopter types, the operator should demonstrate that the types are sufficiently similar from the technical crew member's perspective;
  - (D) the validity period of the operator proficiency check should be 12 calendar months. The validity period should be counted from the end of the month when the check was performed. When the operator proficiency check is undertaken within the last 3 months of the validity period, the new validity period shall be counted from the original expiry date;
  - (E) the operator proficiency check should be conducted by a suitably qualified instructor nominated by the operator to conduct flight crew operator proficiency checks;
- (vii) initial and recurrent line checks, which should meet all of the following criteria:
  - (A) the line check should be performed on the helicopter;

(B) the technical crew member should demonstrate competence in carrying out normal operations described in the operator's operations manual;

(C) the line check should take place after the completion of the LIFUS;

(D) the validity period of the line check should be 12 calendar months. The validity period should be counted from the end of the month when the check was performed. When the line check is undertaken within the last 3 months of the validity period, the new validity period should be counted from the original expiry date;

(E) the line check should be conducted by a suitably qualified commander nominated by the operator;

(F) any task-specific items may be checked by a suitably qualified technical crew member nominated by the operator and trained in CRM concepts and the assessment of non-technical skills.

GM1 SPA.LVO.100(c) Low-visibility operations and operations with operational credits

THE CONCEPT OF OPERATIONS WITH OPERATIONAL CREDITS

For each specific class of standard take-off or approach operations, a standard combination of airborne equipment, aerodrome infrastructure and equipment, and procedures (system components) needs to be available to ensure the required performance of the total system. In real-life operations, one or more system components may exceed the required standard performance. The aim of the concept of operations with operational credits is to exploit such enhanced performance to provide operational flexibility beyond the limits of standard operations.

In certain circumstances it may be possible to achieve the required system performance without some standard items being available by using other enhanced equipment or procedures. In order to apply an operational credit, it is necessary that the equipment or procedures employed mitigate effectively the shortcomings in other system components. Another application of operational credits is to use the enhanced performance of certain system components to allow operations to lower than the standard minima. For approach operations, an operational credit can be applied to the instrument or the visual segment or both.

Where an operational credit allows operation to lower than standard minima, this is not considered a separate approach classification.

GM2 SPA.LVO.100(c) Low-visibility operations and operations with operational credits

OPERATIONS WITH OPERATIONAL CREDITS — SPECIAL AUTHORISATION CATEGORY I (SA CAT I) OPERATIONS

SA CAT I is an operational credit that exploits a navigation solution with superior performance to that required for standard CAT I by extending the instrument segment of CAT I approach operations. This navigation solution may be an ILS installation with the necessary performance coupled to a suitably certified autoland system or a HUD or equivalent display system or SVGS. The extended instrument segment means that the DH can be reduced from the standard minimum of 200 down to 150 ft. The lower DH allows a corresponding reduction in the RVR required for the approach.

SA CAT I is not a separate approach classification; it is an operational credit applied to a CAT I operation.

GM3 SPA.LVO.100(c) Low-visibility operations and operations with operational credits

OPERATIONS WITH OPERATIONAL CREDITS — SPECIAL AUTHORISATION CATEGORY II (SA CAT II) OPERATIONS

SA CAT II is an operational credit that applies to the visual segment of an approach conducted where aerodrome, runway and approach lighting systems do not meet the usual requirements for a CAT II precision lighting system. SA CAT II exploits the performance of a suitably certified HUDLS or autoland system. The DH will be the same as for standard CAT II, and the required RVR will depend on the class of light facility installed.

SA CAT II is not a separate approach classification; it is an operational credit applied to a CAT II operation usually in a CAT I runway.

GM4 SPA.LVO.100(c) Low-visibility operations and operations with operational credits

OPERATIONS WITH OPERATIONAL CREDITS — EFVS OPERATIONS

(a) EFVS operations, if approved, exploit the improved visibility provided by the EFVS to allow an operational credit applied to the visual segment of an instrument approach. An EFVS cannot be used to extend the instrument segment of an approach and thus the DH for operation with an EFVS is always the same as for the same approach conducted without an operational credit.

(b) EFVS operations require specific approval from the competent authority in accordance with Part-SPA. However, other EFVS operations may be conducted by operators and without a specific approval if specifically covered in accordance with Part-CAT, Part-NCC or Part-SPO (e.g. 'EFVS 200').

(c) Equipment for EFVS operations

  (1) In order to conduct EFVS operations, a certified EFVS is used. An EFVS is an enhanced vision system (EVS) that also incorporates a flight guidance system and displays the image on a HUD or an equivalent display. The flight guidance system will incorporate aircraft flight information and flight symbology.

  (2) For operations for which a minimum flight crew of more than one pilot is required, the aircraft will also be equipped with a suitable display of EFVS sensory imagery for the pilot monitoring the progress of the approach.

  (3) Legacy systems may be certified as 'EVS with an operational credit'. Such a system may be considered an EFVS used for approach (EFVS-A).

(4) Aircraft holding a type certificate issued by a third country may be certified for operations equivalent to EFVS operations. Specific approval for an operational credit for EFVS operations will be available only if the operator can demonstrate that the equipment meets all the requirements for certification in accordance with CS-AWO.

(5) For approaches for which natural visual reference is not required prior to touchdown, the EFVS (EFVS used for landing (EFVS-L)) will additionally display:

(i) flare prompt or flare guidance information; and

(ii) height AGL.

(d) Suitable approach procedures

(1) For types of approach operation, refer to AMC1 SPA.LVO.110 ‘Additional verification of the suitability of runways for EFVS operations’.

EFVS operations may be used for 3D approach operations. These may include operations based on non-precision approach (NPA) procedures, approach procedures with vertical guidance and PA procedures including approach operations requiring specific approvals, provided that the operator holds the necessary approvals.

An NPA procedure flown using vertical guidance from computer-generated navigation data from ground-based, space-based, self-contained navigation aids, or a combination of these may be considered a 3D instrument approach operation, so EFVSs may be used for NPA procedures provided that vertical guidance is available to the pilot.

(2) Offset approaches

The extent to which EFVSs can be used for offset approaches will depend on the FOV of the specific system. Where an EFVS has been demonstrated to be usable with a final approach track offset more than 3 degrees from the runway centre line, this will be stated in the AFM.

Instrument approach procedures (IAPs) may have the final approach course significantly offset from the centre line of the runway and still be considered ‘straight-in approaches’. Many approach procedures with an offset final approach course are constructed so that the final approach course crosses the runway centre line extended well out from the runway. Depending on the construction of a particular procedure, the wind conditions and the available FOV of a specific EFVS installation, the required visual references may not come into view before the aircraft reaches the DH.

(3) Circling approaches

EFVSs incorporate a HUD or an equivalent system so that the EFVS image is visible in the pilot’s forward external FOV. Circling operations require the pilot to maintain visual references which may not be directly ahead of the aircraft and may not be aligned with the current flight path. EFVSs cannot therefore be used in place of natural visual reference for circling approaches.

(e) For aerodrome operating minima for EFVS operations, refer to AMC3 SPA.LVO.100(c).

The performance of EFVSs depends on the technology used and weather conditions encountered. The minimum RVR for an approach is based on the specific capabilities of the installed equipment in the expected weather conditions, so the RVR for a particular operation is determined according to criteria stipulated in the AFM.

Table 10 has been provided to allow calculation of an appropriate RVR for aircraft where the AFM does not contain criteria to determine the minimum usable RVR. This table has been developed after an operational evaluation of two different EVSs both using infrared sensors, along with data and support provided by the Federal Aviation Administration (FAA). Approaches were flown in a variety of conditions including fog, rain and snow showers, as well as at night to aerodromes located in mountainous terrain. Table 10 contains conservative figures to cater for the expected performance of infrared sensors in the variety of conditions that might be encountered.

(f) The conditions for commencement and continuation of the approach are in accordance with CAT.OP.MPA.305, NCC.OP.230, NCO.OP.210 and SPO.OP.215 as applicable.

Pilots conducting EFVS operations may commence an approach and continue that approach below 1 000 ft above the aerodrome or into the final approach segment (FAS) if:

(1) the reported RVR or converted meteorological visibility (CMV) is equal to or greater than the lowest RVR minima determined; and

(2) all the conditions for conducting EFVS operations are met.

If any equipment required for EFVS operations is unserviceable or unavailable, then the conditions for conducting EFVS operations would not be satisfied, and the approach cannot be commenced. Operators may develop procedures for flight crew to follow in the event of unserviceability arising after the aircraft descends below 1 000 ft above the aerodrome or into the FAS. Such procedures should ensure that the approach is not continued unless the RVR is sufficient for the type of approach that can be conducted with equipment that remains available. In the event of failure of the equipment required for EFVS operations, a go-around would be executed unless the RVR reported prior to commencement of the approach was sufficient for the approach to be flown without the use of EFVS in lieu of natural vision.

(g) EFVS image requirements at the DA/H are specified in AMC7 SPA.LVO.105(c).

The requirements for features to be identifiable on the EFVS image in order to continue approach below DH are more stringent than the visual reference requirements for the same approach flown without EFVS. This is necessary because the EFVS might not display the colour of lights used to identify specific portions of the runway and might not consistently display the runway markings. Any visual approach path indicator using colour-coded lights may be unusable.

(h) Obstacle clearance in the visual segment

The 'visual segment' is the portion of the approach between the DH and the runway threshold. In the case of EFVS operations, this part of the approach may be flown using the EFVS image as the primary reference and there may be obstacles that are not always identifiable on an EFVS image. Approach procedures designed in accordance with PANS-OPS criteria is required to ensure that the visual segment is protected for obstacles by the visual segment surface (VSS) that extends from 60 m before the threshold to the location of the OCH. Procedures not designed in accordance with PANS-OPS may have not been assessed for terrain or obstacle clearance below the OCH–and may not provide a clear vertical path to the runway at the normally expected descent angle. SA CAT I and CAT II/III runways subject to EU aerodrome regulations are required to provide an OFZ, which offers protection from obstacles in the visual segment. Standard CAT I runways may also provide an OFZ and if not, the lack of an OFZ shall be indicated, according to ICAO Annex 4, normally on the approach chart.

(i) Visual reference requirements at minimum height to continue approach without natural visual reference

For operations other than EFVS to touchdown, natural visual reference is required before landing. The objective of this requirement is to ensure that the pilot will have sufficient visual reference to land. The visual reference should be the same as the one required for the same approach flown without the use of EFVS. The specific height at which this is required will depend on the capability of the aircraft installation and will be specified in the AFM. For aircraft certified for EFVS operations but where no such height is specified in the AFM, natural visual reference is required by a height of 100 ft above the threshold elevation.

Specific EFVSs may have additional requirements that must be fulfilled at this height to allow the approach to continue, such as a requirement to check that the elements of the EFVS display remain correctly aligned and scaled to the external view. Any such requirements will be detailed in the AFM.

(j) Use of EFVS to touchdown

In order for the use of EFVS to touchdown to be approved, the EFVS will provide flare prompt or flare guidance (EFVS-L). This mitigates the fact that a 2D image and a narrow FOV displayed by the EFVS may cause erroneous perceptions of depth or height. The EFVS will also display height above the runway by the use of a radio altimeter or other device capable of providing equivalent performance. Unless the operator has verified that the terrain ahead of the threshold and landing system assessment area (LSAA) slope is suitable for the use of a radio altimeter, such a system should not be relied upon to provide accurate information about the height of the aircraft above the runway threshold until the aircraft is over the runway surface.

(k) Go-around

A go-around will be promptly executed if the required visual references are not maintained on the EFVS image at any time after the aircraft has descended below the DA/H or if the required visual references are not distinctly visible and identifiable using natural vision after the aircraft is below the minimum height to continue approach without natural visual reference (if applicable). It is considered more likely that an operation with EFVS could result in initiation of a go-around below the DA/H than the equivalent approach flown without EFVS. According to AMC1 SPA.LVO.105(f), operators involved in EFVS operations should keep records of the number of successful and unsuccessful approaches using EFVS in order to detect and act on any undesirable trends.

For category II and III PA procedures designed in accordance with PANS-OPS criteria, obstacle protection is provided for a go-around initiated below the DH (balked landing) by means of an obstacle free zone (OFZ). An OFZ may also be provided for category I PA procedures. Where an OFZ is not provided for a category I PA, this may be indicated on the approach chart. NPA procedures and approach procedures with vertical guidance provide obstacle clearance for the missed approach based on the assumption that the missed approach is executed at or above the DH. The DH should be located at or before the MAPt.

GM5 SPA.LVO.100(c) Low-visibility operations and operations with operational credits

OPERATIONS WITH OPERATIONAL CREDITS — COMBINED VISION SYSTEMS

A combined vision system (CVS) consisting of an EFVS and an SVS can be approved for EFVS operations if it meets all the certification requirements for an EFVS.

GM6 SPA.LVO.100(c) Low-visibility operations and operations with operational credits

OPERATIONS WITH OPERATIONAL CREDITS — HELICOPTER SPECIAL AUTHORISATION CATEGORY I (HELI SA CAT I) OPERATIONS

HELI SA CAT I is an operational credit that exploits a navigation solution with superior performance to that required for standard CAT I by extending the instrument segment of CAT I approach operations. This navigation solution may be an ILS installation with the necessary performance coupled to a suitably certified 3- or 4-axis autopilot capable of handling low speeds, together with the superior outside visibility of the helicopter on the visual segment, and the go-around performance of a helicopter. The better outside visibility and the lower speed allows a reduction in the RVR required for the approach, for a given DH. With a 4-axis autopilot and auto-level-off capability, the DH can also be reduced from the standard minimum of 200 ft down to 150 or 130 ft.

HELI SA CAT I is not a separate approach classification; it is an operational credit applied to a CAT I operation.

~~GM1 SPA.LVO.100(f) Low Visibility Operations~~

~~**OPERATIONS UTILISING EVS**~~

~~AMC1 SPA.LVO.105 LVO approval~~

~~**OPERATIONAL DEMONSTRATION – AEROPLANES**~~

~~AMC2 SPA.LVO.105 LVO approval~~

~~OPERATIONAL DEMONSTRATION – HELICOPTERS~~

~~AMC3 SPA.LVO.105 LVO approval~~

~~CONTINUOUS MONITORING – ALL AIRCRAFT~~

~~AMC4 SPA.LVO.105 LVO approval~~

~~TRANSITIONAL PERIODS FOR CAT II AND CAT III OPERATIONS~~

~~AMC5 SPA.LVO.105 LVO approval~~

~~MAINTENANCE OF CAT II, CAT III AND LVTO EQUIPMENT~~

~~AMC6 SPA.LVO.105 LVO approval~~

~~ELIGIBLE AERODROMES AND RUNWAYS~~

AMC1 SPA.LVO.105(a) Specific approval criteria

AIRCRAFT CERTIFICATION FOR THE INTENDED OPERATIONS

(a) Aircraft used for LVTO in an RVR of less than 125 m should be equipped with a system certified for the purpose.

(b) Aircraft used for low-visibility approach operations should be equipped in accordance with the applicable airworthiness requirements and certified as follows:

(1) For CAT II operations, the aircraft should be certified for CAT II operations.

(2) For CAT III operations, the aircraft should be certified for CAT III operations.

(3) For SA CAT I, the aircraft should be certified for SA CAT I operations.

(4) For SA CAT II, the aircraft should be certified for CAT II operations and be equipped with HUDLS or fail-passive autoland or better.

(5) For EFVS operations, the aircraft should be equipped with a certified EFVS-A or EFVS-L.

GM1 SPA.LVO.105(a) Specific approval criteria

AIRCRAFT CERTIFICATION — EQUIPMENT ELIGIBLE FOR LOW VISIBILITY TAKE-OFF IN AN RVR LESS THAN 125 M

Systems that are used to qualify for take-off in an RVR less than 125 m typically allow the pilot to use the external visual cues as well as instrumented guidance to track the runway centre line. The kind of systems in use today include paravisual display (PVD) and HUD. It is expected that EFVSs will be certified for take-off guidance in the future. Where the PVD or HUD uses an ILS localiser signal as reference, the ILS sensitive area must be protected by the LVPs at the aerodrome.

AMC1 SPA.LVO.105(c) Specific approval criteria

OPERATING PROCEDURES FOR LVOs

Prior to commencing an LVO, the pilot-in-command/commander should be satisfied that:

(a) the status of visual and non-visual facilities is as required;

(b) if LVPs are required for such operations, LVPs are in effect; and

(c) the flight crew members are appropriately qualified.

AMC2 SPA.LVO.105(c) Specific approval criteria

OPERATING PROCEDURES — GENERAL

(a) Operating procedures should be established for all types of LVOs and operations with operational credits for which an operator is seeking approval. The operating procedures should:

  (1) be consistent with the AFM;

  (2) be appropriate to the technology and equipment to be used;

  (3) specify the duties and responsibilities of each flight crew member in each relevant phase of flight;

  (4) ensure that flight crew workload is managed to facilitate effective decision-making and monitoring of the aircraft; and

  (5) minimise, as much as practical, the deviation from normal procedures used for routine operations (non-LVOs).

(b) Operating procedures should include:

  (1) the required checks for the satisfactory functioning of the aircraft equipment, both before departure and in flight;

  (2) the correct seating and eye position;

  (3) determination of aerodrome operating minima;

  (4) the increment to be added to minima for use by pilots-in-command/commanders who are new to the aircraft type, if applicable;

(5) the effect on aerodrome operating minima of temporarily failed or downgraded ground equipment;

(6) the effect on aerodrome operating minima of the failure or change of the status of any aircraft systems;

(7) when the LVPs at the aerodrome are required. LVPs are required:

(i) for low-visibility flight approach operations;

(ii) for LVTOs with RVR less than 400 m.

If an operator selects an aerodrome with equivalent procedures, where the term 'LVPs' is not used (e.g. regional procedures), the operator should verify that suitable procedures are established to ensure an equivalent level of safety to that achieved at approved aerodromes. This situation should be clearly noted in the operations manual or procedures manual, including guidance to the flight crew on how to determine that the suitable procedures are in effect at the time of an actual operation. Note: the AFM may state that some elements of LVPs are not required and therefore the equivalent level of safety may be established on that basis;

(8) a requirement for an 'approaching minima' call-out to prevent inadvertent descent below the DA/H;

(9) the requirement for height call-outs below 200 ft to be based on the use of a radio altimeter or other device capable of providing equivalent performance, if applicable;

(10) the required visual references;

(11) the action to be taken in the event of loss of the required visual references; and

(12) the maximum allowable flight path deviations and action to be taken in the event that such deviations occur.

(c) Operators required to comply with the requirements of Annex III (Part-ORO) to this Regulation should include operating procedures in the operations manual as required by ORO.MLR.100. The operators to which Part-ORO does not apply should include the operating procedures in a 'procedures manual'.

AMC3 SPA.LVO.105(c) Specific approval criteria

OPERATING PROCEDURES — CAT II

For CAT II operations, the following should apply:

(a) The flight crew should consist of at least two pilots.

(b) The approach should be flown using a certified system as identified in the AFM.

(c) If the approach is flown using autopilot, for a manual landing the autopilot should remain engaged until after the pilot has achieved visual reference.

(d) All height call-outs below 200 ft above the runway threshold elevation should be determined by the use of a radio altimeter or other device capable of providing equivalent performance.

(e) The DH should be determined by the use of a radio altimeter or other device capable of providing equivalent performance, if so determined by the aircraft certification process.

(f) At DH, the following visual references should be distinctly visible and identifiable to the pilot:

(1) a segment of at least three consecutive lights, which are the centre line of the approach lights or TDZ lights or runway centre line lights or edge lights or a combination of these; and

(2) a visual reference that should include a lateral element of the ground pattern, such as an approach lighting crossbar, or the landing threshold, or a barrette of the TDZ lighting unless the operation is conducted using a HUD or an equivalent system to touchdown.

AMC4 SPA.LVO.105(c) Specific approval criteria

OPERATING PROCEDURES — CAT III

For CAT III operations, the following should apply:

(a) The flight crew should consist of at least two pilots.

(b) The approach should be flown using a certified system as identified in the AFM.

(c) All height call-outs below 200 ft above the runway threshold elevation should be determined by the use of a radio altimeter or other device capable of providing equivalent performance.

(d) For operations in which a DH is used, the DH should be determined by the use of a radio altimeter or other device capable of providing equivalent performance, if so determined by the aircraft certification process.

(e) At DH, the following visual references should be distinctly visible and identifiable to the pilot:

(1) for operations conducted either with fail-passive flight control systems or with the use of an approved HUD or equivalent display system: a segment of at least three consecutive lights, which are the centre line of the approach lights, or TDZ lights, or runway centre line lights, or runway edge lights, or a combination of these; and

(2) for operations conducted either with fail-operational flight control systems or with a fail-operational hybrid landing system using a DH: at least one centre line light to be attained and maintained by the pilot.

(f) For operations with no DH, there is no specification for visual reference with the runway prior to touchdown.

AMC5 SPA.LVO.105(c) Specific approval criteria

OPERATING PROCEDURES — SA CAT I

For SA CAT I operations, the following should apply:

(a) The approach should be flown using a certified system as identified in the AFM.

(b) All height call-outs below 200 ft above the runway threshold elevation should be determined by the use of a radio altimeter or other device capable of providing equivalent performance.

(c) The DH should be determined by the use of a radio altimeter or other device capable of providing equivalent performance, if so determined by the aircraft certification process.

(d) At DH the following visual references should be visible to the pilot:

(1) a segment of at least three consecutive lights, which are the centre line of the approach lights, or TDZ lights, or runway centre line lights, or runway edge lights, or a combination of these; and

(2) a visual reference that should include a lateral element of the ground pattern, such as an approach lighting crossbar, or the landing threshold, or a barrette of the TDZ lighting unless the operation is conducted utilising an approved HUD or an equivalent system usable down to 120 ft above the runway threshold.

AMC6 SPA.LVO.105(c) Specific approval criteria

OPERATING PROCEDURES — SA CAT II

For SA CAT II operations, the following should apply:

(a) The flight crew should consist of at least two pilots.

(b) The approach should be flown using a certified HUDLS or autoland system as identified in the AFM.

(c) All height call-outs below 200 ft above the runway threshold elevation should be determined by the use of a radio altimeter or other device capable of providing equivalent performance.

(d) The DH should be determined by the use of a radio altimeter or other device capable of providing equivalent performance, if so determined by the aircraft certification process.

(e) At DH the visual references should be distinctly visible and identifiable to the pilot:

(1) a segment of at least three consecutive lights, which are the centre line of the approach lights or TDZ lights, or runway centre line lights, or runway edge lights or a combination of these;

(2) a visual reference that should include a lateral element of the ground pattern, such as an approach lighting crossbar, or the landing threshold, or a barrette of the TDZ lighting.

AMC7 SPA.LVO.105(c) Specific approval criteria

OPERATING PROCEDURES — EFVS OPERATIONS TO A RUNWAY

For EFVS operations to a runway, the following should apply:

(a) The approach should be flown using a certified EFVS-A or EFVS-L as identified in the AFM.

(b) The pilot flying should use the EFVS throughout the approach.

(c) In multi-pilot operations, the pilot monitoring should monitor the EFVS-derived information.

(d) The approach between the final approach fix (FAF) and the DA/H should be flown using vertical flight path guidance mode (e.g. flight director)

(e) The approach may be continued below the DA/H provided that the pilot can identify on the EFVS image either:

(1) the approach light system; or

(2) both of the following:

(i) the runway threshold identified by the beginning of the runway landing surface, the threshold lights or the runway end identifier lights; and

(ii) the TDZ identified by the TDZ lights, the TDZ runway markings or the runway edge lights.

(f) Unless the aircraft is equipped with a certified EFVS-L, a missed approach should be executed promptly if the required visual reference is not distinctly visible and identifiable to the pilot without reliance on the EFVS by the following height above the threshold:

(1) the height below which an approach should not be continued if natural visual reference is not acquired by the crew as stated in the AFM; or

(2) if the AFM does not specify such a height, 100 ft.

GM1 SPA.LVO.105(c)~~100(e) Low visibility operations~~ Specific approval criteria

FLIGHT CREW ACTIONS IN CASE OF AUTOPILOT FAILURE AT OR BELOW DH IN FAIL-PASSIVE CAT III OPERATIONS

[…]

AMC1 SPA.LVO.105(g) Specific approval criteria

SAFETY ASSESSMENT — MONITORING, DATA COLLECTION AND PERFORMANCE INDICATORS

(a) The operator should monitor LVOs and operations with operational credits in order to validate the effectiveness of the applicable aircraft flight guidance systems, training, flight crew procedures, and aircraft maintenance programme, and to identify hazards.

(b) Data should be collected whenever an LVO or an operation with an operational credit is attempted regardless of whether the approach is abandoned, is unsatisfactory, or is concluded successfully. The data should include records of the following:

(1) occasions when it was not possible to commence an approach due to deficiencies or unserviceabilities of related airborne equipment;

(2) occasions when approaches were discontinued, including the reasons for discontinuing the approach and the height above the runway at which the approach was discontinued;

(3) occasions when system abnormalities required pilot intervention to ensure a continued approach or safe landing;

(4) landing performance, whether or not the aircraft landed satisfactorily within the desired touchdown area with acceptable lateral velocity or cross-track error. The approximate

lateral and longitudinal position of the actual touchdown point in relation to the runway centre line and the runway threshold, respectively, should be recorded.

(c) Data about LVOs should be collected by means of the operator's flight data monitoring programme supplemented by other means including reports submitted by flight crew. Operators that do not have a flight data monitoring programme should use reports submitted by flight crew as the primary means of gathering data.

(d) Performance indicators should include the following:

(1) the rate of unsuccessful low-visibility approaches, i.e. the number of attempted approaches terminating in discontinued approaches, approaches where pilot intervention was required to ensure a continued approach or safe landing or where landing performance was unsatisfactory, compared to the number of low-visibility approaches attempted;

(2) measures of performance of the airborne equipment for low-visibility approaches or operations with operational credits;

(3) safety performance indicators related to other specific risks associated with LVOs.

(e) The following information should be retained for at least 5 years:

(1) the total number of low-visibility approaches or operations with an operational approval attempted or completed, including practice approaches, by aircraft type; and

(2) reports of unsatisfactory approaches and/or landings, by runway and aircraft registration, in the following categories:

(i) airborne equipment faults;

(ii) ground facility difficulties;

(iii) missed approaches because of air traffic control (ATC) instructions; or

(iv) other reasons.

AMC2 SPA.LVO.105(g) Specific approval criteria

SAFETY ASSESSMENT PRIOR TO OBTAINING AN APPROVAL

(a) Prior to commencing LVOs or operations with operational credits, an operator should demonstrate to the competent authority that such operations will achieve an acceptable level of safety. This requires the operator to gather data from operations using the relevant systems and procedures and conduct safety assessments taking that data into account.

(b) The operator applying for the approval of low-visibility approach operations should determine the minimum number of approaches required to gather sufficient data to demonstrate an acceptable level of safety and the time period over which such data should be gathered.

(c) If an operator is applying for more than one LVO approval or an approval for operation with operational credits for a particular aircraft type, then data gathered from operations using the systems and procedures designed for one classification of operations or operation with operational credits may be used to support the application for another classification of operations or operation with operational credits provided the following elements are similar:

(1) type of technology, including:

(i) flight control/guidance system (FGS) and associated displays and controls;

(ii) flight management system (FMS) and level of integration with the FGS;

(iii) use of HUD or an equivalent display system; and

(iv) use of EFVS;

(2) operational procedures, including:

(i) alert height;

(ii) manual landing/automatic landing;

(iii) no DH operations;

(iv) use of HUD or an equivalent display system in hybrid operations; and

(v) use of EFVS to touchdown; and

(3) handling characteristics, including:

(i) manual landing from automatic or HUD or an equivalent display system guided approach;

(ii) manual missed approach procedure from automatic approach; and

(iii) automatic/manual roll-out.

(d) An operator holding an approval for low-visibility approach operations or operations with operational credits may use data gathered from approaches conducted using one aircraft type to support an application for approval for a different aircraft type or variants provided the following elements are similar:

(1) type of technology, including the following:

(i) FGS and associated displays and controls;

(ii) FMS and level of integration with the FGS;

(iii) use of HUD or an equivalent display system; and

(iv) use of EFVS;

(2) operational procedures, including:

(i) alert height;

(ii) manual landing/automatic landing;

(iii) no DH operations;

(iv) use of HUD or an equivalent display system in hybrid operations; and

(v) use of EFVS to touchdown; and

(3) handling characteristics, including:

(i) manual landing from automatic or HUD or an equivalent display system guided approach;

(ii) manual missed approach procedure from automatic approach; and

(iii) automatic/manual roll-out.

GM1 SPA.LVO.105(g) ~~LVO approval~~ Specific approval criteria

SPECIFIC APPROVAL CRITERIA — ~~FOR A~~ SUCCESSFUL ~~CAT II, OTS CAT II, CAT III~~ APPROACH AND ~~AUTOMATIC~~ LANDING

(a) The purpose of this GM is to provide operators with supplemental information regarding the criteria for a successful approach and landing ~~to facilitate fulfilling the requirements prescribed in SPA.LVO.105~~.

(b) An approach may be considered to be successful if:

(1) from 500 ft to start of the flare:

(i) speed is maintained ~~as specified in AMC-AWO 231, paragraph 2 'Speed Control' and~~ within +/- 5 kt of the intended speed, disregarding rapid fluctuations due to turbulence;

(ii) no relevant system failure occurs;

and

(2) from 300 ft to the DH:

(i) no excess deviation occurs; and

(ii) no centralised warning gives a missed approach procedure command (if installed).

(c) A~~n automatic~~ landing may be considered to be successful if:

(1) no relevant system failure occurs;

(2) no flare failure occurs;

(3) no de-crab failure occurs (if installed);

(4) longitudinal touchdown is beyond a point on the runway ~~60~~150 m after the threshold and before the end of the touchdown zone (TDZ) ~~light~~ (~~900~~750 m from the threshold);

(5) lateral touchdown with the outboard landing gear is not outside the ~~touchdown zone~~ TDZ ~~light~~ edge;

(6) sink rate is not excessive;

(7) bank angle does not exceed a bank angle limit; and

(8) no roll-out failure or deviation (if installed) occurs.

(d) More details can be found in ~~CS-AWO 131, CS-AWO 231 and AMC-AWO 231~~CS AWO.A.ALS.106, CS AWO.B.CATII.113 and AMC AWO.B.CATII.113.

GM2 SPA.LVO.105(g) Specific approval criteria

SAFETY PERFORMANCE MONITORING

(a) Data gathering for safety performance monitoring of LVOs and operations with operational credits will need to include sufficient information for the operator to identify hazards and assess the risks associated with LVOs and operations with operational credits.

(b) The following data relating to LVOs and operations with operational credits may be gathered via flight crew reports, flight data monitoring or other means, as appropriate:

(1) date and time;

(2) aircraft details (type and registration);

(3) airport, approach procedure, final approach and take-off area (FATO) and/or runway used;

(4) the type of LVO or operation with operational credits attempted or completed;

(5) weather conditions including wind, reported RVR and natural phenomena that restrict visibility;

(6) the reason for a discontinued approach (if applicable);

(7) details of any pilot intervention to ensure a continued approach or safe landing;

(8) adequacy of speed control;

(9) trim at time of automatic flight control system disengagement (if applicable);

(10) compatibility of automatic flight control system, flight director and raw data;

(11) an indication of the position of the aircraft relative to the centre line when descending through to 100 ft;

(12) touchdown position relative to the TDZ;

(13) an assessment of the sink rate, lateral velocity and bank angle at touchdown;

(14) the nature of any problems encountered by the crew in relation to operating procedures or training; and

(15) any human factors issues that arose in relation to the operation.

(c) Where data is gathered as part of the operator's flight data monitoring programme, procedures should be established to ensure that information that is only available directly from the flight crew or other sources (e.g. weather information) is captured.

(d) In order to assess the risks associated with LVOs and operations with operational credits, operators may consider hazards with the potential to result in the following unacceptable safety outcomes:

(1) loss of control in flight;

(2) runway overrun or excursion;

(3) controlled flight into terrain;

(4) runway incursion and ground collision; and

(5) airborne conflict.

(e) Operators’ safety control processes will ensure that LVOs and operations with operational credits:

(1) meet the safety objectives and performance standards established in the operator’s safety policy;

(2) achieve at least the same level of safety as operations other than LVOs and operations without operational credits; and

(3) have a continuously improving safety performance.

(f) Two methods to determine the rate of unsuccessful low-visibility approaches are described below:

(1) Fail/pass method (binary): the rate of unsuccessful low-visibility approaches determined in accordance with GM1 SPA.LVO.105(g) should not exceed 5 %. If the unsuccessful operations appear to occur on a given aircraft, aircraft series or runway, specific mitigation measures need to be established and a separate specific rate may need to be calculated and monitored. Note: the term ‘aircraft series’ is explained in GM5 SPA.LVO.110. Operators may choose to apply a lower rate than 5 %.

(2) Continuous method: this method may be selected by operators with a flight data monitoring programme. This methodology is more refined and allows identifying undesirable trends earlier and possibly before they become severe. This method applies an event monitoring methodology in which the deviations from the nominal performance are categorised according to their severity (severity index). For each event (criterion), a level of deviation may be defined as follows:

(i) Low (‘green’): the deviation is small and within the limits of nominal behaviour. No action is required.

(ii) Medium (‘yellow’): the deviation is above the criteria for low (‘green’) and below the criteria for high (‘red’). No corrective action should be required based on an isolated occurrence; however, a corrective action should be taken if the situation does not improve, or a negative trend is identified. The monitoring should then focus on the particular runway or aircraft series or combination of those.

(iii) High (‘red’): the deviation is undesirably high. Investigation and corrective action should be undertaken even based on an isolated occurrence. The threshold for level high (‘red’) may be based on the criteria of GM1 SPA.LVO.105(g).

GM3 SPA.LVO.105(g) Specific approval criteria

DATA GATHERING FOR SAFETY ASSESSMENT PRIOR TO OBTAINING AN APPROVAL

(a) General

The intention of the safety assessment is to validate the use and effectiveness of the applicable aircraft flight control and guidance systems, procedures, flight crew training and aircraft maintenance programme. The intention is not to repeat the statistical analysis required for certification of equipment, but rather to demonstrate that the various elements of the 'total system' for LVOs work together for a particular operator.

(b) Data gathering for safety assessment — LVTOs

(1) If the procedures used for LVTOs are not significantly different from those used for standard take-offs, it may be sufficient for operators to conduct only a small number of take-offs using the procedures established for LVTOs for the purpose of data gathering. The following could be considered as a minimum:

(i) For LVTOs in an RVR of 125 m or more if procedures are similar to those used for standard take-offs: 1 take-off;

(ii) For LVTOs in an RVR of less than 125 m or any other LVTOs using specific procedures: 10 take-offs.

(2) An operator holding an approval for LVTOs on one aircraft type and applying the approval for LVTOs on another type or variant may use data from LVTOs conducted on the first type if the following are similar:

(i) level of technology, including flight deck displays, HUD or an equivalent guidance system;

(ii) operational procedures; and

(iii) handling characteristics.

(c) Data gathering for safety assessment — approach operations with a DH below 200 ft

The data required for the safety assessment needs to be gathered from approaches conducted in a representative sample of expected operating conditions. The operator needs to take seasonal variations in operating conditions such as prevalent weather, planned destinations and operating bases, and ensure that the approaches used for data gathering are conducted over a sufficient period of time to be representative of the planned operation.

In order to ensure that the data is representative of planned operations, approaches are conducted at a variety of airports and runways. If more than 30 % of the approaches are conducted to the same runway, the operator may increase the number of approaches required and take measures to ensure that the data is not distorted.

The number of approaches used for data gathering will depend on the performance indicators and analysis methods used by the operator. The operator will need to demonstrate that the operation for which approval is sought will achieve an acceptable level of safety. The following figures may be considered a minimum for an operator without previous experience of low-visibility approach operations:

(1) for approval of operations with a DH of not less than 50 ft: 30 approaches;

(2) for approval of operations with a DH of less than 50 ft: 100 approaches.

Approaches conducted for the purpose of gathering data in order to conduct a safety assessment prior to obtaining an LVO approval may be conducted in line operations or any other flight where the operator's procedures are used. Approaches may also be conducted in an FSTD if the operator is satisfied that this would be representative of the operation.

The data gathered from these approaches will only be representative if all required elements of the total system for LVOs are in place. These include not only operating procedures and airborne equipment, but also airport and ATC procedures and ground- or space-based navigation facilities. If the operator chooses to collect data from approaches conducted without all required elements in place, then the data analysis takes into account the effect of at least the following:

(1) air traffic services (ATS) factors including situations where a flight conducting an instrument approach is vectored too close to the FAF for satisfactory lateral and vertical path capture, lack of protection of ILS sensitive areas or ATS requests to discontinue the approach;

(2) misleading navigation signals such as ILS localiser irregularities caused by taxiing aircraft or aircraft overflying the localiser array;

(3) other specific factors that could affect the success of LVOs that are reported by the flight crew.

(d) Safety considerations for approaches used for data gathering

If an operator chooses to collect data from approaches conducted without all required elements of the total system for LVOs in place, then the operator takes actions to ensure an acceptable level of safety.

(e) Sharing of data: operators may use data from other operators or aircraft manufacturers to support the safety assessment required to demonstrate an acceptable level of safety. The operator applying for a specific approval would need to demonstrate that the data used was relevant to the proposed operation.

(f) It is expected that operators will have more than 6 months or at least 1 000 hours of total operational experience on the aircraft model before they can have sufficient data to set up meaningful performance indicators and establish whether planned LVOs would achieve an acceptable level of safety.

~~GM1 SPA.LVO.110(c)(4)(i) General operating requirements~~

~~APPROVED VERTICAL FLIGHT PATH GUIDANCE MODE~~

AMC1 SPA.LVO.110 Aerodrome-related requirements, including instrument flight procedures

SUITABLE AERODROMES — ASSESSMENT — AEROPLANES

(a) The assessment of the suitability of an aerodrome, including instrument flight procedures, for the intended operations comprises the availability of:

(1) suitable navigation facilities and associated instrument flight approach procedures;

(2) suitable aerodrome operating procedures, including LVPs, and the compatibility with the intended aircraft operations; and

(3) suitable runway and runway environment characteristics and facilities.

(b) The assessment of the suitability of an aerodrome, including instrument flight procedures, for the intended operations should be made by means of one or a combination of the following:

(1) An assessment of previous operational data for the particular aerodrome, runway and instrument flight procedures. This entails the verification of the availability of previous operational data, such as records of approaches flown in the same aerodrome, with the same procedures and aircraft type.

(2) A desktop assessment of the:

(i) aerodrome data;

(ii) instrument flight procedures; and

(iii) the aircraft data and capabilities.

This desktop assessment compares aircraft data and capabilities and the aerodrome and instrument approach characteristics. If the aircraft data is compatible with the aerodrome and instrument approach procedure characteristics, the aerodrome and runway should be considered suitable for the intended LVO;

(3) An operational assessment

This is meant to be used if the suitability of the aerodrome for the intended operations could not be positively assessed by means of the other methods. In that case, an operational assessment becomes necessary, and actual flights should be performed. The operational assessment should consider the level of complexity of the aerodrome characteristics.

ASSESSMENT OF PREVIOUS OPERATIONAL DATA

(c) Previous operational data refers to data from:

(1) the operator itself, or when not available;

(2) the following entities:

(i) the State of the aerodrome or the competent authority issuing the operator's LVO approval;

(ii) the type certificate holder of the aircraft; or

(iii) other operators.

(d) Previous operational data should only be used if:

(1) it concerns the same runway and there were no relevant changes to the runway and runway environment;

(2) it is derived in accordance with Table 14 below for the intended operation; and

(3) there is no safety concern for such operation.

(e) Previous operational data may be credited to an aircraft if it is from:

(1) the same aircraft make and model, unless the credit from the same aircraft make and model is restricted by any of the entities in point (c)(2); or

(2) another aircraft model, if stated in the AFM or additional data from the TC/STC holder.

Table 14

Intended operation	**Operation from which previous operational data was derived – subject to the conditions specified in points (c), (d) and (e)**	**Remark**
SA CAT I – automatic landing	CAT I/II/III — automatic landing SA CAT I — automatic landing SA CAT II — automatic landing LTS CAT I — automatic landing.	Automatic landing in hybrid systems may also be used
SA CAT I — HUDLS	CAT II/III — HUDLS SA CAT I — HUDLS SA CAT II — HUDLS LTS CAT I — HUDLS	
SA CAT II — automatic landing	CAT II/III — automatic landing SA CAT II — automatic landing	Automatic landing in hybrid systems may also be used
SA CAT II — HUDLS	SA CAT II — HUDLS CAT II/III — HUDLS	
CAT II — HUD to below DH with manual landing	CAT II — HUD to below DH with manual landing	Data related to the LSAA should only be used in

	CAT II or CAT III — automatic landing CAT II or CAT III HUDLS SA CAT II HUDLS	the case of HUDLS or automatic landing
CAT II — auto-coupled to below DH with manual landing	CAT II — auto-coupled to below DH with manual landing CAT II or CAT III — automatic landing SA CAT II automatic landing	
CAT II — automatic landing	CAT II — automatic landing SA CAT II — automatic landing CAT III automatic landing	Automatic landing in hybrid systems may also be used
CAT II — HUDLS	CAT II or CAT III — HUDLS SA CAT II — HUDLS	
CAT III — HUDLS	CAT III — HUDLS	
CAT III— automatic landing	CAT III — automatic landing	If the hybrid system uses automatic landing, then the data may be used as any CAT III system.
CAT III — hybrid system	CAT III — hybrid system based on same components	
EFVS operations requiring flare prompt or flare command, i.e. EFVS-L	EFVS operations requiring flare prompt or flare commands	

Note: Previous operational data should be based on the same kind of xLS (e.g. ILS to ILS, MLS to MLS or GLS to GLS). Data related to landing system performance derived from infrastructure systems with lower performance may be used on systems with higher performance (e.g. data derived from a CAT II ILS may be used on a CAT III ILS). However, an ILS may qualify a GLS operation under the following conditions:

— The performance of the ILS installation on which the data is based can only be credited to the ILS point promulgate.

— An ILS facility performance category II installation can only be credited an operation using GAST C.

— An ILS facility performance category III installation can only be credited to an operation GAST C or GAST D.

DESKTOP ASSESSMENT — AERODROME DATA, INSTRUMENT FLIGHT PROCEDURE AND AIRCRAFT DATA AND CAPABILITIES

(f) The desktop assessment should correspond to the nature and complexity of the operation intended to be carried out and should take into account the hazards and associated risks inherent in these operations.

(g) The assessment should include the AFM or additional data from the TC/STC holder, instrument flight procedures and aerodrome data. For landing systems, the runway or airport conditions should include as a minimum:

(1) the approach path slope;

(2) the runway elevation;

(3) the type of xLS navigation means intended to be used;

(4) the average slope of the LSAA; and

(5) the ground profile under the approach path (pre-threshold terrain). The distance should be calculated from the published threshold. It should be 300 metres, unless otherwise stated by the AFM or additional data from the TC/STC holder, the State of the aerodrome or AIP data, or the competent authority issuing the operator's LVO approval.

Note: The above points assume a CAT II or CAT III runway. For other types of runways, the operator may need to consider other factors.

(h) In addition to (g), additional elements may need to be included in the assessment if stated by:

(1) the AFM, or additional data from the TC/STC holder; or

(2) the State of the aerodrome or AIP data; or

(3) the competent authority issuing the operator's LVO approval.

(i) For EFVS operations, the following applies:

If the system used to perform an EFVS operation contains a flare cue, each aircraft type/equipment/runway combination should be verified before authorising the use of EFVS-L, on any runway with irregular pre-threshold terrain (not within the certification assumption for pre-threshold terrain), if the LSAA presents significant slope change.

OPERATIONAL ASSESSMENT

(j) When performing an operational assessment, the operator should verify each aircraft type and runway combination by successfully completing the determined number of approaches and landings according to the process in point (l) below and the conditions determined in Table 15.

Table 15

Type of approach	RVR/VIS
CAT III	CAT II conditions if the approach was previously successfully assessed in CAT II operations
CAT II & CAT III	CAT I conditions
EFVS-A	As per instrument approach no EFVS credits
SA CAT I & SA CAT II	CAT I conditions

(k) The operational assessment should validate the use and effectiveness of the aircraft flight guidance systems, and operating procedures for the intended operation applicable to a specific instrument flight procedure and runway.

(l) The process to determine the number of approaches and landings should be based on identified risks and agreed with the competent authority, and comprise the following steps:

(1) Identify the risks related to the landing system (based on the AFM or additional data from the TC/STC holder) which may include limitations in the conditions during the operational assessment (e.g. to perform the assessment under a non-commercial flight).

(2) Determine complexity of the runway based on:

(i) a set of criteria based on the certification assumptions identified in the AFM or additional data from the TC/STC holder;

(ii) availability and quality of runway data supporting the risk assessment;

(iii) other known factors identified.

(3) Scale the number of required approaches based on complexity.

(m) The operational assessment may be performed in a commercial flight.

(n) If the operator has different variants of the same type of aircraft, utilising the same landing systems, the operator should show that the variants have satisfactory operational performance, but there is no need to conduct a full operational assessment for each variant/runway combination.

(o) The operator may replace partially or completely the approaches and landings to a particular runway, if approved by the competent authority, with:

(1) simulations made by the aircraft manufacturer or approved design organisations, if the terrain is properly modelled in the simulation;

(2) a verification using an FSTD, if the FSTD is suitable for the operational assessment.

ADDITIONAL VERIFICATION OF THE SUITABILITY OF RUNWAYS FOR EFVS OPERATIONS

(p) The assessment of the suitability of the aerodrome should include whether the approach and runway lights installed (notably incandescent or LED lights) are adequate for the EFVS equipment used by the operator.

(q) Additionally, the operator should assess obstacles for the following operations:

(1) NPA procedures;

(2) APV;

(3) category I PA procedures on runways where an OFZ is not provided; and

(4) approach procedures not designed in accordance with PANS-OPS or equivalent criteria.

(r) The assessment in point (q) should determine whether:

(1) obstacle protection can be ensured in the visual segment from DA/H to landing, without reliance on visual identification of obstacles or in the event of a balked landing; and

(2) obstacle lights installed (notably incandescent or LED lights) are adequate for the EFVS equipment used by the operator.

(s) If the assessment determines that:

(1) obstacle clearance cannot be ensured in the visual segment without reliance on visual identification of obstacles, the operator should not authorise EFVS operations to that runway or restrict the operation to the type and/or category of instrument approach operations where obstacle protection is ensured.

Note: Obstacles of a height of less than 50 ft above the threshold may be disregarded when assessing the VSS.

(2) obstacle protection is not assured in the event of a go-around initiated at any point prior to touchdown, the operator should not authorise the operation unless procedures to mitigate the risk of inadequate obstacle protection are developed and implemented.

(t) If the AFM stipulates specific requirements for approach procedures, the operational assessment should include a determination of whether these requirements can be met.

AMC2 SPA.LVO.110 Aerodrome-related requirements, including instrument flight procedures

SUITABLE INSTRUMENT FLIGHT APPROACH PROCEDURES

(a) CAT II instrument approach operations should only be conducted using a CAT II IAP.

(b) CAT III instrument approach operations should only be conducted using a CAT III IAP.

(c) SA CAT I operations should only be conducted using a SA CAT I IAP or, if not available, a CAT I IAP that includes an OCH based on radio altimeter.

(d) SA CAT II operations should only be conducted using a SA CAT II IAP or, if not available, a CAT II IAP.

(e) EFVS operations should only be conducted using an IAP which is offset by a maximum of 3 degrees unless a different approach offset is stated in the AFM.

AMC3 SPA.LVO.110 Aerodrome-related requirements, including instrument flight procedures

SUITABLE AERODROMES — RUNWAY AND RUNWAY ENVIRONMENT — NAVIGATION FACILITIES — APPROACH OPERATIONS OTHER THAN EFVS OPERATIONS

(a) For CAT II instrument approach operations, a PA runway category II or category III should be used. The following visual aids should be available:

(1) category II approach lights;

(2) standard runway markings;

(3) category II runway lights.

(b) For CAT III instrument approach operations, a PA runway category III should be used. The following visual aids should be available:

(1) category III approach lights;

(2) standard runway markings;

(3) category III runway lights.

(c) For SA CAT I operations:

(1) where an ILS or MLS or GLS is used, it should not be promulgated with any restrictions affecting its usability and should not be offset from the extended centre line;

(2) where an ILS or GLS is used, it should be at least the minimum ILS or GLS classification stated in the AFM and meet any of the required minimum performance parameters stated in the AFM;

(3) the glide path angle is 3.0°; a steeper glide path, not exceeding 3.5 ° and not exceeding the limits stated in the AFM, can be approved provided that an equivalent level of safety is achieved; and

(4) runway markings, category I approach lights as well as runway edge lights, runway threshold lights, and runway end lights should be available.

(d) For SA CAT II operations:

(1) where an ILS or MLS or GLS is used, it should not be promulgated with any restrictions affecting its usability and should not be offset from the extended centre line;

(2) where an ILS or GLS is used, the following applies:

(i) if the AFM provides such data, the minimum ILS or GLS classification stated in the AFM; or

(ii) when such data is not provided:

(A) where an GLS is used, it should be certified to at least GAST-C and to the GBAS point D;

(B) where an ILS is used, it should be certified to at least class II/D/2;

(3) the glide path angle is 3.0°; a steeper glide path, not exceeding 3.2°, can be approved provided that the operator demonstrates an equivalent level of safety; and

(4) the following visual aids should be available:

(i) standard runway markings, category I approach lights as well as runway edge lights, runway threshold lights and runway end lights; and

(ii) for operations with an RVR of less than 400 m, centre line lights.

AMC4 SPA.LVO.110 Aerodrome-related requirements, including instrument flight procedures

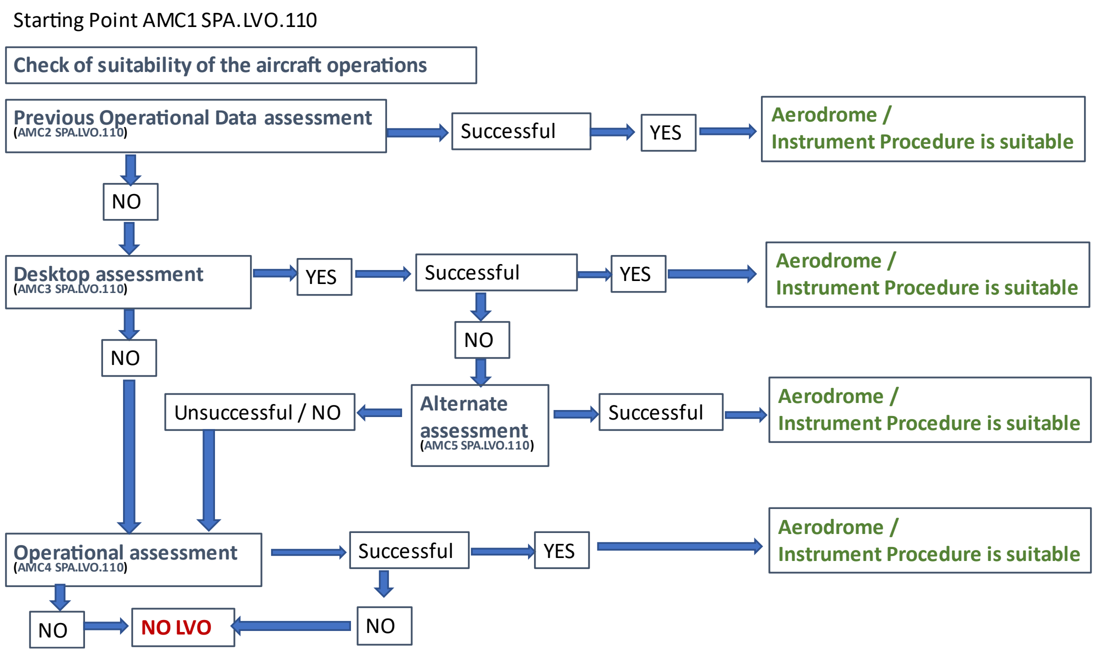
COLLECT AND DEVELOP AIRPORT DATA NOT CONTAINED IN THE AIP — AEROPLANES

When the operator wishing to use an aerodrome where its relevant data for the purpose of LVO is not provided or some data is not provided, the operator should develop procedures to collect or develop the necessary data. The procedure should be specific to the State of the aerodrome or the area of operation and should be approved by competent authority.

GM1 SPA.LVO.110 Aerodrome-related requirements, including instrument flight procedures

ASSESSMENT OF AERODROMES FOR THE INTENDED OPERATIONS — AEROPLANES

A diagram with a schematic of the assessment described in AMC1 SPA.LVO.110 *Aerodrome-related requirements, including instrument flight procedures* is provided below:



GM2 SPA.LVO.110 Aerodrome-related requirements, including instrument flight procedures.

SUITABLE AERODROMES — ASSESSMENT — AVAILABILITY OF SUITABLE NAVIGATION FACILITIES

As detailed in point (a) of AMC1 SPA.LVO.110, the assessment of the suitability of an aerodrome, including instrument flight procedures, for the intended operations comprises the availability of suitable navigation facilities and associated instrument flight approach procedures.

When assessing the availability of suitable navigation facilities, the following information is relevant.

(a) Classification for ILS: the ILS classification, e.g. 'III/E/4', II/T/3, 'I/C/2', etc., is defined in ICAO Annex 10 Volume 1 by using three characters:

(1) I, II or III: this character indicates conformance to the facility performance category which is usually associated with the approach operational category,

(2) A, B, C, T, D or E: this character defines the ILS points to which the localiser/glide path has been verified to be conformal to the course structure of a localiser CATII/III or glide path CAT II/III (where glide path is always limited to T).

(3) 1, 2, 3 or 4: this number indicates the level of integrity and continuity of service. The integrity relates to the trust which can be placed in localiser or glide path not radiating false guidance signals. The continuity of service relates to the rarity of signal interruptions. The minimum levels of integrity and continuity of service are represented by a single descriptor 'level' which would typically be associated as follows:

(i) Level 1: the localiser's or glide path's integrity or continuity of service have not been demonstrated or they have been demonstrated but at least one of them does not meet the level 2 requirements.

(ii) Level 2 is the performance objective for ILS equipment used to support LVOs when ILS guidance for position information in the landing phase is supplemented by visual cues/references.

(iii) Level 3 is the performance objective for ILS equipment used to support operations which place a high degree of reliance on ILS guidance for positioning through touchdown.

(iv) Level 4 is the performance objective for ILS equipment used to support operations which place a high degree of reliance on ILS guidance throughout touchdown and roll-out.

Further information may be found in ICAO Annex 10 Volume 1.

(b) GBAS facility classification (GFC)

The facility classification, e.g. i.e. 'C/G1/35/H', refers to the station serving all approaches to a given airport and is defined in ICAO Annex 10 Volume 1 using four elements:

(1) Facility approach service type (FAST): (A-D) indicate the service types supported by the navigation facility, i.e. 'C' means FAST C, which denotes a facility meeting all the

performance and functional requirements necessary to support GBAS approach service type (GAST) C. GAST C has been designed to meet requirements for CAT I as well as, with additional constraints, CAT II. GAST D has been designed to meet requirements for CAT III. A downgrade from GAST D to C is possible and announced in the avionics.

(2) Ranging source types: these indicate what ranging sources are augmented by the ground subsystem. i.e. 'G1' means GPS ('G2': SBAS, 'G3': GLONASS, 'G4': reserved for Galileo, etc.).

(3) Facility coverage: this defines the outer horizontal coverage of the GBAS positioning service expressed in nautical miles. '0' is for facilities that do not provide positioning service. The facility coverage for position service does not indicate the coverage for the GBAS approach service. The information on the coverage for the approach service is contained in the 'Service volume radius from the GBAS reference point' to the nearest kilometre or nautical mile as described in point (d) below.

(4) Polarisation: this indicates the polarisation of the VHF Data Broadcast (VDB) signal. E indicates elliptical polarisation (option), and H indicates horizontal polarisation (standard). Aircraft operators that use vertically polarised receiving antennas will have to take this information into account when managing flight operations, including flight planning and contingency procedures.

Further information may be found in ICAO Annex 10 Volume 1.

(c) Approach facility designation (AFD) for GBAS

The approach facility designation, e.g. 'EDDF/G25A/20748/S/C' or 'ABCD/XABC/21278/150/CD', describing parameters for an individual approach procedure, is defined in ICAO Annex 10 using five elements:

(1) GBAS identification: 4-character facility identifier, e.g. ABCD.

(2) Approach identifier: 4-character approach identifier, e.g. XABC.

(3) Channel number: 5-digit channel number (20 001 – 39 999) associated with the approach.

(4) Approach service volume: this indicates the inner limit of the service volume either by a numerical value in feet corresponding to the minimum decision height (DH), e.g. '150', or by the GBAS points (i.e. A, B, C, T, D, E, or S). The GBAS points are equivalent to the ILS points, where 'S' is only specific to GBAS and denotes the stop end of the runway.

(5) Supported service types: these designate the supported GBAS service types (A-D).

Further information may be found in ICAO Annex 10 Volume 1.

(d) Service volume radius from the GBAS reference point

Maximum use distance (D_{max}): the maximum distance (slant range) from the GBAS reference point to the nearest kilometre or nautical mile within which pseudo-range corrections are applied by the aircraft system.

Note: This parameter does not indicate the distance within which VHF data broadcast field strength requirements for the approach service are met.

Further information may be found in ICAO Annex 10 Volume 1.

TYPE OF xLS NAVIGATION MEANS

(e) In the context of AMC1 SPA.LVO.110 point (g)(3), 'type of xLS navigation means' means the facilities external to the aircraft and the associated limitations (if any) which have been used as the basis for certification.

GM3 SPA.LVO.110 Aerodrome-related requirements, including instrument flight procedures

SUITABLE AERODROMES — ASSESSMENT — SUITABLE RUNWAY AND RUNWAY ENVIRONMENT CHARACTERISTICS

(a) As detailed in point (a) of AMC1 SPA.LVO.110, the assessment of the suitability of an aerodrome, including instrument flight procedures, for the intended operations comprises the availability of suitable runway and runway environment characteristics.

(b) For operations based on radio altimeter or other device measuring the height over the ground:

(1) the suitability of the indication of the DH should be based on data covering the actual DH location. This indication should be expected to be stable and continuous;

(2) The suitability of the indication of the alert height (where applicable) should be based on data covering the actual alert height location. This indication should be expected to be stable and continuous.

(3) The primary source of information to determine the suitability should be the precision approach terrain chart (PATC). If the information is not conclusive, the operator may collect and develop airport data not contained in the AIP. More information can be found in GM10 SPA.LVO.110.

(c) For runways intended to be used for CAT III, CAT II, SA CAT II and SA CAT I operations, the State of aerodrome should provide a PATC. More information is provided in GM7 SPA.LVO.110.

(d) There should be a radio altimeter operating area for runways intended to be used for CAT III, CAT II, SA CAT II and SA CAT I operations. The ICAO aerodrome provisions detail that the radio altimeter operating area extends to at least 300 m from the runway threshold with a width of 60 metres on either side of the extended centre line of the runway. The width may be reduced to not less than ± 30 metres if such a reduction does not affect the safety of aircraft operations as assessed by the aerodrome operator in cooperation with affected stakeholders. Slope changes should be kept to a minimum.

(e) Information on pre-threshold terrain and its effect on radio altimeters and automatic flight control systems (AFCS) is contained in the Manual of All-Weather Operations (ICAO Doc 9365, Section 5.2.)

SUITABLE AERODROMES — ASSESSMENT — PREVIOUS OPERATIONAL DATA — RUNWAY AND RUNWAY ENVIRONMENT

(f) As detailed in point (d)(1) of AMC1 SPA.LVO.110, previous operational data should only be used to assess the suitability of an aerodrome for the intended operations when it concerns the same runway and there were no relevant changes to the runway and runway environment.

(g) Relevant changes to the runway and runway environment may include changes to:

(1) the pre-threshold terrain, including the radio altimeter operating area;

(2) runway dimensions;

(3) the average slope of the landing system assessment area (LSAA);

(4) visual aids including approach lights and runway lights;

(5) the obstacle free zone (OFZ);

(6) the visual segment surface (VSS) — only relevant for operational credits in the visual segment (EFVS).

GM4 SPA.LVO.110 Aerodrome-related requirements, including instrument flight procedures

SUITABLE AERODROMES — ASSESSMENT — PREVIOUS OPERATIONAL DATA PROVIDED BY THE STATE OF THE AERODROME

(a) As detailed in point (b)(1) of AMC1 SPA.LVO.110, the assessment of the suitability of an aerodrome, including instrument flight procedures, for the intended operations, may be made considering previous operational data for the particular aerodrome, runway and instrument flight procedures.

(b) The following guidance is provided for the assessment of suitability of aerodromes for LVOs or operations with operational credits.

(1) If a State provides a list of airports or runways in its territory that are suitable for CAT II or CAT III operations with a specific aircraft model or group of aircraft models, those airports or runways may be considered suitable for the purpose of AMC2 SPA.LVO.110. Note: A CAT II or CAT III approved runway does not necessarily mean that the airport is suitable for the purpose of AMC2 SPA.LVO as the aerodrome's provisions may not ensure that the requirements for certain aircraft models are fulfilled.

(2) If a State provides a list of airports or runways in its territory that are found suitable for SA CAT I or SA CAT II, those airports or runways may be considered suitable for the purpose of AMC2 SPA.LVO.110. Note: In some States the concept of SA CAT I and SA CAT II may be different from the EU concept. The operator should consider these differences.

(3) If a State provides a list of airports or runways in its territory that are approved for CAT II/III operations but are designated as restricted or non-standard or irregular, those designated runways should be considered not suitable. The remaining CAT II/III runways of that State may be considered regular.

(4) A competent authority may provide a list of airport or runways that can be considered suitable for defined LVOs. The suitability statement could be credited by operators under the oversight of that authority.

GM5 SPA.LVO.110 Aerodrome-related requirements, including instrument flight procedures.

SUITABLE AERODROMES — ASSESSMENT — PREVIOUS OPERATIONAL DATA — TERMINOLOGY: MAKE, MODEL, SERIES AND VARIANT

The following terms, in accordance with the ICAO Commercial Aviation Safety Team (CAST) taxonomy, are often used (e.g. AMC1 SPA.LVO.110):

(a) Aircraft make: The aircraft make is the name assigned to the aircraft by the aircraft manufacturer when each aircraft was produced. In most cases, the aircraft make is the common name of the aircraft manufacturer; for example, Airbus, Boeing, Embraer, etc.

(b) Aircraft model: An aircraft model is an aircraft manufacturer's designation for an aircraft grouping with a similar design or style of structure. In EASA type certificate data sheet (TCDS), this means the aircraft type certificate; for example, A330, B777.

(c) Aircraft series: An aircraft series is an aircraft manufacturer's designation to identify differences within an aircraft model grouping. It provides a further specification to the aircraft type; for example, B777-232 where the series is the number 232. Some manufacturers define the so-called master series: An aircraft master series creates a grouping of similar aircraft series for analytical purposes and to identify aircraft series that share airworthiness properties. A master series contains aircraft series from within one aircraft model. For example, A320-100 and A320-200: the A320-100 master series only has one series (A320-111), while the A320-200 master series has many series (211, 212, 214, 215, 216, 231, 232, 233).

(d) Aircraft variant; a variant defines different sets of limiting structural masses (e.g. MTOW, MLW, MZFW, etc.) within a series. For example, A320-232-007 or the A330-243 RR engine's variant 052. Variants are not covered in the ICAO Cast taxonomy; however, they may be specified in the EASA TCDS.

(e) More information can be found in ICAO documentation under: https://www.icao.int/publications/DOC8643/Pages/Search.aspx?msclkid=a28160bbd09311ecbbe633ef5f1957a4 and http://www.intlaviationstandards.org/.

GM6 SPA.LVO.110 Aerodrome-related requirements, including instrument flight procedures

SUITABLE AERODROMES — DESKTOP ASSESSMENT — DATA NOT PROVIDED IN THE AFM

(a) When the AFM or additional data from the TC/STC holder does not provide the information needed in AMC1 SPA.LVO.110 points (g)(1) to (5), the operator may contact the TC/STC holder to request such information. Otherwise the operator may seek to use previous operational data or perform operational demonstration in accordance with AMC1 SPA.LVO.110.

SUITABLE AERODROMES — DESKTOP ASSESSMENT — USE OF PREVIOUS OPERATIONAL DATA

(b) In-service consolidated experience from already successfully demonstrated and consistently used runways with the specific aircraft type and with the same intended operations (typically CAT II/III) could be used to support the desktop assessment. The assessment criteria, for pre-threshold terrain variation and LSAA slope, could then be defined by the prevailing complexity of the runway on which the operator already has in-service experience and where sufficient operational flight data is available to prove adequate performance of the automatic landing system.

GM7 SPA.LVO.110 Aerodrome-related requirements, including instrument flight procedures

SUITABLE AERODROMES — DESKTOP ASSESSMENT — AERODROME DATA SOURCES

As detailed in point (b)(2) of AMC1 SPA.LVO.110, the assessment of the suitability of an aerodrome, including instrument flight procedures, for the intended operations, may be made by a desktop assessment, that should consider aerodrome data.

This GM describes some aerodrome data sources that ICAO Member States provide in accordance with ICAO Annex 4.

(a) Type A and Type B aerodrome obstacle charts

Aerodrome obstacle charts come in two forms. Type A and B charts may be combined, and the chart is called aerodrome obstacle chart (ICAO Comprehensive). Where a terrain and obstacle chart is provided in electronic form, there is no need to provide Type A or B aerodrome obstacle charts.

(b) Type A aerodrome obstacle chart (ICAO Annex 4, Chapter 3)

Type A aerodrome obstacle charts are found at most aerodromes approved for LVOs. The function of the Type A chart is to enable an operator to comply with the performance operating limitations in Annex 6. The Type A chart does not have to be provided if there are no take-off obstacles, but a note informing about this is needed according to ICAO Annex 4. The elevation is given to the nearest half-metre or nearest foot. Linear dimensions are shown to the nearest half metre.

(c) Type B aerodrome obstacle chart (ICAO Annex 4, Chapter 4)

Type B aerodrome obstacle charts contain information about the elevation (at the centre line) of both runways plus the elevation at each significant change of the slope of the runway. The function of the Type B chart is:

(1) the determination of minimum safe altitudes/heights including those for circling procedures;

(2) the determination of procedures for use in the event of an emergency during take-off or landing;

(3) the application of obstacle clearing and marking criteria; and

(4) the provision of source material for aeronautical charts.

Elevations and linear dimensions are shown to the nearest half metre.

(d) Aerodrome terrain and obstacle Chart – ICAO (Electronic) (ICAO Annex 4, Chapter 5)

The function of this chart is to:

(1) enable an operator to comply with the operating limitations of Annex 6, Part I, Chapter 5, and Part III, Section II, Chapter 3, by developing contingency procedures for use in the event of an emergency during a missed approach or take-off, and by performing aircraft operating limitations analysis; and

(2) support the following air navigation applications:

(i) instrument procedure design (including circling procedure);

(ii) aerodrome obstacle restriction and removal; and

(iii) provision of source data for the production of other aeronautical charts.

Note that this chart may also contain the information required for the PATC.

According to ICAO Annex 4, from November 2015, this chart is made available for aerodromes regularly used by international aviation. The chart is made available in printed form on request.

(e) Aerodrome chart (ICAO Annex 4, Chapter 13)

According to ICAO Annex 4, an aerodrome chart is provided for aerodromes regularly used by international aviation. The function of this chart is to provide information to facilitate the ground movement of aircraft and in general also to provide essential operational information.

This chart contains information about the height of the threshold and, for PA runways, the highest point of the TDZ. This information may also be included in the text part of the AIP, Chapter AD2 (normally paragraph 2.12 – Runway Physical Characteristics). The elevation is provided to the nearest half metre.

(f) Precision approach terrain chart (PATC) (Annex 4, Chapter 6)

According to ICAO Annex 4, a PATC is made available for all PA runways Categories II and III at aerodromes used by international civil aviation, except where the requisite information is provided in the aerodrome terrain and obstacle chart — ICAO (Electronic). The chart includes:

(i) a plan showing contours at 1 m (3 ft) intervals in the area 60 m on either side of the extended centre line of the runway, to the same distance as the profile, the contours to be related to the runway threshold;

(ii) an indication where the terrain or any object thereon, within the plan defined in (i), differs by ± 3 m in height from the centre line profile and is likely to affect a radio altimeter;

(iii) a profile of the terrain to a distance of 900 m from the threshold along the extended centre line of the runway. Where the terrain at a distance greater than 900 m from the runway threshold is mountainous or otherwise significant to users of the chart, the profile of the terrain should be shown to a distance not exceeding 2 000 m from the runway threshold.

(g) Summary

(1) For the determination of runway slopes, the aerodrome obstacle chart, preferably the combined version, appears to provide the best information. The PATC appears to be the best source to determine the elevations and slopes in the approach area.

(2) If the information provided by different parts of the AIP is inconsistent, this may indicate an error in the data and should be reported to the State of aerodrome or AIP issuing authority, unless the inconsistency is insignificant. It should however be noted that there may be different requirements for accuracy and resolution between different AIP charts or sections, which might cause values to differ slightly.

(3) It may be difficult to conclusively state which chart is best for determining the runway slope in each case, but the primary source of information is the AIP, and therein the aerodrome obstacle chart and the PATC. As the aerodrome terrain and obstacle chart – ICAO (Electronic) becomes more available, it will probably take over as the primary source of information about both runways and pre-threshold terrain.

GM8 SPA.LVO.110 Aerodrome-related requirements, including instrument flight procedures.

SUITABLE AERODROMES — OPERATIONAL ASSESSMENT — PROCESS TO DETERMINE THE NUMBER OF APPROACHES AND LANDINGS — AEROPLANES

(a) When performing an operational assessment to determine the suitability of an aerodrome for the intended operations, the operator should have a process to determine the number of approaches and landings, in accordance with point (l) of AMC1 SPA.LVO.110. The following guidance provides examples of criteria that can be used to evaluate level complexity of the runway versus a landing system for the purpose of the determination of the number of approaches and landings. Depending on the landing system used, some criteria might not be relevant, or others might need to be considered.

(1) Pre-threshold terrain profile

The typical length of pre-runway threshold is calculated from the published threshold (displaced threshold if present) to 300 m on the extended centre line unless otherwise specified by the AFM or additional data from the TC/STC holder, the State of the aerodrome or AIP data, or the competent authority issuing the operator’s LVO approval. The complexity of the pre-threshold terrain profiles is described as follows:

(i) Simple

(A) approximately ± 1 m variation from runway threshold elevation in the typical length; or

(B) previous experience in more constraining pre-threshold terrain in the same aircraft type or variant.

(ii) Moderate

(A) presence of ARAS; or

(B) approximately ± 1 m variation from runway threshold elevation within the last 60 m prior to runway threshold; and

(C) prior to 60 m and up to typical length:

— moderate rising slope (less than 7 % rising); or

— moderate 'sea wall' (less than 3 m).

(iii) Complex

(A) approximately ± 2 m variation from runway threshold elevation within the last 60 m prior to runway threshold; and

(B) prior to 60 m and up to typical length:

— significant rising slope (up to 15 % rising); or

— significant 'see wall' (up to 6 m); or

— significant change of slope (rising then descending or descending then rising close to the limit values)

(iv) Very complex

Outside any of the limits defined above for complex pre-threshold terrain profiles.

Note: The term 'sea wall' refers to sudden changes of terrain elevation that typically occur when runway thresholds are located near the sea. Sea level may change due to tides. Other cases of sudden terrain elevation may occur in other cases, a slope of 100 % may be considered as comparable to 'sea wall' (e.g. Boston USA).

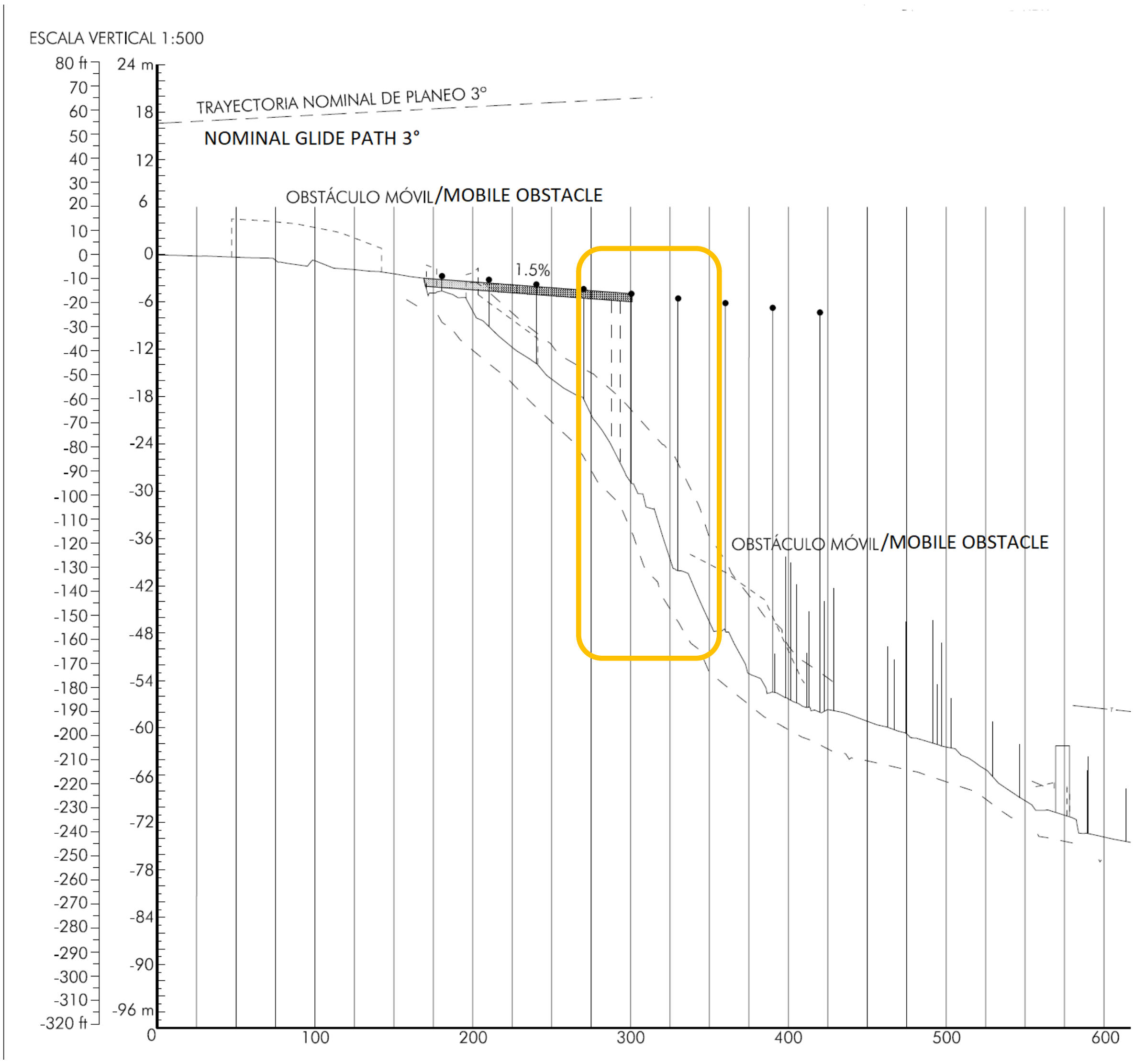


Figure 1: *Typical example of 'very complex' with greater than 6 m 'sea wall' at 300 m (Asturias, LEAS 29 dated 2007) that after suitability assessment and due to the present of ARAS it may be changed to **'moderate'**.*

Example: A pre-threshold terrain with the following features would be considered as 'moderate'.

(1) Less than 1 m variation of pre-threshold terrain elevation from runway threshold elevation, in the area from runway threshold up to 100 m prior to runway threshold

(2) Less than 3 m variation of pre-threshold terrain elevation from runway threshold elevation, in the area from 100 m prior to runway threshold up to 300 m prior to runway threshold

(2) Landing system assessment area (LSAA) slope

Note: 600 metres after the threshold is the standard length; however depending on the landing system, other lengths might be relevant.

Although not recommended by ICAO Annex 14 Volume 1, slope variation in the LSAA can exist (refer to point 3.1.15 to point 3.1.18) and represent a factor of risk to be considered.

For the purpose of determining the relevant parameters characterising slope and slope variation, the following definitions may be used (Figure 1):

— Mean LSAA slope: Slope computed from runway threshold elevation up to runway elevation at 600 metres after the threshold.

— Deviation from mean LSAA slope: greatest elevation difference between any runway elevation inside LSAA and mean LSAA slope.

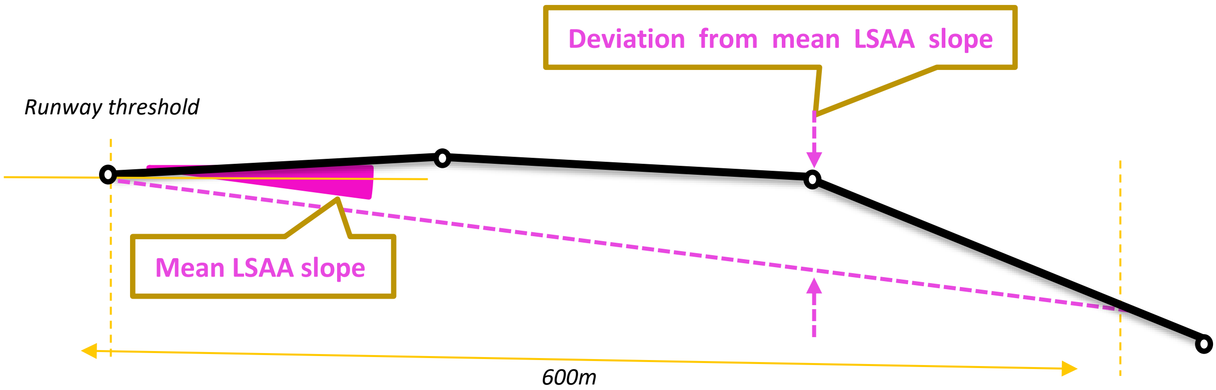


Figure 1: Mean LSAA slope & Deviation from mean LSAA slope

Note: Published runway profiles usually contain the position and elevation of each significant runway longitudinal slope change. Elevation at other location can be interpolated assuming straight slope between each published elevation. The highest / lowest elevation of the LSAA might not be the one where the deviation from mean LSAA slope is the greatest.

(i) Simple

(A) Approximately ± 0.4 % mean LSAA slope and less than 1 m (3 ft) variation around mean LSAA slope; or

(B) previous experience in more constraining touch down condition in the same aircraft type or variant.

(ii) Moderate

Approximately ± 0.8 % mean LSAA slope and less than 2 m (3 ft) variation around mean LSAA slope.

(iii) Complex

Approximately ± 1.0 % mean LSAA slope and less than 4 m (6 ft) variation around mean LSAA slope.

(iv) Very complex

Outside any of the limits defined above.

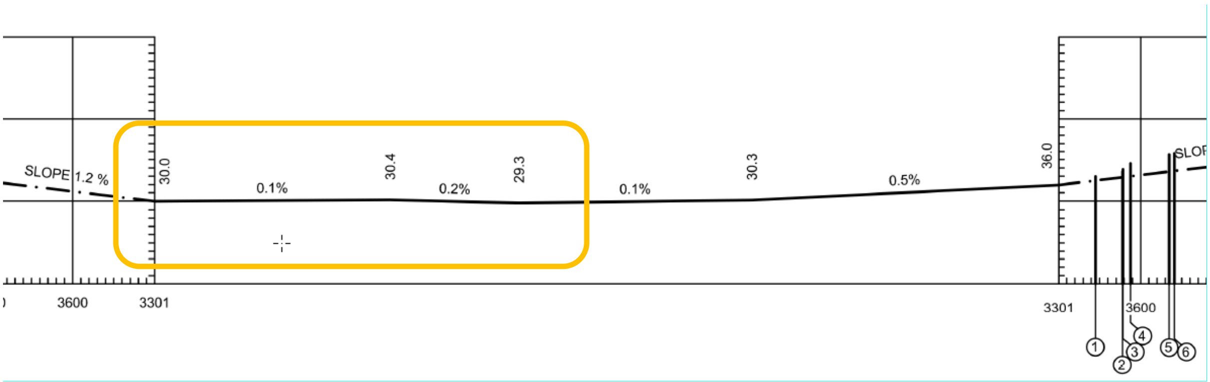


Figure 2: Typical example of 'simple' LSAA Slope (ESSA 01L dated 2018)

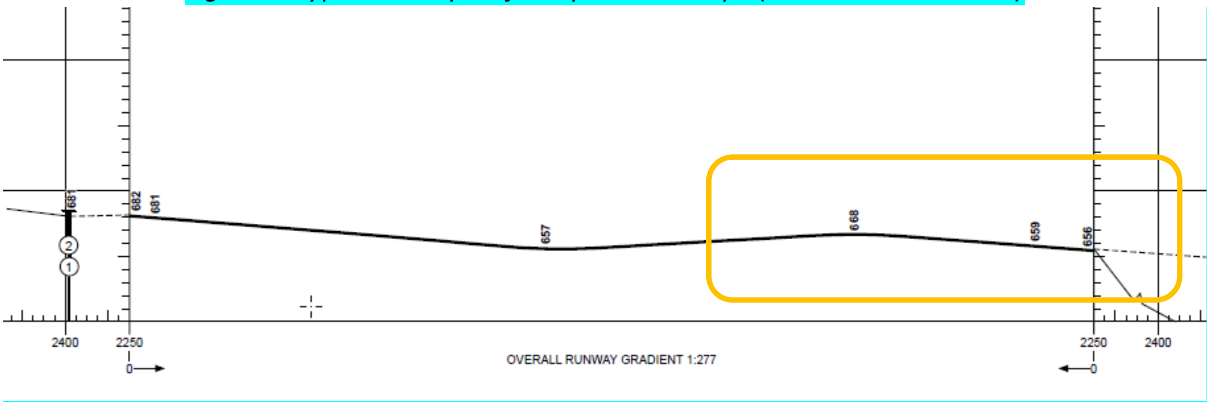


Figure 3: *Typical example of 'moderate' LSAA slope due to variation around mean LSAA slope greater than 1 m but lower than 2 m (EGNM 32 dated 2018)*

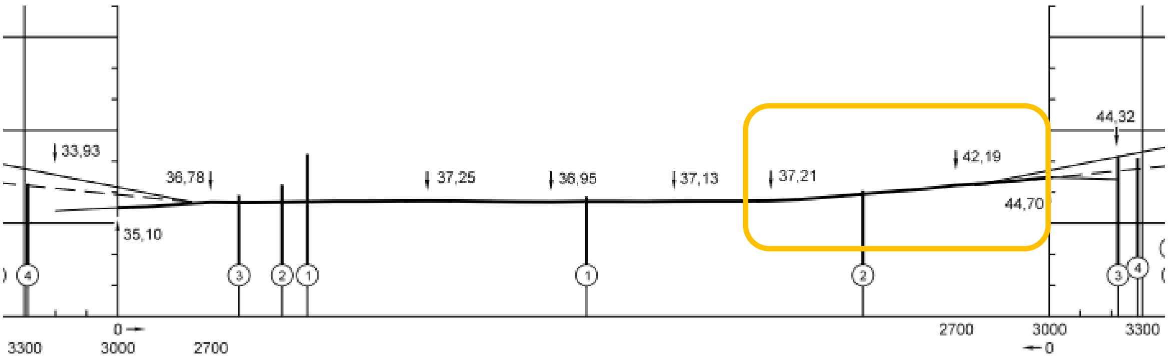


Figure 4: *Typical example of 'complex' mean LSAA slope greater than 0.8 % but lower than 1 % (EDD 23L dated 2009)*

(b) Operational assessment programme: the following guidance provides examples of typical flight programmes than can be used to demonstrate suitability of a landing system using the operational assessment method, considering the overall level of runway irregularities.

Note: For CAT II operations with no use of autoland nor guidance for the flare manoeuvre, the programmes could be alleviated.

The flight programmes are expected to depend on the level of runway irregularities. Table 1 provides examples of criteria that can be used to determine the level of runway irregularities.

Pre-threshold / LSAA slope	Simple	Moderate	Complex	Very complex
Simple	Simple	Moderate	Complex	Very complex
Moderate	Moderate	Moderate	Complex	Very complex
Complex	Complex	Complex	Complex	Very complex
Very complex	Very complex	Very complex	Very complex	Very complex

Table 1: *Level of runway irregularities to scale the flight programme*

(1) Simple runway

For simple runways, unless other factors can be identified as a source of concern, no in-flight approach and landing may be required.

(2) Moderate runway

For moderate runways, a minimum of one successful approach/landing using the procedures, equipment and operationally relevant heights (DH/AH) for the intended operations is performed in the meteorological conditions described in AMC1 SPA.LVO.110 Table 14. More approaches could be required if any issue is identified during this approach/landing.

(3) Complex runway

For complex runways, an initial minimum of three approaches/landings using the procedures, equipment and operationally relevant heights (DH/AH) for the intended operations is performed in the meteorological conditions described in AMC1 SPA.LVO.110 Table 14, with at least one of the landings close to the maximum landing weight for the intended operation and the other two with other different conditions; for example, with a mid-weight in one and low weight in another or with different or wind conditions or aircraft configuration flap full/flap 3, or a combination of them. The flights for the assessment is conducted by pilots designated by the operator with defined minimum experience and qualifications, with procedures defined for the purpose. More approaches could be required if any issue is identified during these approaches/landings.

(4) Very complex runway

For very complex runways, an initial minimum of four to six approaches/landings using the procedures, equipment and operationally relevant heights (DH/AH) for the intended operations is performed in the meteorological conditions described in AMC1 SPA.LVO.110 Table 14 in typical aircraft weight conditions in flights with no commercial passengers.

If no anomaly is observed after the first four to six approaches/landings, extend the condition progressively close to the maximum landing weight for the intended operation with at least 15 successful approaches or landings and report any anomalies with the meteorological conditions described in AMC1 SPA.LVO.110 Table 14 and with different conditions, for example with different range of weight conditions (high, mid, low) or with different wind conditions or aircraft configuration flap full/flap 3, or a combination of them. The flights for the assessment should be conducted by pilots designated by the operator with defined minimum experience and qualifications, with procedures defined for the purpose.

(c) Operational assessment successful criteria

(1) Data to be recorded

To assess adequate performance of the landing system, some form of quantitative data should be recorded and reviewed with the competent authority as verification of performance. Acceptable methods of data collection include but are not limited to:

(i) Record of wind conditions and touch down point (can be observation).

(ii) Record of pertinent landing system parameters (typically from a digital flight data recorder, quick-access recorder or equivalent) with sufficient sampling rate (typically higher than 1 sample per second) for the part of the flight paths of interest (typically from 300 ft height above touch down through de-rotation after touch down) including typically:

— barometric altitude;

— radio altitude;

— glide path error;

— vertical speed;

— elevator command;

— pitch attitude;

— throttle position / thrust commanded;

— airspeed;

— mode transition or engagement.

(iii) Photo or video recording of pertinent instrument or instrument and outside view allowing post-flight replay and review of the above parameters.

(2) Data review and analysis to assess acceptable performance

The final approach, flare and touch down profile should be reviewed with the competent authority to ensure suitability of at least each of the following:

(i) suitability of the resulting flight path;

(ii) acceptability of any flight path deviation from the nominal path (e.g. glide path deviation, deviation from nominal flare profile);

(iii) proper mode switching;

(iv) suitable touch down point;

(v) suitable sink rate at touch down;

(vi) proper flare initiation altitude;

(vii) suitability flare quality (e.g. no evidence of early or late flare, no over-flare or under flare, no undue 'pitch down' tendency at flare initiation or during flare, no flare oscillation, no abrupt flare, no inappropriate pitch response during flare, no unacceptable floating tendency, or other unacceptable characteristic that a pilot could interpret as a failure or inappropriate response of the landing system);

(viii) no unusual flight control displacement (e.g. elevator control input spikes or oscillation);

(ix) appropriate throttle/thrust retard (e.g. no early or late retard, no failure to retard, no undue reversal of retard, no undue pitch/thrust coupling);

(x) appropriate speed decay in flare (e.g. no unusually low speed risking high pitch attitude and tail strike, no excessive float, appropriate seed decay even if well above Vref at flare initiation due to planned wind or gust compensation);

(xi) proper mode initiation or mode transition relating to altitude or radio altitude inputs (e.g. crosswind alignment).

GM9 SPA.LVO.110 Aerodrome-related requirements, including instrument flight procedures

SUITABLE AERODROMES — OPERATIONAL ASSESSMENT — VERIFICATION USING AN FSTD

(a) When performing an operational assessment to determine the suitability of an aerodrome for the intended operations, the operator may replace partially or completely the approaches and landings by a verification using an FSTD, if the FSTD is suitable for the operational assessment, in accordance with point (o) of AMC1 SPA.LVO.110.

Using an FSTD to support an operational assessment can be useful when, for example, terrain criteria would qualify as 'complex' or 'very complex' (level of runway irregularities according to GM8 SPA.LVO.110).

FSTDs are usually designed with the objective of replicating the aspects relevant to the scope of flight training associated with the type and level of the FSTD qualification. FSTDs are usually not designed to be used in the context of an operational assessment of the aerodrome for the intended operations, and there may be limits to what an FSTD may be used for. It should be ensured that the capabilities of the FSTD can support the objectives of the operational assessment.

When using an FSTD, any relevant differences between the real aircraft and the FSTD should be taken into consideration. A full flight simulator (FFS) Level D certified for zero flight time training is generally the most suitable for such use.

TO APPLY A VERIFICATION USING AN FSTD, A SUITABLE FSTD SHOULD BE USED

(b) An FSTD should only be used if it is from:

(1) the same aircraft make and model, unless the same aircraft make and model is restricted by any of the entities in point (c)(2) AMC1 SPA.LVO.110; or

(2) another aircraft model, if stated in the AFM or additional data from the TC/STC holder.

The following factors should be considered:

(1) Aircraft systems

The FSTD replicates the aircraft system in regard to the configuration and behaviour of the approach system or landing system. It covers all systems that are relevant and includes — as a minimum — the guidance and control systems, the relevant displays and the automatic call-outs.

The FSTD may be composed of actual aircraft components or simulated components either by the aircraft manufacturer or by another supplier (e.g. the FSTD manufacturer). If a version or standard of a system or component differs from the aircraft, the operator verifies with the TC/STC holder whether the differences have an impact on the performance or behaviour of the approach system or landing system.

(2) Pre-threshold and runway terrain

The aircraft operator ensures that all relevant pre-threshold and runway profile data is fed into the FSTD and is presentative of the real world. This could mean that additional features may need to be implemented in the terrain database of the FSTD, as the certification specifications for FSTDs require a realistic topography only for a very limited number of aerodromes.

If the pre-threshold terrain includes an artificial radio altimeter surface (ARAS), the ARAS may be verified in the FSTD, if it can be shown for this ARAS that the actual echoes of the radio altimeters can be adequately reproduced in the FSTD. This may be done by using flight data.

(3) Navigation facilities and associated instrument flight approach procedures

All relevant navigation facilities for the instrument flight approach procedures need to be adequately represented in the FSTD. It has to be taken into account that the FSTD representation of the signal in space is usually not realistic in the sense of the signal propagation and is limited to being a straight line in space, which is adequate for training purposes. Some FSTDs support, as a simulation feature for a failure case, a parallel displacement of target approach path; however, dynamic displacements (bends) or VHF noise in the signal are usually not simulated.

If the operation depends on a navigation aid, the use of the FSTD should be limited to the published service volume of the real-world navigation aid. The use of the FSTD outside this space is usually not meaningful as the signal performance and quality of the real-world navigation aid is not known.

(4) Runway environment characteristics and facilities

Whenever the flight operation relies on visual references in both natural or enhanced vision to control or monitor the flight path or to identify relevant obstacles, all relevant environment characteristics and facilities need to be suitably represented. In the case of an EFVS, the visual advantage of the system needs to be representative of the EFVS presentation in the aircraft. This could mean that additional features may need to be implemented in the visual database of the FSTD, as the certification specifications for FSTD require a realistic scenery only for a very limited number of aerodromes.

(5) Scope of FSTD verification

The minimum scope of the FSTD verification may be based on the level of runway irregularities as per GM8 SPA.LVO.110 (scaled approach).

GM10 SPA.LVO.110 Aerodrome-related requirements, including instrument flight procedures.

SUITABLE AERODROMES — ASSESSMENT — COLLECT AND DEVELOP AIRPORT DATA NOT CONTAINED IN THE AIP — AEROPLANES

An AIP should be the primary means to collect the necessary data to perform the assessment of aerodromes for the intended operation. However, sometimes the relevant data may not be available. In that case, AMC4 SPA. LVO.110 establishes that the operator should develop procedures to collect or develop the necessary data.

In this context, the operator may use surveys and/or collected data from aeroplane sensors or data recorders. This method could be typically used to determine the pre-threshold terrain profile and partially the LSAA if not published by a State authority.

These options should be part of the LVO approval and could include, among others:

(a) data from appropriate sensors (e.g. radio altimeter, GNSS position, LOC/GS deviations);

(b) data collected from appropriate sensors stored in recorders;

(c) FDM data, if appropriate.

Sensors and data accuracy, including recorded sampling rate, should be considered in the usage of the collected data.

When defined in the approval, the respective data might be used for other airplane types.

GM11 SPA.LVO.110 Aerodrome-related requirements, including instrument flight procedures

SUITABLE AERODROMES — SUITABLE INSTRUMENT APPROACH PROCEDURES (IAPs) — SA CAT I AND SA CAT II

ICAO design criteria for IAPs are contained in PANS-OPS (Doc 8168), Volume II.

The design criteria for SA CAT I are the same as those used for standard CAT I approaches, except that the procedures used for SA CAT I should have an OCH based on radio altimeter height loss, since the use of a radio altimeter or other device capable of providing equivalent performance to determine the DH is prescribed.

PANS-OPS Volume II contains the following statement about OCH based on the use of a radio altimeter: 'If the radio altimeter OCA/H is promulgated, operational checks shall have confirmed the repeatability of radio altimeter information.' To assist in assessing the suitability of the approach area for the use of a radio altimeter, aerodromes may produce a precision approach terrain chart (PATC). Such a chart is a standard requirement for CAT II/III runways. The criteria for the PATC are contained in ICAO Annex 4, which explains the function as follows: 'The chart shall provide detailed terrain profile information within a defined portion of the final approach so as to enable aircraft operating agencies to assess the effect of the terrain on DH determination by the use of radio altimeters.' A DH of 150 ft is located approximately 600 m before the threshold on a 3° glide path.

For SA CAT I operations, the instrument approach chart should contain an OCH based on the use of a radio altimeter or other device capable of providing equivalent performance, and the information in Part C of the operations manual must contain a DH based on the use of a radio altimeter. This procedure may be titled 'SA CAT I' or 'CAT I'.

For SA CAT II, the situation is similar. The design criteria are identical to those for CAT II approaches in PANS-OPS, the only exception being the lack of some lighting systems. The OCH and DH are based on the use of a radio altimeter or other device capable of providing equivalent performance.

Since some of the lighting systems are missing, it is unlikely that a State will publish the instrument approach chart as CAT II or OTS CAT II but preferably as SA CAT II, even though the design criteria are the same. If a State, however, promulgates such an instrument approach as CAT II, it can be used for SA CAT II operations.

SA CAT II operations can be conducted on regular CAT II runways and following CAT II procedures.

GM12 SPA.LVO.110 Aerodrome-related requirements, including instrument flight procedures

SUITABLE AERODROMES — VERIFICATION OF THE SUITABILITY OF RUNWAYS FOR EFVS OPERATIONS

(a) EFVS operations allow operation below the DA/H without 'natural' visual reference. Obstacles may not be obvious to the crew using the EFVS and thus the approach descent slope used has to ensure that obstacle protection will be provided in the visual segment.

(b) When operating below the DA/H, pilots rely on the EFVS and, for EFVS-A operations, the pilot flying will need to acquire 'natural' visual reference at some point prior to touchdown (typically 100 ft above the threshold elevation). EFVS operations may present a higher probability of initiating a go-around below the DA/H than non-EFVS operations, depending on the equipment used.

(c) The purpose of the assessment of the suitability of aerodromes of Instrument Approach Procedures (IAPs) is to confirm that clearance from terrain and obstacles will be available at every stage of the approach including the visual segment and, in the event of a go-around initiated below the DH, the missed approach segment. The assessment of the visual segment should be done with reference to the visual segment surface (VSS).

(d) If a runway and an approach has been promulgated as suitable for EFVS operations, it may be assumed that the required obstacle clearance for the instrument segment and obstacle protection for the visual segment is assured and that the lighting systems are suitable. For EFVS-L operations, the pre-threshold terrain and LSAA need to be evaluated with regard to the function of flare cues or flare commands. Additionally, for runways not promulgated as suitable for EFVS operations, the operator may include the switch-over time for electrical power supply for the approach or runway lights in the safety assessment.

(e) US TERPS and ICAO Doc 9905 'Required Navigation Performance Authorisation Required (RNP AR) Procedure Design Manual' describe procedure design criteria that may be considered equivalent to PANS-OPS.

(f) Procedures not designed in accordance with PANS-OPS may have not been assessed for obstacle protection below the OCH and may not provide a clear vertical path to the runway at the normal descent angle. IAPs do not ensure obstacle clearance if a go-around is initiated below the DA/H. If an obstacle free zone (OFZ) is established, obstacle protection is provided for the go-around manoeuvre.

(g) For approach procedures where obstacle protection is not assured for a balked landing, operational procedures available to the operator could include one or more of the following actions:

(1) continue to the end of the runway and follow a published departure procedure for the landing runway (standard instrument departure or omnidirectional departure) in the event of a go-around below the DA/H;

(2) require that a go-around should be executed promptly if the required visual reference is not distinctly visible and identifiable to the pilot without reliance on the EFVS by a height above the threshold that will ensure that obstacle protection. This height might be greater than 100 ft or the height below which an approach should not be continued if the flight crew does not acquire natural visual reference as stated in the AFM;

(3) develop an alternative lateral profile to be followed in the event of a go-around below the DA/H; and

(4) impose an aircraft mass restriction for EFVS operations so that the aircraft can achieve a sufficient missed approach climb performance to clear any obstacles in the missed approach segment if a go-around is initiated at any point prior to touchdown.

(h) The terrain/obstacle clearance required in the missed approach phase for EFVS operations should be no less than for the same approach flown without EFVS.

(i) Certain EFVSs may have additional requirements for the suitability of the runways to be used. These could include verification of the accuracy of charting information for the runway threshold or the type of approach lighting installed (incandescent or LED). The assessment of the suitability of aerodromes should include the verification that all such requirements can be satisfied before EFVS operations are authorised for a particular runway.

~~AMC1 SPA.LVO.120 Flight crew training and qualifications~~

~~GENERAL PROVISIONS~~

~~GM1 SPA.LVO.120 Flight crew training and qualifications~~

~~FLIGHT CREW TRAINING~~

AMC1 SPA.LVO.120(a) Flight crew competence

COMPETENCE OF THE FLIGHT CREW FOR THE INTENDED OPERATIONS — EXPERIENCE IN TYPE OR CLASS, OR AS PILOT-IN-COMMAND/COMMANDER

To ensure that the flight crew is competent to conduct the intended operations, the operator should assess the risks associated with the conduct of low-visibility approach operations by pilots new to the aircraft type or class and take the necessary mitigations. Where such mitigations include an increment to the visibility or RVR for LVOs, this should be stated in the operations manual.

AMC2 SPA.LVO.120(a) Flight crew competence

COMPETENCE OF THE FLIGHT CREW FOR THE INTENDED OPERATIONS — RECENT EXPERIENCE FOR EFVS OPERATIONS

To be considered competent to conduct EFVS operations:

(a) Pilots should complete a minimum of two approaches on each type of aircraft operated using the operator’s procedures for EFVS operations during the validity period of each operator proficiency check or periodic demonstration of competence unless credits related to recent experience when operating more than one type are defined in the operational suitability data established in accordance with Regulation (EU) No 748/2012. When the operator is approved for both EFVS-L and EFVS-A, a minimum of one approach in each EFVS operation should be completed.

(b) If a flight crew member is authorised to operate as pilot flying and pilot monitoring during EFVS operations, the flight crew member should complete the required number of approaches in each operating capacity.

AMC3 SPA.LVO.120(a) Flight crew competence

COMPETENCE OF THE FLIGHT CREW FOR THE INTENDED OPERATIONS — RECENT EXPERIENCE FOR SA CAT I, CAT II, SA CAT II AND CAT III APPROACH OPERATIONS

To be considered competent:

(a) Pilots authorised to conduct low-visibility approach operations or operations with operational credits should complete at least two approaches using the operator’s procedures for low-visibility approach operations or operations with operational credits, during the validity period of each operator proficiency check or periodic demonstration of competence, unless credits related to recent experience when operating more than one type are defined in the operational suitability data established in accordance with Regulation (EU) No 748/2012.

(b) If the operator is approved for more than one piece of aircraft equipment used (e.g. autoland, HUD, auto-coupled approach with manual landing, SVGS, etc.), pilots should complete at least one additional approach in the lowest approved RVR (either to go-around or landing) for each piece of aircraft equipment used during the validity period of each operator proficiency check or periodic demonstration of competence (e.g. two approaches CATII with autoland and one CAT II with auto-coupled to below DH with manual landing, two CATII autoland and one CATII HUD to below DH with manual landing or vice versa) unless credits related to recent experience when operating more than one type are defined in the operational suitability data established in accordance with Regulation (EU) No 748/2012.

(c) Pilots authorised to conduct low-visibility approach operations or operations with operational credits using HUDLS or equivalent display systems to touchdown should complete two approaches (e.g. an operator approved for CAT II/III HUDLS will do two CAT III HUDLS; other examples would be two CAT III autoland and two CAT III HUDLS to touchdown, two SA CAT II autoland and two SA CAT II HUDLS, or when combining several LVOs and equipment, two CAT III autoland and one CAT II auto-coupled to below DH with manual landing and two CAT III HUDLS to touchdown) using the operator's procedures for low-visibility approach operations or operations with operational credits using HUDLS, during the validity period of each operator proficiency check or periodic demonstration of competence unless credits related to recent experience when operating more than one type are defined in the operational suitability data established in accordance with Regulation (EU) No 748/2012.

(d) If a flight crew member is authorised to operate as pilot flying and pilot monitoring, the flight crew member should complete the required number of approaches in each operating capacity.

GM1 SPA.LVO.120(a) Flight crew competence

COMPETENCE OF THE FLIGHT CREW FOR THE INTENDED OPERATIONS — EXPERIENCE IN TYPE OR CLASS, OR AS PILOT-IN-COMMAND/COMMANDER

As general guidance, the operator may use the following reference to assess the experience in type or class or as pilot-in-command/commander referred to in AMC1 SPA.LVO.120(a):

(a) Before commencing CAT II operations, the following guidance applies to pilots-in-command/commanders or pilots to whom conduct of the flight may be delegated, who are new to the aircraft type:

(1) 50 hours or 20 sectors on the type, including LIFUS; and

(2) 100 m should be added to the applicable CAT II RVR minima when the operation requires a CAT II manual landing to touchdown until:

(i) a total of 100 hours or 40 sectors, including LIFUS, has been achieved on the type; or

(ii) a total of 50 hours or 20 sectors, including LIFUS, has been achieved on the type where the flight crew member has been previously qualified for CAT II manual landing operations with an EU operator;

(3) 100 m may be added to the applicable CAT II RVR minima when the operation requires the use of CAT II HUDLS to touchdown until:

(i) a total of 40 sectors, including LIFUS, has been achieved on the type; or

(ii) a total of 20 sectors, including LIFUS, has been achieved on the type where the flight crew member has been previously qualified for CAT II HUDLS to touchdown with an EU operator.

The sector provision in point (a)(1) may always be applicable; the hours on type or class may not fulfil the provisions.

(b) Before commencing CAT III operations, the following additional provisions may apply to pilots-in-command/commanders or pilots to whom conduct of the flight may be delegated, who are new to the aircraft type:

(1) 50 hours or 20 sectors on the type, including LIFUS; and

(2) 100 m may be added to the applicable CAT II or CAT III RVR minima unless they have been previously qualified for CAT II or III operations with an EU operator, until a total of 100 hours or 40 sectors, including LIFUS, has been achieved on the type.

AMC1 SPA.LVO.120(b) Flight crew competence

INITIAL TRAINING FOR LVTO IN AN RVR LESS THAN 400 M

The operator should ensure that the flight crew members have completed the following training and checking prior to being authorised to conduct take-offs in an RVR below 400 m unless credits related to training and checking for previous experience in LVTOs on similar aircraft types are defined in the operational suitability data established in accordance with Regulation (EU) No 748/2012:

(a) A ground training course including at least the following:

(1) characteristics of fog;

(2) effects of precipitation, ice accretion, low-level wind shear and turbulence;

(3) the effect of specific aircraft/system malfunctions;

(4) the use and limitations of RVR assessment systems;

(5) procedures to be followed and precautions to be taken with regard to surface movement during operations when the RVR is 400 m or less and any additional procedures required for take-off in conditions below 150 m;

(6) qualification requirements for pilots to obtain and retain approval to conduct LVOs; and

(7) the importance of correct seating and eye position.

(b) A course of FSTD/flight training covering system failures and engine failures resulting in continued as well as rejected take-offs. Such training should include at least:

(1) normal take-off in minimum approved RVR conditions;

(2) take-off in minimum approved RVR conditions with an engine failure:

(i) for aeroplanes, between V_1 and V_2 (take-off safety speed) or as soon as safety considerations permit;

(ii) for helicopters, at or after the take-off decision point (TDP); and

(3) take-off in minimum approved RVR conditions with an engine failure:

(i) for aeroplanes, before V_1 resulting in a rejected take-off; and

(ii) for helicopters, before the TDP.

(c) The operator approved for LVTOs with an RVR below 150 m should ensure that the training specified in (b) is carried out in an FSTD. This training should include the use of any special procedures and equipment.

(d) The operator should ensure that a flight crew member has completed a check before conducting LVTOs in RVRs of less than 150 m. The check should require the execution of:

(1) at least one LVTO in the minimum approved visibility;

(2) at least one rejected take-off at minimum approved RVR in an aircraft or FSTD.

For pilots with previous experience with an EU operator of LVTOs in RVRs of less than 150 m, the check may be replaced by successful completion of the FSTD and/or flight training specified in (a), (b) and (c).

AMC2 SPA.LVO.120(b) Flight crew competence

INITIAL TRAINING AND CHECKING FOR SA CAT I, CAT II, SA CAT II AND CAT III APPROACH OPERATIONS

Operators should ensure that flight crew members complete the following training and checking before being authorised to conduct SA CAT I, CAT II, SA CAT II and CAT III approach operations unless credits related to training and checking for previous experience on similar aircraft types are defined in the operational suitability data established in accordance with Regulation (EU) No 748/2012:

(a) For flight crew members who do not have previous experience of low-visibility approach operations requiring an approval under this Subpart with an EU operator:

(1) A course of ground training including at least the following:

(i) characteristics and limitations of different types of approach aids;

(ii) characteristics of the visual aids;

(iii) characteristics of fog;

(iv) operational capabilities and limitations of airborne systems to include symbology used on HUD/HUDLS or equivalent display systems, if appropriate;

(v) effects of precipitation, ice accretion, low level wind shear and turbulence;

(vi) the effect of specific aircraft/system malfunctions;

(vii) the use and limitations of RVR assessment systems;

(viii) principles of obstacle clearance requirements;

(ix) the recognition of failure of ground equipment or in satellite approaches, the loss of signal in space and the action to be taken in the event of such failures;

(x) procedures to be followed and precautions to be taken with regard to surface movement during operations when the RVR is 400 m or less and any additional procedures required for take-off in conditions below 150 m;

(xi) the significance of DHs based upon radio altimeters and the effect of terrain profile in the approach area on radio altimeter readings and on automatic approach/landing systems. This applies also to other devices capable of providing equivalent information;

(xii) the effect of the pre-threshold terrain and LSAA on airborne landing systems;

(xiii) the significance of alert height, if applicable, and action in the event of any failure above and below the alert height;

(xiv) qualification requirements for pilots to obtain and retain approval to conduct LVOs;

(xv) the importance of correct seating and eye position; and

(xvi) the significance of LVPs or equivalent procedures.

(2) A course of FSTD training and/or flight training in two phases as follows:

(i) Phase one (LVOs with aircraft and all equipment serviceable) — objectives

(A) understand the operation of equipment required for LVOs;

(B) understand the operating limitations resulting from airworthiness certification;

(C) practise the monitoring of automatic flight control systems and status annunciators;

(D) practise the use of HUD/HUDLS or equivalent display systems, where appropriate;

(E) understand the significance of alert height, if applicable;

(F) become familiar with the maximum lateral and vertical deviation permitted for different types of approach operation;

(G) become familiar with the visual references required at DH;

(H) master the manual aircraft handling relevant to low-visibility approach operations;

(I) practise coordination with other crew members; and

(J) become proficient at procedures for low-visibility approach operations with serviceable equipment.

(ii) Phase one of the training should include the following exercises:

(A) the required checks for satisfactory functioning of equipment, both on the ground and in flight;

(B) the use of HUD/HUDLS or equivalent display systems during all phases of flight, if applicable;

(C) approach using the appropriate flight guidance, autopilots, and control systems installed on the aircraft to the appropriate DH and transition to visual flight and landing;

(D) approach with all engines operating using the appropriate flight guidance, autopilots and control systems installed on the aircraft, including HUD/HUDLS or equivalent display systems, down to the appropriate DH followed by a missed approach, all without external visual reference;

(E) where appropriate, approaches using autopilot to provide automatic flare, hover, landing and roll-out; and

(F) where appropriate, approaches using approved HUD/HUDLS or equivalent display system to touchdown.

(iii) Phase two (low-visibility approach operations with aircraft and equipment failures and degradations) — objectives

(A) understand the effect of known aircraft unserviceability including use of the MEL;

(B) understand the effect of failed or downgraded equipment on aerodrome operating minima;

(C) understand the actions required in response to failures and changes in the status of automatic flight control/guidance systems including HUD/HUDLS or equivalent display systems;

(D) understand the actions required in response to failures above and below alert height, if applicable;

(E) practise abnormal operations and incapacitation procedures; and

(F) become proficient at dealing with failures and abnormal situations during low-visibility approach operations.

(iv) Phase two of the training should include the following exercises:

(A) approaches with engine failures at various stages of the approach;

(B) approaches with critical equipment failures, such as electrical systems, auto-flight systems, ground or airborne approach aids and status monitors;

(C) approaches where failures of auto-flight or flight guidance systems, including HUDLS or equivalent display systems, require either:

(a) reversion to manual control for landing or go-around; or

(b) reversion to manual control or a downgraded automatic mode control for go-around from the DH or below, including those which may result in contact with the runway.

This should include aircraft handling if, during a CAT III fail-passive approach, a fault causes autopilot to disconnect at or below the DH when the last reported RVR is 300 m or less;

(D) failures of systems that will result in excessive lateral or vertical deviation both above and below the DH in the minimum visual conditions for the operation;

(E) incapacitation procedures appropriate to low-visibility approach operations; and

(F) failures and procedures applicable to the specific aircraft type.

(v) FSTD training should include:

(A) for approaches flown using HUDLS or equivalent display systems, a minimum of eight approaches;

(B) otherwise, a minimum of six approaches.

(vi) For aircraft for which no FSTDs representing the specific aircraft are available, operators should ensure that the flight training phase specific to the visual scenarios of low-visibility approach operations is conducted in a specifically approved FSTD. Such training should include a minimum of four approaches. Thereafter, type-specific training should be conducted in the aircraft.

(3) A check requiring the completion of at least the following exercises in an aircraft or FSTD

(i) Low-visibility approaches in simulated instrument flight conditions down to the applicable DH, using the flight guidance system. Standard procedures of crew coordination (task sharing, call-out procedures, mutual surveillance, information exchange and support) should be observed. For CAT III operations, the operator should use an FSTD approved for this purpose;

(ii) Go-around after approaches as indicated in (2) at any point between 500 ft above ground level (AGL) and on reaching the DH; and

(iii) Landing(s) with visual reference established at the DH following an instrument approach. Depending on the specific flight guidance system, an automatic landing should be performed.

(4) For operators for which LIFUS is required by Part-ORO, practice in approaches during LIFUS, as follows:

(i) For low-visibility approach operations using a manual landing:

(A) if a HUDLS or equivalent display system is used to touchdown, four landings, or if the training required by (a)(2) was conducted in an FSTD qualified for zero flight-time training (ZFTT), two landings;

(B) otherwise, three landings, or if the training required by (a)(2) was conducted in an FSTD qualified for ZFTT, one landing;

(ii) For low-visibility operations using autoland:

(A) if the training required by (a)(2) was conducted in an FSTD qualified for ZFTT, one landing, or none if the fight crew member successfully completed a type rating based on ZFTT;

(B) otherwise, two landings.

(b) For flight crew members who have previous experience of low-visibility approach operations requiring an approval under this Subpart with an EU operator, when changing to an aircraft for which a new class or type rating is required, within the same operator:

(1) A course of ground training as specified in (a)(1), taking into account the flight crew member's existing knowledge of low-visibility approach operations.

(2) A course of FSTD and/or flight training, as specified in (a)(2) above. If the flight crew member's previous experience of low-visibility approach operations is on a type where the following were the same or similar:

(i) the technology used in the flight guidance and flight control system;

(ii) operating procedures;

(iii) handling characteristics; and

(iv) the use of HUD/HUDLS or equivalent display systems,

then the flight crew member may complete an abbreviated course of FSTD and/or flight training.

(3) An abbreviated course should meet the objectives described in (a)(2), need not include the number of approaches required by (a)(2)(v), but should include at least the following number of landings:

(i) if a HUDLS or an equivalent display system is utilised to touchdown, then four approaches including a landing at the lowest approved RVR and a go-around; or

(ii) otherwise, two approaches including a landing at the lowest approved RVR and a go-around.

(c) For flight crew members who have previous experience of low-visibility approach operations requiring an approval under this Subpart with an EU operator, when joining another operator:

(1) A course of ground training as specified in (a)(1), taking into account the flight crew member's existing knowledge of low-visibility approach operations.

(2) A course of FSTD and/or flight training as specified in (a)(2) above. If the flight crew member's previous experience of low-visibility approach operations is on the same aircraft type and variant, or on a different type or variant where the following were the same or similar:

(i) the technology used in the flight guidance and flight control system;

(ii) operating procedures;

(iii) handling characteristics; and

(iv) the use of HUD/HUDLS or equivalent display systems,

then the flight crew member may complete an abbreviated course of FSTD and/or flight training. Such an abbreviated course should meet the objectives described in (a)(2), need not include the number of approaches required by (a)(2)(v), but should include at least the following number of landings:

(A) if a HUDLS or an equivalent display system is utilised to touchdown, then four approaches including a landing at the lowest approved RVR and a go-around; or

(B) otherwise, two approaches including a landing at the lowest approved RVR and a go-around.

(3) Practice in approaches during LIFUS as required by (a)(3) above unless the flight crew member's previous experience of low-visibility approach operations is on the same aircraft type and variant.

AMC3 SPA.LVO.120(b) Flight crew competence

INITIAL TRAINING AND CHECKING FOR EFVS OPERATIONS

Operators should ensure that flight crew members complete the following training and checking before being authorised to conduct EFVS operations unless credits related to training and checking for previous experience on similar aircraft types are defined in the operational suitability data established in accordance with Regulation (EU) No 748/2012:

(a) For flight crew members who do not have previous experience of EFVS operations requiring an approval under this Subpart with an EU operator:

(1) A course of ground training including at least the following:

(i) characteristics and limitations of HUDs/HUDLSs or equivalent display systems including information presentation and symbology;

(ii) EFVS sensor performance, sensor limitations, scene interpretation, visual anomalies and other visual effects;

(iii) EFVS display, control, modes, features, symbology, annunciations and associated systems and components;

(iv) the interpretation of EFVS imagery;

(v) the interpretation of approach and runway lighting systems and display characteristics when using EFVS;

(vi) weather associated with low-visibility conditions and its effect on EFVS performance;

(vii) pre-flight planning and selection of suitable aerodromes and approach procedures;

(viii) principles of obstacle clearance requirements;

(ix) the use and limitations of RVR assessment systems;

(x) normal, abnormal and emergency procedures for EFVS operations;

(xi) the effect of specific aircraft/system malfunctions;

(xii) procedures to be followed and precautions to be taken with regard to surface movement during operations when the RVR is 400 m or less;

(xiii) for EFVS-L, the effect of the pre-threshold terrain and LSAA on airborne landing systems;

(xiv) human factors aspects of EFVS operations;

(xv) qualification requirements for pilots to obtain and retain approval for EFVS operations; and

(xvi) the significance of LVPs or equivalent procedures when operating below RVR 550 m.

(2) A course of FSTD training and/or flight training in two phases as follows:

(i) Phase one (EFVS operations with aircraft and all equipment serviceable) — objectives:

(A) understand the operation of equipment required for EFVS operations;

(B) understand operating limitations of the installed EFVS;

(C) practise the use of HUD/HUDLS or equivalent display systems;

(D) practise the set-up and adjustment of EFVS equipment in different conditions (e.g. day and night);

(E) practise the monitoring of automatic flight control systems, EFVS information and status annunciators;

(F) practise the interpretation of EFVS imagery;

(G) become familiar with the features needed on the EFVS image to continue approach below the DH;

(H) practise the identification of visual references using natural vision while using EFVS equipment;

(I) master the manual aircraft handling relevant to EFVS operations including, where appropriate, the use of the flare cue and guidance for landing;

(J) practise coordination with other crew members; and

(K) become proficient at procedures for EFVS operations.

(ii) Phase one of the training should include the following exercises:

(A) the required checks for satisfactory functioning of equipment, both on the ground and in flight;

(B) the use of HUD/HUDLS or equivalent display systems during all phases of flight;

(C) approach using the EFVSs installed on the aircraft to the appropriate DH and transition to visual flight and landing;

(D) approach with all engines operating using the EFVS, down to the appropriate DH followed by a missed approach, all without external visual reference;

(E) where appropriate, approaches using approved EFVS to touchdown.

(iii) Phase two (EFVS operations with aircraft and equipment failures and degradations) — objectives:

(A) understand the effect of known aircraft unserviceabilities including use of the MEL;

(B) understand the effect of failed or downgraded equipment on aerodrome operating minima;

(C) understand the actions required in response to failures and changes in the status of the EFVS including HUD/HUDLS or equivalent display systems;

(D) understand the actions required in response to failures above and below the DH;

(E) practise abnormal operations and incapacitation procedures; and

(F) become proficient at dealing with failures and abnormal situations during EFVS operations.

(iv) Phase two of the training should include the following exercises:

(A) approaches with engine failures at various stages of the approach;

(B) approaches with failures of the EFVS at various stages of the approach, including failures between the DH and the height below which an approach should not be continued if natural visual reference is not acquired, requiring either:

(a) reversion to head-down displays to control missed approach; or

(b) reversion to flight with no, or downgraded, guidance to control missed approaches from the DH or below, including those which may result in a touchdown on the runway;

(C) incapacitation procedures appropriate to EFVS operations; and

(D) failures and procedures applicable to the specific EFVS installation and aircraft type.

(v) FSTD training should include a minimum of eight approaches.

(vi) If a flight crew member is to be authorised to operate as pilot flying and pilot monitoring during EFVS operations, then the flight crew member should complete the required FSTD training for each operating capacity.

(3) For operators for which LIFUS is required by Part-ORO, practice in approaches during LIFUS, as follows:

(i) if EFVS is used to touchdown, four landings; or

(ii) otherwise, three landings.

(b) For flight crew members who have previous experience of EFVS operations requiring an approval under this Subpart with an EU operator, when changing to an aircraft for which a new class or type rating is required, with the same operator:

(1) A course of ground training as specified in (a)(1), taking into account the flight crew member's existing knowledge of low-visibility approach operations.

(2) The course of FSTD and/or flight training required by (a)(2) above. If the flight crew member's previous experience of low-visibility approach operations is on a type where the following were the same or similar:

(i) the technology used in the EFVS sensor, flight guidance and flight control system;

(ii) operating procedures; and

(iii) handling characteristics,

then the flight crew member may complete an abbreviated course of FSTD and/or flight training. Such an abbreviated course should meet the objectives described in (a)(2), need not include the number of approaches required by (a)(2)(v), but should include at least the following number of landings:

(i) for EFVS to touchdown, four approaches including a landing at the lowest approved RVR and a go-around, or

(ii) otherwise, two approaches including a landing at the lowest approved RVR and a go-around.

(c) For flight crew members who have previous experience of EFVS operations requiring an approval under this Subpart with an EU operator, when joining another operator:

(1) A course of ground training as specified in (a)(1), taking into account the flight crew member's existing knowledge of low-visibility approach operations.

(2) The course of FSTD and/or flight training required by (a)(2) above. If the flight crew member's previous experience of EFVS operations is on the same aircraft type and variant with the same EFVS or on a different type or different EFVS where the following were the same or similar:

(i) the technology used in the EFVS sensor, flight guidance and flight control system;

(ii) operating procedures; and

(iii) handling characteristics,

then the flight crew member may complete an abbreviated course of FSTD and/or flight training.

(3) Such an abbreviated course should meet the objectives described in (a)(2), need not include the number of approaches required by (a)(2)(v), but should include at least the following number of landings:

(i) for EFVS to touchdown, four approaches including a landing at the lowest approved RVR and a go-around, or

(ii) otherwise, two approaches including a landing at the lowest approved RVR and a go-around.

(4) Practice in approaches during LIFUS as required by (a)(3) above unless the flight crew member's previous experience of low-visibility approach operations is on the same aircraft type and variant.

AMC4 SPA.LVO.120(b) Flight crew competence

RECURRENT CHECKING FOR LVTO, SA CAT I, CAT II, SA CAT II AND CAT III APPROACH OPERATIONS

(a) The operator should ensure that the pilots' competence to perform LVOs for which they are authorised is checked by completing at least the following exercises:

(1) One or more low-visibility rejected take-off at minimum approved RVR at least once over the period between two operator proficiency checks or once at every periodic demonstration of competence.

(2) Pilots authorised for LVTO operations in an RVR of less than 150 m should additionally conduct at least one LVTO in the minimum approved visibility at each required operator proficiency check or periodic demonstration of competence.

(3) One or more low-visibility approaches in simulated instrument flight conditions down to a point between 500 ft AGL and the applicable DH followed by go-around at DH at each required operator proficiency check or periodic demonstration of competence; and

(4) One or more low-visibility approach and landings with visual reference established at the DH at each required operator proficiency check or periodic demonstration of competence.

(b) Pilots authorised to conduct CAT III operations on aircraft with a fail-passive autoland system, or HUDLS or equivalent, should complete a missed approach at least once over the period of three consecutive operator proficiency checks or demonstrations of competence as the result of an equipment failure at or below the DH when the last reported RVR was less than 300 m.

(c) CAT III approach operations should be conducted in an FSTD. Other exercises may be conducted in an FSTD or aircraft.

AMC5 SPA.LVO.120(b) Flight crew competence

DIFFERENCES TRAINING FOR LVTO, SA CAT I, CAT II, SA CAT II AND CAT III APPROACH OPERATIONS

(a) The operator should ensure that the flight crew members are provided with differences training or familiarisation whenever they are required to conduct low-visibility approach operations or operations with operational credits requiring an approval under this Subpart for which they are not already authorised, or whenever there is a change to any of the following:

(1) the technology used in the flight guidance and flight control system;

(2) the operating procedures including:

(i) fail-passive/fail-operational;

(ii) alert height;

(iii) manual landing or automatic landing;

(iv) operations with DH or no DH operations;

(3) the handling characteristics;

(4) the use of HUD/HUDLS or equivalent display systems;

(5) the use of EFVS.

(b) The differences training should:

(1) meet the objectives of the appropriate initial training course;

(2) take into account the flight crew members' previous experience; and

(3) take into account the operational suitability data established in accordance with Regulation (EU) No 748/2012.

AMC6 SPA.LVO.120(b) Flight crew competence

RECURRENT CHECKING FOR EFVS OPERATIONS

(a) The operator should ensure that the pilots' competence to perform EFVS operations is checked at each required demonstration of competence or operator proficiency check by performing at least two approaches of which one should be flown without natural vision, to the height below which an approach should not be continued if natural visual reference is not acquired.

(b) If a flight crew member is authorised to operate as pilot flying and pilot monitoring during EFVS operations, then the flight crew member should complete the required number of approaches in each operating capacity.

AMC7 SPA.LVO.120(b) Flight crew competence

DIFFERENCES TRAINING FOR EFVS OPERATIONS

(a) The operator should ensure that the flight crew members authorised to conduct EFVS operations are provided with differences training or familiarisation whenever there is a change to any of the following:

(1) the technology used in the EFVS sensor, flight guidance and flight control system;

(2) the operating procedures;

(3) the handling characteristics.

(b) The differences training should:

(1) meet the objectives of the appropriate initial training course;

(2) take into account the flight crew members' previous experience; and

(3) take into account the operational suitability data established in accordance with Regulation (EU) No 748/2012.

GM1 SPA.LVO.120(b) Flight crew competence

FLIGHT CREW TRAINING

(a) The number of approaches referred to in AMC2, AMC3, AMC4 and AMC6 to SPA.LVO.120(b) represents the minimum number of approaches that the flight crew members should conduct during initial and recurrent training and checking. More approaches or other training exercises may be required in order to ensure that flight crew members achieve the required proficiency.

(b) Where flight crew members are to be authorised to conduct more than one kind of LVOs including operations with operational credits for which the technology and operating procedures are similar, there is no requirement to increase the number of approaches in initial training if the training programme ensures that the flight crew members are competent for all operations for which they will be authorised. Where flight crew members are to be authorised to conduct more than one kind of LVOs including operations with operational credits using different technology or operating procedures, then the required minimum number of approaches should be completed for each different technology or operating procedure.

(c) Where flight crew members are authorised to conduct more than one kind of LVOs including operations with operational credits for which the technology and operating procedures are similar, then there is no requirement to increase the number of approaches flown during recurrent checking. However, where flight crew members are authorised to conduct more than one kind of LVOs including operations with operational credits using different technology or operating procedures, then the required number of approaches should be completed for each different technology or operating procedure.

(d) Flight crew members are required to complete initial and recurrent FSTD training for each operating capacity for which they will be authorised (e.g. as pilot flying and/or pilot monitoring). A pilot who will be authorised to operate in either capacity will need to complete the minimum number of approaches in each capacity.

(e) Approaches conducted in a suitably qualified FSTD and/or during a proficiency check or demonstration of competence may be counted towards the recent experience requirements. If a flight crew member has not complied with the recent experience requirements of AMC2 SPA.LVO.120(a) or AMC3 SPA.LVO.120(a), the required approaches may be conducted during recurrent training, an operator proficiency check or a periodic check of competence either in an aircraft or on an FSTD.

(f) Table 1 presents a summary of initial training requirements for LVOs and operations with operational credits.

(g) Table 2 presents a summary of recent experience and recurrent training/checking requirements for LVOs and operations with operational credits.

Table 1

Summary of initial training requirements for LVOs and operations with operational credits

Approval	Airborne equipment	Previous experience	Reference	Practical (FSTD) training[4]	LIFUS (if required)[4]
CAT II	Auto coupled to below DH with manual landing	none	AMC2 SPA.LVO.120(b) point (a)(2)(v)	As required but not less than 6 approaches	3 landings or 1 landing[1]
		Previously qualified with the same operator, similar operations[3]	AMC2 SPA.LVO.120(b) point (b)(2)(ii)	2 approaches	none
		Previously qualified with a different EU operator, same type and variant	AMC2 SPA.LVO.120(b) point (c)(2)	2 approaches	none
		Previously qualified with a different EU operator, similar operations[3]	AMC2 SPA.LVO.120(b) point (c)(2)	2 approaches	3 landings or 1 landing[1]
SA CAT I CAT II SA CAT II CAT III	Autoland	none	AMC2 SPA.LVO.120(b) point (a)(4)(ii)	As required but not less than 6 approaches	2 landings or 1 landing[1] or no landings[2]
		Previously qualified with the same operator, similar operations[3]	AMC2 SPA.LVO.120(b) point (b)(3)(ii)	2 approaches	None
		Previously qualified with a different EU operator, same type and variant	AMC2 SPA.LVO.120(b) point (c)(2)	2 approaches	none
		Previously qualified with a different EU operator, similar operations[3]	AMC2 SPA.LVO.120(b) point (c)(2)	2 approaches	2 landings or 1 landing[1] or no landings[2]
CAT II SA CAT II CAT III	HUDLS / manual landing	none	AMC2 SPA.LVO.120(b) point (a)(2)(v)	As required but not less than 8 approaches	4 landings or 2 landings[1]
		Previously qualified with the same operator, similar operations[3]	AMC2 SPA.LVO.120(b) point (b)(3)(i)	4 approaches	None

Approval	Airborne equipment	Previous experience	Reference	Practical (FSTD) training[4]	LIFUS (if required)[4]
		Previously qualified with a different EU operator, same type and variant	AMC2 SPA.LVO.120(b) point (c)(2)	4 approaches	none
		Previously qualified with a different EU operator, similar operations[3]	AMC2 SPA.LVO.120(b) point (c)(2)	4 approaches	4 landings or 2 landings[1]
SA CAT I CAT II SA CAT II CAT III	HUDLS / automatic landing	none	AMC2 SPA.LVO.120(b) point (a)(4)	As required but not less than 8 approaches	2 landings or 1 landing[1] or no landings[2]
		Previously qualified with the same operator, similar operations[3]	AMC2 SPA.LVO.120(b) point (b)(3)	4 approaches	None
		Previously qualified with a different EU operator, same type and variant	AMC2 SPA.LVO.120(b) point (c)(2)	4 approaches	None
		Previously qualified with a different EU operator, similar operations[3]	AMC2 SPA.LVO.120(b) point (c)(2)	4 approaches	2 landings or 1 landing[1] or no landings[2]
EFVS-A	EFVS with HUD / HUDLS	none	AMC3 SPA.LVO.120(b) point (a)(2)	As required but not less than 8 approaches	3 landings
		Previously qualified with the same operator, similar operations[3]	AMC3 SPA.LVO.120(b) point (b)(3)	2 approaches	None
		Previously qualified with a different EU operator, same type and variant	AMC3 SPA.LVO.120(b) point (c)(2)	2 approaches	none
		Previously qualified with a different EU operator, similar operations[3]	AMC3 SPA.LVO.120(b) point (c)(2)	2 approaches	3 landings
EFVS-L	EFVS with HUD / HUDLS	none	AMC3 SPA.LVO.120(b) point (a)(2)	As required but not less than 8 approaches	4 landings
		Previously qualified with the same operator, similar operations[3]	AMC3 SPA.LVO.120(b) point (b)(3)	4 approaches	None
		Previously qualified with a different EU operator, same type and variant	AMC3 SPA.LVO.120(b) point (c)(2)	4 approaches	none

Approval	Airborne equipment	Previous experience	Reference	Practical (FSTD) training[4]	LIFUS (if required)[4]
		Previously qualified with a different EU operator, similar operations[3]	AMC3 SPA.LVO.120(b) point (c)(2)	4 approaches	4 landings

Notes:

1: Fewer landings during LIFUS are required if a level 'D' FSTD is used for conversion training.

2: No landings are required if a candidate has completed the zero flight-time (ZFT) type rating.

3: 'Similar operations' implies that the level of technology, operating procedures, handling characteristics and HUD/HUDLS or equivalent display systems are the same or similar.

4: 'operational suitability data established in accordance with Regulation (EU) No 748/2012 may define credits'

Table 2

Summary of recent experience and recurrent training/checking requirements for LVOs and operations with operational credits

<table>
<tr><th>LVO / operational credit</th><th>Airborne equipment</th><th>Recent experience[1, 2]</th><th>Reference</th><th>Recurrent training / checking</th><th>Reference</th></tr>
<tr><td>LVTO</td><td>-</td><td>-</td><td>-</td><td>1 rejected take-off and 1 LVTO at minimum RVR[1]</td><td>AMC4 SPA.LVO.120(b) point (a)(1), (a)(2)</td></tr>
<tr><td>CAT II</td><td>Auto coupled below DH with manual landing</td><td rowspan="2">2 or more approaches[4]</td><td rowspan="2">AMC3 SPA.LVO.120(a) points (a) and (b)</td><td rowspan="2">1 approach to land;
1 approach to go-around</td><td rowspan="2">AMC4 SPA.LVO.120(b) point (a)(2), (a)(3)</td></tr>
<tr><td>SA CAT I
CAT II
SA CAT II
CAT III</td><td>Autoland</td></tr>
<tr><td>CAT II / III
SA CAT I
SA CAT II</td><td>HUDLS / manual landing</td><td rowspan="2">2 or 4 approaches</td><td rowspan="2">AMC3 SPA.LVO.120(a) point (c)</td><td rowspan="2">2 approaches including a landing</td><td rowspan="2">AMC4 SPA.LVO.120(b) point (b)</td></tr>
<tr><td>CAT II / III
SA CAT I
SA CAT II</td><td>HUDLS / automatic landing</td></tr>
<tr><td>Approach using EFVS</td><td>(HUD / HUDLS)</td><td>2 approaches[4]</td><td>AMC2 SPA.LVO.120(a)</td><td>2 approaches[3]</td><td>AMC6 SPA.LVO.120(b)</td></tr>
</table>

Notes:

1: LVTO only required if the minimum approved RVR is less than 150m.

2: If a flight crew member is authorised to operate as pilot flying and pilot monitoring, then the flight crew member should complete the required number of approaches in each operating capacity.

3: One approach to be flown without natural vision, to the height below which an approach should not be continued if natural visual reference is not acquired.

4: 'operational suitability data established in accordance with Regulation (EU) No 748/2012 may define credits'

GM2 SPA.LVO.120(b) Flight crew competence

RECURRENT TRAINING AND CHECKING FOR EFVS OPERATIONS

In order to provide the opportunity to practise decision-making in the event of system failures and failure to acquire natural visual reference, the recurrent training and checking for EFVS operations is recommended to periodically include different combinations of equipment failures, go-around due to loss of visual reference and landings.

GM3 SPA.LVO.120(b) Flight crew competence

INITIAL TRAINING AND CHECKING FOR SA CAT I, CAT II, SA CAT II AND CAT III APPROACH OPERATIONS

The ground training referred to in points (a)(1)(i) and (iv) of AMC2 SPA.LVO.120(b) may include:

(a) airborne and ground equipment:

(1) technical requirements;

(2) operational requirements;

(3) operational reliability;

(4) fail-operational;

(5) fail-passive;

(6) equipment reliability;

(7) operating procedures;

(8) preparatory measures;

(9) operational downgrading; and

(10) communications; and

(b) procedures and limitations:

(1) operating procedures; and

(2) crew coordination.

~~AMC1 SPA.LVO.125 Operating procedures~~

~~GENERAL~~

AMC1 SPA.NVIS.120 NVIS operating minima

NVIS OPERATIONS UNDER IFR

(a) Any limitation in the rotorcraft flight manual should be complied with.

(b) Night-vision goggles may be used in a flipped-down position during a flight under IFR:

(1) under VMC;

(2) under IMC:

(i) in preparation of the visual segment of an instrument approach or a visual approach;

(ii) during the visual segment of an instrument approach or departure;

(iii) during a visual approach;

(iv) in preparation of a transition to VFR.

(c) The pilot-in-command/commander should not proceed on a visual segment of an IFR flight unless the visual cues required for the visual segment are visible using unaided vision.

(d) The pilot-in-command/commander should not proceed VFR unless the VFR weather minima are assessed without using unaided vision.

GM1 SPA.NVIS.120 NVIS operating minima

NVIS OPERATIONS UNDER IFR

The use of night-vision goggles in a flipped-down position does not prevent the use of unaided vision, by looking out below the goggles or to the sides.

AMC1 SPA.NVIS.130(f) Crew requirements for NVIS operations

CHECKING OF NVIS CREW MEMBERS

(a) The operator proficiency check and line check required in SPA.NVIS.130(f) should have a validity of 12 calendar months. The validity period should be counted from the end of the month when the training was taken. When the check is undertaken within the last 3 months of the validity period, the new validity period should be counted from the previous expiry date.

(b) These ~~The~~ checks ~~required in SPA.NVIS.130 (f)~~ may be combined with those checks required for the underlying activity.

AMC2 SPA.NVIS.130(f) Crew requirements for NVIS operations

CREW TRAINING AND CHECKING — NVIS OPERATIONS UNDER IFR

(a) The minimum crew should be two pilots, or one pilot and one NVIS technical crew member.

(b) The crew training and experience should ensure:

(1) efficient scanning of the instruments with the night-vision goggles (NVGs) flipped up or down as defined in the standard operating procedures (SOPs);

(2) proficiency during the transition phase;

(3) proficient use of the NVGs on the visual segments of the flight during which they are expected to be used;

(4) the continuity of a crew concept.

(c) A crew member that is involved in NVIS operations under IFR should undergo initial and recurrent training using a suitable FSTD as part of the normal crew complement. The training should cover at least the following items under a variety of weather conditions and cultural lighting:

(1) transition from instrument to visual flight during the final approach;

(2) transition from visual to instrument flight on departure.

(d) In addition to (b) and (c), a technical crew member that is involved in NVIS operations under IFR should be trained to perform navigation and monitoring functions under IFR, as described under AMC3 SPA.NVIS.130(f). The training should include all of the following on the given helicopter type:

(1) initial and recurrent general training;

(2) initial and recurrent monitoring training;

(3) initial and recurrent navigation training;

(4) initial and recurrent aircraft/FSTD training focusing on crew cooperation with the pilot;

(5) LIFUS.

(e) An FSTD suitable for the NVIS training described in (c) should meet all of the following criteria:

(1) be a helicopter FSTD;

(2 have a NVIS-compatible cockpit;

(3) have a night visual system that can be representative of different moon phases and allows external visual cues to be adjusted to the point where they are no longer visible without NVGs and remain visible with NVGs, when simulating night conditions;

(4) The night visual system should be able to support atmospheric conditions such as:

(i) more than one cloud layer or one cloud layer with a geographically variable cloud base;

(ii) variable visibility; and

(iii) snow, light rain and heavy rain with and without NVGs;

(5) be of a helicopter type on which the crew member is current unless the crew member receives additional training for the use of the FSTD.

(f) The person conducting the training defined in (c) above should be a NVIS instructor and should hold an instrument rating in accordance with Regulation (EU) No 1178/2011.

(g) The training should have a validity of 12 calendar months. The validity period should be counted from the end of the month when the training was taken. When the training is undertaken within the last 3 months of the validity period, the new validity period should be counted from the previous expiry date.

(h) The flight crew operator proficiency check should include one transition from instrument to visual flight during the final approach, using NVIS. This manoeuvre may be combined with a 2D or 3D approach to minima.

(i) NVIS operations under IFR on more than one type or variant with different levels of automation

(1) The crew member should be provided with differences training or familiarisation.

(2) The flight crew member should perform the manoeuvre defined in (h) each time on a different type or variant.

AMC3 SPA.NVIS.130(f) Crew requirements for NVIS operations

CREW TRAINING AND CHECKING — TECHNICAL CREW MEMBER TRAINING FOR OPERATIONS UNDER IFR — INITIAL AND RECURRENT GENERAL TRAINING AND CHECKING

(a) The technical crew member initial and recurrent training and checking syllabus should include the following items:

(1) duties in the technical crew member role;

(2) map reading, including:

(i) ability to keep track with helicopter position on map;

(ii) ability to detect conflicting terrain/obstacles on a given route, and at a given altitude;

(iii) use of moving maps, as required;

(3) basic understanding of the helicopter type in terms of location and design of normal and emergency systems and equipment, including all helicopter lights and operation of doors, and including knowledge of helicopter systems and understanding of the terminology used in checklists;

(4) the dangers of rotor-running helicopters;

(5) outside lookout during the flight;

(6) crew coordination with in-flight call-outs, with emphasis on crew coordination regarding the tasks of the technical crew member, including checklist initiation, interruptions and termination;

(7) warnings, and use of normal, abnormal and emergency checklists assisting the pilot as required;

(8) the use of the helicopter intercommunications system;

(9) basic helicopter performance principles, including the definitions of Category A certification, performance class 1 and performance class 2;

(10) operational control and supervision;

(11) meteorology;

(12) applicable parts of SERA, including instrument flight rules (IFR), as relevant to the tasks of the technical crew member;

(13) mission planning;

(14) early identification of pilot incapacitation;

(15) debriefing; and

(16) PBN, as necessary.

INITIAL AND RECURRENT NAVIGATION TRAINING AND CHECKING

(b) The initial and recurrent navigation training and checking syllabus should include the following items:

(1) aeronautical map reading (additional training to (a)(4) above), navigation principles;

(2) navigation aid principles and use;

(3) crew coordination with in-flight call-outs, with emphasis on navigation issues;

(4) applicable parts of SERA; and

(5) airspace, restricted areas, and noise-abatement procedures.

INITIAL AND RECURRENT MONITORING TRAINING AND CHECKING

(c) The initial and recurrent monitoring training and checking syllabus should include the following items:

(1) basic understanding of the helicopter type, including knowledge of any limitations to the parameters the crew member is tasked to monitor, and knowledge of the basic principles of flight;

(2) instrument reading;

(3) inside monitoring during the flight;

(i) aircraft state/cockpit cross-check;

(ii) automation philosophy and autopilot status monitoring, as relevant;

(iii) FMS, as relevant;

(4) crew coordination with in-flight call-outs, with emphasis on call-outs and actions resulting from the monitoring process; and

(5) flight path monitoring.

INITIAL AIRCRAFT/FSTD TRAINING

(d) The technical crew member training syllabus should include aircraft/FSTD training focusing on crew cooperation with the pilot.

(1) The initial training should include at least 4 hours instruction dedicated to crew cooperation unless:

(i) the technical crew member has undergone this training under another operator; or

(ii) the technical crew member has performed at least 50 missions in assisting the pilot from the front seat as a technical crew member.

(2) The training described in (1) should be organised with a crew composition of one pilot and one technical crew member.

(3) The training described in (1) should be supervised by a pilot with a minimum experience of 500 hours in either multi-pilot operations or single-pilot operations with a technical crew member assisting from the front seat, or a combination of these.

(4) The training may be combined with the LIFUS.

LINE FLYING UNDER SUPERVISION (LIFUS)

(e) LIFUS

(1) LIFUS should take place during the operator's conversion course.

(2) Line flights under supervision provide the opportunity for a technical crew member to practise the procedures and techniques he or she should be familiar with, regarding ground and flight operations, including any elements that are specific to a particular helicopter type. Upon completion of the LIFUS, the technical crew member should be able to safely conduct the flight operational duties assigned to him or her according to the procedures laid down in the operator's operations manual.

(3) LIFUS should be conducted by a suitably qualified technical crew member or commander nominated by the operator.

(4) LIFUS should include a minimum of five sectors under IFR.

RECURRENT AIRCRAFT/FSTD TRAINING

(f) Recurrent helicopter/FSTD training

(1) The recurrent training should focus on crew cooperation and contain a minimum of 2 hours of flight.

(2) The training described in (1) should take place in the same conditions as the initial training in (d) above.

GM1 SPA.NVIS.130(f) Crew requirements for NVIS operations

(…)

GM2 SPA.NVIS.130(f) Crew requirements for NVIS operations

(…)

GM3 SPA.NVIS.130(f) Crew requirements for NVIS operations

(…)

GM4 SPA.NVIS.130(f) Crew requirements for NVIS operations

(…)

GM5 SPA.NVIS.130(f) Crew requirements for NVIS operations

CREW TRAINING AND CHECKING — SUITABLE FSTD — NVIS OPERATIONS UNDER IFR

The FSTD may be a generic FSTD and may have no motion system.

GM1 SPA.NVIS.140 Information and documentation

[…]

Executive summary

[…]

Simply stated, night vision imaging systems are an aid to night VFR flight. Currently, such systems consist of a set of night vision goggles and normally a compl~~i~~ementary array of cockpit lighting modifications. The specifications of these two sub-system elements are interdependent and, as technology advances, the characteristics associated with each element are expected to evolve. The complete description and performance standards of the night vision goggles and cockpit lighting modifications appropriate to civil aviation are contained in the Minimum Operational Performance Standards for Integrated Night Vision Imaging System Equipment.

[…]

An FAA study (DOT/FAA/RD-94/21, 1994) best summarised the need for night vision imaging systems by stating, ~~“~~‘When properly used, NVGs can increase safety, enhance situational awareness, and reduce pilot workload and stress that are typically associated with night operations.~~”~~’

Concept of operations — NVIS operations under IFR

The NVIS can be useful to assess the environment when not in a cloud layer if procedures are established for its use. It may also be useful for decision-making before cancelling IFR and during the transition from instrument flight to visual flight under IFR.

During departure, the NVIS provides extra safety if used correctly. This is especially true for a departure where the instruction is to proceed VFR from the FATO to the initial departure fix (IDF) because VFR departures provide no obstacle protection. It could also be useful for other instrument departures.

During the transition to visual flight, the NVIS provides additional safety because the visibility may be very different with or without the NVIS, and it may help to assess the situation.

The scanning of instruments and of external cues will be modified. Multi-crew operations with SOPs and the relevant training should be in place.

Operator SOPs may define that when one of the crew members uses the NVGs in a flipped-down position, the other should have the NVGs flipped up and should monitor the flight instruments and navigation instruments used for the flight. In this case, the continuity of the crew concept will rely on efficient crew communication.

In other situations and operations, the operator SOPs may also define that both crew members have NVGs in the flipped-down position, using the capability to look below the NVGs to monitor both the instruments and the VMC situation.

2. Terminology

[…]

3. SYSTEM DESCRIPTION

[…]

3.2.1.7 LED lights

Some red obstacle lights and other artificial lights that are clearly visible to the naked eye are not visible to NVGs. These obstacle lights may employ LED instead of traditional incandescent sources. The use of LED lights is becoming more common for almost all lighting applications because of their extensive lifetime and low energy consumption.

Aviation red light ranges from about 610 to 700 nanometres (nm), and NVGs approved for civil aviation (having a Class B Minus Blue Filter) are only sensitive to energy ranging from 665 to about 930 nm. LED and other artificial lights may have a relatively narrow emission band (around 630 nm ± 20 nm) and that band is below the range in which NVGs are sensitive and LEDs do not emit infrared energy like incandescent lights for obstacle red lights.

In general terms, NVG users should be aware that obstacle lighting systems and other artificial lights that fall outside the combined visible and near-infrared spectrum of NVGs (approximately 665 to 930 nm) will not be visible to their goggles. Other obstacle lights may use a wavelength very close to the approximate cut-off wavelength of 665 nm and will remain visible to the goggles, but they will be dimmed and will be better seen with the naked eye.

Full awareness of obstacle lights can only be achieved with an unaided scan.

[…]

3.2.2.6 Instrument lighting brightness considerations

When viewing the NVG image, the brightness of the image will affect the amount of time it takes to adapt to the brightness level of the instrument lighting, thereby affecting the time it takes to interpret information provided by the instruments. The higher the quality (figure of merit (FOM), resolution, filters, contrast, etc.) of the 'tubes', the less critical this effect becomes.

For example, if the instrument lighting is fairly bright, the time it takes to interpret information provided by the instruments may be instantaneous. However, if the brightness of the lighting is set to a very low level, it may take several seconds to interpret the information, thus increasing the heads-down time and increasing the risk of spatial disorientation. It is important to ensure that instrument lighting is kept at a brightness level that makes it easy to rapidly interpret the information. This will likely be brighter than the one that is used ~~to~~ during unaided operations. If the NVGs are used in the transition phase from IFR to VFR, the brightness level of the instrument lighting should be set in advance.

[…]

4. OPERATIONS

[…]

4.2.2.2 Artificial illumination

Since ~~the~~ NVGs are sensitive to any source of energy in the visible and near-infrared spectrums, there are also many types of artificial illumination sources (e.g.~~,~~ flares, IR searchlights, cultural lighting, etc.). As with any illumination source, these can have both positive and detrimental effects on NVG utili~~z~~sation. For example, viewing a scene indirectly illuminated by a searchlight can enable the pilot to more clearly view the scene; conversely, viewing the same scene with the searchlight near or within the NVG field of view will reduce the available visual cues. It is important to be familiar with the effects of cultural lighting in the flying area in order to be able to avoid the associated problems and to be able to use the advantages provided. Also, it is important to know how to properly use artificial light sources (e.g.~~,~~ aircraft IR spotlight). It should be noted that artificial light sources may not always be available or dependable, and this should be taken into consideration during flight planning.

When using NVGs in an area with high-intensity cultural lighting, the lights beyond this area may not be visible. The visibility assessed with the NVGs might be judged to be worse than the unaided visibility.

[…]

4.4.1.1.3 Unaided scan

Under certain conditions, this scan can be as important as the others can. For example, it may be possible to detect distance and/or closure to another aircraft more easily using unaided vision, especially if the halo caused by the external lights

~~is masking~~ masks aircraft details on the NVG image. Additionally, there are other times when unaided information can be used in lieu of or can augment NVG and instrument information.

When using the NVGs in the transition from IFR to VFR, the unaided scan is essential to assess the unaided visibility conditions. Focusing on the first light seen when looking out is an automatic response, but it is vital to continue the scan in order to assess the surrounding weather conditions.

Some examples where unaided scan can enhance safety is where LED-lit obstacles can be encountered (e.g. during low-altitude flying and when performing a reconnaissance of landing areas) or when unmanned aircraft systems (UASs) fly at night with LED navigation lights.

Air operators should incorporate procedures into their manuals and/or SOPs that require periodic unaided scanning when operating at low altitudes, when looking for potential landing areas, and when performing a reconnaissance of a landing area. This may be accomplished by looking under the NVGs, or by briefly placing the NVGs in the stowed (flipped-up) position. Manuals/SOPs should include procedures and call-outs for LED-lit obstacles.

Air operators and pilots are encouraged to report encounters with obstacles equipped with LED lighting systems not visible by NVGs, with pertinent information, to their competent authority.

[…]

AMC1 SPA.HOFO.120 Selection of aerodromes and operating sites

~~COASTAL AERODROME~~ DESTINATION AERODROME — SUFFICIENT OPERATIONAL CONTINGENCY

(a) Any alleviation from the requirement to select an alternate aerodrome ~~for a flight to a costal aerodrome~~ under instrument flight rules (IFR) routing from offshore to a land destination should be based on an individual safety risk assessment with sufficient operational contingency to ensure a safe return from offshore.

REVISED AERODROME OPERATING MINIMA

(b) Unless the destination is a coastal aerodrome, the operator should ensure that all the following criteria are met:

(1) the destination aerodrome has a published instrument approach;

(2) the flight time is less than 3 hours; and

(3) the published weather forecast valid from 1 hour prior, and 1 hour subsequent to the expected landing time specifies that:

(i) the ceiling is at least 700 ft above the minima associated with the instrument approach, or 1 000 ft above the destination aerodrome, whichever is the higher; and

(ii) visibility is at least 2 500 m.

COASTAL AERODROME

(c) A coastal aerodrome is an aerodrome used for offshore operations within 5 nm of the coastline.

(d) If the coastal aerodrome has a published instrument approach, the operator should use the aerodrome operating minima defined in (b)(3).

(e) The operator may use the following operating minima by day only, as an alternative to (b)(3):

(1) the cloud base is at least 400 ft above the minima associated with the instrument approach; and

(2) visibility is at least 4 km.

(f) If descent over the sea is intended to meet VFR criteria, the operator should ensure that the coastal aerodrome is geographically sited so that the helicopter is able, within the rules of the air and within the landing forecast, to proceed inbound from the coast and carry out an approach and landing in full compliance with VFR for the associated airspace category(ies) and any notified route.

(g) If the operator makes use of the provisions in (e) or (f), the following should be taken into account as part of the risk assessment:

1) where the destination coastal aerodrome is not directly on the coast, the required usable fuel for the flight should be sufficient to return to the coast at any time after crossing the coastline, descend safely, carry out an approach under VFR and land, with the VFR fuel reserves intact;

(2) the descent to establish visual contact with the surface should take place over the sea away from the coastline and in an area clear of surface obstructions, or as part of the instrument approach;

(3) routings and procedures for coastal aerodromes nominated as such should be included in the operations manual (Part C for CAT operators);

(4) the MEL should reflect the requirement for airborne radar and radio altimeter for this type of operation; and

(5) operational limitations for each coastal aerodrome should be specified in the operations manual.

~~(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, NCC.OP.131 or SPO.OP.131 except for the 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 is able, at any time after crossing the coastline, to return to the coast, descend safely, carry out an approach under visual flight rules (VFR) and land, with the VFR fuel reserves intact;~~

~~(ii) within 5 nm of the coastline; and~~

~~(iii) geographically sited so that the helicopter is able, within the rules of the air and within the landing forecast:~~

~~(A) to proceed inbound from the coast at 500 ft above ground level (AGL), and carry out an approach and landing under VFR; or~~

~~(B) to proceed inbound from the coast on an agreed route, and carry out an approach and landing under VFR;~~

~~(4) procedures for coastal aerodromes should be based on a landing forecast no worse than:~~

~~(i) by day, a cloud base of ≥ 400 ft above descent height (DH)/minimum descent height (MDH), 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 (OM) (Part C for CAT operators);~~

~~(7) the minimum equipment list (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 OM.~~

AMC1 SPA.HOFO.125 ~~Airborne radar approach (ARA) to offshore locations~~ Offshore standard approach procedures (OSAPs)

~~Note: alternative approach procedures using original equipment manufacturer (OEM)-certified approach systems are not covered by this AMC.~~

AIRBORNE RADAR APPROACH (ARA) ~~**GENERAL**~~

[...]

AMC2 SPA.HOFO.125 Offshore standard approach procedures (OSAPs)

OSAP — ORIGINAL EQUIPMENT MANUFACTURER (OEM) — CERTIFIED APPROACH SYSTEM

Where an OSAP is conducted to a non-moving offshore location (i.e. fixed installation or moored vessel), and an original equipment manufacturer (OEM)-certified approach system is available, the use of automation to reach a reliable GNSS position for that location should be used to enhance the safety of the OSAP.

The OSAP should meet the following requirements:

(a) The OEM-certified approach system should be approved in accordance with the applicable airworthiness requirements for operations at night and in IMC.

(b) The aircraft should be equipped with a radar altimeter and a suitable airborne radar.

(c) The GNSS position of the installation should be retrieved from the area navigation system database or by manual entry if the aircraft flight management system will allow for that.

(d) The approach system vertical path should be a Baro VNAV or a GNSS SBAS vertical source type. The radar height should be cross-checked (either automatically or by the crew) to avoid erroneous QNH selection.

(e) The descent angle should be of a maximum of 4°. Up to 6° could be acceptable only if the GS is reduced to 60 kt.

(f) The minimum descent height (MDH) should not be less than 50 ft above the elevation of the helideck:

 (1) the MDH for an approach should not be lower than:

  (i) 200 ft by day; or

  (ii) 300 ft by night; and

 (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.

(g) The minimum descent altitude (MDA) may only be used if the radio altimeter is unserviceable. The MDA should be a minimum of the MDH + 200 ft and should be based on a calibrated barometer at destination or on the lowest forecast barometric pressure adjusted to sea level (QNH) for the region.

(h) The MDA/H for a single-pilot ARA should be 100 ft higher than that calculated in accordance with (f) and (g) above. The decision range should not be less than 1 NM.

(i) The approach system lateral path guidance should be capable of at least performance monitoring and alerting function of RNP 0.3 NM up to the missed approach point (MAPt), then RNP 1.0 NM to missed approach holding point.

(j) The horizontal flight path should be defined in accordance with the RNP capability of the approach system (e.g. offset no lower than the RNP capability).

(k) The maximum acceptable offset angle between the final inbound course and the installation should be 30°.

(l) Before commencing the final approach, the pilot-in-command/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 is less than the navigation performance, the pilot-in-command/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.

(m) The minimum decision range (MDR) should not be less than 0.75 NM. The maximum acceptable GS at the MAPt for a 0.75-NM MDR should be 80 kt.

(n) The segment from the MAPt to destination should not be flown in tailwind conditions. The approach course should be selectable accordingly.

(o) The aircraft should have the capability to compare the airborne radar picture and GNSS range and bearing data to cross-check the position of the offshore location.

AMC1 SPA.HOFO.125(g) Offshore standard approach procedures (OSAPs)

TRAINING AND CHECKING FOR OSAPs

(a) Initial training and checking for OSAPs should be conducted either as part of the operator's conversion course or as a separate equipment and procedure training, and should include all of the following:

(1) ground training, including knowledge of:

(i) the structure of the OSAP;

(ii) the airborne radar specifications, limitations, modes, and usage;

(iii) the area navigation system, as necessary for the envisaged OSAP;

(2) aircraft/FSTD training, including all of the following:

(i) OSAPs to various offshore sites with and without obstacles or obstructions;

(ii) OSAPs in different wind conditions, followed by landings and go-arounds;

(iii) OSAPs in the pilot-monitoring, pilot-flying and single-pilot functions, by day and by night, as relevant to the kind of operations;

(3) LIFUS;

(4) line check.

(b) The recurrent training and checking programme should include at least one OSAP per year in the pilot-monitoring, pilot-flying and single-pilot functions as relevant to the kind of operations. OSAPs should be part of the annual aircraft/FSTD training, the line check or the operator's proficiency check. Checking is not necessary if training to proficiency is employed.

GM1 SPA.HOFO.125 ~~Airborne radar approach (ARA) to offshore locations~~ Offshore standard approach procedures (OSAPs)

~~GENERAL~~ AIRBORNE RADAR APPROACH (ARA)

[…]

GM2 SPA.HOFO.125 ~~Airborne radar approach (ARA) to offshore locations~~ Offshore standard approach procedures (OSAPs)

GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS)/AREA NAVIGATION SYSTEM — AIRBORNE RADAR APPROACH (ARA)

[…]

(c) ~~operation of the GNSS equipment in terminal mode;~~ the full-scale deviation of the GNSS/area navigation system display should be in accordance with the expected navigation performance, and be no greater than 1 NM;

[…]

SUBPART N: HELICOPTER POINT-IN-SPACE APPROACHES AND DEPARTURES WITH REDUCED VFR MINIMA

AMC1 SPA.PINS-VFR.100 Helicopter point-in-space (PinS) approaches and departures with reduced VFR minima

GENERAL

(a) The operating minima prescribed in the Annex (Rules of the air) to Regulation (EU) No 923/2012 should apply under VFR, unless one of the following applies:

(1) The VFR segment of the flight follows a PinS approach and the distance from the missed approach point (MAPt) to the destination is less than 5 km.

(2) The VFR segment of the flight is a departure with the intention of transitioning to IFR at the IDF and the distance from the take-off to the initial departure fix (IDF) is less than 5 km.

(3) The VFR segment of the flight follows the planned cancellation of the IFR flight plan at or above the MAPt or decision point of an instrument approach, the destination is different from the aerodrome attached to the instrument approach, the distance from the planned point of cancellation of IFR to the destination is less than 5 km, and the operator charts the obstacle environment on the VFR segment of the flight.

(b) By day, if either (a)(1) or (a)(2) applies, the operating minima in Tables 1 and 2 should apply and visual references to the ground should be maintained.

(c) By night, if either (a)(1) or (a)(2) applies, the operating minima in Tables 3 and 4 should apply and visual references to the ground should be maintained.

(d) If (a)(3) applies, Table 1 applies by day, Table 3 applies by night, and visual references to the ground should be maintained. The MDH in the table should be understood as the DH/MDH of the IAP, whichever is higher.

Table 1

VFR operating minima BY DAY when instructed to 'proceed VFR' following an instrument approach		
x is the distance between the MAPt and the heliport or operating site		
X	Visibility	Ceiling
x < 1 000 m	1 000 m	MDH or 300 ft*
1 000 m ≤ x ≤ 3 000 m	x or 1 500 m, whichever is lower	MDH or 400 ft*
3 000 m < x ≤ 5 000 m	1 500 m	MDH or 600 ft*

Note: In Class B/C/D airspace, a special VFR clearance is needed and may require higher minima in accordance with local airspace restrictions.

* Whichever is higher.

Table 2

VFR operating minima BY DAY when instructed to 'proceed VFR' prior to an IFR departure		
x is the distance between the heliport or operating site and the IDF		
X	Visibility	Ceiling
x < 1 000 m	1 000 m	MDH or 300 ft*
1 000 m ≤ x ≤ 3 000 m	x or 1 500 m, whichever is lower	MDH or 400 ft*
3 000 m < x ≤ 5 000 m	1 500 m	MDH or 600 ft*

Note: In Class B/C/D airspace, a special VFR clearance is needed and may require higher minima in accordance with local airspace restrictions.

* Whichever is higher.

Table 3

VFR operating minima by NIGHT when instructed to 'proceed VFR' following an instrument approach		
x is the distance between the MAPt and the heliport or operating site		
X	Visibility	Ceiling

x < 1 000 m	2 000 m	MDH or 600 ft*
1 000 m ≤ x ≤ 3 000 m	x + 1 000 m	MDH + 200 ft or 600 ft*
3 000 m < x ≤ 5 000 m	5 000 m	MDH + 200 ft or 600 ft*

* Whichever is higher.

Table 4

VFR operating minima BY NIGHT when instructed to 'proceed VFR' prior to an IFR departure		
x is the distance between the heliport or operating site and the IDF		
X	Visibility	Ceiling
x < 1 000 m	2 000 m	MCA or 600 ft*
1 000 m ≤ x ≤ 3 000 m	x + 1 000 m	MCA + 200 ft or 600 ft*
3 000 m < x ≤ 5 000 m	5 000 m	MCA + 200 ft or 600 ft*

* Whichever is higher.

(d) The operator should define SOPs that describe the VFR segment of the departure and approach, including the transition from IFR to VFR and the transition from VFR to IFR.

(e) The operator should provide a thorough description of the following elements; the description may be provided by means of a chart and should be included in the operations manual or other document:

(1) the environment in the vicinity of the VFR segment of the flight;

(2) the visual cues that are useful for the purpose of VFR navigation and that should be available on departure or for the continuation of the flight at the MAPt;

(3) the relevant obstacles.

(f) The operator should ensure that the elements in (e) are updated on a regular basis.

(g) The operator should encourage occurrence reporting and have a safety analysis capability.

(h) The pilot-in-command/commander should have at least 1 000 hours of flying experience on helicopters, and 100 hours of instrument time on helicopters.

(i) The pilot-in-command/commander should undergo initial and yearly recurrent FSTD training or checking, covering the following items:

(1) 3D approach operation to minima;

(2) go-around on instruments;

(3) 2D approach operation to minima;

(4) at least one of the 3D or 2D approach operations should be a PinS approach followed by a transition to VFR and a VFR landing;

(5) in the case of multi-engined helicopters, a simulated failure of one engine should be included in either the 3D or 2D approach operation to minima;

(6) where appropriate to the helicopter type, approach with flight control system/flight director system malfunctions, flight instrument and navigation equipment failures;

(7) recovery from unusual attitudes by instrument;

(8) loss of VMC during the VFR segment of flight;

(9) VFR departure followed by a manoeuvre back to the take-off location;

(10) VFR departure to the IDF followed by an IFR departure.

(j) The training and checking elements of an approved training programme may be credited towards compliance with point (i) and need not be duplicated.

(k) The training under (i) should take place on a suitable FSTD, corresponding to the helicopter type on which the operations take place.