

# Advisory Circular

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## LOW VISIBILITY OPERATIONS (LVO)

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### GENERAL

Advisory Circulars (ACs) are issued by the Director-General of Civil Aviation (DGCA) from time to time to provide practical guidance or certainty in respect of the statutory requirements for aviation safety. ACs contain information about standards, practices and procedures acceptable to CAAS. An AC may be used, in accordance with section 3C of the Air Navigation Act (Cap. 6) (ANA), to demonstrate compliance with a statutory requirement. The revision number of the AC is indicated in parenthesis in the suffix of the AC number.

### PURPOSE

This AC provides guidance to demonstrate compliance with the requirements regarding, and information related to an application for, an approval for low visibility operations in accordance with ANR-98.

### APPLICABILITY

This AC is applicable to the operator seeking an approval for low visibility operations, including Category II and III operations.

### RELATED REGULATIONS

This AC relates specifically to Division 4 in Part 2 of ANR-98.

### RELATED ADVISORY CIRCULARS

- AC 98-1-1 Application for an Approval to Conduct a Special Operation

### CANCELLATION

This AC supersedes AC AOC-18.

### EFFECTIVE DATE

This AC is effective from 1 October 2018.

**OTHER REFERENCES**

- ICAO Doc 9365 Manual of All-Weather Operations
- FAA AC 120-29A Criteria for approval of Category I and Category II weather minima for approach
- AC 120-28D Criteria for approval of Category III weather minima for take-off, landing and rollout
- EASA CS-AWO Easy access rules for All Weather Operations

## **1 INTRODUCTION**

- 1.1 Low Visibility Operation (LVO) is any taxi, take-off and landing operations in conditions where visual reference is limited by weather conditions.
- 1.2 The operational approval granted by CAAS for LVO covers such major elements such as the aircraft as a system, flight crew capabilities and flight procedures. The operational approval does not include aerodrome facilities.
- 1.3 The operator must take cognisance of the physical and design characteristics of the runways and taxiways, pre-threshold terrain topography and back-up services of the aerodromes of intended operation and ensure that they are certified by the State of the Aerodrome to ICAO standard specifications.

## **2 LOW VISIBILITY TAXI AND TAKE-OFF**

- 2.1 When an aerodrome visibility drops below a pre-determined level, the local ATC may declare LVP (Low Visibility Procedure) operation in effect.
- 2.2 Pilots are required to follow LVP procedures and use specific aerodrome taxi charts to ensure correct taxiing to the intended runway for take-off.
- 2.3 Low visibility take-off (RVR below 400 m or RVR as promulgated by the aerodrome authority, whichever is the higher) is predicated by the declared RVRs for the three runway zones to provide adequate visual reference for accelerate-go as well as accelerate-stop.

## **3 CATEGORY II AND III OPERATIONS**

- 3.1 Equipment capabilities and limitations
  - 3.1.1 As required in Regulation 26 of ANR-98, the operator has to establish procedures or limitations necessary for safe operations. These may include:
    - (a) DA/H or AOM limitations;
    - (b) Minimum airborne equipment prior to commencement of the LVO approach;
    - (c) Equipment operating procedures and sequences;
    - (d) Aircraft performance data; and
    - (e) Any factors affecting the aeroplane LVO operations.
  - 3.1.2 Continuing Airworthiness Maintenance Procedures (CAMP)
    - (a) The CAMP should include at least the following:
      - (i) Maintenance procedures to ensure continued airworthiness relative to low visibility operations;
      - (ii) Procedure to revise and update the maintenance programme.
    - (b) The operator should publish guidance to maintenance personnel and flight crews on the control of the validity of low visibility categorisation. This guidance should take the form of –
      - (i) A list of the systems required to be fully serviceable in order to qualify the aircraft for CAT II or III operations;
      - (ii) A company procedure for the control of the modification status of the equipment fitted in the required systems which are deemed to be 'sensitive' in terms of low visibility operations;

- (iii) Placards applied to both equipment and installation to alert maintenance personnel to the need to fit only controlled equipment;
  - (iv) Procedures for downgrading low visibility capability from CAT III or II to CAT I in the event that an uncontrolled item of equipment is fitted or after any defect in an affected system or any event which results in disturbance of the system;
  - (v) Procedures for up-grading capability from CAT I to CAT II or III as appropriate when serviceability is proven, normally by performing a successful CAT II approach or CAT III landing in CAT I weather conditions (sometimes referred to as a standard landing).
- (c) When setting alert levels in system reliability monitoring, consideration should be given to the levels of reliability assumed in qualifying the aircraft for CAT II or III operations.

### 3.2 Flight Crew Training and Qualification

3.2.1 As part of flight crew training and qualification expected in Regulation 25 of ANR-98, the flight crew training programmes for low visibility operation should include structured courses covering at least the following:

- (a) Ground Training
  - (i) Characteristics, including limitations of the airborne and ground equipment, visual aids such as marking and lightings and fog, as well as capability and limitations of any other airborne systems including HUD and/or EVS;
  - (ii) Effects of precipitation, ice accretion, LLWS (Low Level Windshear) and turbulence and specific aeroplane/system malfunctions;
  - (iii) Use and limitations of RVR assessment systems, principle of obstacle clearance requirements;
  - (iv) Procedures and precautions with regard to surface movements during LVP operations including take-off requirement, e.g. minimum of 200 m RVR for Category D aeroplanes;
  - (v) Effects of irregular terrain on radio altimeter, significance of Alert Height and Decision Height, pilots' seating and eye position: and
  - (vi) Required qualification to obtain LVP take-off and CAT II/III operations
- (b) Flight Simulator and/or Aeroplane Flight Training
  - (i) Function check of equipment in air and ground, effect of known unserviceabilities and use of MEL as well as limitation due to airworthiness certification;
  - (ii) Monitoring of autoflight status and progress including special guidance systems, action in the event of failures such as engine, electrical, hydraulic or flight control;
  - (iii) Effects on minima caused by changed status of airborne /ground equipment;
  - (iv) Significance of Alert Height (AH) and failure actions above and below;
  - (v) Visual cues guidance and maximum allowable localiser or glide path deviation

3.2.2 For LVO by a helicopter, CAAS may consider the approval of the operator's training and qualification programme if it is established in accordance with **Appendix A**.

3.3 Flight crew recency

3.3.1 The operator should propose the recency criteria for his crew of that type of aircraft for CAAS's assessment and approval. As a guide, CAAS may consider the following CAT II and III operations recency criteria as appropriate for a pilot –

- (a) on aeroplanes, at least eight CAT II/III approaches with autolands in flight or in an Authority-approved flight simulator in the preceding year;
- (b) on helicopters, at least three approaches and landings using approved CAT II/III procedures, including at least one which is to be conducted in the helicopter, in the preceding 180 days.

#### **4 APPLICATION FOR APPROVAL**

4.1 The operator should arrange to meet CAAS at least 90 working days in advance of his plan to engage in low visibility operations.

4.2 CAAS' 5-step structured process (as described in AC 98-1-1) is applicable and it comprises: Pre-application meeting, Formal application, Document evaluation/assessment, Flight proving/validation and Award or rejection of application.

4.3 The application package should include the following items:

- (a) Application letter with statement on operating experience, types of aircraft and currently approved Instrument Approach Procedure (IAP);
- (b) LVO category applied for and with the relevant minima, LVP if applicable;
- (c) List of destination and alternate aerodromes with categorisation approved for LVO operations;
- (d) Relevant pages of AFM, Operations manual stating operator operating policy and/or procedures and, training programmes;
- (e) Relevant pages of the AFM, TC, STC, TCDS and/or the aeroplane operations manual attesting that the aeroplane meets the relevant airworthiness requirements and performance criteria for, as applicable, Category II (CAT II) and/or Category III (CAT III) operations as well as autoland capabilities; and
- (f) Proposed timeline, if any, for the completion of aeroplane and crew qualification.

4.4 The grant of operational approval shall depend on successful evaluation of the submitted documents, approval and validation of crew training programmes, and compliance with requirements set out in paragraph 3.

#### **5 OPERATIONAL DEMONSTRATION**

5.1 The purpose of operational demonstration required in Regulation 23 of ANR-98 is to determine or validate the use and effectiveness of the applicable aeroplane flight guidance system (including HUDLS if any), crew procedures, training, maintenance programmes and operating policy and/or procedures applicable to CAT II / III operations.

5.2 The operational demonstration should cover the following:

- (a) At least 30 approaches and landings to be accomplished utilising onboard CAT II/III system of the aeroplane type if the requested DH is 50 ft or higher;
- (b) If the DH is less than 50 ft, at least 100 approaches and landings should be accomplished;

- (c) Unsuccessful approaches such as those due to unsatisfactory landings or system disconnect, should not exceed 5% of the total. In such instance, the evaluation programme should be extended in step increments of 10 approaches and landings until over-all failure rate does not exceed 5%; and
  - (d) On a case by case basis, CAAS may consider granting credits in the form of reduction to the number of required approaches and landings based on the operator's experience gained from operating other aeroplane-type.
- 5.3 The operational demonstration should include data collection for recording approach and landing performance which includes the following information:
- (a) Deficiencies relating to airborne equipment that causes inability initiate an approach;
  - (b) Reasons for abandoning an approach and the altitude above the runway where the approach was discontinued or the autoland system disengaged; and
  - (c) Touchdown and/or rollout: A landing is considered satisfactory if the autopilot or pilot is able to correct, with normal control input, the lateral velocity so as to remain within the lateral confines of the runway. The data for the record should include, at touchdown, the approximate lateral and longitudinal position, indicated airspeed and the sink rate.
- 5.4 A summary of the operational demonstration data will be evaluated by CAAS.

## **APPENDIX A TRAINING AND QUALIFICATION FOR LOW VISIBILITY OPERATIONS BY HELICOPTERS**

### **1 GENERAL**

- 1.1 The appendix provides guidance for the training and qualification of flight crew members with no experience in CAT II or III operations.
- 1.2 The operator may abbreviate the course content for pilots with CAT II and III experience, provided the content of the abbreviated course is acceptable to CAAS.
  - (a) Flight crew members with CAT II and III experience may undertake an abbreviated ground training course.
  - (b) Flight crew members with CAT II or III experience with the operator may undertake an abbreviated ground, flight simulator and/or flight training course. The abbreviated course must include at least the requirements in Paragraph 4.

### **2 GROUND TRAINING**

- 2.1 The initial ground training course for low visibility operations should cover at least:
  - (a) The characteristics and limitations of the ILS and/or MLS;
  - (b) The characteristics of the visual aids;
  - (c) The characteristics of fog;
  - (d) The operational capabilities and limitations of the particular airborne system;
  - (e) The effects of precipitation, ice accretion, low level wind shear and turbulence;
  - (f) The effects of specific helicopter malfunctions;
  - (g) The use and limitations of RVR assessment systems;
  - (h) The principles of obstacle clearance requirements;
  - (i) Recognition and action to be taken in the event of failure of ground equipment;
  - (j) The procedures and precautions to be followed with regard to surface movement during operations when the RVR is 400 m or less and any additional procedures required for take-off in condition below 150 m;
  - (k) The significance of Decision Heights based upon radio altimeters and the effect of terrain profile in the approach area on radio altimeter readings and on the automatic approach/landing systems;
  - (l) The importance and significance of Alert Height if applicable and the action in the event of any failure above and below the alert height;
  - (m) The qualification requirements for pilots to obtain and retain approval to conduct Low Visibility Take-offs and Category II and III operations; and
  - (n) The importance of correct seating and eye position.

### 3 FLIGHT SIMULATOR TRAINING AND/OR FLIGHT TRAINING

- 3.1 The flight simulator and/or flight training should include:
- (a) Checks of satisfactory functioning of equipment, both on the ground and in flight;
  - (b) Effect of minima caused by changes in the status of ground installations;
  - (c) Monitoring of automatic flight control systems and auto-land status annunciators with emphasis on the action to be taken in the event of failures of such systems;
  - (d) Action to be taken in the event of failures such as engines, electrical systems, hydraulics or flight control system;
  - (e) The effect of known unserviceabilities and use of minimum equipment lists;
  - (f) Operating limitations resulting from airworthiness certification;
  - (g) Guidance on the visual cues required at decision height together with information on maximum deviation allowed from glidepath or localiser; and
  - (h) The importance and significance of Alert Height if applicable and the action in the event of any failure above and below the Alert Height.
- 3.2 Consistent with ANR-135, each flight crew member must be trained to carry out his duties and instructed on the coordination required with other crew members. Maximum use should be made of suitably equipped flight simulators for this purpose.
- 3.3 Training may be divided into phases covering normal operations with no helicopter or equipment failures but including low visibility conditions which may be encountered and detailed scenarios of helicopter and equipment failure which could affect CAT II or III operations. If the helicopter system involves the use of hybrid or other special systems (such as head up displays or enhanced vision equipment), flight crew members must practice the use of these systems during the flight simulator phase of training.
- 3.4 Training on incapacitation procedures appropriate to low visibility take-offs and CAT II or III operations should be included.
- 3.5 For helicopters with no type specific flight simulator, the flight training phase specific to the visual scenarios of CAT II operations should be conducted in a flight simulator approved for the purpose by CAAS and it should include a minimum of 4 approaches. Training that is type specific must then be practiced in the helicopter.
- 3.6 CAT II and III training should include at least the following exercises:
- (a) Approach using the appropriate flight guidance, autopilots and control systems installed in the helicopter, to the appropriate decision height and to include transition to visual flight and landing;



- (b) Approach with all engines operating using the appropriate flight guidance systems, autopilots and control systems installed in the helicopter down to the appropriate decision height followed by missed approach, all without external visual reference;
- (c) Where appropriate, approaches using automatic flight systems to provide automatic flare, hover, landing and roll-out; and
- (d) Normal operations of the applicable system both with and without acquisition of visual cues at decision height.

3.7 Subsequent phases of training should include at least:

- (a) Approaches with engine failure at various stages of the approach
- (b) Approaches with critical equipment failure (e.g. electrical systems, autoflight systems, ground and /or airborne ILS/MLS systems and status monitor).
- (c) Approaches where failure of autoflight equipment at low level require either:
  - (i) Reversion to manual flight to control flare, hover, landing and roll out or missed approach; or
  - (ii) Reversion to manual flight on a degraded automatic mode to control missed approaches from, at or below decision height including those which may result in a touchdown on the runway.
- (d) Failure of the systems which will result in excessive localiser and/or glide-slope deviation, both above and below decision height, in the minimum visual conditions authorised for the operation. In addition, a continuation to a manual landing must be practiced if a head-up display forms the only flare mode; and
- (e) Failures and procedures specific to helicopter type or variant.

3.8 The training programme should also:

- (a) provide practice in handling faults which require a reversion to higher minima.
- (b) include, the handling of the helicopter when, during a fail passive CAT III approach, the fault causes the autopilot to disconnect at or below decision height when the last reported RVR is 300 m or less.
- (c) include, for low visibility take-offs, handling of systems failure and engine failures resulting in continued as well as rejected take-offs.

#### 4 **Conversion Training Requirements to conduct Low Visibility Take-off and CAT II and III operations**

4.1 Each flight crew member should have successfully completed low visibility procedure training before qualifying for conversion to a new type or variant of helicopter in which the low visibility take-off and CAT II and III Operations will be conducted. A flight crew member may undertake an abbreviated training programme in accordance with Paragraph 1.2 if he has the necessary training and experience.

4.2 Ground training should be based on Paragraph 2.1, taking into account the flight crew member's training and experience in CAT II and III operations.

- 4.3 Notwithstanding Paragraph 1.2, a flight crew member undergoing simulator training and/or flight training should meet the following requirements:
- (a) A minimum of 8 approaches and/or landings in a flight simulator approved for the purpose;
  - (b) When no type specific flight simulator is available, a minimum of 3 approaches including at least one go-around is required on the helicopter; and
  - (c) Appropriate additional training if any special equipment is required such as head-up displays or enhanced vision equipment.
- 4.4 Flight Crew Qualification
- 4.4.1 Each flight crew member should have completed a check specific to the operator and the type of helicopter operated before conducting CAT II or III operations. The check may be replaced by the successful completion of the flight simulator and/or flight training prescribed in Paragraph 4.3 above.
- 4.5 Line Flying under Supervision.
- 4.5.1 Each flight crew member should have undergone supervision before performing the following operations:
- (a) For CAT II when a manual landing is required, at least 3 landings from autopilot disconnect.
  - (b) For CAT III, at least 3 autolands except that only 1 autoland is required when the training required in sub-paragraph 4.3 above has been carried out in a full flight simulator usable for zero flight time training.
- 4.6 Addition Experience Requirements for Pilot-in-command
- 4.6.1 The operator should not designate a flight crew member as pilot-in-command for low visibility take-off, and CAT II and III operations unless the flight crew member has achieved, before performing any CAT II or III operations, the following:
- (a) 50 hours or 20 sectors as pilot-in-command on the type, provided 100 m is added to the applicable CAT II or III RVR minima unless he has been previously qualified for CAT II or III operations with another operator; and
  - (b) 100 hours or 40 sectors as pilot-in-command on the type.
- 4.6.2 CAAS may authorise a reduction in the command experience requirement contained in sub-paragraph 4.6.1 for flight crew members who have CAT II or III command experience.

- 4.7 Low visibility Take-off with RVR less than 150m
- 4.7.1 The following training should be carried out prior to authorisation to conduct any take-offs in RVRs below 150 m:
- (a) Normal take-off in minimum authorised RVR conditions;
  - (b) Take-off in minimum authorised RVR conditions with an engine failure at or after TDP; and
  - (c) Take-off in minimum authorised RVR conditions with an engine failure before the TDP.
- 4.7.2 The training described in sub-paragraph 4.7.1 should be carried out in an approved flight simulator and includes the use of any special procedures and equipment. Where no approved simulator exists, CAAS may consider an approval of such training in a helicopter without the requirement for minimum RVR conditions.
- 4.7.3 The flight crew member should have completed a check before conducting low visibility take-offs in RVRs of less than 150 m if applicable. The check may only be replaced by successful completion of the flight simulator and/or flight training prescribed in sub-paragraph 4.7.1 on initial conversion to a helicopter type.
- 4.8 Recurrent Training and Checking
- 4.8.1 In conjunction with the normal recurrent training and operator proficiency checks, the pilot should have been checked for his knowledge and ability to perform the tasks associated with the particular category of operation, including low visibility take-off for which he is authorised.
- 4.8.2 The recurrent training should include a minimum of two approaches, of which one should be a missed approach and at least one low visibility take-off to the lowest applicable minima. The period of validity for this check must be consistent with the requirements of Subpart J of Part 135.
- 4.8.3 Recurrent training and checking for CAT III operations must be performed in a flight simulator approved by CAAS for CAT III training.
- 4.8.4 For CAT III operations on helicopters with a fail passive flight control system, flight crew members should undergo recurrent training and checking at least once every 18 months for a missed approach as a result of an autopilot failure at or below decision height when the last reported RVR is 300 m or less.
- 4.8.5 CAAS may authorise recurrent training for CAT II operations in a helicopter type where no approved flight simulator is available.