Annex B

Proposed DRAFT Civil Aviation Advisory Publication – CAAP LVO -1(1) – Approval to conduct low visibility operations Manual of Standards
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Approval to conduct low visibility operations

The relevant regulations and other references

- Civil Aviation Orders Section 20.7.1B
- Federal Aviation Administration (FAA) Advisory Circular (AC) 120-28
- FAA AC 120-29
- ICAO Annex 14 Volume I: Aerodrome Design and Operations
- ICAO Manual of All Weather Operations Doc 9365-AN/910
- Manual of Standards (MOS) Part 139: Aerodromes
- Regulation 257 of the Civil Aviation Regulations 1988 (CAR 1988)

This CAAP will be of interest to

Australian aircraft operators wishing to conduct low visibility operations both within Australia and overseas; and
Foreign aircraft operators wishing to conduct low visibility operations within Australia.

Why this publication was written

This Civil Aviation Advisory Publication (CAAP) provides Australian and foreign aircraft operators with information on preparing an application for an exemption from standard operating minima in order to conduct low visibility landings or low visibility take-offs operations.
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1. Status of this CAAP

This is the first amendment to this CAAP LVO-1. All copies and references to the previous versions should be replaced by this version.

Following is guidance of the changes made in this issue:

- New information about:
  - acceptable methods for gaining approval to conduct Special Authorisation (SA) Category (CAT) I and II instrument approach operations;
  - required ground or runway equipment for low visibility operations;
  - the effect on landing minima as a result of failed or downgraded equipment;
  - Alert or decision height requirements;
- Amendments have been made to the following subsections or paragraphs:
  - 7.2.12 – low visibility operation exemption process
  - 8.1.1 – low visibility take-offs.
  - 8.1.2 – Conditions on low visibility take-off exemptions.
  - 10.6 - Ongoing competence or periodic evaluation of aircraft.
- Appendix 2 - Requirements for grant of an autoland approval has been relocated as Appendix 1 and has been amended in some places.

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- Section 10.7 - Low visibility operational restrictions and requirements – has been substantially amended.
- Appendix 1 Low visibility operation training syllabus has been substantially amended and relocated as Appendix 2.
- A new Appendix 3 - Example Head Up Display Training Program – has been added.

2. **For further information**

Contact the relevant Civil Aviation Safety Authority (CASA) Regional Office for your operation on 131 757.

3. **Acronyms**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>AC</td>
<td>Advisory Circular</td>
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<tr>
<td>ACARS</td>
<td>Aircraft Communications Addressing and Reporting System</td>
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<tr>
<td>AIP</td>
<td>Aeronautical Information Publication</td>
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<tr>
<td>AH</td>
<td>Alert Height</td>
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<tr>
<td>AFCS</td>
<td>Automatic Flight Control System</td>
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<tr>
<td>AFM</td>
<td>Aircraft Flight Manual</td>
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<tr>
<td>ALS</td>
<td>Approach Lighting System</td>
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<tr>
<td>AOA</td>
<td>Angle Of Attack</td>
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<tr>
<td>ATC</td>
<td>Air Traffic Control</td>
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<tr>
<td>autoland</td>
<td>Automatic Landing</td>
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<td>CAAP</td>
<td>Civil Aviation Advisory Publication</td>
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<td>CAO</td>
<td>Civil Aviation Order</td>
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<td>CAR</td>
<td>Civil Aviation Regulations 1988</td>
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<td>CASA</td>
<td>Civil Aviation Safety Authority</td>
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<td>CAT</td>
<td>Category</td>
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<td>DDG</td>
<td>Dispatch Deviations Guide</td>
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<tr>
<td>DH</td>
<td>Decision Height</td>
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<tr>
<td>DME</td>
<td>Distance Measuring Equipment</td>
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<tr>
<td>END</td>
<td>End Zone</td>
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<tr>
<td>EFVS</td>
<td>Enhanced Flight Vision System</td>
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<tr>
<td>FMA</td>
<td>Flight Mode Annunciator</td>
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<tr>
<td>ft</td>
<td>Feet</td>
</tr>
<tr>
<td>GPWS</td>
<td>Ground Proximity Warning System</td>
</tr>
<tr>
<td>HAT</td>
<td>Height Above Touchdown</td>
</tr>
<tr>
<td>HIRL</td>
<td>High Intensity Runway Edge Lighting</td>
</tr>
<tr>
<td>HUD</td>
<td>Head Up Display</td>
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</tbody>
</table>

*Draft only: November 2012*
ICAO
International Civil Aviation Organization
IFR
Instrument Flight Rules
ILS
Instrument Landing System
IOE
Initial Operating Experience
kt
Knot
LDA
Landing Distance Available
LH
Left Hand
VMC
Visual Meteorological Conditions
LVO
Low Visibility Operation
m
Metre
MEL
Minimum Equipment List
MID
Mid Zone
MOS
Manual of Standards
NAVAID
Navigation Aid
NOTAM
Notice to Airmen
OEM
Original Equipment Manufacturer
PF
Pilot-Flying
PIC
Pilot-in-Command
PM
Pilot Monitoring
RA
Radio Altimeter
RCLL
Runway Centreline Lighting
RCLM
Runway Centreline Markings
RDH
Reference Datum Height
RH
Right Hand
RTO
Rejected Take-off
RV
Runway Visibility
RVR
Runway Visual Range
SA
Special Authorisation
SMGCS
Surface movement guidance and control system
TCAS-RA
Traffic Collision Avoidance System – Resolution Advisory
TDZ
Touchdown Zone
VOR
Very High Frequency Omni Range

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4. Definitions

Alert Height – A height above the runway based on the characteristics of the aircraft and its Fail-operational landing system, above which a CAT III approach would be discontinued and a missed approach initiated if a failure occurred in one of the redundant parts of the Fail-operational landing system, or in the relevant ground equipment.

Controlling – In relation to runway visual range (RVR) or runway visibility (RV), means the reported value of an RVR or RV reporting location (touchdown, mid-point and stop-end) used to determine whether operating minima are, or are not, met.

Fail-operational flight control system – A system capable of completing the specified phases of an operation following the failure of any single system component after passing a point designated by the applicable safety analysis (e.g., Alert Height) [FAA].

Fail-passive flight control system – A system which, in the event of a failure, causes no significant deviation of aircraft flight path or attitude [FAA].

Hybrid system – A combination of two or more flight control systems of dissimilar design used to perform a particular operation [FAA].

Low visibility operations (LVO) – An operation involving:
- an approach with landing minima less than either:
  - a decision height of 200 ft; or
  - a runway visual range of 550 m; or
  - a take-off with visibility below 550 m.

Low visibility take-off – A take-off with visibility below 550 m.

Low visibility procedures – Procedures applied at an aerodrome for protecting aircraft operations during conditions of reduced visibility or low cloud.

Runway visual range (RVR) – The range over which the pilot of an aircraft on the centre line of a runway can see the runway surface markings or the lights delineating the runway or identifying its centre line.

Note: Within Australia, the term runway visual range (RVR) is used exclusively in relation to RVR measured by an instrumented system.

Runway visibility (RV) – The distance along a runway over which a person can see and recognise a visibility marker or runway lights.

Note: The term runway visibility is used by air traffic control (ATC) or ground personnel to report visibility along a runway as determined by a ground observer.

SA CAT I operation – A precision instrument approach and landing with a decision height not lower than 150 ft and a runway visual range not less than 450 m to a standard precision approach CAT I runway.

SA CAT II operation – A precision approach CAT II operation with a decision height not lower than 100 ft and a runway visual range not less than 350 m to a runway for which the following variations from the standard Precision Approach CAT II or III lighting system are permitted:
- Runway centreline lighting is not required.
- Touchdown zone lighting is not required.
- A precision approach CAT I lighting system may be provided instead of a precision approach CAT II and III lighting system.
5. Introduction

5.1 Why the publication was written
5.1.1 Instrument approach and Instrument Flight Rules take-off minima are established in Australia as a legislative determination made under Regulation 257 of CAR 1988. These minima are intended for broad use by pilots and aircraft operators without the need for specific permission from the Civil Aviation Safety Authority (CASA). Consequently the minima promulgated by determination are given as:
- values not less than those which apply for a CAT I precision approach; or
- take-off minima with visibility not less than 550 m.
5.1.2 These minima are consistent with international practice that requires operators to have specific approval to conduct instrument approaches with minima less than CAT I and to conduct low visibility take-offs.
5.1.3 For operators wishing to conduct operations with lower minima, CASA is able to grant operators an exemption to the ‘standard’ minima determined under Regulation 257 of CAR 1988. This exemption will require the approved operator to comply with specific requirements.
5.1.4 This CAAP is written to provide potential applicants for an exemption to the standard minima with information on:
- the specific range of minima that CASA will normally grant under an exemption; and
- the specific conditions CASA will normally apply to the exemption.

The information is intended to assist operators with any application for exemption against the standard minima requirements.

5.2 The Rules
5.2.1 Regulation 257 of CAR 1988 authorises CASA to determine the meteorological minima for the landing or taking off of an aircraft at an aerodrome.
5.2.2 CASA issues a Determination from time to time, which sets out the various minima. These minima are then reflected in the Aeronautical Information Publication (AIP).

6. Method of approval

6.1 Operations within Australia
6.1.1 Authorisation to Australian and foreign aircraft operators to conduct LVO within Australia will be given by way of an Instrument of Exemption to the determination mentioned in paragraph 5.2.2 of this CAAP.

6.2 Operations outside Australia
6.2.1 Australian operators intending to conduct LVO in another country will need:
- An exemption from CASA to conduct the relevant LVO;
- An approval from the foreign regulatory authority to conduct the relevant LVO; and
To provide the following information to CASA:
- For landing operations, a statement confirming the aerodrome and runway terrain details and charts, including the calculations used to determine the applicable minima have been checked; and
- A copy of the foreign approval for LVO.

7. **How to apply**

7.1 **Applications from foreign aircraft operators**

7.1.1 Foreign aircraft operators should apply to:
International Operations
Civil Aviation Safety Authority
GPO Box 2005
CANBERRA ACT 2601, AUSTRALIA

7.1.2 The request must include a copy of the operator’s approval for LVOs from their own regulatory authority.

7.2 **Applications from Australian aircraft operators**

7.2.1 The operator should contact the relevant CASA office for your operation in the first instance to commence the process for requesting an exemption to conduct LVO.

7.2.2 CASA will arrange a suitable time for an interview. At the interview CASA will provide a cost estimate for the time it will require to assess the application.

7.2.3 The operator will need to provide CASA with all applicable documentation including:
- A safety case that includes, but is not limited to, a description of the proposed operations and action taken to identify risks and appropriate controls for the proposed operations’
- Aircraft Flight Manual (AFM) approval for the application;
- Information intended to be inserted into operations manuals covering crew training, crew low visibility procedures and flight administration procedures in tracking automatic landing (autoland) system results;
- Applicable Minimum Equipment List (MEL) entries pertaining to necessary aircraft equipment;
- Aircraft maintenance manual procedures for maintaining autoland to low visibility status; and
- Procedures for the operator to determine the aircraft operating minima.

7.2.4 Operators may apply for ‘restricted low visibility take-off minima to 350 m’ or ‘low visibility landing minima CAT II or CAT III’ and/or ‘unrestricted low visibility take-off minima’.

**Prerequisites**

7.2.5 Approval will only be given to operators of 2-pilot aircraft with access to the aircraft-type simulator (at least level C), with applicable low visibility runway modelling and lighting standards for taxiways, runways and approach lighting systems. Pilots will be required to access the simulator for competency assessment (nominally) every six months.
7.2.6 Approval for autoland operations will normally be an essential prerequisite for granting of an exemption to conduct low visibility landings. However, CASA will consider requests for use of certified flight guidance systems including Head Up Display (HUD), hybrid systems or Enhanced Flight Vision Systems (EFVS) in relation to low visibility take-off, SA CAT I, SA CAT II, and standard CAT II or CAT IIIA operations.

Note: See Appendix 1 of this CAAP for the requirements for an autoland approval.

7.2.7 When take-off minima are predicated on the use of HUD, only operators of aircraft operationally approved for the use of HUD for take-offs at the particular minima will be eligible for the associated exemption.

7.2.8 Only operators holding, or eligible for an exemption to conduct CAT II operations certified of aircraft for CAT II operations and equipped with an operable HUD which is certified for at least CAT II operations will be eligible for exemption to conduct SA CAT I operations.

7.2.9 Only operators of aircraft certified for CAT III operations (i.e. autoland or HUD approved to touchdown capability) will be eligible for exemption to conduct SA CAT II operations.

7.2.10 Only operators of aircraft certified for CAT II operations will be eligible for exemption to conduct CAT II operations.

7.2.11 Only operators of aircraft certified for CAT III operations will be eligible for exemption to conduct CAT III operations.

LVO exemption process

7.2.12 The following is a brief overview of the processes for gaining various LVO exemptions:

- **Low visibility take-off operations**, an exemption after successful assessment of operator’s procedures and systems; and crew training in a simulator.

- **SA CAT I operations**, an exemption after:
  - presentation of a current exemption for CAT II or CAT III operations using an approved HUD, and
  - successful assessment of the operator’s procedures, systems and crew training for SA CAT I operations.

  Note: The operator is eligible for SA CAT I if the operator’s CAT II or CAT III exemption allows at least RVR 350 m minimums using an approved HUD to DH or touchdown.

- **SA CAT II operations**, an exemption after:
  - presentation of evidence of a current exemption for CAT II or CAT III operations using autoland or an approved HUD that provides guidance to touchdown, and
  - successful assessment of the operator’s procedures, systems and crew training for SA CAT II operations.

  Note: The operator is eligible for SA CAT II if the operator’s CAT II or CAT III exemption allows at least RVR 350 m minimums using autoland or an approved HUD that provides guidance to touchdown.

- Operators with no CAT II or CAT III experience seeking CAT II:
  - one of the following initial approvals:
    - For operators using an autoland system, an initial autoland approval for CAT I minima; or
For operators using a HUD system, an initial approval of the operator’s procedures, systems and training using an operational HUD system to CAT I minima to enable validation of proposed operations; then

- following a successful completion of:
  - a six-month demonstration of maintenance and crew operations; and
  - at least 100 landings in CAT I conditions or better using the low visibility landing system installed in each applicable aircraft type or variant;

an exemption to conduct CAT II operations.

**Notes:**

1. Upon successful completion of 90 percent of the required landings in CAT I conditions, an operator may be granted an exemption authorising CAT II operations to RVR 500 m minimums for the remainder of the six-month demonstration period.

2. The new operator exemption process will also apply to an operator with an existing CAT II or III exemption who wishes to introduce CAT II operations with a new aircraft type or variant, or new aircraft systems such as introduction of HUD.

- Operators with no CAT II or III experience seeking CAT III:
  - one of the following initial approvals:
    - for operators using an autoland system, an initial autoland approval for CAT I minima; or
    - for operators using a HUD system, an initial approval of the operator’s procedures, systems and training to allow validation of proposed operations using CAT I minima; then
  - following a successful completion of:
    - a six-month demonstration of maintenance and crew operations; and
    - at least 100 landings in CAT I conditions or better using the low visibility landing system installed in each applicable aircraft type or variant
    an exemption for CAT IIIA operations; then
  - for operator requesting minimums below RVR 175 m — following successful completion of a second 6-month demonstration of maintenance and crew operations to CAT IIIA minima, an exemption for CAT IIIB operations to RVR 125 m or 75 m.

  **Note:** Upon successful completion of 90 percent of the required landings in CAT I conditions, an operator may be granted an exemption authorising CAT II operations to RVR 350 m minimums for the remainder of the first six-month demonstration period.

- Experienced CAT III exemption holders seeking changes to their current approved operations:
  - **New Airports/Runways.** New airports/runways with a published CAT III procedure may be used without further demonstration, if the same or equivalent aircraft/airborne system for the approach will be used as for existing airports/runways.
New or Upgraded Airborne System Capability. New or upgraded airborne system capabilities/components may be introduced in accordance with the following:

- Unless otherwise specified by CASA, new or upgraded airborne system capabilities/components may be used to the lowest authorised minima established for those systems or components.
- On request, CASA may accept reduced demonstration periods, consistent with the new airborne systems, navigation aids, runways and procedures to be used.
- Examples of this provision include addition of a new capability such as “one engine inoperative” autoland for a system currently approved for “all engine operative” CAT III, or introduction of an updated flight guidance system software version on an aircraft previously authorised for CAT III for that operator. In such cases, the lowest authorised minima may be used, or may continue to be used, without additional demonstration.

Adding a New CAT III Aircraft Type or Variant. New CAT III aircraft type or variant in accordance with the following:

- New or upgraded aircraft types/systems, or variants, using reduced demonstration periods (e.g. less than six months/100 landings) when authorised by CASA.
- Demonstration requirements will be established considering any applicable CASA criteria such as: applicability of previous operator service experience, experience with that aircraft type or variant by other operators, experience of flight crews of that operator for CAT III and the type of system and other such factors, on an individual basis.
- Appropriate minima reduction steps may also be established for an abbreviated demonstration period, consistent with prior operator experience, navigation aids and runways and procedures to be used.

Notes:

1. Experienced operators are considered to be those operators having successfully completed their initial six month/100 landing CAT III demonstration period, and have current exemptions authorising use of the lowest applicable or intended CAT III minima.

2. Operators authorised for CAT III using one type of system (e.g. autoland) but who are introducing a significantly different type of system as the basis for a CAT III exemption (e.g. manually flown CAT III approaches using a HUD) are typically considered to be “New low visibility operators” for the purposes of demonstration period provisions and acceptable minima “step down” provisions for that class of system.
8. Range of operational minima

8.1 Low visibility take-offs

8.1.1 CASA will approve low visibility take-off exemptions for the following minima and associated aerodrome facilities.

<table>
<thead>
<tr>
<th>Minima (Note 1)</th>
<th>Required Aerodrome Facilities</th>
</tr>
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<tbody>
<tr>
<td>350 m</td>
<td>• Illuminated runway edge lighting at spacing intervals not exceeding 60 metres.</td>
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<td></td>
<td>• Runway centreline markings (RCLM) or illuminated runway centreline lighting (RCLL).</td>
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<tr>
<td></td>
<td>• RVR or RV: Touchdown zone (TDZ) and either Mid Zone (MID) or End zone (END) information available and controlling.</td>
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<tr>
<td>200 m</td>
<td>• Illuminated high intensity runway edge lighting (HIRL) at spacing intervals not exceeding 60 metres.</td>
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<tr>
<td></td>
<td>• Illuminated RCLL at spacing intervals not exceeding 15 metres.</td>
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<tr>
<td></td>
<td>• RVR: TDZ and either MID or END information available and controlling.</td>
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<tr>
<td>125 m/150 m (Note 2)</td>
<td>• Illuminated HIRL at spacing intervals not exceeding 60 metres.</td>
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<tr>
<td></td>
<td>• Illuminated RCLL at spacing intervals not exceeding 15 metres.</td>
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<tr>
<td></td>
<td>• RVR: TDZ, MID and END information available and controlling.</td>
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<tr>
<td>75 m (Note 3)</td>
<td>• Front course guidance is available from an Instrument Landing System (ILS) localiser meeting that meets ICAO Annex 10, Volume I, CAT III standards.</td>
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<tr>
<td></td>
<td>• ATC is safeguarding the ILS localiser critical and sensitive areas during the take-off.</td>
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<tr>
<td></td>
<td>• Illuminated HIRL at spacing intervals not exceeding 60 metres.</td>
</tr>
<tr>
<td></td>
<td>• Illuminated RCLL at spacing intervals not exceeding 15 metres.</td>
</tr>
<tr>
<td></td>
<td>• RVR: TDZ, MID and END information available and controlling.</td>
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</tbody>
</table>

Note 1: The reported RVR/RV value representative of the initial part of the take-off run may be replaced by pilot assessment.

Note 2: The higher value applies to CAT D aeroplanes.

Note 3: Applicable only to aircraft with a certified take-off lateral guidance system.

8.1.2 CASA will apply the following conditions on low visibility take-off exemptions:

- Subject to the provision for a pilot assessing visibility in place of reported TDZ RVR or RV value, the required RVR or RV value is controlling at all the RVR or RV reporting points that must be available.
- The reported TDZ RVR or RV value may be replaced by pilot assessment if:
  - either:
    - the TDZ RVR is inoperative or not reported, (e.g. TDZ RVR inoperative) or a valid RV report is not available; or
    - local visibility conditions as determined by the pilot indicate that a significantly different visibility exists than the reported RVR or RV (e.g. patchy fog, blowing snow, RVR believed to be inoperative or inaccurate); and
  - Pertinent markings, lighting, and electronic aids are clearly visible and in service (e.g. no obscuring clutter); and
  - The assessment is made by identifying an appropriate number of runway edge or centreline lights, or markings, of known spacing visible to the pilot when viewed from the flight deck when the aircraft is at the take-off point;

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observed visibility is determined to be greater than the equivalent of 75 m; and
the pilot’s determination of visibility is reported to ATC.

Note: The report of a pilot’s determination of visibility is intended to facilitate other operations and timely distribution of meteorological information. It is not intended to be a verification of minima or to limit or restrict minima for the aircraft making the report.

- low visibility take-offs can only be carried out using multi-engined aircraft that are operated in accordance with the take-off weight and climb performance limitations specified in Civil Aviation Order (CAO) 20.7.1B.
- the pilot-in-command (PIC) must not commence take-off unless:
  ○ the weather conditions at the departure aerodrome are equal to or better than applicable minima for landing at that aerodrome; or
  ○ the aeroplane’s performance and fuel availability is adequate to enable the aeroplane to proceed to a suitable aerodrome, having regard to terrain, obstacles and route distance limitations.

8.2 Precision approach — SA CAT I

8.2.1 CASA will apply the following minima to exemptions permitting SA CAT I approaches:
- Decision height (DH) lower than 200 ft, but not lower than 150 ft.
- TDZ RVR: not less than 450 m.
- The TDZ RVR is required and controlling – a MID RVR report shall NOT be substituted for the TDZ RVR report in SA CAT I operations.

8.2.2 Visual reference. The PIC must not continue an approach below the SA CAT I DH unless a visual reference comprising a segment of at least three consecutive longitudinally aligned lights, being the:
- centreline of the approach lighting system,
- touchdown zone lights,
- runway centre line lights,
- runway edge lights, or
- a combination of these has been attained and can be maintained.

8.3 Precision approach — SA CAT II

8.3.1 CASA will apply the following minima to exemptions permitting SA CAT II approaches:
- DH lower than 200 ft, but not lower than 100 ft.
- RVR: not less than:
  ○ 350 m for TDZ; and
  ○ 125 m for MID, if MID is not available – for END;
- TDZ is required and controlling; if any one of the other RVR are inoperative, then the remaining RVR is required and controlling.
8.3.2 **Visual reference.** The PIC must not continue an approach below the SA CAT II DH unless a visual reference comprising a segment of at least three consecutive longitudinally aligned lights, being the:

- centreline of the approach lighting system,
- touchdown zone lights,
- runway centre line lights,
- runway edge lights, or
- a combination of these

has been attained and can be maintained.

8.4 **Precision approach — CAT II operations**

8.4.1 Depending on the type of aircraft approach system used, CASA will apply the following minima to exemptions permitting precision approach – CAT II approaches:

- DH lower than 200 ft, but not lower than 100 ft.
- RVR: not less than:
  - for an approach using autoland- 300 m for TDZ, otherwise 350 m for TDZ; and
  - 125 m for MID, or if MID is not available, for END;
- TDZ RVR is required and controlling; if any one of the other RVR are inoperative, then the remaining RVR is required and controlling).

8.4.2 **Visual reference.** The PIC must not continue an approach below the CAT II DH unless the following visual references have been attained and can be maintained:

- a segment of at least three consecutive longitudinally aligned lights, being the:
  - centreline of the approach lighting system;
  - touchdown zone lights;
  - runway centre line lights;
  - runway edge lights; or
  - a combination of these; and
- unless the approach is conducted using HUD to touchdown\(^1\), a lateral element of lighting, being an approach lighting crossbar, or landing threshold or a barrette of touchdown zone lighting.

8.5 **Precision approach — CAT II\(\text{IIA}^\) operations**

8.5.1 Depending on the type of aircraft approach system used, CASA will apply the following minima to exemptions permitting precision approach – CAT II\(\text{IIA}^\) approaches:

- DH lower than 100 ft or no DH;
- If no DH is specified, Alert Height is required; and

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\(^1\) **Consultation draft note:** During initial team consultation it was proposed that an autoland should not require visual reference to a lateral element of lighting. Following review of international standards which only apply the exception in the case where HUD is used to touchdown, this proposal has not been carried through.
• RVR: not less than:
  ◦ 175 m for TDZ; and
  ◦ 125 m for MID;
• TDZ and MID RVR are required and controlling; the END RVR, if operative, is advisory.

8.5.2 **Visual reference.** The PIC must not continue an approach below a CAT IIIA decision height (where one is specified or required) unless a visual reference comprising a segment of at least three consecutive longitudinally aligned lights, being the:
  • centreline of the approach lighting system;
  • touchdown zone lights;
  • runway centre line lights;
  • runway edge lights; or
  • a combination of these
has been attained and can be maintained.

*Note:* For CAT IIIA with no DH, but with an Alert Height, there is no specific requirement for visual reference to the runway prior to touchdown.

8.6 **Precision approach — CAT IIIB operations**

8.6.1 Depending on the type of aircraft approach system used, CASA will apply the following minima to exemptions permitting precision approach – CAT IIIB approaches:
  • DH lower than 50 ft or no DH;
  • If no DH is specified, an Alert Height is required; and
  • RVR: Not less than 75 m for TDZ, MID and END (all required and controlling).

8.6.2 **Visual reference.** The PIC must not continue an approach below a CAT IIIB decision height (where one is specified or required) unless a visual reference containing at least one centreline light is attained and can be maintained.

*Note:* For Cat IIIB with no DH, there is no specific requirement for visual reference to the runway prior to touchdown. The decision to continue depends only on operational status of aircraft and ground equipment.

9. **ATC and Aerodrome Requirements**

9.1 **ATC services**

9.1.1 CASA will only allow LVO to be conducted at an aerodrome where:
  • aerodrome control (ATC) services are in operation; and
  • ATC has declared low visibility procedures in effect.

9.2 **Aerodrome capability**

9.2.1 CASA will only allow LVO to be conducted at an aerodrome:
  • within Australia, that meets the appropriate regulatory standards for operations at the visibility minima specified for the particular LVO; or
• within a foreign country, where that aerodrome or runway is approved by the foreign regulatory authority for operations at the minima specified for the particular LVO.

Note: Many aerodromes in Australia do not have aerodrome lighting or infrastructure that fully conforms to the regulatory standards for operations in visibility conditions of less than 550 m. In particular, many aerodromes do not have stop bar lighting or taxiway lighting with spacing of 30 m or less as normally required for operations under these visibility conditions.

While some aerodrome limitations will not preclude LVOs, they do require aircraft operators:

- to be aware of limitations in aerodrome lighting;
- to take appropriate account of any limitations of aerodrome lighting on the aircraft operator’s low visibility flight operations at the particular aerodrome; and
- to be aware that limitations in aerodrome lighting and infrastructure can constrain movement rates and flight operations under conditions of reduced visibility.

Details of Australian aerodrome lighting and infrastructure capabilities can be found in the AIP.

9.3 Required Ground/Runway equipment

9.3.1 The following table lists the ground or runway facilities required for different low visibility instrument approach procedures.

Note: A statement in the AIP indicating that an aerodrome supports a particular instrument approach procedure may be taken as indicating the aerodrome has the necessary ground or runway facilities.

<table>
<thead>
<tr>
<th>Component</th>
<th>SA CAT I</th>
<th>SA CAT II</th>
<th>CAT II</th>
<th>CAT III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Localiser and Glidepath</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>CAT I Approach Lighting System (ALS)</td>
<td>Yes</td>
<td>Yes</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>CAT II/III ALS</td>
<td>N/A</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Outer Marker or ILS Distance Measuring Equipment (DME)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Middle Marker</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Inner Marker or ILS DME</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Electronic RVR – TDZ</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Electronic RVR – MID (1)</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Electronic RVR – END (1)</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>HIRL</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>TDZ lighting</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>RCLL</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

(1) The requirement for both MID and END zone RVR is specifically determined by the operating minima – in some cases both are not required.
# 9.4 Failed or downgraded equipment – effect on landing minima

9.4.1 The following table details the effect on the landing minima for a particular instrument approach procedure of failure or downgrade of a particular ground or runway facility.

<table>
<thead>
<tr>
<th>Failed or downgraded equipment (Note 1)</th>
<th>Effect on landing minima</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SA CAT I</td>
</tr>
<tr>
<td>ILS standby transmitter</td>
<td>No effect</td>
</tr>
<tr>
<td>Outer marker</td>
<td>No effect if replaced by alternate fixes nominated on the instrument approach chart or by Notice to Airmen (NOTAM) are used for altimeter checks.</td>
</tr>
<tr>
<td>Middle marker</td>
<td>No effect</td>
</tr>
<tr>
<td>Inner Marker</td>
<td>No effect if replaced by alternate fixes nominated on the instrument approach chart or by NOTAM are used for altimeter checks.</td>
</tr>
<tr>
<td>TDZ RVR assessment system</td>
<td>Not allowed</td>
</tr>
<tr>
<td>MID or END RVR</td>
<td>No effect</td>
</tr>
<tr>
<td>Anemometer for runway in use</td>
<td>No effect if other ground source is available</td>
</tr>
<tr>
<td>Celiometer</td>
<td>No effect</td>
</tr>
<tr>
<td>ALS</td>
<td>Minima as for nil facilities</td>
</tr>
<tr>
<td>ALS beyond 210 m from threshold</td>
<td>Minima as for nil facilities</td>
</tr>
<tr>
<td>ALS beyond 420 m from threshold</td>
<td>RVR 650 m</td>
</tr>
<tr>
<td>Standby power for approach lighting</td>
<td>No effect</td>
</tr>
<tr>
<td>Whole runway lighting system</td>
<td>Day – minima for nil facilities Night – not allowed</td>
</tr>
<tr>
<td>Runway edge lighting</td>
<td>Day only; Night – not allowed</td>
</tr>
<tr>
<td>RCLL</td>
<td>No effect</td>
</tr>
<tr>
<td>RCLL light spacing increased to 30 m</td>
<td>No effect</td>
</tr>
<tr>
<td>TDZ lighting</td>
<td>No effect</td>
</tr>
<tr>
<td>Standby power for runway lighting</td>
<td>No effect</td>
</tr>
<tr>
<td>Taxiway light system</td>
<td>No effect – except delays due to reduced movement rate</td>
</tr>
</tbody>
</table>

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2 Consultation draft note: This table is derived from the European Union – Operations 1 (EU-OPS 1) [formerly JAR-OPS1]

Draft only: November 2012
10. Conditions on exemptions

10.1 General

10.1.1 This part of the CAAP details the conditions that CASA will impose on exemptions granted to Australian operators to conduct LVO. These conditions are standardised for all low visibility operational exemptions insofar as possible, however CASA may need to vary these conditions for particular cases.

10.1.2 Foreign aircraft operators approved for LVO will generally not be subject to these conditions, but would be required to conform to any conditions imposed by their own regulator.

10.2 On board documentation

10.2.1 The aircraft operator must ensure that there is an operations manual on board each aircraft containing:

- all the necessary crew procedures required for a safe LVO;
- details of the aircraft equipment required for the LVO;
- a copy of the operator’s low visibility Exemption;
- low visibility checklist;
- a list of aerodromes and runways approved for SA CAT I, SA CAT II, CAT II and CAT III operations; and
- the minima for the approved aerodromes and runways in the above list.

10.3 Training

10.3.1 The operator, or an approved training organisation, must certify that each pilot of the aircraft has successfully completed an LVO training course including ground training and flight simulator training.
10.3.2 The LVO training course syllabus must be approved in writing by CASA and may not be amended without CASA’s written approval.

10.3.3 Example training course programs can be found in the following Annexes to this CAAP:
- Appendix 2 – Low visibility operation training syllabus; and
- Appendix 3 – Example Head Up Display training program.

10.4 Pilot qualification

10.4.1 A pilot is qualified for LVO on the aircraft only if he or she:
- has completed the aircraft-type training appropriate to the type of LVO in accordance with the approved training syllabus;
- for operations involving autoland, has performed two autolands in the aircraft in at least CAT I conditions, one of which must be performed during line training if aircraft transition training is occurring; and
- for approach operations involving the use of HUD — has performed the following in the relevant flight crew role:
  - for SA CAT I, SA CAT II or CAT II qualification, or simultaneous qualification for any or all of these types:
    - Five approaches for the lowest SA CAT I, SA CAT II, or CAT II qualification as applicable (three with, two without failures); and
    - Five Missed Approaches/balked landings due to a failure and at least one due to a windshear event;
  - for simultaneous CAT I/II/III qualification:
    - Two SA CAT I approaches (one with, one without failure);
    - One SA CAT II or CAT II approach (with or without a failure);
    - Five CAT III approaches (three with, two without failure);
    - Five Missed approaches/balked landings due to a failure; and
    - One approach with a windshear escape manoeuvre;
- for operations involving SA CAT I approaches, is qualified for CAT II operations;
- for operations involving SA CAT II approaches, is qualified for CAT II operations; and
- for take-off operations involving the use of HUD — has performed in the relevant flight crew role:
  - Two take-offs (RVR at lowest authorized minima);
  - One take-off with an engine failure leading to continuation;
  - One take-off with any failure leading to a Rejected Take-off (RTO); and
  - One take-off involving a windshear event during take-off.

10.4.2 Unless CASA approves otherwise in writing for an aircraft type with an approved cross-crew qualification transition course, the following pilot experience is required to operate to the lowest approved minima:
- for a captain:
  - at least 300 hours on any aircraft type as a PIC while authorised for SA CAT I, SA CAT II, CAT II or CAT III operations; and
  - at least 100 hours as PIC or in command under supervision or dual in the left hand (LH) seat on the aircraft type with the current operator.
• for a co-pilot:
  ○ at least 100 hours on any aircraft type as a co-pilot while authorised for SA CAT I, SA CAT II, CAT II or CAT III operations; and
  ○ at least 50 hours on the aircraft type with the current operator.

10.4.3 However, if a pilot does not have the experience mentioned above, he or she is restricted to:
• for take-off — a cross-wind not exceeding 10 kt and a minima of at least 200 m RVR; and
• for landing — CAT II minima of 100 ft DH and 450 m RVR in the TDZ.

10.5 Recency

10.5.1 For approach operations involving the use of autoland, a captain must have completed an autoland using LVO procedures in a flight simulator or in the aircraft type within the 90 days before conducting an SA CAT II, CAT II or CAT III landing.

10.5.2 For manual flight guidance landing or take-off systems (e.g. HUD) a pilot-flying (PF) should have used such systems or procedures in the aircraft or in simulation once each 90 days.

10.5.3 A captain must not conduct CAT II or CAT III landing if he or she has lost recency and not regained it in way specified below.

10.5.4 For autoland operations, a captain regains recency by performing an autoland:
• a flight simulator; or
• an aircraft in at least CAT I conditions.

10.5.5 If a PF has not otherwise had an opportunity to conduct line approaches or landings using the manual flight guidance system within the previous 90 days, a simulator refresher, recurrent training or checking event, line operational use in weather conditions at least Visual Meteorological Conditions (VMC), flight with a check pilot, or other similar method acceptable to CASA may be used to re-establish recency of experience with that system.

10.6 Ongoing competence or periodic evaluation of aircraft

Flight Crew

10.6.1 Each pilot of the aircraft occupying a flight control seat during LVO must have successfully completed in their respective roles, to the operator’s approved operational and meteorological limits for a particular aircraft type or operation, a flight simulator competency check according to a cyclic training program that includes:
• A take-off with an engine failure prior to V\(_1\) and subsequent RTO
• A take-off with an engine failure above V\(_1\) and subsequent continued take-off
• SA CAT I, SA CAT II, CAT II or CAT III go-arounds; and
• SA CAT I, SA CAT II, CAT II or CAT III landings
• Inclusion of both night and day visual scenarios.
10.6.2 Unless otherwise approved in writing by CASA, each pilot must demonstrate competency in LVO at least twice in every 12 months but not more than eight months and not less than four months may elapse between demonstrations.

10.6.3 Each pilot of the aircraft must demonstrate competency to an operational check captain of the aircraft type, at least once every 12 months.

10.6.4 A captain may not operate in LVO from the right hand (RH) seat unless he or she has demonstrated competency in LVO from the RH seat within the previous 12 months.

10.6.5 For operations involving the use of HUD, selected ground training subjects should be reviewed annually.

**Aircraft system checking**

10.6.6 The operator should have a suitable process for ensuring satisfactory operation of the aircraft systems applicable to SA CAT I, SA CAT II, CAT II or CAT III.

10.6.7 Unless the approved Aircraft Maintenance Planning Document or Aircraft Maintenance Manual specifies another method, an acceptable method for assuring satisfactory performance of a low visibility flight guidance system (e.g. autoland or HUD) is to periodically use the system and note satisfactory performance. A reliable record such as a logbook entry or Aircraft Communications Addressing and Reporting System (ACARS) record showing satisfactory performance within the previous six months for SA CAT I, SA CAT II CAT II, or previous 30 days for CAT III, is typically an acceptable method for assuring satisfactory system operation.

10.7 Low visibility operational restrictions and requirements

**Take-offs and landings**

10.7.1 For a low visibility take-off or landing, the following restrictions apply:

- for minima — the PIC of the aircraft must use the most restrictive of the following:
  - the minima approved in the AFM (as amended);
  - the minima approved by CASA that apply to the type of operation or procedure in which the aircraft is engaged;
  - subject to changes in minima specified by NOTAM, the minima shown on the operator’s aeronautical chart used for take-off or approach and landing; and
  - the minima approved by the relevant foreign aviation regulatory authority;

- the maximum cross-wind component for an aircraft conducting an LVO is:
  - if any RVR is less than 200 m — 10 kt dry runway; or
  - the AFM autoland limit or 15 kt, whichever is less;

- the PF must:
  - be a captain with the operator; and
  - not be undergoing initial command training with the operator; and
  - occupy the LH seat;

- A low visibility checklist must be provided which includes all relevant information for:
  - briefing on low visibility take-offs and landings; and
identifying the aircraft (including MEL items) and ground equipment necessary for carrying out the LVO;

- the approach, runway, taxiway and ramp lighting must be operating in accordance with the aerodrome lighting requirements for the type of operation.

- Where the use of HUD is required for a particular operation, the operator’s MEL must clearly state that the SA approvals included in this CAAP and approved by CASA are not applicable in the event that the HUD is unserviceable.

- Taxi considerations including Surface Movement Guidance and Control System (SMGCS) briefing, charts, lighting and taxi route.

**Take-offs**

10.7.2 For take-offs, the operator’s procedures must include standard call outs for the pilot monitoring (PM) to advise the PF of deviations from the runway centreline.

10.7.3 At start up, the flight crew must inform ATC if there is a requirement to conduct a take-off that requires protected guidance provided by an ILS localiser.

**Landings**

10.7.4 For landings, the following approach ban rules apply:

- when making an approach, the PIC of the aircraft must not continue beyond 1 000 ft above aerodrome elevation if a controlling zone RVR is reported by ATC as continually less than the specified minimum for the approach; and

- if, after passing 1 000 ft above aerodrome elevation, a controlling zone RVR is reported by ATC as falling below the specified minimum, the approach may be continued to the minima.

10.7.5 For autoland operations where the runway is not a designated CAT II or III runway, the runway must have been assessed by the operator as suitable for autoland in accordance with the operator’s ‘Safety Operational Specification – Approval to Conduct Autolands’.

10.7.6 For landings, the braking action on the runway must not be reported by ATC as worse than ‘medium’.

10.7.7 The landing distance available for the aircraft should be:

- 1.15 times the landing distance required under subsection 11 of CAO 20.7.1B with:
  - Anti-Skid system operative (if installed for the aircraft type), and
  - The runway surface breaking action is expected to be at least medium, or

- In the event that neither of the preceding requirements can be met, then the landing distance required should be the greater of:
  - 1.3 times the landing distance required under subsection 11 of CAO 20.7.1B, or
  - the landing distance specified by the aircraft type certificate holder.

**Note:** *These landing distance available requirements will not apply in an emergency.*

10.7.8 For SA CAT, SA CAT II, CAT II or CAT III procedures, the radio altimeter (RA) minimum must be used where an RA minimum is specified on the instrument approach chart.
10.7.9 For an SA CAT I approach:
   • the aircraft’s HUD system must be used at least until the DH, or to the initiation of missed approach, unless adequate visual references with the runway environment are established that allow the safe continuation to a landing;
   • the HUD system must be operated in the mode used for CAT II or CAT III operations;
   • if the HUD malfunctions during the approach, the flight crew must execute a missed approach unless visual reference to the runway environment has been established and the aircraft is in a position to allow the safe continuation to a landing and
   • the TDZ RVR is required and controlling – a MID RVR report (if available) may NOT be substituted for the TDZ RVR report.

10.7.10 For an SA CAT II approach, one of the following systems must be used:
   • at least a Fail-passive autoland system; or
   • a HUD system at least to touchdown.

10.7.11 For a CAT II approach one of the following systems must be used:
   • until visual conditions are established, at least a Fail-passive autoland system; or
   • a HUD system at least to touchdown; or
   • a flight director system or command guidance information certified for CAT II operations provided for each pilot.

10.7.12 For a CAT IIIA landing, one of the following systems must be used:
   • a Fail-operational or Fail-passive autoland system at least to touchdown;
   • a Fail-operational or Fail-passive manual flight guidance system providing suitable head-up or head-down command guidance, and suitable monitoring capability at least to touchdown;
   • a hybrid system, using autoland capability as the primary means of landing at least to touchdown; or
   • another system which can provide an equivalent level of performance and safety to the above.

Notes:
1. For system concepts not currently deemed acceptable by CASA in this CAAP, or the FAA in AC 120-29, proof of concept demonstrations will be required prior to operational consideration for approval.
2. The above list only details acceptable flight control or guidance systems. CAT III operations require other aircraft systems, such as, and not limited to, automatic throttle, suitable navigation receivers or sensors, radio altimeters. CASA expects these additional system aspects to be covered by requirement for the aircraft to be certified for CAT III operations.

10.7.13 CAT IIIA operations using a Fail-passive system must be conducted with a DH of not less than 50 ft.
10.7.14 For a CAT IIIB landing with an RVR in any zone of not less than 125 m, the aircraft must use a flight guidance or control system which includes one of the following:

- a Fail-operational landing system with a Fail-operational or Fail-passive automatic rollout system, or
- a Fail-operational hybrid autoland and rollout system with compatible manual flight guidance system, using autoland capability as the primary means of landing, or
- another system which can provide an equivalent level of performance and safety to the above.

**Notes:**

1. For system concepts not currently deemed acceptable by CASA in this CAAP, or the FAA in AC 120-29, proof of concept demonstrations will be required prior to operational consideration for approval.

2. The above list only details acceptable flight control or guidance systems. CAT III operations require other aircraft systems, such as, and not limited to, automatic throttle, suitable navigation receivers or sensors, radio altimeters. CASA expects these additional system aspects to be covered by requirement for the aircraft to be certified for CAT III operations.

10.7.15 For a CAT IIIB landing with an RVR of not less than 75 m, the following systems must be used:

- a flight guidance or control system which includes one of the following:
  - a Fail-operational automatic flight control system; or
  - a manual flight guidance system designed to meet Fail-operational system criteria; or
  - a hybrid system in which both the Fail-passive automatic system and the monitored manual flight guidance components provide approach and flare guidance to touchdown, and in combination provide full Fail-operational capability, and
- a Fail-operational rollout guidance or control system that can assure safe rollout to taxi speed consisting of either:
  - a Fail-operational automatic rollout control system or Fail-operational manual flight guidance rollout system, or
  - a hybrid system consisting of at least a Fail-passive automatic rollout system and a compatible Fail-passive manual flight guidance rollout control system.

**Note:** The above list only details acceptable flight control or guidance systems. CAT III operations require other aircraft systems, such as, and not limited to, automatic throttle, suitable navigation receivers or sensors, radio altimeters. CASA expects these additional system aspects to be covered by requirement for the aircraft to be certified for CAT III operations.

10.7.16 SA CAT II, CAT II and CAT III landings will normally require use of an automatic throttle or automatic thrust control system. However, for operations with a 50 ft DH, automatic throttles may not be required if it has been demonstrated that operations can safely be conducted, with an acceptable work load, without their use.
10.8 Alert Height

10.8.1 Fail-operational CAT III is based on use of an Alert Height (AH). An AH is the height above a runway based on characteristics of the airplane and its Fail-operational System, above which a CAT III approach must be discontinued and a missed approach initiated if a failure occurred in one of the redundant parts of the flight control or related aircraft systems, or if a failure occurred in any one of the relevant ground systems.

10.8.2 Use of an AH is consistent with the design philosophy which requires that an aircraft be capable of safely completing a touchdown and rollout (if applicable) following an autoflight director monitored system failure occurring after passing AH.

10.8.3 The AH should be specified by an operator of an aircraft and must be approved by CASA. The operational AH used must be consistent with the aircraft design, training, ground facilities, and other factors pertinent to the air carriers operation. AH is specific to the type and will be designated in the AFM.

*Use of the Decision Height or Alert Height*

10.8.4 DHs are normally used for Fail-passive CAT III operations and AHs are used for Fail-operational CAT III operations. However, there may be circumstances where a DH may be used for a particular situation – for example to account for a specific Fail-operational aircraft characteristic at a runway with irregular pre-threshold terrain.

10.8.5 When DHs are specified, procedures for setting various reference bugs in the cockpit should be clearly identified, responsibilities for DH call-outs should be clearly defined, and visual reference requirements necessary at DH should be clearly specified so that flight crews are aware of the necessary visual references that must be established by, and maintained after passing DH.

10.8.6 When AHs are specified, the operator may elect to use an AH at or below 200 ft. Height Above Touchdown (HAT) as suitable for the procedure or procedures identified for use by that operator. Procedures should be specified for call-out of the AH and if applicable for reversion of approach CAT with the applicable change of the AH to a DH in the event that the aircraft reverts from Fail-operational to Fail-passive flight control.

10.8.7 The operator should assure that at each runway intended for CAT III operations, the radar altimeter systems used to define AH or DH provides consistent, reliable, and appropriate readings for determination of DH or AH in the event of irregular terrain underlying the approach path, or an alternate method should be used. Any adjustments to approach minima or procedures made on final approach should be completed at a safe altitude (e.g., above 1 000 ft HAT).

10.9 Hybrid Systems

10.9.1 Hybrid systems (e.g. a Fail-passive autoland system used in combination with a monitored HUD flight guidance system) may be acceptable for CAT III if each element of the system alone is shown to meet its respective suitability for CAT III, and if taken together, the components provide the equivalent performance and safety to a non-hybrid system as specified for the minima sought (e.g. Fail-operational CAT III B).

10.9.2 Hybrid systems with autoland capability should be based on the concept of use of the autoland system as the primary means of control, with the manual flight guidance system serving as a backup mode or reversionary mode.
10.9.3 Manual rollout flight guidance capability must be provided for hybrid systems which do not have automatic rollout capability. Such manual rollout capability must have been shown to have performance and reliability at least equivalent to that of a Fail-passive automatic rollout system.

10.9.4 Any transition between hybrid system elements (e.g. control transition from autoland use to manual control HUD use, or for response to failures) must be acceptable for use by properly qualified flight crews. Transitions should not require extraordinary skill, training or proficiency.

10.9.5 For any system which requires a pilot to initiate manual control near or shortly after touchdown, the transition from automatic control prior to touchdown to manual control using the remaining element of the hybrid system (e.g. HUD) after touchdown must be shown to be safe and reliable.

10.9.6 For hybrid systems, operational procedures following failure of the automatic system or flight guidance system prior to touchdown may require that the pilot initiate a go-around, even though the aircraft using a hybrid system must have been demonstrated as being capable of safely completing a landing and rollout following a failure of one of the hybrid system elements below alert height.

10.9.7 A hybrid system may be approved for CAT III if it is shown to meet performance criteria specified in FAA AC 120-28, as in force at the time of application for approval. Alternately, a hybrid system may be acceptable for CAT III if it is determined to meet applicable airworthiness criteria for each element of the system separately (e.g. separately meets CAT III criteria for autoland and HUD), and in addition, a successful operational suitability demonstration is completed using the individual system elements together as a hybrid system. If acceptability is determined through an operational demonstration process, the individual elements of the hybrid system must be shown to be compatible for both normal and non-normal operations, and the combined system must be shown to have the necessary performance, integrity and availability appropriate for the operations intended.

10.9.8 An operator may receive approval to use an autoland system and a manual flight guidance system as a Hybrid System provided, (a) each system individually meets appropriate airworthiness assessments, and (b), that operator conducts a successful operational demonstration showing the hybrid system's capability to meet applicable provisions of this section.

10.9.9 For hybrid systems used for CAT III an AH of 50 ft or higher should be used unless otherwise approved by CASA.

10.10 Equipment Installation and Maintenance

10.10.1 The aircraft equipment required for LVOs must be maintained in accordance with the Aircraft Maintenance Planning Document.

10.10.2 Exemptions that require or allow the use of a HUD for a particular operation will be conditional on the following:

- The HUD system must be certified for the particular operation by the aircraft manufacturer or in accordance with a supplemental type certificate (STC) from a recognised national aviation authority (NAA).
- The HUD installation must have been performed in accordance with Original Equipment Manufacturer (OEM).
- Maintenance personnel must receive initial and recurrent training as necessary for an effective program.
- The aircraft’s approved flight manual must contain the operating instructions and procedures to use the system.
- The aircraft’s system of maintenance must include continuing airworthiness and maintenance procedures relating to the HUD in accordance with OEM recommendations.
- The HUD system must be operated in accordance with the operating instructions and procedures for the particular operation.\(^3\)

\(^3\) Consultation draft note: The installation and maintenance requirements for HUD were original proposed as an inclusion in CAO Section 20.18. Based on advice, CASA is instead proposing to include such requirements as a condition on Exemptions to conduct low visibility HUD operations.
REQUIREMENTS FOR GRANT OF AN AUTOLAND APPROVAL

This appendix provides information on the standard requirements for grant of an approval to carry out autolands. Approval for autoland operations will normally be an essential prerequisite for grant of an exemption to conduct low visibility landings. However, CASA will consider requests for use of certified EVFS and HUD for particular low visibility operations.

1. **Aircraft Certification**
   Aircraft must be certified for autoland in the AFM. The MEL/Dispatch Deviations Guide (DDG) must indicate the equipment that is required to satisfy the certification requirements.

2. **Aircraft Maintenance Approved Data**
   The Aircraft Maintenance Planning Document must specify:
   - the frequency that the autoland system must be exercised to remain valid;
   - the action to be taken in the event of autoland loss of validity;
   - any special maintenance requirements that the aircraft manufacturer has specified for autoland; and
   - where required for a particular aircraft type, a technical log entry recording of the autoland functionality after completing each autoland.

3. **Operations Manual**
   The following must be included in an on-board Operations manual:
   - a copy of the autoland ‘Safety Operational Specification’.
   - an instruction on how the autoland validity status will be indicated to the pilots if required by the AFM.
   - in relation to CAT I autoland:
     - autoland pilot procedures;
     - operator approved aircraft environmental limits;
     - runways approved for autoland;
     - approved landing configurations;
     - the aircraft equipment required in accordance with the MEL/DDG; and
     - an explanation of the ILS critical area, and
     - Low visibility checklist.

4. **Autoland Training**
   The training course syllabus for autoland and autoland procedures must be approved by CASA.
5. **Pilot requirements**

Pilots are approved to conduct autoland following type endorsement, provided approved autoland training has been given on that type. The pilot flying the autoland must be in the left hand seat.

Pilots must be assessed in autoland procedures in a simulator or line check at least every eight months.

6. **Introduction of Aircraft to an Operator’s Fleet**

All aircraft must have successfully completed an autoland flown by the operator’s pilots and without passengers, prior to being approved for autoland in revenue operations.

Where an operator introduces a new aircraft type, an autoland program, requiring approval by CASA, must be completed before the aircraft conducts landings in CAT II or III weather conditions.

7. **Monitoring of Required Accuracy**

As part of an internal reporting system pilots must indicate on a pilot reporting form provided by the operator and approved by CASA, each autoland as ‘successful’ or ‘unsuccessful’. The forms, or an on-board operations manual, must show the parameters for the autoland to be classified as ‘successful’.

An autoland report requires an evaluation of:

- the approach below 1 000 ft;
- the touchdown; and
- the rollout.

An approach is considered to be successful if:

- From 500 ft to start of flare:
  - speed is maintained within +/- 5 kts disregarding rapid fluctuations due turbulence;
  - no relevant system failure occurs;
  - from 300 ft to DH:
    - no excessive deviation occurs; and
    - no centralised warning gives a go-around order.

An autoland is considered to be successful if:

- no system failure occurs;
- no flare failure occurs;
- no de-crab failure occurs;
- main wheel touchdown occurs in the touchdown area;
- nose wheel touchdown occurs within 8 m of centreline;
- bank angle at touchdown does not exceed 7 degrees;
- pitch angle at touchdown does not exceed the maximum value for a safe tail clearance;
- rollout lateral deviation does not exceed 8 m; or
- no rollout failure occurs.
Any malfunction of a relevant system used for the approach, landing or rollout will require the autoland to be classified as ‘unsuccessful’.

The operator must analyse all ‘unsuccessful’ autolands in order to assess the continuing acceptability of aircraft equipment and runway ground systems and must retain the autoland forms and the analysis of ‘unsuccessful’ autolands for at least two years.

Unsuccessful autoland trends involving a particular runway are to be notified to CASA.

8. Approval of Runways for Autoland

Before a particular runway may be used for autoland operations, that runway must be approved by the Head of Flight Operations/Chief Pilot or his or her nominee.

Where the runway is currently approved by the State of the aerodrome for CAT II or III operations and that State is a compliant ICAO member, then no evaluation is required.

For runways that do not meet the above requirements, an evaluation is required and must confirm:

- the runway has an ILS of at least CAT I transmission quality with the localiser centreline coincident with the runway centreline;
- the nominal glideslope angle is between 2.5 and 3.0 degrees inclusive or as limited by the AFM;
- the glideslope reference datum height (RDH) is between 48 and 70 ft inclusive. If RDH exceeds 59 ft, the landing distance available must be reduced by the following distance ‘D’ (m) and published in the operations manual;

\[ D = \frac{(RDH - 59)}{3.3 \times \tan \theta} \]

Where \( \theta \) = Glidepath angle

- the runway slope complies with the Part 139 Manual of Standards (MOS), Chapter 6; and
- the pre-threshold terrain complies with the Part 139 MOS, Chapter 6 {Runway Strip Longitudinal Slope Changes at Runway Ends (Radio Altimeter Operating Area)}.

Where confirmation cannot be established with any of the above criteria, the autoland assessment must be referred to CASA for resolution.

9. Conducting an Autoland

If the airport does not support SA CAT II, CAT II or CAT III operations, or “Low visibility procedures in effect/progress” have not been advised by ATC, then prior to commencing an approach for an autoland, the pilots must advise ATC of their intention. If ATC cannot provide protection of the ILS critical areas, pilots must ensure vigilance is maintained against any sudden flight path divergence.

Autolands must be conducted using approved autoland procedures.
APPENDIX 2

LOW VISIBILITY OPERATION TRAINING SYLLABUS

This appendix provides the suggested elements for training in low visibility landing and take-off operations.

For operations involving the use of HUD systems, the elements of this appendix should be amalgamated with the training elements shown in Appendix 3 of this CAAP.

PART A – GROUND TRAINING

Ground training must cover at least the following subjects:

- general concepts and appropriate definitions (see ICAO Manual of All Weather Operations Doc 9365-AN/910);
- Instrument approach types, including allowable exceptions to normal aerodrome lighting and infrastructure requirements;
- the importance of AH, and actions in the event of failures above and below the AH; a knowledge of aircraft or ground equipment failures not protected by the AH concept;
- Understand under what conditions reversion from CAT IIIB to CAT IIIA and CAT II is required. In addition clarify the procedures for the reversion between the different approach types. All reversion procedures and minima “bug” setting should be complete prior to descending below 1 000 ft above touchdown;
- Understanding the implications of ATC stating “low visibility procedures in effect”;
- **SMGCS training.** Training items should include but are not limited to:
  - Apron (ramp) operations;
  - ILS critical areas, runway safety areas, and obstacle free zones;
  - Pilot assessment of runway visibility;
  - Stop bar lights;
  - Runway guard lights;
  - Low visibility-specific aerodrome chart;
  - Taxiway lighting, including ILS critical area alternating green and yellow lights from runway centreline;
  - Runway lead-in and lead-off lights;
  - Runway centre line lighting transition from white to alternating red white to alternating red, red;
  - Runway edge lighting transition to alternating white yellow;
  - Geographic position markings;
  - Taxiway and runway hold position markings;
  - Movement/non-movement boundary marking;
  - Other pavement markings such as surface painted signs;
  - Use of low visibility taxi route(s) chart(s);
  - Taxi procedures specific to the aircraft type;
Use and limitations of different types of RVR systems including “controlling” and “required requirements”;
- ILS characteristics, limitations and Class of Performance classification (see ICAO Annex 10, Volume I, Attachment C);
- the principles of obstacle clearance requirements; factors affecting the determination of minima;
- clear knowledge of minima “bug” setting and the difference between Radio and Baro “bug” setting.
- Clear knowledge of the minima “bug” setting requirements for approaches with an AH;
- effect of terrain profiles on radio altimeter readings at DH and on the autoland system;
- characteristics of fog – homogenous and non-homogenous;
- effects of cold temperature on the barometric altimeter’s reading for the glide slope check;
- Cold temperature corrections to approach procedures
- effects of precipitation, ice accretion, low level windshear and turbulence;
- actions to be taken in the event of airborne or ground equipment failures;
- reversionary minima;
- an understanding of any special aircraft maintenance requirements for LVO equipment;
- correct seating and eye position;
- correct use of aircraft lighting;
- correct pilot call outs;
- knowledge and correct use of the low visibility checklist;
- knowledge of duties for PF and PM;
- understanding of increased separation and expected delays during low visibility approaches with due consideration for fuel requirements;
- aircraft and ground equipment requirements with knowledge of MEL provisions; and
- requirement to check windscreen wipers are operational.
PART B – FLIGHT SIMULATOR TRAINING

The session should be approximately three hours for a captain paired with a first officer or four hours for two paired captains. The session should be a stand-alone exercise conducted after all endorsement training has been completed. The simulator must be at least level C and type specific with correct visual modelling.

Some exercises should be conducted at maximum take-off weight (to provide a maximum split between V1 and VR) and maximum landing weight, both take-off and landing at approved (or applied for) RVR minima with up to maximum cross-wind for the applicable visibility and where possible a mix of day and night environment.

Training must include:

- normal operation with no failures;
- visual cues required for landings;
- pilot assessment of runway visibility
- low visibility check list;
- checks of satisfactory functioning of ground and aircraft equipment;
- correct use of MEL and the effect of known unserviceabilities;
- effects on minima caused by changes in the status of ground installations;
- correct monitoring of automatic flight control systems and annunciators;
- correct pilot call-outs
- correct pilot compliance with each pilot duties, i.e. PM notices Flight Mode Annunciator (FMA) failures etc.
- any reduced operating limitations;
- procedures for reversion between approach CAT, i.e. CAT IIIB to CAT IIIA etc. including the lowest altitude for approach reversion (above 1,000 ft HAT)
- maximum deviation allowed for glide slope and localizer;
- actions to be taken in the event of failures or malfunctions of:
  - ILS transmitter, ILS receiver(s);
  - radio altimeter(s);
  - autopilot(s) and autothrust system;
  - primary and standby attitude failure;
  - engine, electrical, hydraulic, flight control and instrumentation systems;
  - autoland system indicated by lack of expected FMA annunciations (flare, rollout);
- system failures pertinent to the aircraft type which would prevent an autoland when a failure occurs below the AH;
- if aircraft approved, engine-out autoland and engine-out missed approach;
- loss of visibility during take-off and below the minima during approach;
- pilot incapacitation during take-off and approach; and
- Fail-passive autoland approach with further system failure below the minima.
Taxi exercises

Use of the aerodrome chart, including Low visibility-specific aerodrome chart, in following cleared taxi route to and from the runway and the terminal, identifying stop bars and CAT II or CAT III holding points and using all options to check line up on the correct runway.

Knowledge and demonstration of different light colours for taxiway and runway lights. Indicating proximity of adjacent taxiway and or runways in addition to awareness of runway distance remaining.

Take-off exercises

There must be a minimum of eight take-offs, including RTO, covering the exercises below. Additional exercises should be conducted to cover operator requirements and the above training requirements.

If the use of HUD is required to gain lower take-off visibility minima, the number of exercises must be increased to cover both take-off with HUD and increased minima without HUD.

Instructors should demonstrate in visual conditions the effectiveness of the localiser display or other lateral guidance equipment, as the aircraft deviates from the runway centreline.

Exercises should cover night and day operations, and include scenarios that may reasonably be encountered during line operations (for example slippery runway operations or take-off in blowing snow).

Exercises must include:

- normal take-offs (2) (RVR 200 m, Crosswind 15 kts – RVR 150 m Crosswind 10 kts);
- engine failure near V₁ (RTO) and engine failure at V₁ (continue);
- loss of visibility at low speed (RTO) and after 100 kts (continue);
- PF incapacitation; and
- deliberate runway centreline deviation.
- Take off at maximum take-off weight

Approach and landing, and go-around exercises

There must be a minimum of eight approaches from at least 1 500 ft to either a landing or a go-around. However, additional exercises should be conducted to cover operator requirements and the training requirements mentioned above.

Instructors must demonstrate in the simulator the approach (Calvert and ALSF-2) and runway lighting and various visual segments that will permit a landing relating to SA CAT I, SA CAT II, CAT II, CAT IIIA, and CAT IIIB approaches, prior to students commencing low visibility landing exercises.

Instructors must provide varying RVR reports to the crew during some of the simulator exercises to ensure a correct understanding of minima “bug” setting, approach bans and approach CAT reversion requirement.
Scenarios may include:

- normal operations;
- approaches resulting in missed approaches due to either lack of visual reference at DH or loss of visibility below DH/AH;
- aircraft and ground system failures;
- loss of visibility above and below DH/AH;
- PF incapacitation;
- reversion to manual flight at or below CAT II DH to control flare, landing and rollout or missed approach;
- reversion to higher minima;
- Fail-passive CAT IIIA approach with autopilot disconnect below minima;
- engine failure at various stages of the approach and during the missed approach; and
- CAT IIIB No Flare.

If the use of HUD is required, the number of exercises should be increased to cover take-offs and approaches with and without HUD.
EXAMPLE HEAD UP DISPLAY TRAINING PROGRAM

Note: This example program is derived from the US Federal Aviation Administration’s Flight Standardization Board Report for the Boeing 737 aircraft

HUD pilot training normally consists of those related to initial and recurrent ground and flight training. Unless covered concurrently during an initial or transition type rating course, a prerequisite to beginning this course of training is prior training, qualification and currency in the relevant aircraft. It should be noted that the program focuses principally upon training events flown in the left seat by the PIC. Nevertheless, first officer indoctrination and training is also essential.

1. INITIAL GROUND TRAINING: The initial ground training program should include the following elements:

A. Classroom instruction covering HUD operational concepts, crew duties and responsibilities and operational procedures including pre-flight, normal and non-normal pilot activities. For operators wishing to seek credit for LVO predicated on use of the HUD, information should be provided on the operational characteristics, capabilities, and limitations of the ground facilities (surface movement guidance control system) and airborne CAT III system. Airline policies and procedures concerning LVO should include a reporting process, MEL issues, operation following a missed approach, Initial Operating Experience (IOE) and currency requirements.

B. Classroom instruction (or CBT) on the HUD symbology set and its interrelationship with aeroplane aerodynamics, inertial factors and environmental conditions.

C. A HUD pilot training manual or equivalent material in the Operations Manual which explains all modes of operation, the use of various HUD controls, clear descriptions of HUD symbology including limit conditions and failures, and incorporating a crew procedures guide clearly delineating PF and PM duties, responsibilities and procedural call-outs and responses during all phases of flight during which HUD operations are anticipated. Emphasis on the availability and limitations of visual cues encountered on approach both before and after DH. This would include:
   • procedures for unexpected deterioration of conditions to less than minimum RVR encountered during approach, flare and rollout;
   • demonstration of expected visual references with weather at minimum conditions; and
   • expected sequence of visual cues during an approach in which visibility is at or above landing minima.

D. An audio-visual presentation demonstrating all modes of operation complete with sound. For operators wishing credit for LVO predicated on use of the HUD, this should include narrative descriptions and several low weather approach demonstrations with procedural call-outs and responses. All critical procedural callout possibilities should be covered.

E. If the HUD is used as a CAT II/CAT III landing system, emphasis on the need for rigorous crew discipline, coordination and adherence to procedural guidelines as is required for other CAT II/CAT III landing systems.

F. Recognition of pilot incapacitation and appropriate action to be taken in response.

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2. INITIAL FLIGHT TRAINING: Unless integrated with initial or transition type rating training, flight training dedicated to HUD familiarisation and proficiency is in addition to other required elements. When a simulator is used, only approved simulator (at least level C) with both a visual and the Heads Up Guidance System installed may be used. For flight simulator training, all required approaches should be flown from no closer than the final approach fix (FAF) for instrument approaches and from no closer than approximately 1 000 ft above ground level (AGL) [3 - 4 NM] to the runway threshold for visual approaches.

The following flight training program is generic in nature and should not be construed to dictate what the flight course of instruction must consist of. Each operator has his own unique requirements, route structure, fleet composition and operations policies to consider in developing their training program. Therefore, what follows might be considered as a guide to an operator who is tailoring a HUD training program to fit his own needs.

A. Cockpit setup – Cockpit set up training should cover:
   • Deployment of HUD combiner;
   • Importance of correct seating position; and
   • Brightness controls.

B. Airwork – Airwork should include:
   • straight and level flight, accelerations and decelerations;
   • normal and steep turns, climbs and descents;
   • approach to stall and recovery and unusual attitudes;
   • vectors to intercept and track selected courses;
   • use of Automatic Flight Control System (AFCS) and flight director modes;
   • actions in relation to Traffic Collision Avoidance System – Resolution Advisory (TCAS-RA) warnings; and
   • actions in relation to Ground Proximity Warning System (GPWS) (terrain and windshear) warnings.

   Note: Emphasis should be placed on HUD unique symbology, i.e., flight path, flight path acceleration, airspeed error tape, Angle Of Attack (AOA) limit bracket, and excessive pitch chevrons. When this training is complete, the trainee should have a thorough understanding of the relationship between aircraft flight path parameters and the HUD symbology.

C. Visual Approaches (VMC mode)
   • perform one approach showing deviations above and below glideslope for symbology/runway relationship;
   • straight-in landings, no wind, repeat with 10 kt cross wind and at night; and
   • circling approaches and landing with 10 kt crosswind.

   Note: It is desirable to fly half of these approaches at different airports that have dissimilar approach and runway lighting systems. Special emphasis should be placed on optimising circling approach techniques and procedures. Approaches with the aircraft in a non-normal flap configuration should be included.
D. Instrument Approaches:
   • For all operators:
     ○ Perform a CAT I approach to 200 ft DH, 550 m RVR, wind calm;
     ○ Illustrate unique characteristics of symbology in wind shear conditions, i.e. erratic wind speed and direction, flight path, flight path acceleration and speed error etc.;
     ○ Demonstrate failures and incorrect settings on approach, i.e. mis-set runway elevation, airspeed, selected course etc.;
   • For operators wishing credit for LVO predicated on use of the HUD:
     ○ Perform an SA CAT I approach to 150 ft DH, 450 m RVR, wind calm - another ILS with a 10 kt crosswind;
     ○ Perform an SA or standard CAT II approach to 100 foot DH, 350 m RVR, 5 - 10 kts crosswind;
     ○ Perform a CAT IIIA ILS approach and landing starting on a 30 degree intercept to the ILS, below glideslope, weather clear and calm;
     ○ CAT IIIA ILS with 175 m RVR, wind calm - another ILS with a 10 kt crosswind;
     ○ CAT IIIA ILS with 0/0 weather. After touchdown, raise weather to demonstrate position on runway;
     ○ CAT IIIA ILS with various reasons for a missed approach (system downgrade, “APCH WARN”, etc.); and
     ○ CAT IIIA ILS with various RVRs and crosswinds, include light turbulence.

   Note: Several of the instrument approaches should include a variety of ground and airborne system failures requiring pilot recognition and appropriate procedural actions. Demonstrate system/component failures could include flap asymmetry problems, engine out operations, HUD sensor failures, etc. Demonstration about how HUD failure modes can reduce precision and increase pilot workload unless PF/PM duties and responsibilities are clearly delineated and understood.

E. Take-off: For operators wishing to gain approval for low visibility take-off operations predicated on use of the HUD:
   • Normal takeoff, clear and calm, repeated with gusty winds;
   • Take-off, 200 m RVR, 5 kt crosswind;
   • Take-off, 100 m RVR, 5 kt crosswind, engine failure prior to V1;
   • Take-off, 100 m RVR, 5 kt crosswind, engine failure after V1; and
   • Take-off with HUD failure, 100 m RVR.

F. Flight training should address:
   • ground and airborne system failures requiring pilot recognition and appropriate procedural actions.
   • System or component failures including, but not limited to, flap asymmetry problems, engine out operations, HUD sensor failures, etc.
   • Human factors aspects such as how HUD failure modes can reduce precision and increase pilot workload unless PF/PM duties and responsibilities are clearly delineated and understood.
   • recognition of pilot incapacitation and appropriate action to be taken in response.
For airline operators; within 60 days subsequent to completion of HUD training, pilots must have completed their IOE for HUD SA CAT I, CAT II or CAT III operations. All previously qualified (in aircraft) pilots should be certified upon satisfactory completion of the HUD ground and flight training programs. All initial, upgrade and transition captains must be certificated by an appropriately approved check pilot during their IOE. This requirement should include three HUD assisted take-offs: one visual approach and three instrument approaches in conditions not less than 550 m RVR. First Officers should be certificated to perform SA CAT I, CAT II or CAT IIIA PM duties upon satisfactory completion of the HUD training program.