**Low Visibility Operations**

Low Visibility Operations include:

- Manual take-off with or without electronic guidance systems.
- Auto-coupled approach to below DH, with manual flare, landing and roll-out.
- Auto-coupled approach followed by auto-flare, autolanding and manual roll-out.
- Auto-coupled approach followed by auto-flare, autolanding and auto-roll-out.
- An autopilot system with a rollout capability is one capable of guidance on the runway centreline.

**Approach Categories**

We can break the landing limits down now into three categories i.e. CAT I, II and III.

CAT I is a normal approach.

CAT II and III are low visibility operations.

**ICAO Criteria**

<table>
<thead>
<tr>
<th>Category</th>
<th>System minima</th>
<th>Decision Height</th>
<th>RVR requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAT I</td>
<td>60 m (200 ft)</td>
<td>Not less than 200 ft</td>
<td>Not less than 550 m or ground visibility not less than 800 m</td>
</tr>
<tr>
<td>CAT II</td>
<td>30 m (100 ft)</td>
<td>Less than 200 ft but not less than 100 ft</td>
<td>Not less than 350 m**</td>
</tr>
<tr>
<td>CAT III A</td>
<td>Nil</td>
<td>Less than 100 ft or no DH</td>
<td>Not less than 200 m</td>
</tr>
<tr>
<td>CAT III B</td>
<td>Nil</td>
<td>Less than 50 ft or no DH</td>
<td>Not less than 50 m *</td>
</tr>
<tr>
<td>CAT III C</td>
<td>Nil</td>
<td>No DH</td>
<td>None</td>
</tr>
</tbody>
</table>

* JAR OPS specifies 75 m RVR minimum for CAT III B


For both CAT II and CAT III operations, DH is based on the radar altimeter.

**Low Visibility General Operating Rules**

An Operator must establish procedures and instructions to be used for Low Visibility Take-Off and Category II and III operations.

These procedures must be included in the Operations Manual with approval by the Authority.

The procedures shall contain the duties of flight crew members during taxiing, take-off, approach, flare, landing, roll-out and missed approach as appropriate.

Particular emphasis must be placed on flight crew responsibilities during transition from non-visual conditions to visual conditions, and on the procedures to be used in deteriorating visibility or when failures occur.
The instructions in the operations manual must be compatible with procedures in the Aeroplane Flight Manual and cover the following items in particular:

- Checks for the satisfactory functioning of the aeroplane equipment, both before departure and in flight.
- Effect on minima caused by changes in the status of the ground installations and airborne equipment.
- Procedures for the take-off, approach, flare, landing, roll-out and missed approach.
- Procedures to be followed in the event of failures, warnings and other non-normal situations.
- The minimum visual reference required.
- The importance of correct seating and eye position.
- Action which may be necessary arising from a deterioration of the visual references.
- Allocation of crew duties to allow the Commander to devote himself mainly to supervision and decision making.
- The requirement for all height calls below 200 ft to be based on the radio altimeter and for one pilot to continue to monitor the aeroplane instruments until the landing is completed.
- The requirement for the Localiser Sensitive Area to be protected.
- The use of information relating to wind velocity, windshear, turbulence, runway contamination and use of multiple RVR assessments.
- Procedures to be used for practice approaches and landing on runways at which the full Category II or Category III aerodrome procedures are not in force.
- Operating limitations resulting from airworthiness certification.
- Information on the maximum deviation allowed from the ILS glide path and/or localiser.

The Operator is also responsible for training crews in low visibility operations. They must be simulator checked and qualified for each operation. This training is type specific and all flight crew require qualification.

The Operations Manual must list the minimum equipment that has to be serviceable at the start of a Low Visibility Take-off or a Category II or III approach.

The aerodrome must be approved for Cat II or III operations by its own authority and the Operator must establish that low visibility procedures are in place.

It is up to the commander to satisfy himself that the aeroplane, the crew and the airport all conform to the requirements before conducting low visibility operations.

If any one does not, then low visibility operations are not permitted.

A suitable system for recording approach and/or automatic landing success and failure must be established and maintained to monitor the overall safety of the operation.
**DEFINITIONS**

**Circling:**
The visual phase of an instrument approach to bring an aircraft into position for landing on a runway which is not suitably located for a straight-in approach.

**Low Visibility Procedures (LVP):**
Procedures applied at an aerodrome for the purpose of ensuring safe operations during Category II and III approaches and Low Visibility Take-offs.

**Low Visibility Take-Off (LVTO):**
A take-off where the Runway Visual Range (RVR) is less than 400 m.

**Flight Control System:**
A system which includes an automatic landing system and/or a hybrid landing system.

**Fail-Passive Flight Control System:**
A flight control system is fail-passive if, in the event of a failure, there is no significant out-of-trim condition or deviation of flight path or attitude but the landing is not completed automatically. A fail-passive automatic flight control system disengages the autopilots after a failure.

**Fail-Operational Flight Control System:**
A flight control system is fail-operational if, in the event of a failure below alert height, the approach, flare and landing, can be completed automatically.

**Fail-Operational Hybrid Landing System:**
A system which consists of a primary fail-passive automatic landing system and a secondary independent guidance system enabling the pilot to complete a landing manually after failure of the primary system. A typical secondary independent guidance system would be a monitored head-up display with command or situation information.

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**Note:**

**Hybrid Landing System:** A viable option for flight operations during Category III weather conditions may prove to be a hybrid landing system, described in the ICAO All Weather Operations Manual as a primary fail-passive automatic landing system combined with a secondary independent guidance system generally understood as Head Up Display. Redundancy for the failure of the primary autoland system is provided through the head up guidance of the secondary system in order to permit completion of the landing manually. Such a combination could provide fail-operational protection at an installation cost that may be significantly less than cost options for traditional fail-operational systems. This presentation will endeavour to explain the viability of the concept.

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**Visual Approach:**
An approach when either part or all of an instrument approach procedure is not completed and the approach is executed with visual reference to the terrain.

### Instrument Approach

The pilot can begin an instrument approach regardless of the reported RVR or prevailing visibility. However, the approach can not be continued, beyond the outer marker or the equivalent position if the reported RVR or visibility is less than the applicable minima.

The equivalent position is one that can be established by means of a DME distance, a suitably located NDB or VOR, SRE or PAR fix or any other suitable fix between 3 and 5 miles from threshold that independently establishes the position of the aeroplane.

If, after passing the outer marker, the reported RVR/visibility falls below the minimum the approach may be continued to DA/H or MDA/H.

Where no outer marker or equivalent position exists, the pilot must make the decision to continue or abandon the approach before descending below 1000 ft above the aerodrome on the final approach segment.

The approach may be continued below DA/H or and the landing may be completed provided that the required visual reference is established at the DA/H or MDA/DH and is maintained.

Where RVR is not available for landing, equivalent values can be found by converting the prevailing visibility, using this table:

<table>
<thead>
<tr>
<th>Runway Lighting</th>
<th>RVR = Reported Met. Visibility multiplied by:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Day</td>
</tr>
<tr>
<td>HI Approach and Runway Lighting</td>
<td>1.5</td>
</tr>
<tr>
<td>Any other lighting</td>
<td>1.0</td>
</tr>
<tr>
<td>No lighting</td>
<td>1.0</td>
</tr>
</tbody>
</table>

This table may not be used to assess take-off RVR, it is only for landing.

It also cannot be used for calculation, if the required RVR minimum is less than 800m, or when reported RVR is available.

**Quote:**

RVR can be same as met visibility or greater but can never be less

### Single Pilot Operations Minimum

In single pilot operations a landing RVR of less than 800 m is not permitted except when using a suitable autopilot coupled to an ILS or MLS, in which case normal minima apply.

The Decision Height applied must not be less than one and a quarter (1.25) times the minimum height for using the autopilot.

### Lighting For Night Operations

For night operations at least the following lights must be on:
• Runway Edge.
• Threshold.
• Runway End Lights.

**Quote:**

In other words, Runway Rectangular Outline

**Aeroplane Categories**

Aircraft are divided into five approach and take-off categories depending on their target threshold speed (VAT or VREF).

**Aircraft categories for Instrument Approaches**

<table>
<thead>
<tr>
<th>Aircraft category</th>
<th>$V_{st}$</th>
<th>Range of speeds for initial approach</th>
<th>Range of final approach speeds</th>
<th>Max speed for visual circling</th>
<th>Max speed for missed approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>&lt;91</td>
<td>90/150 (110*)</td>
<td>70/100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>B</td>
<td>91/120</td>
<td>120/180 (140*)</td>
<td>85/130</td>
<td>135</td>
<td>130</td>
</tr>
<tr>
<td>C</td>
<td>121/140</td>
<td>160/240</td>
<td>115/160</td>
<td>180</td>
<td>160</td>
</tr>
<tr>
<td>D</td>
<td>141/165</td>
<td>185/250</td>
<td>130/185</td>
<td>205</td>
<td>185</td>
</tr>
<tr>
<td>E</td>
<td>166/210</td>
<td>185/250</td>
<td>155/230</td>
<td>240</td>
<td>230</td>
</tr>
</tbody>
</table>

* Max speed for track reversal or racetrack procedures

VAT is found by taking either:

The stalling speed or minimum steady flight speed in the landing configuration (VSO) and multiplying it by 1.3

OR

The slightly higher $V_S(1G)$, the stalling speed where the aircraft can generate lift equal to its weight, and multiplying it by 1.23

Both calculations are run in the landing configuration at the maximum certificated landing mass.

Generally, the resulting values of VAT are very similar but, if both VSO and VS1G are available, the higher resulting VAT is be used.