

# B777 LOW VISIBILITY PROCEDURES

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## DEPARTURE

### PREFLIGHT

#### Aircraft Status:

- Technical Logbook: Snags shall not affect equipment required for CAT II/III.

RVR/Visibility (m)	Limitation
Below 400	TAC Required
Below 200	Auto Thrust Required Auto Brakes Required

#### Crew Certification:

- Both must be qualified and current.

**Notams:** Make sure that the destination airport meets CAT II/III requirements:

- RVR equipment availability.
- Radio NAV aid availability.
- Runway and approach lighting.

#### Weather:

- Destination forecast shall be at or above the company and crew operating minima.
- Alternate forecast shall be equal to or better than the planning minima.

RVR/Visibility (m)	Limitation
Below 150	Max crosswind of 15 knots
Departure Aerodrome Below Landing Minima	Take Off Alternate Required  <u>Weather:</u> <ul style="list-style-type: none"><li>• At or above the applicable landing minima ( ± 1 hour of ETA )</li><li>• Ceiling must be checked if only approaches are non precision or circling</li></ul> <u>Distance:</u> <ul style="list-style-type: none"><li>• 1 hour S/E TAS if Non ETOPS</li><li>• 2 hours S/E TAS if ETOPS</li></ul> Note: Consider unexpected events that could affect landing minima at takeoff alternate

## **Fuel:**

- Higher of the following should be carried:
  - Min 30 minutes taxi fuel.
  - Expected delays (taxiing / approach).

## **Performance:**

- Normal T/OFF thrust is recommended.
- Pay load permitting, use flap setting / wind component that gives the lowest take-off speeds.
- Below 200 m RVR, no contaminated runway takeoff.

## **TAXI**

- Cabin crew not to enter cockpit or call on intercom during taxi or approach, except in emergency.
- Familiarize with taxi-way routing, sensitive areas and CAT II / III holding points.
- NOTAMS and charts should be consulted for airport status regarding closed taxiways, runways, construction etc.
- Min visibility for taxi is equivalent to an RVR of more than 75m (75 or less is insufficient).
- Max speed for taxi is 10 knots.
- PM (FO) should provide the required information (speed/heading etc) in "rally navigator" style to PF (CAPT).
- Use EFB moving map to enhance positional awareness.
- Checklist action to be done with aircraft stationary and parking brakes ON.
- After lining up for take-off:
  - Cross check runway heading.
  - Make sure the aircraft is on the runway centre line.
  - Verify by ILS Localizer and markings on runway centre line.
  - May also be verified through ND when there is parallel runway.

## TAKEOFF MINIMA

- RVR/VIS minima required for LVTO is the higher of state minimum or the following:

FACILITIES	RVR VIS (M)	
	Cat A, B, C	Cat D
Nil (Day Only)	500	
Below 400 LVP must be in use. (Reported RVR/VIS of initial part of takeoff run can be replaced by pilot assessment)		
RL and/or RCLM (For night operation at least RL & Runway end lights are required)	250	300
RL & CL	200	250
RL, CL & Multiple RVR Information (RVR is required for all relevant points except initial part of T/O run)	150	200
<b>Approved Operators <sup>1</sup></b>	<b>125</b>	<b>150</b>
Approved Operators (with approved lateral guidance system) <sup>2</sup>	75	

### <sup>1</sup> Approved Operators:

- Subject to the approval of the Authority (PIA is an approved operator).
- Training in a simulator approved for this procedure.
- Low Visibility Procedures are in force.
- High intensity CL spaced 15m or less and HRL spaced 60m or less are in operation.
- The required RVR value has been achieved for all of the relevant RVR reporting points.
- A 90m visual segment is available from the cockpit at the start of the takeoff run.

### <sup>2</sup> Approved Operators with Lateral Guidance System:

- Subject to approval of the Authority.
- Using an approved lateral guidance system or an approved HUD/HUDLS.
- Runway protection & facilities equivalent to Cat III landing operations are available.

## TAKEOFF REJECTION

- Losing visual references:
  - Below 80 knots – Take-off may be rejected.
  - Above 80 knots – Take-off should be continued.
- Localizer guidance is helpful in maintaining the runway centre line. PM, if required should call left/right on localizer movement.
- Standard runway centre line lights change:
  - From white to alternate red and white when approx 3000 ft of runway is remaining.
  - To continuous red when only 1000 ft of runway is remaining.
- On takeoff rejection, PF (CAPT) should switch on all landing lights after stopping.

# ARRIVAL – NORMAL PROCEDURES

## REQUIREMENTS:

APP	ASA Autoland Status Annunciator	Equipment	Min DH (ft)	RVR (m)	Visual References
<b>CAT II</b>	Land 2 (Fail Passive)	<p><b>Displays:</b></p> <ul style="list-style-type: none"> <li>• 2 PFD's (Not Single Source)</li> <li>• EICAS (Not Single Source)</li> </ul> <p><b>Radio Altimeter:</b> (Not Single Source)</p> <p><b>ILS:</b> (Not Single Source)</p>	100	TD 350 <sup>1</sup> MID 125 END 75 <sup>2</sup>	<p><b>Longitudinal:</b></p> <p>Approach Lights:</p> <ul style="list-style-type: none"> <li>• 3 Centerline</li> </ul> <p>Runway Lights:</p> <ul style="list-style-type: none"> <li>• 3 Centerline</li> <li>• 3 Touchdown Zone</li> <li>• 3 Runway Edge</li> </ul> <p><b>Lateral: (w/o HUDLS)</b></p> <p>Approach Lights:</p> <ul style="list-style-type: none"> <li>• Crossbar</li> </ul> <p>Runway Lights:</p> <ul style="list-style-type: none"> <li>• Landing Threshold</li> <li>• TDZ Barrette</li> </ul>
<b>CAT III A</b>	Land 2 (Fail Passive)	<p><b>Displays:</b></p> <ul style="list-style-type: none"> <li>• 2 PFD's (Not Single Source)</li> <li>• EICAS (Not Single Source)</li> </ul> <p><b>Radio Altimeter:</b> (Not Single Source)</p> <p><b>ILS:</b> (Not Single Source)</p> <p><b>ASA:</b> 2</p>	50	TD 200 MID 75 <sup>3</sup> END 75 <sup>2</sup>	<p><b>Longitudinal:</b></p> <p>Approach Lights:</p> <ul style="list-style-type: none"> <li>• 3 Centerline</li> </ul> <p>Runway Lights:</p> <ul style="list-style-type: none"> <li>• 3 Centerline</li> <li>• 3 Touchdown Zone</li> <li>• 3 Runway Edge</li> </ul>
<b>CAT III B</b>	Land 3 (Fail Operational)	<p><b>Displays:</b></p> <ul style="list-style-type: none"> <li>• 2 PFD's (Not Single Source)</li> <li>• EICAS (Not Single Source)</li> </ul> <p><b>Radio Altimeter:</b> (Not Single Source)</p> <p><b>ILS:</b> (Not Single Source)</p> <p><b>ASA:</b> 2</p> <p><b>Auto Throttle</b></p>	<50 or No DH	TD 75 MID 75 <sup>3</sup> END 75 <sup>2</sup>	<p><b>With DH:</b></p> <ul style="list-style-type: none"> <li>• 1 Centerline Light</li> </ul> <p><b>Without DH:</b></p> <ul style="list-style-type: none"> <li>• Not Required<sup>4</sup></li> </ul>

<sup>1</sup> TDZ measurement for CAT II is Mandatory. European and ICAO value is now 300m. Some operators still use 350m.

<sup>2</sup> END RVR controlling only when that part of the runway is relevant (used during high speed phase of landing).

<sup>3</sup> MAN Rollout requirement is 125. TDZ & MID mandatory for CAT III (MID if u/s can be replaced by END RVR).

<sup>4</sup> However PF must look for visual cues crossing ALERT HEIGHT.

## **CREW BRIEFING**

In the standard IFR arrival briefing, include the following:

### **1) Destination and Alternate Weather:**

### **2) Legality:**

- Crew qualification.
- Aircraft systems status and capacity.
- Airfield operational status (unless LVP is reported active by ATIS, get clearance from ATC)

### **3) Review Approach Procedure:**

- Approach Ban
  - Regardless of the reported RVR/VIS, approach may be commenced but shall not be continued beyond the outer marker (OM), or equivalent position.
  - Without OM or equivalent position the limit is either as specified in the state procedures (e.g. U.K) or 1000ft above aerodrome on the final approach segment.
  - Beyond OM RVR/VIS has to be equal to or above the applicable minimums.
  - If after passing OM the RVR/VIS falls below the applicable minimum, approach may be continued to DA/H or MDA/H.
  - Below DA/H or MDA/H visual references have to be maintained for landing.
- Stabilized Approach
  - If any of these limits are exceeded, a go-around shall be made.

<b>Parameter</b>	<b>Limit</b>	<b>Call</b>
IAS	+10 / -5 Kts	Speed
Rate of Descent	1000 ft/min	Sink Rate
Pitch Attitude	+5° / -2.5°	Pitch
Bank Angle	7°	Bank
Localizer	1 dot	Localizer
Glide Slope	½ dot	Glideslope

#### 4) Set Applicable “Radio” and “Baro” Landing Minima:

- **CATII**
  - Set DH and leave it displayed.
  - Rotate minimums reference selector to BARO for downgrading to CAT I.
- **CAT IIIA or CATIIIB - with DH**
  - Set DH and leave it displayed.
  - Reset DH for downgrade to CAT III A or CAT II as applicable.
- **CAT III B - No DH**
  - SET CAT III A DH and blank the display.
  - Push minimums reference selector for downgrade to CAT III A.

#### 5) Brief Review of Task Sharing:

- PF (supervising and decision making):
  - Hands on controls
  - Approaching DH starts looking for visual references.
  - At DH, Calls "LANDING" or "GOAROUND".
  - Without DH at Alert height, Calls "LANDING" or "GOAROUND".
  - In case of Landing, scans mostly head-up.
  - Monitor thrust reduction to IDLE with "RETARD" FMA announcement.
  - Selects reverse thrust.
  - Disengages autopilot, when taxi speed is reached.
- PM (monitoring operation of the automatic system):
  - Monitors flight instruments head-down until rollout is completed.
  - Calls any deviation, failure warning or FMA mode changes.
  - Monitors auto callouts or calls radio heights.
  - For a CAT III approach at AH calls "ALERT HEIGHT".
  - At 100ft above or at DH with PF not responsive, land if visual otherwise Go-around.

## 6) Review of FMA Calls:

In addition to routine standard calls, following are additional:

Situation	Call (PM)	Response (PF)
Passing Approach Ban	APPROACH BAN	Continue or Go-Around
500 feet RA	Auto Land Status & Minima (e.g. LAND 3 , 50 FEET etc)	CHECK
200 feet RA (CAT III)	ALERT HEIGHT	CHECK
50 feet RA FLARE not engaged (autoland)	NO FLARE	Go-Around or Land Manually
20 feet RA IDLE not annunciated	RETARD	CHECK (appropriate action)
Touchdown ROLLOUT not engaged (autoland)	MANUAL ROLLOUT	CHECK (appropriate action)

Manual callouts are required by pilot monitoring if auto callouts are u/s.

## 7) Review Procedure for Malfunction above 1000 ft AGL:

- Check Auto Land Status annunciation.
- If it has Not Changed, and the faulty equipment is not required then Continue.
- If it has Changed, or the equipment is required then:
  - Downgrade to a higher minimum i.e. from CAT III to II or CAT II to I (permitted if):
    - EICAS (checklist) actions are completed.
    - RVR is equal to CAT II or CAT I minima as applicable.
    - Briefing is amended to include CAT II / I procedure and DA/DH as applicable.
    - The decision to downgrade is completed above 1000 ft AGL.
  - Go-around
- Consider landing if suitable visual reference is established.

## 8) Review Procedure for Malfunction below 1000 ft AGL:

- Between 1000 ft and Alert Height (200 ft):
  - Go-around and reassess system capability before carrying out another approach.
- At or Below Alert Height:
  - EICAS Alert with Master Caution: Go-Around or Land if visual.
  - EICAS Alert without Master Caution: Continue.
  - In LAND 3, a single failure (e.g. one AP or engine) does not necessitate a go-around.

## 9) Review Go-around:

- Aircraft Procedures
- ATC Procedures
- Loss of Visual References
  - Before Touchdown: GO-AROUND (in case of ground contact AP and ATHR remains engaged. Ground spoilers and auto brakes are inhibited).
  - After Touchdown: ROLLOUT (continue with AP in ROLLOUT mode).

## 10) Optimum Seat Position and Lighting:

- A too-low seat adjustment may greatly reduce the (already short) visual segment.
- Cockpit Lights as required.
- Landing lights not normally used in CAT II /III weather conditions. Reflected light from water droplets or snow may actually reduce visibility.

## 11) Misc:

- Overweight Auto Land is not recommended.
- Min visibility for taxi is equivalent to an RVR of more than 75m (75 or less is insufficient).



# **ARRIVAL – NON-NORMAL PROCEDURES**

## **BASIC DEFINITIONS**

### **Alert Height:**

It is a specified radio height, based on the characteristics of the aeroplane and its fail-operational landing system. In operational use, if a failure occurred above the alert height in one of the required redundant operational systems in the aeroplane (including, where appropriate, ground roll guidance and the reversionary mode in a hybrid system), the approach would be discontinued and a go-around executed unless reversion to a higher decision height is possible. If a failure in one of the required redundant operational systems occurred below the alert height, it would be ignored and the approach continued.

### **Fail-Operational Automatic Landing System:**

An automatic landing system is fail-operational if, in the event of a failure, the approach, flare and landing can be completed by the remaining part of the automatic system. In the event of a failure, the automatic landing system will operate as a fail-passive system.

The following are typical arrangements:

- (i) Two monitored automatic pilots, one remaining operative after a failure.
- (ii) Three automatic pilots, two remaining operative (to permit comparison and provide necessary failure detection and protection) after a failure.

### **Fail-Passive Automatic Landing System:**

An automatic landing 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. For a fail-passive automatic landing system the pilot assumes control of the aircraft after a failure.

The following are typical arrangements:

- (i) A monitored automatic pilot in which automatic monitors will provide the necessary failure detection and protection.
- (ii) Two automatic pilots with automatic comparison to provide the necessary failure detection and protection.

### **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 consists of a monitored head-up display providing guidance which normally takes the form of command information, but it may alternatively be situation (or deviation) information.

## **RESPONSE TO ALERTS ABOVE 200 FT AGL**

- **AUTOPILOT DISC / AUTOPILOT**
  - No visual references – Go-Around
  - With visual references – Land
  
- **NO AUTOLAND**
  - No visual references – Go-Around
  - With visual references – Land
  
- **AUTOTHROTTLE DISC**
  - Continue
  - CAT III B – Go-Around
  
- **SPEEDBRAKE EXTENDED**
  - Retract Speedbrakes
  
- **ENGINE FAIL / THRUST**
  - Continue
  
- **NO LAND3**
  - Continue (Fail Passive LAND2)
  - In case of CAT III B – Go-Around (or revert to higher minima)
  
- **ILS Deviation Alert**
  - No visual references – Go-Around
  - With visual references – Land

## **RESPONSE TO ALERTS BELOW 200 FT AGL**

- **AUTOPILOT DISC / AUTOPILOT**
  - No visual references – Go-Around
  - With visual references – Land
  
- **NO AUTOLAND**
  - No visual references – Go-Around
  - With visual references – Land
  
- **AUTOTHROTTLE DISC**
  - Continue
  - CAT III B – No visual references – Go-Around
  
- **SPEEDBRAKE EXTENDED**
  - No visual references – Go-Around
  - With visual references – Land
  
- **ENGINE FAIL / THRUST**
  - Continue (master caution light and aural inhibited)
  
- **ILS Deviation Alert**
  - No visual references – Go-Around
  - With visual references – Land

## **RESPONSE TO ALERTS DURING GOAROUND**

- **AUTOPILOT DISC** – Manual Goaround
- **AUTOPILOT** – Disengage Autopilot (Manual Goaround)
- **SPEEDBRAKE EXTENDED** – Retract Speedbrakes

# PILOT INCAPACITATION

## Above Alert Height (200 feet)

- Standard calls may be repeated before assuming incapacitation.
- Continue approach and land if visual provided:
  - Flight controls are not obstructed.
  - Status is LAND2 OR LAND3.
- If above requirement not met then go-around.
- Prepare for another approach or divert.

## Below Alert Height

- Standard calls may not be repeated and incapacitation must be assumed.
- At 100ft above or at DH with PF not responsive, land if visual otherwise Go-around.

### **Note:**

*According to one school of thought (basically the policy makers) the standard calls between 1000 ft RA and alert height must be repeated before incapacitation is assumed, if no reply is received, go around should be initiated. This is based on the argument that at this stage (typically 500 Feet and below) there is not enough time to evaluate the condition and a go around is the safest option.*

*However according to the other school of thought (basically the pilots), continuing the approach to autoland is preferable to a go around provided everything else (aircraft systems, safety analysis by the remaining crew etc) remains within limits. A go around may not always be the safest option considering the errors associated with this manoeuvre, especially in a high workload scenario with a single pilot (who does not even perform this manoeuvre regularly as compared to landing). Moreover the outcome of a go around is either a follow on single pilot Cat II/Autoland approach (i.e. all over again from a point where it was about to finish) or a diversion to an alternate with an incapacitated crew (who might be suffering from a cardiac arrest!).*

# EFFECT OF FAILED / DOWNGRADED EQUIPMENT ON LANDING MINIMA

## EU-OPS 1 Aerodrome Operating Minima

For the following CAT II, IIIA and IIIB tables:

1. Multiple failures of runway lights not acceptable.
2. Combination of deficiencies in runway lights and RVR assessment equipment is not allowed.

<b>CAT II</b>	
<b>FAILED / DOWNGRADED EQUIPMENT</b>	<b>EFFECT ON LANDING MINIMA</b>
Standby ILS Transmitter	No effect
Outer Marker	No effect, if replaced by published equivalent position
Middle Marker	No effect
TDZ RVR Assessment System	May be temporarily replaced by Mid RVR if approved by State of Aerodrome. RVR may be reported by human observation.
Mid or Rollout RVR	No effect
Anemometer for Runway in use	No effect, if other ground source available
Ceilometers	No effect
Approach Lights	Not Allowed
Approach Lights – Except last 210 m	Standard CAT II – Not Allowed * Other Than Standard CAT II – No Effect
Approach Lights – Except last 420 m	No effect
Standby Power for Approach Lights	No effect
Whole Runway Light System	Not Allowed
Edge Lights	Day – No Effect Night – Not Allowed
Centerline Lights	Day – RVR 300 m Night – RVR 550 m
CL Light spacing increased to 30 m	No effect
TDZ Lights	Day – RVR 300 m Night – RVR 550 m
Standby Power for Runway Lights	Not Allowed
Taxiway Light System	No effect

\* Other than Standard CAT II operations retain the DH criteria above but allow suitably approved aircraft operators to operate down to an RVR of not less than 350/400 m depending upon the category of aircraft with reduced Aeronautical Ground Lighting from that required for a standard CAT II.

### CAT III A

FAILED / DOWNGRADED EQUIPMENT	EFFECT ON LANDING MINIMA
Standby ILS Transmitter	Not Allowed
Outer Marker	No effect, if replaced by published equivalent position
Middle Marker	No effect
TDZ RVR Assessment System	May be temporarily replaced by Mid RVR if approved by State of Aerodrome. RVR may be reported by human observation.
Mid or Rollout RVR	No effect
Anemometer for Runway in use	No effect, if other ground source available
Ceilometers	No effect
Approach Lights	Not Allowed if DH is greater than 50 feet
Approach Lights – Except last 210 m	No effect
Approach Lights – Except last 420 m	No effect
Standby Power for Approach Lights	No effect
Whole Runway Light System	Not Allowed
Edge Lights	Day – No Effect Night – Not Allowed
Centerline Lights	Day – RVR 300 m Night – Not Allowed
CL Light spacing increased to 30 m	RVR 150 m
TDZ Lights	Day – RVR 300 m Night – RVR 550 m
Standby Power for Runway Lights	Not Allowed
Taxiway Light System	No effect

### CAT III B

FAILED / DOWNGRADED EQUIPMENT	EFFECT ON LANDING MINIMA
Standby ILS Transmitter	Not Allowed
Outer Marker	No effect, if replaced by published equivalent position
Middle Marker	No effect
TDZ RVR Assessment System	May be temporarily replaced by Mid RVR if approved by State of Aerodrome. RVR may be reported by human observation.
Mid or Rollout RVR	No effect
Anemometer for Runway in use	No effect, if other ground source available
Ceilometers	No effect
Approach Lights	Not Allowed if DH is greater than 50 feet
Approach Lights – Except last 210 m	No effect
Approach Lights – Except last 420 m	No effect
Standby Power for Approach Lights	No effect
Whole Runway Light System	Not Allowed
Edge Lights	Day – No Effect Night – Not Allowed
Centerline Lights	Day – RVR 300 m Night – Not Allowed
CL Light spacing increased to 30 m	RVR 150 m
TDZ Lights	Day – RVR 200 m Night – RVR 300 m
Standby Power for Runway Lights	Not Allowed
Taxiway Light System	No effect

CAT III B – NO DH (with the lowest RVR limitations)	
FAILED / DOWNGRADED EQUIPMENT	EFFECT ON LANDING MINIMA
RVR	At least one RVR value must be available
Standby ILS Transmitter	Not Allowed
Outer Marker	No effect, if replaced by published equivalent position
Middle Marker	No effect
TDZ RVR Assessment System	May be temporarily replaced by Mid RVR if approved by State of Aerodrome. RVR may be reported by human observation.
Mid or Rollout RVR	No effect
Anemometer for Runway in use	No effect, if other ground source available
Ceilometers	No effect
Approach Lights	Not Allowed if DH is greater than 50 feet
Approach Lights – Except last 210 m	No effect
Approach Lights – Except last 420 m	No effect
Standby Power for Approach Lights	No effect
Whole Runway Light System	Not Allowed
Edge Lights	Day – No Effect Night – Not Allowed
Runway or Centerline Lights	Day – RVR 200m Night – Not allowed
CL Light spacing increased to 30 m	RVR 150 m
TDZ Lights	No effect
Standby Power for Runway Lights	Day – RVR 200m Night – Not allowed
Taxiway Light System	No effect

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