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Civil Aviation Safety Authority

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Approval to conduct low visibility operations

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This Civil Aviation Advisory Publication (CAAP) provides guidance, interpretation and explanation on complying with the Civil Aviation Regulations 1988 (CAR) or a Civil Aviation Order (CAO).

This CAAP provides advisory information to the aviation industry in support of a particular CAR or CAO. Ordinarily, the CAAP will provide additional 'how to' information not found in the source CAR, or elsewhere.

Civil Aviation Advisory Publications should always be read in conjunction with the relevant regulations/orders.

Audience

This civil aviation advisory publication (CAAP) applies to:

- Australian aircraft operators who want to conduct low visibility operations (LVOs), both within Australia and overseas
- foreign aircraft operators wishing to conduct LVO within Australia.

Purpose

This CAAP provides information about the processes and requirements for gaining approval to conduct LVO.

For further information

Within Australia: contact the relevant Civil Aviation Safety Authority (CASA) Regional Office on 131 757.

Overseas operators: contact CASA International Operations on +61 2 6217 1111 or International_Ops@casa.gov.au

Status

This version of the CAAP is approved by the Manager, Flight Standards Branch.

Note: Changes made in the current version are annotated with change bars.

Version	Date	Details
v2.1	November 2017	<p>This version includes the following changes:</p> <ul style="list-style-type: none"> • Clarification of an original expectation that, for take-off or approach operations, an RVR or RV report from a particular location is always controlling, whether or not it is required for the particular operation. • Guidance to the effect that if an operator has procedures for allowing aircraft to be dispatched with its fail-operational flight control system downgraded to fail-passive condition, then recurrent training should include the completion of a missed approach as a result of autopilot failure. • Spelling and reference corrections.
CAAP 257-EX-01(1)	January 2016	<p>This CAAP replaces CAAP LVO-1(0). All copies of and references to CAAP LVO-1(0) should be replaced by this CAAP. Although based on CAAP LVO-1(0), the following changes have been made to the original document:</p> <ul style="list-style-type: none"> • New information added about: <ul style="list-style-type: none"> a. acceptable methods for gaining approval to conduct special authorisation category (SA CAT) I and SA CAT II instrument approach operations b. required ground or runway equipment for LVO c. the effect on landing minima as a result of failed or downgraded equipment d. alert and decision height (DH) requirements • Substantial amendments have been made to the following subsections or paragraphs: <ul style="list-style-type: none"> a. 'How to apply' including 'Prerequisites' and 'Levels of LVO exemption' (originally Section 5) b. Range of minima and required aerodrome facilities for low visibility take-offs (originally subsection 6.1) c. Conditions on exemptions, including those pertaining to training, experience, recency, competency and operational restrictions (originally Section 8) • Appendix 1 - Low visibility operation training syllabus has been omitted • Appendix 2 - Requirements for grant of an autoland approval has been omitted; however, guidance on conducting autolands not associated with low visibility operations has been published as a separate CAAP.
CAAP LVO-1(0)	July 2011	First CAAP.

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1 Reference material

1.1 Acronyms

The acronyms and abbreviations used in this CAAP are listed in the table below.

Acronym	Description
AC	advisory circular
AIP	aeronautical information publication
AH	alert height
AFM	aircraft flight manual
ALS	approach lighting system
ATC	air traffic control
ATS	air traffic services
Autoland	automatic landing
CAAP	civil aviation advisory publication
CAO	Civil Aviation Order
CAR	<i>Civil Aviation Regulations 1988</i>
CASA	Civil Aviation Safety Authority
CAT	category
DH	decision height
DME	distance measuring equipment
EASA	European aviation safety agency
END	stop-end reporting location (related to RVR or RV)
EVS	enhanced vision system
FAA	Federal Aviation Administration
FGS	flight guidance system
FO	fail-operational
FP	fail-passive
GBAS	ground based augmentation system
HUD	head-up display
ICAO	International Civil Aviation Organization
ILS	instrument landing system
LVO	low visibility operation
LVTO	low visibility take-off
MEL	minimum equipment list

Acronym	Description
MID	mid-point reporting location (related to RVR or RV)
MOS	manual of standards
NAA	National Aviation Authority
NAVAID	navigation aid
NOTAM	notice to airmen
OEM	original equipment manufacturer
OPS SPEC	operations specification
PF	pilot flying
PIC	pilot-in-command
PICUS	pilot-in-command under supervision
RA	radio altimeter
RCLL	runway centre line light(s)
RCLM	runway centre line marking(s)
REDL	runway edge light(s)
RV	runway visibility
RVR	runway visual range
SA CAT	special authorisation category
SLF	supervised line flying
SVS	synthetic vision system
TDZ	touchdown zone
TDP	take-off decision point
V ₁	take off decision speed
V ₂	take-off safety speed
VMC	visual meteorological conditions
ZFT	zero flight time

1.2 Definitions

Definitions of terms that do not have accepted dictionary meanings are presented below. Most of the terms used in this CAAP are taken from International Civil Aviation Organization (ICAO) source documents or documents produced by overseas regulatory authorities. In such cases, the source is shown in brackets for each term. However, some terms have been uniquely defined for the Australian context and these definitions are indicated by an “*”.

Term	Definition
Alert height	A height above the runway threshold, based on the characteristics of the aeroplane and its fail-operational landing system, above which a category III operation would be discontinued and a missed approach initiated if a failure occurred in one of the redundant parts of the landing system or in the relevant ground equipment. [FAA]
Better weather conditions	Weather conditions (cloud height or visibility) better than the minima specified for CAT I.
Category I (CAT I) operation	A precision approach operation with a decision height (DH) not lower than 200 ft and either a visibility not less than 800 m or a runway visual range (RVR) not less than 550 m. [ICAO]
Category II (CAT II) operation	A precision approach operation with a DH lower than 200 ft, but not lower than 100 ft; and an RVR not less than 300 m. [ICAO]
Category IIIA (CAT IIIA) operation	A precision approach operation with a DH lower than 100 ft or no decision height, and an RVR not less than 175 m. [ICAO]
Category IIIB (CAT IIIB) operation	A precision approach operation with a DH lower than 50 ft, or no decision height, and an RVR less than 175 m but not less than 50 m. [ICAO]
Controlling	In relation to RVR or runway visibility (RV), means the reported value of one or more RVR or RV reporting locations (touchdown, mid-point and stop-end) used to determine whether operating minima are or are not met.*
Enhanced vision system (EVS)	A system to display electronic real-time images of the external scene achieved through the use of image sensors. [ICAO]
Experienced	<ul style="list-style-type: none"> • CAT II - an operator who has held an exemption for CAT II operations with RVR minima of 350 m or less for at least 1 year. • CAT III - an operator who has held an exemption for CAT III operations with RVR minima of 175 m or less for at least 1 year.
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 (e.g. head-up display [HUD] and autoland or HUD/EVS/SVS) [FAA].
Head-up display (HUD)	A display system that presents flight information into the pilot's forward external field of view. [ICAO]
Low visibility operation (LVO)	An operation involving: <ul style="list-style-type: none"> • a low visibility take-off (LVTO) • an approach using minima less than the CAT I minima published in the

Term	Definition
	AIP for the runway in use.*
Low visibility take-off (LVTO)	A take-off with an RVR or runway visibility (RV) lower than 550 m.*
Low visibility procedures	Procedures applied at an aerodrome for protecting aircraft operations during low visibility operations.*
Radio altimeter (RA) height	The indication on a radio altimeter of the vertical distance between a point on the nominal glidepath at the decision height and the terrain directly beneath this point.
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. [ICAO] 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.*
Simulator	A flight simulator certified to a least level C in accordance with Part 60 Manual of Standards (MOS), with: <ul style="list-style-type: none"> • flight management and guidance systems relevant to the LVO operations conducted by the operator • relevant low visibility runway modelling and lighting standards for taxiways, runways and approach lighting systems.*
Special authorisation category I (SA CAT I) operation	A precision approach CAT I operation with a DH lower than 200 ft, but not lower than 150 ft; and an RVR not less than 450 m.*
Special authorisation category II (SA CAT II) operation	A precision approach operation to a runway where some or all of the elements of the precision approach CAT II lighting system are not available, and with: <ul style="list-style-type: none"> • a DH lower than 200 ft, but not lower than 100 ft • an RVR not less than 350 m.*

1.3 References

Regulations

Regulations are available on the Federal Register of Legislation website <https://www.legislation.gov.au/>

Document	Title
CAO 20.7.1B	Aeroplane weight and performance limitations – specified aeroplanes above 5,700 kg, or 2,722 kg if driven by 2 or more jet engines – all operations
FAA AC 120-29	Criteria for approval of category I and category II weather minima for approach
FAA AC 120-28	Criteria for approval of category III weather minima for take-off, landing, and rollout
ICAO Doc 9365-AN/910	Manual of All-Weather Operations

Document	Title
Regulation (EU) No 965/2012	COMMISSION REGULATION (EU) No 965/2012 of 5 October 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council
AMC & GM to Part-SPA	European Aviation Safety Agency (EASA) Acceptable Means of Compliance (AMC) and Guidance Material (GM) to Annex V Specific approvals of Commission Regulation (EU) 965/2012 on air operations
ICAO Annex 10 Volume 1	Radio Navigation Aids
ICAO Annex 14 Volume 1	Aerodrome Design and Operations
Part 139 Manual of Standards (MOS)	Aerodromes
Part 173 MOS	Standards Applicable to Instrument Flight Procedure Design
CAR 1988	Civil Aviation Regulations 1988

2 Introduction

2.1 Background

- 2.1.1 In Australia, take-off and landing minima are established as a legislative determination made under regulation 257 of *the Civil Aviation Regulations 1988 (CAR)*. This regulation allows CASA to determine the meteorological minima for landing or take-off. 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).
- 2.1.2 The minima set by CASA are intended for broad use by pilots and aircraft operators without the need for specific permission from CASA. These 'standard' minima are currently promulgated as:
- landing: not less than standard precision approach category I (CAT I) minima (200 ft DH, 550 m RVR/800 m visibility)
 - take-off: visibility not less than 550 m.
- 2.1.3 For operators wishing to conduct operations with lower minima (i.e. LVO), CASA may grant operators an exemption to the standard minima. An exemption will require the approved operator to comply with specific requirements as described in this CAAP.
- 2.1.4 This exemption process is consistent with international practice, which requires operators to have specific approval to conduct instrument approaches with minima less than CAT I or to conduct low visibility take-offs.

2.2 References to vision systems and helicopter LVO

- 2.2.1 This CAAP contains a number of references to enhanced vision system (EVS), synthetic vision systems (SVS) and helicopter LVO. This is because some sections of this CAAP are based on EASA regulatory material. These references are for future use only, as CASA has not yet developed relevant EVS and helicopter LVO standards.

3 Method of authorisation

3.1 Operations within Australia

- 3.1.1 CASA will approve Australian and foreign aircraft operators to conduct LVOs within Australia by granting an Instrument of Exemption against the determination of standard minima.

3.2 Operations outside Australia

- 3.2.1 Australian operators intending to conduct LVO in another country will need the following:
- an exemption, issued by CASA, allowing the applicant to conduct the relevant LVO
 - an authorisation from the applicable foreign regulatory authority to conduct the relevant LVO to provide the following information to CASA:
 - o for landing operations, a statement confirming the aerodrome and runway terrain details and charts, including the calculations used to determine the applicable minima
 - o a copy of the operations specification (OPS SPEC), or equivalent authorisation, from the foreign National Aviation Authority (NAA) for LVO.

3.3 Conditions on exemptions

- 3.3.1 CASA may impose conditions on exemptions granted to Australian operators to conduct LVO. These conditions are standardised for all LVO exemptions as much as possible; however, CASA may need to vary these conditions for particular cases.
- 3.3.2 Foreign aircraft operators authorised for LVO will generally not be subject to such conditions, but would be required to conform to any conditions imposed by their own NAA and in accordance with the relevant OPS SPEC.

4 Applications

4.1 Applications from foreign aircraft operators

4.1.1 Foreign aircraft operators should apply to:

International Operations
Civil Aviation Safety Authority
GPO Box 2005
CANBERRA ACT 2601
AUSTRALIA

4.1.2 The request should include a copy of the operator's OPS SPEC for LVO issued by their own NAA.

4.1.3 When operating in Australia, a particular foreign aircraft operator's NAA has the primary responsibility for determining that the operator complies with the special requirements it specifies for low visibility operations at any airport. The operator's NAA also has the primary responsibility for authorising and/or restricting operating minimums for any operation by that foreign air carrier.

4.1.4 General principles

4.1.4.1 CASA will consider a request by a foreign air carrier to conduct LVOs within Australia according to the following principles:

- a foreign aircraft operator will not be authorised to conduct particular LVOs in Australia unless that operator is authorised by its NAA to conduct the same or equivalent LVO
- a foreign aircraft operator will not be authorised for low visibility operating minimums in Australia that are lower than equivalent operating minimums authorised by its NAA
- criteria acceptable for use for assessment of a foreign operator's application for low visibility operations at Australian airports includes FAA AC 120-29 or AC 120-28, equivalent EASA criteria, or the current edition of ICAO Doc 9365-AN/910.

4.2 Applications from Australian aircraft operators

4.2.1 Any proposal for an exemption from standard minima to conduct LVO should be directed the CASA office overseeing the operator in the first instance.

4.2.2 CASA will arrange a suitable time for an interview. At the interview CASA will provide a cost estimate for the time required to assess the application.

4.2.3 The operator will need to provide CASA with all applicable documentation including:

- an application document or exposition that includes, but is not limited to:
 - o a description of the proposed operations
 - o action(s) taken in accordance with a safety risk assessment of the proposed operations
- aircraft flight manual (AFM) documentation supporting the LVO application (e.g. flight manual supplement or LVO AFM section)

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- information intended to be inserted into operations manuals covering:
 - o crew training
 - o crew low-visibility procedures
 - o flight administration procedures for tracking automatic landing (autoland) system integrity
- applicable minimum equipment list (MEL) entries identifying aircraft equipment required for LVO
- information showing that the relevant aircraft or systems are certified for the particular operation requested
- aircraft maintenance manual procedures for maintaining autoland status
- procedures for the operator to determine the aircraft operating minima.

5 Prerequisites

5.1 Multi-crew aircraft and simulator

5.1.1 CASA will only consider applications for approval to conduct LVO for:

- aircraft operating with two flight crew
- operators with access to a simulator for pilot training and competency assessment purposes.¹

5.2 SA CAT I operations

5.2.1 Aircraft are eligible for SA CAT I operations, if they are certified for CAT II operations and equipped with either:

- a HUD system that is certified for at least CAT II operations
- or
- an approved fail-operational (FO) or fail-passive (FP) autoland system.

5.3 SA CAT II operations

5.3.1 Aircraft are eligible for SA CAT II operations, if they are certified for CAT III operations and equipped with either:

- an FO or FP autoland system
- or
- a HUD system certified to touchdown.

5.4 CAT II operations

5.4.1 Aircraft are eligible for CAT II operations if they are equipped with a flight guidance or control system relevant to the particular operation as follows:

- for operations with an RVR of not less than 350 m, one of the following:
 - o an autopilot certified for CAT II operations
 - o a HUD system certified for CAT II or CAT III operations
 - o flight director system or command guidance information certified for CAT II operations provided for each pilot.
- for operations with an RVR of less than 350 m:
 - o a certified FO or FP autoland system
 - or
 - o a HUD system certified for CAT III operations.

¹ See the definition for 'simulator'

5.5 CAT III operations

5.5.1 Aircraft are eligible for CAT IIIA operations if they are certified for CAT III operations and equipped with one of the following:

- an FO or FP autoland system
- an FO or FP 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.

5.5.2 Aircraft are eligible for CAT IIIB operations with an RVR in any reporting location of not less than 125 m if they are certified for CAT III operations and equipped with a flight guidance or control system that includes one of the following:

- an FO landing system with an FO or FP automatic rollout system
- an FO hybrid autoland and rollout system with compatible manual flight guidance system, using autoland capability as the primary means of landing.

5.5.3 Aircraft are eligible for CAT IIIB operations with an RVR of not less than 75 m if they are certified for CAT III operations and equipped with both:

- a flight guidance or control system, which includes one of the following:
 - o an FO autoland system
 - o a manual flight guidance system certified to meet FO system criteria
 - o when approved by CASA, a hybrid system in which both the FP automatic system and the monitored manual flight guidance components provide approach and flare guidance to touchdown, and in combination provide full FO capability
- an FO rollout guidance or control system that can assure safe rollout to taxi speed, consisting of either:
 - o an FO automatic rollout control system or FO manual flight guidance rollout system
 - or
 - o a hybrid system consisting of at least an FP automatic rollout system and compatible FP manual flight guidance rollout control system.

CASA will consider requests for use of certified aircraft systems, including EVS/SVS, that are demonstrated to have an equivalent level of performance and safety to the above.

The system requirements in the preceding paragraphs only list acceptable flight control or guidance systems. Low visibility operations requiring other aircraft systems, such as, but not limited to:

- automatic throttle
- suitable navigation receivers or sensors
- radio altimeters (RAs)

CASA expects these additional system aspects will be covered by relevant certification requirements for the aircraft.

6 Processes for gaining an exemption

For Australian operators, the following sub-sections provide a brief overview of the processes for gaining an exemption to conduct LVOs.

6.1.1 Initial assessment of the formal application package

6.1.1.1 For any application for low visibility exemption, CASA will assess that the following aspects within the application have been addressed:

- the training, qualification and checking processes for flight crew
- the company operations manual includes appropriate standard operating procedures for the conduct of the relevant low visibility operations
- the aircraft are certified for the particular low visibility operations
- the Air Operators Certificate holder's approved maintenance control system addresses the requirements pertaining to the relevant low visibility operations.

6.1.1.2 Following the initial assessment of the operator's formal application package, CASA will require the operator to conduct a program to demonstrate and validate the use and effectiveness of the applicable aircraft flight guidance systems, including:

- HUD (if appropriate)
- training
- flight crew procedures
- maintenance program
- manuals applicable to the requested LVO.

6.1.2 Low-visibility take-off operations

6.1.2.1 CASA will grant an exemption for low visibility take-off operations (LVTOs) after it has assessed and verified the adequacy of:

- an operator's procedures and systems
- crew training in a simulator.

6.1.3 SA CAT I operations

6.1.3.1 CASA will grant an exemption after:

- the operator has presented a current exemption for CAT II or CAT III operations using a HUD or autoland
- CASA has assessed and verified the adequacy of the operator's procedures, systems and crew training for SA CAT I operations.

For SA CAT I operations using a HUD, the operator is eligible for an SA CAT I exemption if the operator's CAT II or CAT III exemption allows at least RVR 350 m minima, using HUD guidance to DH or touchdown.

6.1.4 SA CAT II operations

6.1.4.1 CASA will grant an exemption after:

- the operator has presented a current exemption, using autoland or HUD that provides guidance to touchdown, for CAT II or CAT III operations
- CASA has assessed and verified the adequacy of the operator's procedures, systems and crew training for SA CAT II operations.

The operator is eligible for an SA CAT II exemption if the operator's CAT II or CAT III exemption allows at least RVR 350 m minima using autoland or a HUD that provides guidance to touchdown.

6.1.5 Operators with no CAT II or CAT III experience seeking exemption for CAT II

6.1.5.1 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 a HUD or upgrade from FP to FO.

6.1.5.2 CASA will grant an exemption to conduct CAT II operations after the operator has successfully completed:

- a 6 month demonstration of maintenance and crew operations
- at least 30 landings in CAT I conditions (or better), using the relevant low-visibility landing system installed in each applicable aircraft type or variant.

6.1.6 Operators with no CAT II or III experience seeking exemption for CAT III

6.1.6.1 CASA will grant an exemption to conduct CAT IIIA operations after the operator has successfully completed:

- a 6 month demonstration of maintenance and crew operations
- at least 30 landings in CAT I conditions (or better), using the low-visibility landing procedures and the system installed in each applicable aircraft type or variant (if the requested DH is 50 ft or higher).
- at least 100 landings in CAT I conditions (or better) using the low-visibility landing procedures and the system installed in each applicable aircraft type or variant (if the requested DH is less than 50 ft).

If the operator has successfully completed 90% of the required landings in CAT I conditions or better, CASA may grant an exemption authorising CAT II operations to RVR 350 m minima for the remainder of the first 6 month demonstration period.

- 6.1.6.2 For an operator requesting an RVR minimum below 175 m, CASA will grant an exemption for CAT IIIB operations to RVR 125 m or 75 m after the operator has successfully completed a second 6 month demonstration of maintenance and crew operations to Cat IIIA minima.

6.1.7 Experienced CAT II exemption holder seeking CAT III exemption for new aircraft

This also applies to experienced CAT II exemption holders seeking a CAT II exemption for existing aircraft that have been fitted with new flight control equipment

- 6.1.7.1 CASA will grant an exemption for CAT IIIA operations after the operator has successfully completed:
- a 6 month demonstration of maintenance and crew operations
 - at least 50 landings in CAT I conditions (or better) using the low-visibility landing procedures and the system installed in each applicable aircraft type or variant.

Upon successful completion of 90% of the required landings in CAT I conditions or better, an operator may be granted an exemption authorising CAT II operations to RVR 350 m minima for the remainder of the first 6 month demonstration period.

This RVR 350 m minimum is based on the use of CAT III landing systems (i.e. autoland or HUD).

Although all demonstration landings using the new flight control equipment should be conducted at CAT I visibility minima or better, the operator may, at CASA's discretion, continue to use CAT II minima provided the requirements of the current exemption continue to be met.

- 6.1.7.2 For an operator requesting an RVR below 175 m, CASA will grant an exemption for CAT IIIB operations to RVR 125 m or 75 m (as applicable) after the operator has successfully completed a second 6 month demonstration of maintenance and flight crew operations to CAT IIIA minima.

6.1.8 Experienced CAT II exemption holder seeking CAT III exemption for the same aircraft with the same equipment

- 6.1.8.1 CASA will grant an exemption for CAT IIIA operations or CAT IIIB operations, to RVR 125 m or 75 m (as applicable), after successful completion of:
- a 6 month demonstration of maintenance and flight crew operations
 - at least 50 landings in CAT II conditions (or better), using the low-visibility landing procedures and system installed in each applicable aircraft type or variant.

Upon successful completion of 90% of the required landings in CAT II conditions or better, an operator may be granted an exemption authorising CAT IIIA operations to RVR 175 m minima for the remainder of the 6 month demonstration period.

6.1.9 Experienced CAT III exemption holders seeking changes to their current approved operations

New airports/runways

6.1.9.1 An experienced CAT III exemption holder can use new airports/runways with a published CAT III procedure without further demonstration, if currently approved aircraft/airborne systems will be used.

New or upgraded airborne system capability

6.1.9.2 Unless otherwise specified by CASA, an experienced CAT III exemption holder may use new or upgraded airborne system capabilities/components to the lowest authorised minima established for those system capabilities/components.

6.1.9.3 On request, CASA may accept reduced demonstration periods, consistent with the new airborne systems, navigation aids (NAVAIDs), runways and procedures to be used.

Examples of this provision include addition of a new capability, such as a 'one engine inoperative' autoland for a system currently approved for 'all engine operative' CAT III, and 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 continue to be used, without additional demonstration.

Adding a new CAT III aircraft type or variant

6.1.9.4 An experienced CAT III exemption holder may introduce a 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 6 months/50 landings) when authorised by CASA
- demonstration requirements will be established (on an individual basis), considering any applicable CASA criteria, such as:
 - o applicability of previous operator service experience
 - o experience with that aircraft type or variant by other operators
 - o experience of flight crews of that operator for CAT III
 - o the type of system and other such factors

- appropriate minima reduction steps may also be established for an abbreviated demonstration period, consistent with prior operator experience, NAVAIDs and runways and procedures to be used.

Operators authorised for CAT III using one type of system (e.g. autoland), 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 the demonstration period provisions and the acceptable minima 'step down' provisions for that class of system.

Seeking CAT II for a new aircraft

- 6.1.9.5 For an experienced CAT III operator seeking CAT II for an aircraft new to the operator's fleet, the operator will conduct 50 landings at CAT I weather minimums or better using the CAT II systems. Upon successful completion of 90 % of the landings, then CASA may issue an exemption to conduct CAT II operations to RVR 500 m for the remaining duration of the 6 month demonstration period. Upon successful completion of the demonstration period, the Flying Operations Inspector (FOI) may grant an exemption for CAT II operations to RVR 300 m or 350 m (as appropriate).

An operator may be approved to bypass the 6 month restriction (DH 100 ft and RVR 500 m) based on operational credit for the use of CAT III systems to conduct CAT II operations

6.1.10 Demonstrations

- 6.1.10.1 Demonstrations may be conducted in line operations or any other flight where the operator's procedures are being used.
- 6.1.10.2 In unique situations where the completion of the required successful landings could take an unreasonably long period of time and equivalent reliability assurance can be achieved, a reduction in the required number of landings may be considered on a case-by-case basis.
- 6.1.10.3 A justification is required if the number of landings to be demonstrated is to be reduced. This justification should take into account factors, such as:
- the operator's overall experience in LVO
 - a small number of aircraft in the fleet
 - limited opportunity to use runways having CAT II/III procedures
- or
- the inability to obtain air traffic services (ATS) sensitive area protection during good weather conditions;

However, at the operator's option, demonstrations may be made in a simulator or on other runways and facilities. Sufficient information should be collected to determine the cause of any unsatisfactory performance (e.g. sensitive area was not protected).

- 6.1.10.4 If the operator has different variants of the same type of aircraft utilising the same basic flight control and display systems, or different basic flight control and display systems on the same type of aircraft, the operator should show that the various variants have satisfactory performance, but a full operational demonstration for each variant is not required.
- 6.1.10.5 If possible, not more than 30 % of the demonstration flights should be made on the same runway.

Data collection for operational demonstrations

- 6.1.10.6 Data should be collected whenever an approach and landing is attempted utilising the CAT II/III system, regardless of whether the approach is abandoned, unsatisfactory, or is concluded successfully.
- 6.1.10.7 The data should, as a minimum, include the following information:
- Inability to initiate an approach: Identify deficiencies related to airborne equipment that preclude initiation of a CAT II/III approach.
 - Abandoned approaches: Give the reasons and altitude above the runway for why the approach was discontinued, or the automatic landing system was disengaged.
 - Touchdown or touchdown and rollout performance: Describe whether or not the aircraft landed satisfactorily within the desired touchdown area, with lateral velocity or cross track error that could be corrected by the pilot or automatic system so as to remain within the lateral confines of the runway without unusual pilot skill or technique. The approximate lateral and longitudinal position of the actual touchdown point, in relation to the runway centre line and the runway threshold, respectively, should be indicated in the report. This report should also include any CAT II/III system abnormalities that required manual intervention by the pilot to ensure a safe touchdown or touchdown and rollout, as appropriate.

Data analysis

- 6.1.10.8 Unsuccessful approaches, due to the following factors, may be excluded from the analysis:
- **ATS factors:** Examples include:
 - o situations in which a flight is vectored too close to the final approach fix/point for adequate localiser and glide slope capture
 - o lack of protection of instrument landing system (ILS) sensitive areas
 - or
 - o ATS requests the flight to discontinue the approach.
 - **Faulty NAVAID signals:** NAVAID (e.g. ILS localiser) irregularities, such as those caused by other aircraft taxiing, over-flying the NAVAID (antenna)
 - **Other factors:** Any other specific factors that could affect the success of CAT II/ III operations that are clearly discernible to the flight crew should be reported.

7 Range of operational minima

7.1 Controlling RVR or RV

7.1.1 A valid report from an RVR or RV location is always controlling, whether or not the location is identified as 'required' for a particular take-off or approach operation.

7.2 Low visibility take-off

7.2.1 CASA may approve exemptions to the take-off minima and set associated requirements for aerodrome facilities, as shown in Table 1 below, subject to the certified limits of the aircraft.

Table 1: Aerodrome facilities required for specific LVTO minima

Take-off minima ²	Required aerodrome facilities
350 m	<ul style="list-style-type: none"> • Illuminated runway edge lighting (REDL) at spacing intervals not exceeding 60 m • Runway centre line markings (RCLM) or illuminated runway centre line lighting (RCLL) • RVR or RV: Touchdown zone (TDZ) and either mid-point zone (MID) or stop-end zone (END) information.
200 m	<ul style="list-style-type: none"> • Illuminated high intensity REDL³ at spacing intervals not exceeding 60 m • Illuminated RCLL • RVR: TDZ and either MID or END information.
150 m	<ul style="list-style-type: none"> • Illuminated high intensity REDL at spacing intervals not exceeding 60 m • Illuminated RCLL • RVR: TDZ, MID and END information.
125 m	<ul style="list-style-type: none"> • Illuminated high intensity REDL at spacing intervals not exceeding 60 m • Illuminated RCLL at spacing intervals not exceeding 15 m • RVR: TDZ, MID and END information.
75 m	<ul style="list-style-type: none"> • The aircraft is equipped with a certified lateral guidance system (including a HUD, EVS or other approved systems) for take-off • If the lateral guidance system requires ILS localiser input, runway protection and localiser facilities equivalent to CAT IIIB (ILS classification III/E/4) landing operations are provided • Illuminated high intensity REDL at spacing intervals not exceeding 60 m • Illuminated RCLL at spacing intervals not exceeding 15 m • RVR: TDZ, MID and END information.

² The reported RVR/ runway visibility (RV) value representative of the initial part of the take-off run may be replaced by pilot assessment.

³ High intensity REDL is also known as high intensity runway lighting (HIRL).

7.3 Precision approach — SA CAT I

7.3.1 CASA may approve exemptions allowing SA CAT I approaches according to the following expectations:

- The touchdown zone (TDZ) RVR is required
- A MID RVR report cannot be substituted for the TDZ RVR report in SA CAT I operations
- The pilot-in-command (PIC) will not continue an approach below the SA CAT I DH unless the following visual references have been established and can be maintained:
 - o at least 3 consecutive longitudinally aligned lights, being the centreline of the approach lighting system (ALS), or the TDZ lights, or RCLL, or REDL, or a combination of these lights
 - o a lateral element of lighting—being an approach lighting crossbar, or landing threshold, or a barrette of TDZ lights, unless the approach is conducted using a HUD
- Minima relevant to the flight guidance of the aircraft are as shown in Table 2.

Table 2: SA CAT I minima

DH (RA)	TDZ RVR	MID RVR (if reported)	END RVR (if reported)
150 ft	450 m	125 m	75 m

7.4 Precision approach — SA CAT II

7.4.1 CASA may approve exemptions allowing SA CAT II approaches according to the following expectations:

- TDZ RVR is required
- MID RVR or END RVR is required
- The PIC will not continue an approach below the SA CAT II DH unless the following visual references have been established and can be maintained:
 - o at least 3 consecutive longitudinally aligned lights, being the centreline of the ALS; or the TDZ lights; or RCLL; or REDL; or a combination of these lights
 - o a lateral element of lighting—being an approach lighting crossbar, landing threshold or a barrette of TDZ lights, unless the approach is conducted using HUD to touchdown

- Minima relevant to the aircraft category are as shown in Table 3.

Table 3: SA CAT II minima

Aircraft category	DH (RA)	TDZ RVR ⁴	MID RVR	END RVR
A – C	100 ft	350 m	125 m	75 m
D	100 ft	400 m	125 m	75 m

7.5 Precision approach — CAT II

7.5.1 CASA may approve exemptions allowing CAT II approaches according to the following expectations:

- TDZ RVR is required
- MID RVR or END RVR is required
- The PIC will not continue an approach below the CAT II DH unless the following visual references have been established and can be maintained:
 - o at least 3 consecutive longitudinally aligned lights, being the centreline of the ALS, or the TDZ lights, or RCLL, or REDL, or a combination of these lights
 - o a lateral element of lighting—being an approach lighting crossbar, landing threshold or a barrette of TDZ lights, unless the approach is conducted using HUD to touchdown
- Minima relevant to the flight guidance certification of the aircraft are as shown in Table 4.

Table 4: CAT II minima

Aircraft flight guidance certification	DH (RA)	TDZ RVR	MID RVR	END RVR
CAT III (autoland or HUD to touchdown)	100 ft	300 m	125 m	75 m
CAT II	100 ft	350 m	125 m	75 m

7.6 Precision approach — CAT III

7.6.1 CASA may approve exemptions allowing CAT III approaches according to the following expectations:

- All RVR reports are required, except in the following circumstances:
 - o for operations using an FP landing system with an FP or FO rollout system— if either the MID or END RVR is temporarily inoperative, the operation may be initiated and continued using the TDZ and remaining RVR reporting location

⁴ Actual minimum TDZ RVR limited if runway is not provided with RCLL or TDZ lights. See section 8.2.1.

- o for operations using FO landing systems with an FP or FO rollout system— if any one of the RVR reporting locations is temporarily inoperative, the operation may be initiated and continued using the two remaining RVR reporting location
- Visual reference: CAT III FP or FO – **with a DH**
 - o for CAT III operations utilising an FO landing system with a DH— the PIC will not continue an approach below the DH unless the relevant visual reference of at least one centreline light has been established and can be maintained
 - o for CAT III operations utilising an FP landing system with a DH— the PIC will not continue an approach below the DH unless the relevant visual reference of at least 3 consecutive longitudinally aligned lights, being the centreline of the ALS, or the TDZ lights, or RCLL, or REDL, or a combination of these lights has been established and can be maintained
 - o for CAT III operations utilising an FO hybrid landing system with a DH— the PIC will not continue an approach below the DH unless the relevant visual reference of at least three consecutive lights of the RCLL has been established and can be maintained
- Visual reference: CAT III FO – **with no DH**
 - o for CAT III operations with no DH— the PIC is not required to see the runway prior to touchdown. The permitted RVR is dependent on the level of aircraft equipment
 - o a CAT III runway may be assumed to support operations with no DH unless specifically restricted as published in the AIP or Notice to Airmen (NOTAM)
- Minima relevant to type of aircraft systems are as shown in Table 5.

Table 5: Relevant CAT III minima

Approach Category	Landing System	Rollout System	DH	TDZ RVR	MID RVR	END RVR
CAT IIIA	FO	None	< 100 ft or no DH ⁵	175 m	175 m	75 m
	FP	None	50 ft	175 m	175 m	75 m
	FP	FP or FO		175 m	125 m	75 m
CAT IIIB	FO	FP	< 50 ft or no DH ⁵	125 m	125 m	75 m
	FO	FO		75 m	75 m	75 m

⁵ If no DH is specified, an AH or equivalent as authorized in the AFM is required.

8 Air traffic control and aerodrome requirements

8.1 Aerodrome capability

- 8.1.1 CASA permits LVO to be conducted at an aerodrome where air traffic control (ATC) services are in operation and ATC has declared that low-visibility procedures are in effect. Additionally, CASA will only allow LVO to be conducted:
- **within Australia:** if the aerodrome or runway meets appropriate regulatory standards for operations at the visibility minima specified for the particular LVO
 - **within a foreign country:** if the aerodrome or runway is authorised by the foreign regulatory authority for operations at the minima specified for the particular LVO.
- 8.1.2 Each aircraft type/runway combination should be verified by the successful completion of at least one approach and landing in CAT II or better conditions, before commencing CAT III operations.
- 8.1.3 For runways with irregular pre-threshold terrain or other foreseeable or known deficiencies— each aircraft type/runway combination should be verified by successful operations in CAT I or better conditions, prior to commencing SA CAT I, SA CAT II, CAT II or CAT III operations.

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. While some aerodrome limitations will not preclude LVO, they do require that aircraft operators:

- are aware of limitations in aerodrome lighting
- take account of any limitations of aerodrome lighting and infrastructure in the low-visibility flight operations section of the manual for the particular aerodrome
- are 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 can be found in the AIP.

8.2 Required ground/runway equipment

8.2.1 Table 6 lists the ground/runway facilities normally required for various low-visibility instrument approach procedures at aerodromes where CASA permits LVO.

Table 6: Facilities required for low-visibility instrument approach procedures

Component	SA CAT I	SA CAT II	CAT II	CAT III
Minimum ILS classification⁶	HUD only: Standard CAT I Autoland: I/T/1	II/D/2	RVR ≥ 350 m: II/T/2 RVR < 350 m: II/D/2	RVR ≥ 200 m: III/D/3 RVR ≥ 175 m: III/E/3 RVR < 175 m: III/E/4
CAT I ALS	Yes	Yes	Not required	Not required
CAT II/III ALS	Optional	Optional	Yes	Yes
Outer Marker or ILS Distance Measuring Equipment (DME)	Yes	Yes	Yes	Yes
Middle Marker	No	No	No	No
Inner Marker or ILS DME	No	Yes	Yes	Yes
Electronic RVR – TDZ	Yes	Yes	Yes	Yes
Electronic RVR – MID⁷	No	Yes	Yes	Yes
Electronic RVR – END⁷	No	No	No	Yes
High Intensity REDL	Yes	Yes	Yes	Yes
TDZ lights	No	For RVR < 450m but > 400 m: TDZ lights or RCLL	Yes	Yes
RCLL	No	For RVR ≤ 400 m: RCLL	RVR ≥ 350 m: Yes – ≤ 30m spacing RVR < 350 m: Yes – 15m spacing	Yes

8.3 Failed or downgraded equipment – effect on landing minima

8.3.1 Table 7 details the limitations or otherwise normally applied in respect to low visibility approaches.

⁶ The ILS classification – for each of the 3 alphanumeric characters – specified for the facility must be equal to or better than each of the 3 alphanumeric values specified in the table for the particular procedure. For details of the ILS classification system, see Volume I of Annex 10 to the Chicago Convention.

⁷ The requirement for both MID and END RVR is specifically determined by the operating minima – in some cases both are not required.

8.3.2 The failure effect details are intended for use both pre-flight and in-flight. It is not expected that the PIC will consider the effects after passing the point of continuation of an approach (or otherwise) as mentioned in 11.3. If failures of ground aids are announced at such a late stage, the approach may be continued at the PIC’s discretion. If failures are announced before such a late stage in the approach, their effect on the approach should be considered as described in Table 7, and the approach may have to be discontinued.

8.3.3 The following conditions should be apply to Table 7:

- Multiple failures of runway lighting, other than indicated in Table 7, will not be acceptable
- Deficiencies of approach and runway lights should be treated separately
- For CAT II and CAT III operations, a combination of deficiencies in runway lights and RVR assessment equipment will not be permitted
- Other than for ILS, failures will only affect RVR minima (i.e. not DH).

Table 7: Effect on landing minima of failed/downgraded equipment

Failed or downgraded equipment	SA CAT I	SA CAT II	CAT II	CAT IIIA	CAT IIIB with DH	CAT IIIB (no DH)
ILS standby transmitter	No effect				RVR 200 m	Not allowed
Outer marker	No effect if replaced by height check at a suitable point after glide path intercept					
Middle marker	No effect					
TDZ RVR	Not allowed				Not allowed unless any two RVR values are available	
MID or END RVR	No effect					
ALS	RVR 800 m	RVR 700 m	Not allowed	Not allowed for operations with DH > 50 ft		No effect
ALS except the last 210 m	RVR 650 m	RVR 600 m	Not allowed	No effect		
ALS except the last 420 m	RVR 550 m	RVR 450 m	No effect			
Standby power for approach lighting	No effect					
Runway edge lights, threshold lights and runway end lights	Day: No effect					
	Night – not allowed			Night: RVR 550 m	Night – no effect	
RCLL	No effect	If TDZ lights available: RVR 400 m, otherwise RVR 450 m	Day – RVR 350 m	Day – RVR 300 m	Not allowed	Day – RVR 200 m
			Night: RVR 550 m or RVR 400 m	Night – RVR 400 m		Night – not allowed

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Failed or downgraded equipment	SA CAT I	SA CAT II	CAT II	CAT IIIA	CAT IIIB with DH	CAT IIIB (no DH)
			with HUD to touchdown or autoland			
RCLL spacing increased to 30 m	No effect				RVR 150 m	
TDZ lights	No effect	If RCLL lights available: no effect, otherwise RVR 450 m	Day – RVR 300 m		Day – RVR 200 m	No effect
			Night – RVR 550 m		Night – RVR 300 m	
Taxiway light system	No effect – except delays due to reduced movement rate					

9 Operating procedures and documentation

9.1 General

9.1.1 Procedures and documentation should be provided for the following LVOs:

- manual take-off, with or without electronic guidance systems or HUD/hybrid HUD and/or EVS
- approach flown with the use of a HUD/hybrid HUD and/or EVS
- auto-coupled approach to below DH, with manual flare, hover, landing and rollout
- auto-coupled approach followed by auto-flare, hover, autoland and manual rollout
- auto-coupled approach followed by auto-flare, hover autoland and auto-rollout, when the applicable RVR is less than 400 m.

9.2 Procedures and instructions

9.2.1 The operator should specify detailed operating procedures and instructions in the operations manual or procedures manual.

9.2.2 The precise nature and scope of procedures and instructions given should depend upon the airborne equipment used and the standard operating procedures followed. The operator should clearly define flight crew member duties during take-off, approach, flare, hover, rollout and missed approach in the operations manual or procedures manual. Particular emphasis should be placed on flight crew responsibilities during transition from non-visual conditions to obtaining the required visual references, and on the procedures to be used in deteriorating visibility or when failures occur. Special attention should also be paid to the distribution of flight deck duties and crew resource management, to ensure that the workload of the pilot making the decision to land or execute a missed approach enables that person to concentrate on supervision and the decision making process.

9.2.3 The instructions should be compatible with the limitations and mandatory procedures contained in the AFM, and cover the following items in particular:

- checks for the satisfactory functioning of the aircraft 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, hover, landing, rollout and missed approach
- procedures to be followed in the event of failures, warnings to include HUD/EVS and other non-normal situations
- the minimum visual reference(s) required
- the importance of correct seating and eye position
- action that may be necessary arising from a deterioration of the visual reference
- allocation of crew duties such as to allow the PIC to concentrate on supervision and decision making

- the need for all height calls below 200 ft to be based on the RA and for one pilot to continue to monitor the aircraft instruments until the landing is completed
- procedures to confirm the protection status of the ILS
- the use of information relating to wind velocity, wind shear, turbulence, runway contamination and use of multiple RVR assessments
- procedures to be used for:
 - o SA CAT I
 - o SA CAT II
 - o approach operations utilising EVS/SVS
 - o practice approaches and landing on runways at which the full CAT II or CAT 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.

9.3 On-board documentation

9.3.1 The aircraft operator should 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 LVO exemption
- a low-visibility checklist
- a list of aerodromes and runways approved for SA CAT I, SA CAT II, CAT II, CAT IIIA and CAT IIIB operations
- the minima for the approved aerodromes and runways, including the relevant RA height that equates to the approved SA CAT I, SA CAT II, CAT II or CAT III DH for each listed runway that is approved for such operations.

If a runway has no defined RA minima, the operator may determine the RA minima from a study of the Precision Approach Terrain Charts available from the relevant aerodrome operator.

Appendix A shows a method for determining RA minima.

10 Flight crew training and qualifications

10.1 General provisions

- 10.1.1 The operator should ensure that flight crew member training programs for LVO include structured courses of ground, simulator and/or flight training. The operator, or an approved training organisation, should certify that each pilot has successfully completed an LVO training course, including ground and simulator training.
- 10.1.2 Flight crew members with no CAT II or CAT III experience should complete the full training program prescribed in sections 10.2, 10.3, and 10.4 below.
- 10.1.3 Flight crew members with CAT II or CAT III experience with a similar type of operation (auto-coupled/autoland, HUD/hybrid HUD or EVS) or CAT II with manual land (if appropriate) with another operator may undertake an:
- abbreviated ground training course if operating a different type of aircraft from that on which the previous CAT II or CAT III experience was gained
 - abbreviated ground, simulator and/or flight training course if operating the same type and variant of the same type on which the previous CAT II or CAT III experience was gained. The abbreviated course should include at least the provisions of sections 10.4.2, 10.4.3 (as appropriate), and section 10.4.4. The operator may reduce the number of approaches/landings required by section 10.4.3 if the type or the variant of the type has the same or similar:
 - o level of technology - flight control/guidance system (FGS)
 - o operating procedures
 - o handling characteristics
 - o use of HUD/hybrid HUD
 - o use of EVS
 as the previously operated type or variant, otherwise the provisions of section 10.4.3 should be met.
- 10.1.4 Flight crew members with CAT II or CAT III experience with the operator may undertake an abbreviated ground, simulator and/or flight training course.
- 10.1.5 When changing aircraft type, the abbreviated course should include at least the provisions of sections 10.4.2, 10.4.3 (as appropriate) and 10.4.4.
- 10.1.6 When changing to a different variant of aircraft, within the same type rating that has the same or similar:
- level of technology - FGS
 - operating procedures - integrity
 - handling characteristics
 - use of HUD/Hybrid HUD
 - use of EVS
- as the previously operated type, a difference course or familiarisation appropriate to the change of variant should fulfil the abbreviated course provisions.
- 10.1.7 When changing to a different variant of aircraft within the same type rating that has a significantly different:

- level of technology - FGS
- operating procedures - integrity
- handling characteristics
- use of HUD / Hybrid HUD
- use of EVS.

Note: The provisions of sections 10.4.2, 10.4.3 (as appropriate) and 10.4.4 should be fulfilled.

10.1.8 The operator should ensure when undertaking CAT II or CAT III operations with different variant(s) of aircraft within the same type rating that the differences and/or similarities of the aircraft concerned justify such operations, taking into account at least the following:

- the level of technology, including the:
 - o FGS and associated displays and controls
 - o flight management system and its integration or not with the FGS
 - o use of HUD with hybrid systems and/or EVS
- operating procedures, including:
 - o FP / FO, alert height
 - o manual landing / automatic landing
 - o no DH operations
 - o use of HUD with hybrid systems
- handling characteristics, including:
 - o manual landing from automatic HUD and/or EVS guided approach
 - o manual missed approach procedure from automatic approach
 - o automatic / manual rollout.

10.2 Ground training

10.2.1 The initial ground training course for LVO should include at least the following:

- characteristics and limitations of the ILS, microwave landing system (MLS) and/or GLS⁸ (as relevant to domestic or overseas operations)
- characteristics of the visual aids
- characteristics of fog
- operational capabilities and limitations of the particular airborne system to include HUD symbology and EVS characteristics (if appropriate)
- effects of precipitation, ice accretion, low level wind shear and turbulence
- effect of specific aircraft / system malfunctions
- use and limitations of RVR assessment systems
- principles of obstacle clearance requirements
- recognition of and action to be taken in the event of failure of ground equipment
- procedures and precautions to be followed with regard to surface movement during operations when the RVR is less than 550 m and any additional procedures required for take-off in conditions below 150 m (200 m for category D aeroplanes)
- significance of DHs based upon RAs and the effect of terrain profile in the approach area on RA readings and on the automatic approach/landing systems

⁸ Ground based augmentation system (GBAS) landing system (GLS)

- importance and significance of AH (if applicable), and the action in the event of any failure above and below the AH
- qualification requirements for pilots to obtain and retain approval to conduct LVOs
- importance of correct seating and eye position.

10.3 Simulator training and/or flight training

10.3.1 Simulator and/or flight training for LVO should include at least:

- checks of satisfactory functioning of equipment, both on the ground and in flight
- effect on minima caused by changes in the status of ground installations
- monitoring of:
 - o automatic flight control systems and autoland status annunciators with emphasis on the action to be taken in the event of failures of such systems
 - o HUD / EVS guidance status and annunciators as appropriate, to include head-down displays
- actions to be taken in the event of failures such as engines, electrical systems, hydraulics or flight control systems
- the effect of known unserviceabilities and use of MELs
- operating limitations resulting from airworthiness certification
- guidance on the visual references required at DH together with information on maximum deviation allowed from glide path or localiser
- the importance and significance of AH (if applicable) and the action in the event of any failure above and below the AH.

10.3.2 Flight crew members should be trained to carry out their duties and instructed on the coordination required with other crew members. Maximum use should be made of suitably equipped simulators for this purpose.

10.3.3 Training should be divided into phases covering normal operation with no aircraft or equipment failures, but including all weather conditions that may be encountered and detailed scenarios of aircraft and equipment failure that could affect CAT II or CAT III operations. If the aircraft system involves the use of hybrid or other special systems, such as HUD or EVS equipment, then flight crew members should practise the use of these systems in normal and abnormal modes during the simulator phase of training.

10.3.4 Pilot incapacitation procedures appropriate to LVTO, CAT II and CAT III operations should be covered during training.

10.3.5 For aircraft with no simulator available to represent that specific aircraft, operators should ensure that the flight training phase specific to the visual scenarios of CAT II operations is conducted in a specifically approved simulator. Such training should include a minimum of four approaches. Thereafter, the training and procedures that are type specific should be practised in the aircraft.

10.3.6 Initial CAT II and III training should include at least the following exercises:

- approach using the appropriate flight guidance, autopilots and control systems installed in the aircraft, to the appropriate DH and to include transition to visual flight and landing

- approach with all engines operating using the appropriate flight guidance systems, autopilots, HUD and/or EVS and control systems installed in the aircraft down to the appropriate DH followed by missed approach - all without external visual reference
- approaches utilising automatic flight systems to provide automatic flare, hover, landing and rollout (where appropriate)
- normal operation of the applicable system both with and without acquisition of visual references at DH.

10.3.7 Subsequent phases of training should include at least:

- approaches with engine failure at various stages on the approach
- approaches with critical equipment failures, such as:
 - o electrical systems
 - o auto flight systems
 - o ground and/or airborne ILS
 - o MLS systems and status monitors
- approaches where failures of auto flight equipment and/or HUD/EVS at low level require either:
 - o reversion to manual flight to control flare, hover, landing and rollout or missed approach
 - or
 - o reversion to manual flight or a downgraded automatic mode to control missed approaches from, at or below DH including those which may result in a touchdown on the runway
- failures of the systems that will result in excessive localiser and/or glideslope deviation, both above and below DH, in the minimum visual conditions specified for the operation. In addition, a continuation to a manual landing should be practised if a head-up display forms a downgraded mode of the automatic system or the head-up display forms the only flare mode
- failures and procedures specific to aircraft type or variant.

10.3.8 The training program should provide practice in handling faults, which require a reversion to higher minima.

10.3.9 The training program should include the handling of the aircraft when, during an FP CAT III approach, the fault causes the autopilot to disconnect at or below DH when the last reported RVR is 300 m or less.

10.3.10 Where take-offs are conducted in visibilities of less than 550 m , training should be established to cover systems failures and engine failure resulting in continued as well as rejected take-offs.

10.3.11 The training program should include, where appropriate, approaches where failures of the HUD and/or EVS equipment at low level require either:

- reversion to head down displays to control missed approach
- or
- reversion to flight with no, or downgraded, HUD guidance to control missed approaches from DH or below, including those which may result in a touchdown on the runway.

10.3.12 When undertaking LVTO, SA CAT I, SA CAT II, CAT II and CAT III operations utilising a HUD, hybrid HUD or an EVS, the training and checking program should include, where appropriate, the use of the HUD in normal operations during all phases of flight.

10.4 Conversion training

10.4.1 Flight crew members should complete the low visibility procedures training in this section if converting to a new type or variant of aircraft in which LVTO; SA CAT I, SA CAT II, CAT II, and CAT III operations; and approach operations utilising EVS with an RVR of less than 550 m, will be conducted. Conditions for abbreviated courses are prescribed in sections 10.1.3, 10.1.4, and 10.1.8.

10.4.2 Ground training

10.4.2.1 The appropriate provisions are prescribed in section 10.2, taking into account the flight crew member's CAT II and CAT III training and experience.

10.4.3 Simulator training and/or flight training

10.4.3.1 The flight crew members should complete:

- a minimum of six, respectively eight for HUD with or without EVS, approaches and/or landings in a simulator. The provisions for eight HUD approaches may be reduced to six when conducting hybrid HUD operations
- where no simulator is available to represent that specific aircraft, a minimum of three, respectively five for HUD and/or EVS, approaches including at least one missed approach procedure is required on the aircraft. For hybrid HUD operations a minimum of three approaches is required, including at least one missed approach procedure
- appropriate additional training if any special equipment is required such as HUD or enhanced vision equipment. When approach operations utilising EVS are conducted with an RVR of less than 550 m, a minimum of five approaches, including at least one missed approach procedure are required on the aircraft.

10.4.4 Flight crew qualification

10.4.4.1 The flight crew qualification provisions are specific to the operator and the type of aircraft operated. The operator should ensure that each flight crew member completes a check before conducting CAT II or III operations. This check may be replaced by successful completion of the simulator and/or flight training specified in section 10.4.3.

10.4.5 Supervised line flying

10.4.5.1 Flight crew members should undergo the following supervised line flying (SLF):

- for CAT II, when a manual landing or a HUD approach to touchdown is required, a minimum of:
 - o three landings from autopilot disconnect
 - o four landings with HUD used to touchdown.

Note: Only one manual landing, respectively two using HUD, to touchdown is required when the training required in section 10.4.3 has been carried out in a simulator qualified for zero flight time (ZFT) conversion.

- for CAT III, a minimum of two autolands, except that:
 - o only one autoland is required when the training required in section 10.4.3 has been carried out in an simulator qualified for zero flight time conversion
 - o no autoland is required during SLF when the training required in section 10.4.3 has been carried out in an simulator qualified for ZFT conversion and the flight crew member successfully completed the ZFT type rating conversion course
 - o the flight crew member, trained and qualified, in accordance with provision for ZFT conversion shown above, is qualified to operate during the conduct of SLF to the lowest approved DA/H and RVR, as stipulated in the operations manual.
- for CAT III approaches using HUD to touchdown, a minimum of four approaches.

10.5 Type and command experience

10.5.1 Before commencing SA CAT I, SA CAT II or CAT II operations, the following additional provisions should be applied to a pilot in command who is new to the aircraft type:

- 50 hours or 20 sectors on the type, including pilot-in-command under supervision (PICUS)
- 100 m should be added to the applicable CAT II RVR minima when the operation requires a CAT II manual landing or use of HUD to touchdown until either:
 - o a total of 100 hours or 40 sectors, including PICUS, has been achieved on the type
 - or
 - o a total of 50 hours or 20 sectors, including PICUS, has been achieved on the type where the flight crew member has been previously qualified for CAT II manual landing operations with another operator
- for HUD operations, the sector provisions in this section should always be applicable; the hours on type do not fulfil the provisions.

10.5.2 Before commencing CAT III operations, the following additional provisions should be applied to a pilot in command who is new to the aircraft type:

- 50 hours or 20 sectors on the type, including PICUS
- 100 m should be added to the applicable CAT II or CAT III RVR minima unless that pilot has previously qualified for CAT II or III operations with another operator, until a total of 100 hours or 40 sectors, including PICUS, has been achieved on the type

10.6 Recurrent training and checking

10.6.1 The operator should ensure that, in conjunction with the normal recurrent training and operator's proficiency checks, the pilot's knowledge and ability to perform the tasks associated with the particular category of operation, for which the pilot is authorised by the operator, are checked. The required number of approaches to be undertaken in the simulator within the validity period of the operator's proficiency check should be a minimum of two, respectively four when HUD and/or EVS is utilised to touchdown, one of which should be a landing at the lowest approved RVR. In addition one, respectively two for HUD and/or operations utilising EVS, of these approaches may be substituted by an approach and landing in the aircraft using approved CAT II and CAT III procedures.

- 10.6.2 One missed approach should be flown during the conduct of an operator proficiency check.
- 10.6.3 If the operator is approved to conduct take-off with an RVR less than 550 m, the following operations should be flown at least once per year during recurrent checking:
- take-off in minimum approved RVR conditions with an engine failure:
 - o for aeroplanes between take-off decision speed (V_1) and take-off safety speed (V_2), or as soon as safety considerations permit
 - o for helicopters at or after take-off decision point (TDP)
 - take-off in minimum approved RVR conditions with an engine failure:
 - o for aeroplanes before V_1 resulting in a rejected take-off
 - o for helicopters before the TDP.
- 10.6.4 For CAT III operations and LVTOs with an RVR below 150 m, the operator should use a simulator.
- 10.6.5 At least once over the period of three consecutive operator proficiency checks, operators who either:
- conduct CAT III operations using aircraft with an FP flight control system, including a HUD
 - or
 - have procedures allowing aircraft to be dispatched with FO flight control systems downgraded to FP condition
- should ensure that each flight crew member completes a missed approach as a result of autopilot failure with:
- the aircraft at or below DH
 - the last reported RVR being 300 m or less.
- 10.6.6 Each pilot should complete recurrent training in LVO, in accordance with the operator's approved training and checking system.
- 10.6.7 Each pilot should successfully complete a proficiency check, including LVO, either:
- at least once every 12 months
 - or
 - in accordance with the operators training and checking system.

10.7 Recency of experience

- 10.7.1 There are no recency requirements for LVO in addition to normal operating recency requirements. In the event that special circumstances exist where flight crew members may not have exposure to particular aspects of the flight guidance system used for long periods of time, then the operator should ensure that the necessary recency of experience is addressed prior to pilots conducting low-visibility landings, or low-visibility take-off operations.
- 10.7.2 As a minimum, pilots should be exposed to autoland system operations and procedures during training or checking. This can be in either the aircraft or in a simulator, and should be tested (at least) annually, if the crew has not otherwise conducted line landings using an automatic system within the previous 12 months.

Landings carried out using the autoland system to touchdown should not be counted towards meeting the manual landing recency requirements in Part 61 of *the Civil Aviation Safety Regulations 1998 (CASR)* or the manual landing recency requirements, in accordance with the training and checking system.

10.7.3 When flight guidance landing or take-off systems (e.g. a HUD) are used for manually flown approach or take off operations, the pilot flying (PF) should be afforded an opportunity to use such systems or procedures in the aircraft or in simulation at least once each 90 days. If the pilot has not otherwise had an opportunity to conduct line approaches or landings using the manual flight guidance system within the previous 90 days, one of the following mediums should be used to re-establish recency of experience with that system:

- a simulator refresher
- recurrent training or checking event
- line operational use in visual meteorological conditions (VMC)
- or
- flight with a check pilot.

10.8 LVTO operations

10.8.1 Take-off with visibility less than 550 m

10.8.1.1 Prior to conducting take-offs in visibility conditions of less than 550 m, the flight crew should undergo the following training:

- normal take-off in minimum approved RVR conditions
- take-off in minimum approved RVR conditions with an engine failure:
 - o for aeroplanes between V_1 and V_2 , or as soon as safety considerations permit
 - o for helicopters at or after TDP.
- take-off in minimum approved RVR conditions with an engine failure:
 - o for aeroplanes before V_1 resulting in a rejected take-off
 - o for helicopters before the TDP.

10.8.1.2 The operator approved for LVTOs with an RVR below 150 m should ensure that the training specified by section 10.8.1.1 is carried out in a simulator. This training should include the use of any special procedures and equipment.

10.8.1.3 The operator should ensure that a flight crew member has completed a check before conducting LVTO in RVRs of less than 150 m. The check may be replaced by successful completion of the simulator and/or flight training prescribed in section 10.8.1.1 on conversion to an aircraft type.

10.9 SA CAT I, SA CAT II, and operations using EVS

10.9.1 Additional training provisions

10.9.1.1 Operators conducting SA CAT I operations, SA CAT II operations, and operations utilising EVS with RVR of less than 550 m, should comply with the provisions applicable to CAT II operations, and include the provisions applicable to HUD (if appropriate). The operator may combine these additional provisions (where appropriate) provided that the operational procedures are compatible.

10.9.2 SA CAT I

10.9.2.1 During conversion training, the total number of approaches should not be additional to the requirements for standard operator conversion training, provided the training is conducted utilising the lowest applicable RVR. During recurrent training and checking, the operator may also combine the separate requirements provided the above operational procedure provision is met and at least one approach using SA CAT I minima is conducted at least once every 18 months.

10.9.3 SA CAT II

10.9.3.1 During conversion training, the total number of approaches should not be less than those to complete CAT II training utilising a HUD. During recurrent training and checking the operator may also combine the separate provisions provided the above operational procedure provision is met and at least one approach using SA CAT II minima is conducted at least once every 18 months.

10.9.4 Operations utilising EVS with RVR of less than 550 m

10.9.4.1 During conversion training, the total number of approaches required should not be less than that required to complete CAT II training utilising a HUD. During recurrent training and checking, the operator may also combine the separate provisions provided the above operational procedure provision is met and at least one approach utilising EVS is conducted at least once every 12 months.

11 Low-visibility operational restrictions and requirements

11.1 Take-offs and landings

11.1.1 For a low visibility take-off or landing, operators should apply the following provisions:

- For minima — the PIC of the aircraft should use the most restrictive of the following:
 - o the minima approved in the AFM (as amended)
 - o the minima approved by CASA that apply to the type of operation or procedure in which the aircraft is engaged
 - o subject to changes in minima specified by NOTAM, the relevant minima shown on the operator's aeronautical chart used for take-off or approach and landing
 - o the minima approved by the relevant foreign aviation regulatory authority.
- The maximum cross-wind component for an aircraft conducting an LVO should be either:
 - o the limit specified in the AFM for the relevant operation
 - or
 - o if no limit is specified in the AFM — 15 kts.
- The maximum tail-wind on the landing runway should be either:
 - o not greater than the limit specified in the AFM for the relevant operation
 - or
 - o if no limit is specified in the AFM — 10 kts.
- The PF should:
 - o be a captain with the operator
 - o have completed the applicable LVO training and comply with the recency requirements as stipulated in this CAAP
 - o not be undergoing initial command training with the operator
 - o occupy the left hand seat.
- A low visibility checklist should be provided, which includes all relevant information for:
 - o briefing on low visibility take-offs and landings
 - o identifying the aircraft (including MEL items) and ground equipment necessary for carrying out the LVO.
- Where the use of HUD is required for a particular operation, the operator's MEL should clearly state that the SA approvals included in this CAAP and approved by CASA are dependent on compliance with the relevant serviceability requirements as stipulated in the MEL.

11.2 Take-offs

11.2.1 For take-offs, the operator's procedures should include standard call outs and responses for the pilot monitoring to advise the PF of deviations from the runway centreline.

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

11.3 Commencement and continuation of approach

- 11.3.1 The PIC may commence an instrument approach regardless of the reported RVR.
- 11.3.2 If the reported RVR is less than the applicable minimum the approach should not be continued below 1,000 ft above the aerodrome.
- 11.3.3 If, after passing 1,000 ft above the aerodrome, the reported RVR falls below the applicable minimum, the approach may be continued to DA/H.
- 11.3.4 The approach may be continued below DA/H and the landing may be completed provided that the visual reference adequate required for the type of approach operation and for the intended runway is established at the DA/H and can be maintained to landing.

11.4 Landings

- 11.4.1 For landings, the braking action on the runway should not be reported by ATC as worse than 'MEDIUM'.
- 11.4.2 The landing distance available on a **dry** runway should be greater than or equal to:
- **pre-flight planning:** the landing distance required for a **wet** runway under subsection 11.1 (b) (i) of CAO 20.7.1B with anti-skid system operative (if installed for the aircraft type).
 - **in-flight — 'actual landing distance' data not available:** the landing distance required for a **dry** runway under subsection 11.2 of CAO 20.7.1B with anti-skid system operative (if installed for the aircraft type) multiplied by a factor of 1.15 ($1.67 \times 1.15 = 1.92$).
 - **in-flight — 'actual landing distance' data available:** the actual landing distance required for a **wet** runway under subsection 11.2 of CAO 20.7.1B multiplied by a factor of 1.15.
- 11.4.3 The landing distance available on a **wet** runway should be greater than or equal to:
- **pre-flight planning:** the landing distance required for a **wet** runway under subsection 11.1(b) (i) of CAO 20.7.1B with:
 - o anti-skid system operative (if installed for the aircraft type)
 - o the runway surface braking action expected to be at least MEDIUM.
 - **in-flight — 'actual landing distance' data not available:** the **dry** landing distances required under subsection 11.2 of CAO 20.7.1B multiplied by a factor of 1.15 ($1.67 \times 1.15 = 1.92$) with:
 - o anti-skid system operative (if installed for the aircraft type)
 - o the runway surface braking action expected to be at least MEDIUM.
 - **in-flight — 'actual landing distance' data available:** the actual landing distance required for a **wet** runway under subsection 11.2 of CAO 20.7.1B multiplied by a factor of 1.15.

- 11.4.4 Unless a particular instrument flight procedure indicates otherwise, minima based on RA height should be used for SA CAT I, SA CAT II, CAT II or CAT III (with a DH) procedures.
- 11.4.5 For an SA CAT I approach using a HUD:
- guidance from the aircraft's HUD system should be used at least until the DH or to the initiation of missed approach
 - If the HUD malfunctions during the approach, the flight crew should 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 within the touchdown zone.
- 11.4.6 For an SA CAT I approach using autoland system, the autoland system should be used at least to touchdown.
- 11.4.7 For an SA CAT II approach, the autoland system or HUD should be used at least to touchdown.
- 11.4.8 For a CAT II approach with an RVR of 350 m (or greater) the flight guidance or control system should be used at least to the DH.
- 11.4.9 For a CAT II approach with an RVR of less than 350 m, the flight guidance or control system (including a HUD) should be used at least to touchdown.
- 11.4.10 For a CAT IIIA approach:
- If an FP flight guidance system is used, a DH of not less than 50 ft should be used.
 - The flight guidance or control system (including a HUD) should be used to touchdown.
 - If an FP or FO rollout system is required, the flight guidance or control system should be used to touchdown and rollout.
- 11.4.11 CAT IIIB approaches should be conducted with the flight guidance or control system used to touchdown and rollout.

12 Continuous monitoring – all aircraft

12.1 General

- 12.1.1 After obtaining a low-visibility exemption, the operator should continuously monitor operations to detect any undesirable trends so that potential hazards can be proactively managed or eliminated. Flight crew reports may be used for this purpose. The procedure should be integrated into the operator's safety management system.
- 12.1.2 The operator should establish and maintain a system for recording approach and/or automatic landing success and failure for SA CAT II, CAT II and CAT III operations.
- 12.1.3 The operator should retain the following information:
- **for a period of 12 months:** the total number of approaches, by aircraft type, where the airborne CAT II or III equipment was used to make satisfactory, actual or practice, approaches to the applicable SA CAT II, CAT II or III minima
 - **for a period of 2 years:** reports of unsatisfactory approaches and/or autolands, by aerodrome and aircraft registration, in the following categories:
 - o airborne equipment faults
 - o ground facility difficulties
 - o missed approaches because of ATC instructions
 - o other reasons.

12.2 Criteria for a successful CAT II, SA CAT II, CAT III approach and automatic landing

- 12.2.1 The criteria listed in the following paragraph may be used for determining a successful approach and landing for the purposes of section 12.1.2.
- 12.2.2 Unless otherwise specified by the original equipment manufacturer (OEM), an approach may be considered to be successful if:
- from 500 ft to start of flare:
 - o airspeed remains within ± 5 kt of the intended value, disregarding rapid fluctuations due to turbulence
 - o no relevant system failure occurs
 - from 300 ft to DH:
 - o no excess deviation occurs
 - o no centralised warning gives a missed approach procedure command (if installed).
- 12.2.3 Unless otherwise specified by the OEM, an automatic landing may be considered to be successful if:
- no relevant system failure occurs
 - no flare failure occurs
 - no de-crab failure occurs (if installed)
 - 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°
- pitch angle at touchdown does not exceed the maximum value for a safe tail clearance
- rollout lateral deviation does not exceed 8 m
- no rollout failure occurs.

12.3 Aircraft system checking

12.3.1 Unless the approved aircraft maintenance planning document or aircraft maintenance manual specifies another method to assure the satisfactory performance of a low-visibility flight guidance system (e.g. autoland or HUD), it is acceptable to CASA that the operator periodically use the system and note satisfactory performance in an aircraft technical logbook entry or aircraft communications addressing and reporting system. Period of assessment should be:

- at least every 6 months for SA CAT I, SA CAT II and CAT II operations
- at least every 30 days for CAT III operations.

12.3.2 Reference to aircraft system checking should be included in the operations manual as a requirement of crew compliance; however, this requirement does not impose a flight crew operational limit for crew recency purposes.

13 Hybrid systems

- 13.1.1 Hybrid systems (e.g. an FP autoland system used in combination with a monitored HUD flight guidance system) may be acceptable to CASA for CAT III operations if:
- the individual elements of the system can be shown to independently meet suitability criteria for CAT III
 - the components, when combined, provide an equivalent level of performance and safety to a non-hybrid system applicable to the minima sought (e.g. FO CAT IIIB)
 - the system is certified with supporting information in the AFM.
- 13.1.2 Hybrid systems with autoland capability should be based on a design concept that uses the autoland system as the primary means of control, with the manual flight guidance system serving in backup mode or reversionary mode.
- 13.1.3 Manual rollout flight guidance capability should be provided for hybrid systems that do not have automatic rollout capability. Such manual rollout flight guidance should have been shown to have performance and reliability at least equivalent to that of an FP automatic rollout system.
- 13.1.4 Any transition between hybrid system elements (e.g. control transition from autoland to manual control with the use of HUD, or for response to failures) should be acceptable for use by properly qualified flight crews. Transitions should require normal pilot skill.
- 13.1.5 For any system that requires a pilot to initiate manual control shortly before or 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 should be shown to be safe and reliable and require normal pilot skill.
- 13.1.6 If one of an aircraft's hybrid system elements (e.g. an automatic system or flight guidance system) fails prior to touchdown, operational procedures may require the pilot to initiate a missed approach even though the operator should have demonstrated that the aircraft was capable of completing a safe landing and rollout.
- 13.1.7 CASA may approve a hybrid system for CAT III operations if it meets the performance criteria specified in FAA AC 120-28, or acceptable alternative, as in force at the time of application for approval.
- 13.1.8 An operator may receive approval to use an autoland system and a manual flight guidance system as a hybrid system provided that:
- each system individually meets appropriate airworthiness assessments
 - the operator can successfully demonstrate the hybrid system's capability to meet the applicable provisions of this section in an operational environment.
- 13.1.9 For hybrid systems used in CAT III operations, the operator should use an AH of 50 ft or higher, unless otherwise approved by CASA.

14 Equipment installation and maintenance

14.1 General

14.1.1 The aircraft equipment required for LVO should be maintained in accordance with the aircraft maintenance planning document.

14.2 Head-up display

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

- the HUD system should be certified for the particular operation either:
 - o by the aircraft manufacturer
 - or
 - o in accordance with a supplemental type certificate from a recognised NAA
- the HUD should be installed in accordance with OEM directions
- maintenance personnel should receive initial and recurrent training as necessary for an effective maintenance program
- the aircraft's AFM should contain operating instructions and procedures for use of the HUD
- the aircraft's system of maintenance should include continuing airworthiness and maintenance procedures, relating to the HUD, in accordance with OEM recommendations
- the HUD system should be operated in accordance with the operating instructions and procedures for the particular operation.

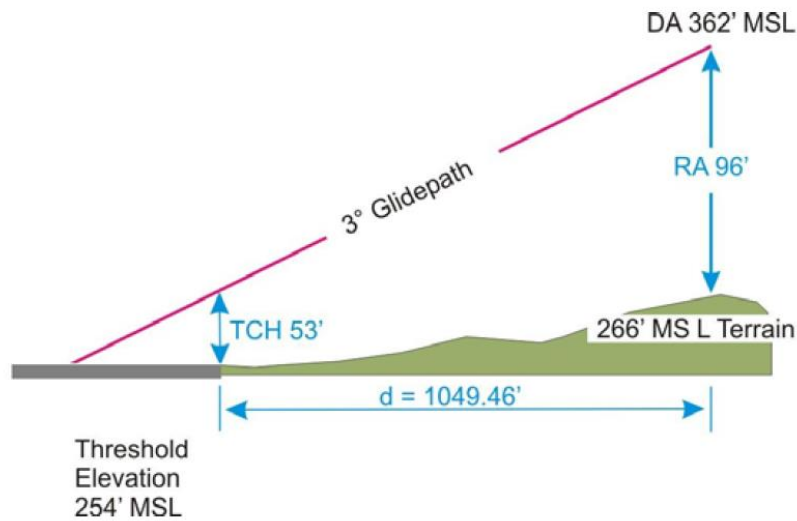
Appendix A

Calculation of RA height

To determine RA height, the operator must:

- determine the distance (d) from landing threshold to the point where the decision altitude (DA) occurs
- obtain the terrain elevation on final approach course at distance (d) feet from the landing threshold
- subtract the terrain elevation from the DA to calculate the RA (see Figure 1).

Figure 1: Calculating RA height



$$d = \frac{DA - (Threshold\ Elevation + TCH)}{\tan(Glidepath\ angle)} \rightarrow d = \frac{362 - (254 + 53)}{\tan(3)} \rightarrow d = 1049.46\text{ ft (319.87m) from threshold}$$

$$RA = DA - \text{terrain elevation} \rightarrow RA = 362 - 266 \rightarrow \mathbf{RA = 96\text{ ft}}$$