The Bureau of Meteorology

Aviation services

Runway visual range

Reference material

Runway visual range (RVR) provides information on runway visibility conditions during periods of low visibility.

Visibility definitions

Visibility

Visibility for aeronautical purposes is the greater of:

(a) the greatest distance at which a black object of suitable dimensions, situated near the ground, can be seen and recognised when observed against a bright background, which is represented by the meteorological optical range (MOR)

(b) the greatest distance at which lights in the vicinity of 1,000 candelas can be seen and identified against an unlit background, which is represented by RVR or runway visibility.

Note: Given that different measurement techniques are used, the 2 distances may be different.

Meteorological optical range (MOR)

Meteorological optical range is defined as the greatest distance at which a black object of suitable dimensions, situated near the ground, can be seen and recognised when observed against a bright background. In Australia, MOR is measured by a visibility sensor or observed by a qualified meteorological observer.

Slant visual range (SVR)

Slant visual range is the visual range of a specified object or light along a line of sight which differs significantly from the horizontal, e.g. the visual range of ground objects or lights as seen from an aircraft on the approach.

Runway visibility (RV)

Runway visibility is the distance along a runway over which a person can see and recognise a visibility marker or runway lights. In Australia, runway visibility is determined by air traffic control (ATC), pilots or ground personnel authorised to report visibility along a runway.

Runway visual range (RVR)

Runway visual range is 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 can identify its centre line. In Australia, RVR is used exclusively in relation to RVR measured by an instrumented system.

Runway visual range

Runway visual range (RVR) provides pilots, air traffic service (ATS) units and other aeronautical users with information on runway visibility conditions during periods of low visibility. Low visibility is defined by the RVR system as visibilities below 2,000 metres. The most frequent cause of low visibility is due to mist or fog, however other common causes include haze, drizzle, rain, snow, smoke, duststorms and sandstorms.

RVR is not an observation or a measurement of a meteorological parameter, as is done for surface wind, temperature or pressure. Rather, it is derived, based on calculations that consider various elements including atmospheric, physical/biological and operational factors.

An RVR system assesses whether conditions are above or below a specified operating minima for takeoff and landing, and is just one parameter used for assessing the availability of instrument approaches for an aerodrome.

Precision approach operations, on instrument runways, are categorised as per the table below.

Category	Decision height	Visibility	RVR
CAT I	≥ 60 m (200 ft)	≥ 800 m	≥ 550 m
CAT II	≥ 30 m (100 ft), but < 60 m (200 ft)	Not applicable	≥ 300 m
CAT IIIa	< 30 m (100 ft), or no decision height (i.e. 0 ft)	Not applicable	≥ 175 m
CAT IIIb	< 15 m (50 ft), or no decision height (i.e. 0 ft)	Not applicable	≥ 50 m, but < 175 m
CAT IIIc	No decision height (i.e. 0 ft)	Not applicable	No RVR limitations (i.e. 0 m)

Reference: Aeronautical Information Publication (AIP) Australia

RVR assessments are to be representative at the touchdown zone (TDZ), mid-point (MID) and stop-end (END) sections of the runway as follows:

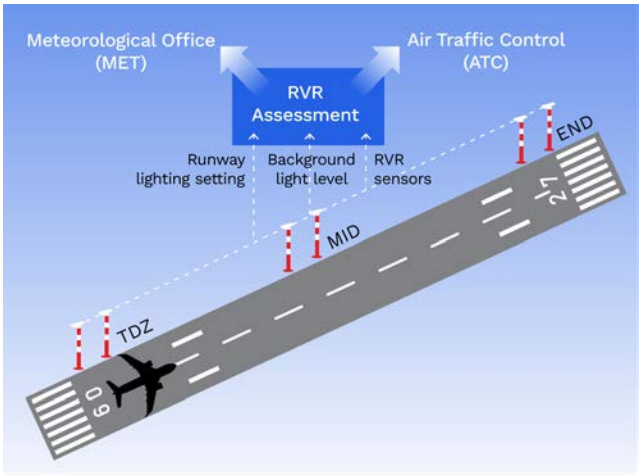
- Category I (CAT I): TDZ
- Category II (CAT II): TDZ and MID
- Category III (CAT III): TDZ, MID and END

RVR is provided to the local ATC unit and is included in the automatic terminal information service (ATIS), VOLMET, the aerodrome meteorological reports (METAR/SPECI) and on the aerodrome weather information service (AWIS).

The RVR value typically only has meaning for the portions of the runway associated with where the instruments are located (TDZ, MID, or END), rather than for the entire airport or other sections of the runway.

The RVR value may be greater or less than the actual visibility available to a pilot at typical flight deck eye height at the runway. This is particularly true at night if runway lights are not at settings standard for the prevailing conditions, or if unusual daylight conditions are experienced such as when a runway is aligned with a sunrise or sunset condition, or in shallow or patchy fog.

Conditions during approach may be significantly different. Until the pilot is actually on the runway, the view from the cockpit down to the ground represents a slant visual range (SVR) and as such may be affected by fog densities varying with height.



Runway visual range system

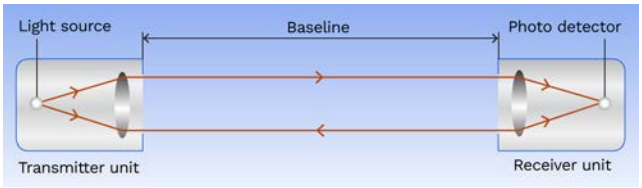
Measurement of RVR

Credit: Vaisala

In Australia, RVR is based solely on the information provided by instrumented systems, such as transmissometers, and must be made available at CAT II and CAT III precision approach runways.

Transmissometers are instruments used to measure the light transmittance of the atmosphere between 2 points, i.e. over a specified path length or baseline. RVR is then calculated taking into account the measured quantity (i.e. transmittance), runway light levels and the expected detection sensitivity of the pilot's eye under the prevailing conditions of background luminance.

The transmissometer consists of a transmitter and a receiver, typically 30 to 75 m apart, that sends a beam of light from the transmitter to the receiver to measure the attenuation of light, either due to scattering or absorption.



Inputs for the calculation of RVR will also include measurement of the background light level (background luminance) and the runway light intensity setting.

Reporting steps

If	Step applicable
RVR < 400 m	25 m
400 m ≤ RVR ≤ 800 m	50 m
800 m < RVR < 2,000 m	100 m

Operational desirable accuracy

- RVR ± 10 m up to 400 m
- RVR ± 25 m between 400 m and 800 m
- RVR ± 10% above 800 m.

Reference: *ICAO Annex 3 – Meteorological Service for International Air Navigation*

Further aviation educational resources produced by the Bureau of Meteorology can be found at www.bom.gov.au/aviation/knowledge-centre.

A vertical line in the margin indicates a change or addition since last update.

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