Visibility

If you're VFR above 10,000 ft you need 8 km visibility. If you're in a balloon below 500 ft AGL you need 100 metres visibility. If you're IFR in a multi-engine aeroplane and you meet the relevant criteria, you can take off with 550 metres visibility. It doesn't matter what you're flying or what flight rules you're under or what stage of flight you're at, there's a minimum visibility for your operation, and for determining whether you need an alternate. It's always relevant.

How it's reported

On a TAF, the reported visibility is the prevailing visibility, that is, the greatest visibility over more than half the horizon. If there is a minimum visibility that is not the prevailing visibility (ie. it covers less than half the horizon), and that minimum visibility is less than 5 km (ie. below VMC), that will be given as well.

For instance, at Jandakot the controllers stand in the tower and look for features they know, and whose distance they know, and make their best estimate of the visibility. So if they look out and they can see the city and the coast and Armadale, but there's bushfire smoke to the south and they can't see Thomson's Lake (or Lake Thomson as Airservices insists on calling it), they may say "Visibility greater than 10 km, reducing to 4000 m in the south" and the TAF will say "9999 4000S FU."

That's useful, because it tells you it's not VMC to the south. But if there's a segment, less than half the horizon, where the vis is 5 or 6 km, that won't be reported – the TAF will just say "9999." But the 5 or 6 km is not necessarily what you'll get when you're flying. If there's no reported visibility that's below VMC, that doesn't necessarily guarantee VMC in every direction.

The Graphical Area Forecasts are a bit easier. Under VIS and WX they say ">10KM NIL", then in another box they'll state any reduced visibility and the associated weather, such as "5000M ISOL SHRA", which leaves you to go flying and see how isolated the showers are, and whether they're isolated to the area you're trying to fly in.

Slant visibility versus horizontal visibility

If you take off from your holiday destination of Busselton and fly home to Northam on a winter morning after a cold clear night, you'll have read the GAF, saying "300M ISOL FG TILL 01Z", but because Northam is always the last place in Area 60 to be clear of fog, you should expect the fog to be there until 10 or 11 a.m. So you wait until 9 to depart, you fly over some low stratus and get to Northam at 1030, and you get overhead and look down and see the runway. But then you get into the circuit , turn final and can't see the keys. The problem may be that the fog is only 500 ft thick, which is 150 metres, and since the visibility in the fog is as advertised – 300 metres – you can see the runway through it from overhead. But on final you're looking through a mile of it. It shouldn't be a huge problem because Northam doesn't get a TAF, and that of course requires you to carry fuel for an alternate. But you knew that already!

SOME CONDITIONS THAT REDUCE VISIBILITY

FOG

This is the most common problem for visibility. There are many causes of fog, that are well covered in any good meteorology textbook, but by far the most relevant one at Northam is radiation fog. The factors that make it likely are:

- A clear night over land, so the land can lose its heat by radiation to the atmosphere, without that heat being re-radiated to the ground by clouds;
- Moist air, meaning the temperature and dewpoint are close, and the air doesn't need to cool very much for condensation to happen;
- Light winds, which mix the cold air near the ground with the warmer air above, and make the fog thicker.

If there is no wind at all, the ground will radiate heat to the atmosphere, but then only a very thin layer of air at the surface will lose heat to the ground. This will cause dew (or frost if the ground temperature is subzero), but when the sun comes up and the dew evaporates, you may get fog. That's why the day can sometimes start nice and clear and then turn foggy.

The worst days for fog are when the night is clear, but then the mid-level clouds roll in in the morning and stop the sun from getting through. That's likely to make the fog stay all morning.

PRECIPITATION

It's always a good idea to dodge showers and rain, because although the visibility may be above the VMC minimum, it's a good idea to assume it won't be. Also, you can expect worse visibility in drizzle than in showers, because drizzle comes from stratiform clouds, which means a stable atmosphere, which traps any pollution and doesn't disperse it.

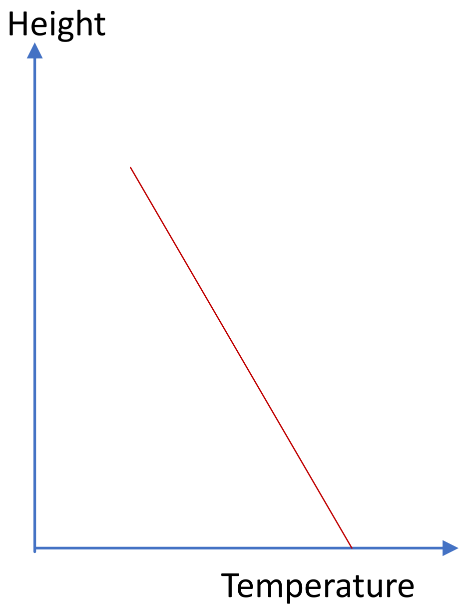
SMOKE HAZE

Bushfires and burning off can reduce the visibility to well below VMC, as you well know if you're flown anywhere near widespread burning off. The best example in Australia is all the burning off that happens in the Northern Territory in the dry season, to reduce the risk of bushfires when all the lightning happens at the start of the wet. Anyone who's flown up there in the dry is familiar with the phrase "Territory VFR."

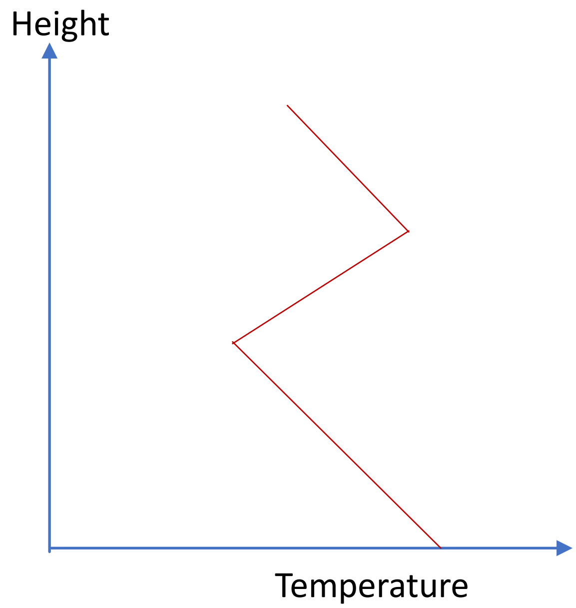
INVERSIONS

Normally the air gets colder as you climb, usually by about 2°C/1000 ft. An inversion is a shallow layer of air in which it gets warmer with height. One common type is a radiation inversion, which happens when the ground cools on a clear night and the air in the first few hundred feet above the ground gets colder than the air above it. All you need then is enough moisture and you have radiation fog, as described above.

The other common type is a subsidence inversion, which as the name implies, happens when the air subsides, which means it's a characteristic of a high pressure system. These generally sit at around 4000 to 6000 ft. The temperature profile looks like the one on the right below, where the air cools in the first few thousand feet above the ground, as normal, then warms for a few hundred or maybe 1000 feet, then cools again above that.



Normal temperature



Subsidence inversion

The importance for visibility is that rising air will stop when it hits the warmer air of an inversion, and smoke, dust and pollution will be trapped below it. That's why it's usually hazy to a greater or lesser extent, particularly anywhere near Perth, when there's a high pressure system around. And in the morning after a cold clear night, if there's not enough moisture to from fog, it will probably be hazy down low, and clear once you climb above the radiation inversion.

If there's enough moisture around, stratiform clouds are a good indication of a high (just in case you didn't check the synoptic chart), and a clue that visibility will be okay rather than brilliant. On the other hand, small fair-weather cumulus clouds suggest a low pressure system, which allows dust and pollution to rise and dissipate better, and they usually suggest one of those days when the only limit to the visibility is your own eyesight.