

On the clocks

If you have an instrument rating or a Night VFR rating and you use it on any kind of regular basis, you're used to preparing, briefing, and executing instrument flight. But if you're not instrument or night rated, how would you go if you ended up in cloud, and had to replace the real horizon with an instrument?

Avoiding IMC

One of the many "lists of 3" in aviation is the three things that will save your life: the go-round, the 180 degree turn, and the decision not to take off. Wise use of the second and third items in this list has saved many pilots' skins.

In IMC, the 180 degree turn can save your life. And there was a good quote in the most recent Flight Safety magazine – it's not bad weather, but marginal weather that kills you. You're more likely to take off and "give it a go" in marginal weather than in clearly "Let's go home and watch Top Gun 2" weather. And as for the decision to take off or not, remember that as a private pilot there is no such thing as having to go flying. If there's any doubt about the weather, there's no doubt. Stay on the ground, and if you really must go somewhere, get in the car.

Good preparation and judgment ought to stop you becoming a "Continued VFR flight into IMC" statistic. That includes getting and reading all the available weather information, which doesn't just mean the area forecasts and TAFs. That could be the Northam airfield Skycam or your mate at the destination saying, "Mate, I don't care what the TAF says. This muck won't clear till after lunch." If you do decide to get airborne, and you're in any doubt, plan an alternate even if the forecast doesn't strictly require you to.

And as for crosswinds, where an aeroplane's limit may be 15 knots but you don't feel happy in more than 10, you can have your own minimums for flying in marginal weather. For instance, you may decide that if the cloud forces you below 2000 ft AGL, you'll turn around or land at the nearest aerodrome. Good planning means you'll always know which aerodrome that is, and where. And of course, you'll turn around if the back door looks like it's closing.

Into the clouds

But how would you manage if it all went wrong, your Plan B fell flat and you found yourself in IMC? If you're a VFR pilot and you don't have any recent practice in instrument flying, your problems start straight away. If you find yourself in IMC on a VFR flight, you've probably already lost some degree of situational awareness (SA), whether from bad planning or another reason, so you're stressed and under the pump to begin with.

A key item in a night take-off is "Rotate onto the clocks" – eyes inside and into the instrument scan the moment you're airborne. The same applies once you lose sufficient visual reference for VFR flight. Get your head inside and start trusting your instruments.

The currency requirements for night and IFR flying are more stringent than for VFR flight, and even if your instrument flying experience is only what you did in your PPL training, you can understand why – flying on the clocks is a higher workload for anyone, but especially so if you don't have an instrument rating or a NVFR rating, or if you're not current. Take out the real horizon, which is big enough that your peripheral vision allows you see that you're right way up even if you're not really paying attention, and substitute a little instrument in the middle of your

panel, and life has just got a whole lot harder. A 3° pitch up or down is very noticeable if your eyes are outside, but it can very easily go unnoticed if you're on the clocks and your scan goes missing for a few seconds. With that increased workload, your SA – thinking about fuel, diversion aerodromes, asking for help – will probably deteriorate further.

And as for marginal weather rather than bad weather being the killer, if you're in and out of cloud, there's the temptation to look outside hoping to see enough visual cues, rather than committing to the instruments.

Spatial disorientation

Accidents involving spatial disorientation generally mean loss of control, so they're usually fatal. Spatial disorientation happens because your senses give you conflicting information. The most important balance organs in your body are not your ears; they're your eyes. (If you don't believe that, stand on one leg, which is probably no trouble. Stay on one leg and now close your eyes.) It's your eyes that tell you the ground is horizontal (more or less), the walls are vertical and the sky is up. It's your eyes that you have to believe when you're on instruments. For instance, if you're established in a balanced level turn, your proprioceptive organs ("seat of your pants") will tell you that the seat is "down", and your ears will eventually tell you your wings are level. It's only your eyes, via the instruments, that will tell you the truth.

If you lose concentration and don't stay focused on the instruments, it's likely you'll end up one wing low, and if that happens slowly enough, the roll will be too gentle for your inner ear to detect. The best case scenario is that you eventually look at the attitude indicator, realise what's wrong, and level your wings. Your ears will detect that movement, and because they thought you were wings level, they'll now tell you you're banked. That's one example of the leans, and the only way out of that is to trust your instruments.

If you drop a wing, the worst case scenario comes from the relationship between directional stability, which wants to point the nose into the relative airflow, and lateral stability, which wants to pick up a dropped wing. Directional stability in most light aeroplanes is strong, which makes it easy to hold a heading, and lateral stability is weaker, which makes it easy to turn. So if a wing drops, rather than lateral stability lifting the wing up, directional stability will win, and the roll will be followed by a yaw, a roll, a yaw, and eventually a spiral, which in many "continued VFR flight into IMC" cases has ended very badly.

The key point here is that if you keep your wings level, you won't end up in a spiral. Focus on that first, then worry about other actions that will help you, including:

- Turn pitot heat on;
 - Turn your strobes off if they're disorienting;
 - Climb above the highest ground;
 - Do a 180° turn (or continue straight ahead if you're in CB, rather than add stress to the airframe by turning);
 - Talk to ATC, and declare an emergency if need be;
 - Aim to get back into VMC and land at the nearest suitable aerodrome;
 - Maintain terrain clearance until you're visually established in the circuit area.
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The scan

It's different in a glass cockpit, with the flight information all on the one instrument, but in an old-fashioned conventional cockpit with the basic six flight instruments laid out correctly, good instrument flying involves a selective radial scan:

- Selective – you look at the instruments that matter, and don't waste brain space on the others.
- Radial – the hub of the wheel is the AI/AH, and your eyes go back to that after every other instrument you look at.
- Scan – don't fixate on any one instrument, even the AI.

For example, if you're flying straight and level, your aim is a straight line, a constant height, and balance. That determines which instruments to focus on in your scan.



In a climb or descent, you want a constant speed, so take the altimeter out of the above scan and add in the ASI.

All turns on instruments are Rate 1, meaning 3° per second, or 2 minutes for an orbit. The little lines on the turn coordinator below show a Rate 1 turn, but since some TC's wobble around a bit, it's better to focus on the AI. The angle of bank for a Rate 1 turn, which of course you remember from your very earliest IF training, is roughly $TAS/10 + 7$. For instance, at 100 kt, Rate 1 means about 17° angle of bank. When you're under the pump, a couple of degrees either way will be neither here nor there.



So in a level turn (constant height, constant angle of bank, in balance), once you've put the right amount of rudder in, you can basically focus on the AI and the altimeter, and bring the DG into

the scan as you approach your desired heading. And to make it easier to see that desired heading, don't forget to use the heading bug before you turn.



If you're rusty and you'd like to brush up on flying on the clocks, CASR 91.720 says you can simulate IMC – put the hood on – as long as you have a safety pilot who's qualified to fly the aircraft. The rules don't say it has to be an instructor. But if you want some good practice, including in recovering from unusual attitudes, make to note to add that into your next flight review.

Happy flying, and remember if you die in a weather-related accident, it'll be blue skies and sunshine for your funeral.