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ROTARY
VISIBILITY
ISSUES
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Fatal helicopter accidents due to poor visibility are second only in number to mast bumping, and the stats are not reducing. Fixed-wing pilots, also, will find the following stories and lessons relevant.

Near-disaster in white-out

In November 2019, a pilot came within 200 feet of the ground after going IIMC (inadvertent instrument meteorological conditions).

“It was an ag spraying operation. I waited for some early morning valley fog to rise, and then took off.”

As he flew up the valley, the pilot found the high ground in front of him still shrouded in cloud.

“I wasn’t going to get through, so decided to wait it out back at the hangar. But as I did a 180 turn, I allowed the aircraft to climb and enter the cloud. I really wasn’t expecting that.

“I should have immediately lowered the collective and just dropped down. Unfortunately, I saw a patch of blue ahead and above me. It was my only reference; a false sense of security. So rather than dropping down, in my alarm I headed for that gap.

“I got further and further into the cloud, and pretty quickly that blue disappeared. I was in total whiteout.

“I was trying not to move the controls, to keep the aircraft as stable as possible, hoping it would just ‘pop out’ of the murk.

“But even if you hold the controls very still, if you don’t have any references, a helicopter will quickly wander off course. It’s the nature of the machine to be ‘dynamically unstable’.

“I knew I was losing orientation but could not sense which way the aircraft was going. My artificial horizon started to show pitch and roll. But not being current with its use, and in the stress of the moment, I struggled to understand what it was telling me.

“I tried to use the instruments, and quickly came to understand just how hard it is to suddenly transition on to them under duress. I’d been told this before, but really didn’t appreciate how hard it would be.

“When I did try a couple of little control inputs to go on to the instruments, I wasn’t confident I was making the right ones. Because of my lack of currency and in my panic, I think I got it backwards. I was expecting a disaster – a ground impact at any second.

“After what felt like an eternity – but was probably about 20 seconds – the aircraft exited the cloud, perhaps 200 ft AGL.

“My tracking showed I’d travelled quite some distance from where I’d entered the cloud and had flown a large right-hand arc. I ended up over a high river terrace, and landed safely in a paddock.”

Lessons learned

“I don’t take anything lightly now. My first mistake was to take that 180 turn too casually, and not give it the attention it required.

“I now consider ‘what if’ scenarios. If I’d given ‘what if’ some thought, I may not have irrationally headed for that blue hole, instead of lowering down to what I knew was 1000 feet of clear sky.

“I would advise anyone to keep current on instruments, even those of us who have no intention of doing instrument flying. My story shows why it’s essential. Currency on instruments is perishable so it needs to be kept up – maybe built into annual check flights.”

The stubborn stats

CAA Intelligence Analyst Joe Dewar says that, as a category of accident or incident, visibility-related accidents are extremely dangerous.

“Between 2000 and 2019, there were 27 reported accidents due to poor visibility,” says Joe. “A high proportion – almost 40 percent – were fatal.

“In addition, many of the reported visibility-related incidents have come extremely close to turning into accidents.”

Inadvertent IMC – the big killer

Of all the visibility occurrences, which include those caused by optical illusions, night vision issues, even a dirty windscreen, the most lethal are those related to inadvertent IMC.

“There are periods of degraded visibility and low cloud not suitable for VFR operations,” says former CAA Flight Operations Inspector (helicopter) Jason Frost-Evans.

“If you forge on in those conditions, you’re compromising your safety margin and are potentially just a moment of inattention from disaster. If you make a habit of it, the increased exposure increases the odds of something going wrong.”

One pilot who knows exactly what Jason is talking about told *Vector* this story:

“I started out quite a conservative pilot but over the years, as my confidence grew, so did my complacency.

“I ended up eating into my safety margin until, one day, the smallest distraction almost led to disaster. »

» “The day before, weather had stopped me completing a job, so I was feeling pressure from the client to get the job done, and efficiently. So I was looking for any way I could to take the most efficient route. And as a result I was pushing the weather.

“I was attempting to get over a little ridge. And as I was approaching the ridge I slowed down, slowed down, slowed down. But in my mind I was still fine.”

About a week earlier the pilot had “got away with a close-ish call”.

“So I thought to myself, ‘I’ve got this nailed. I’m a good pilot and, as long as I’ve got a tree as a reference, there’s no way I can go inadvertent IMC.’”

The helicopter tracked along the ridge at about 30 knots in marginal conditions. The pilot, however, had his tree at about 4 o’clock. And he could see ahead – despite the rain and deteriorating visibility – the outline of a ridge. He felt “perfectly fine”.

Then an extraordinary thing happened. The passenger leaned forward and scratched his backside, obscuring the pilot’s vision.

“That was the single thing that meant I was toast. When he leaned forward I lost my visual reference up ahead. So I turned around to find my four o’clock reference had disappeared into the cloud.

“I turned my attention back and the hole up ahead had also gone.”

Over the next ten or so minutes, the pilot flew blind in cloud.

“I spent a few seconds uncontrolled, my feet going all over the place, my cyclic bouncing left and right. And then I applied forward full power and waited for a positive rate of climb. And then I had nothing to do. I’d done all I could and I remember massive G forces. I was looking down through the bubble between my feet, just seeing grey, and waiting for the trees to smash through.”

The pilot was not trained in IMC conditions, except for a couple of hours during CPL training. But instinct took over. His was a powerful machine and he was very familiar

with it. He immediately made good use of his GPS. And he’d ‘caged’ the artificial horizon during the preflight.

After three episodes of climbing and descending in whiteout, while the airspeed careened between 40 and 140 knots, the machine finally popped out of the murk at 14,000 feet.

“I was at a point in my career where I was cocky and complacent and operating right on the line. I’d had that close call a few days earlier but I’d got away with it. And that reinforced to me that I was awesome.

“So I was really comfortable with eroded safety margins. But I almost killed someone because they leaned forward and scratched their bum.”

Even years later, the pilot still flies to the legal minimums.

“If you’re operating to the legal minimums, you’ve got plenty of scope to mess up without getting yourself into a situation.

“That’s why we have met minima.”

Check the weather

Jason Frost-Evans says pilots should take their flight planning seriously.

“There are still people whose weather check is the television news the night before a flight. They depart not knowing what the visibility is forecast to be, or when a front is predicted to come through.

“But it’s not hard to get a good picture of what the weather’s going to do. We’ve got plenty of valuable planning services in New Zealand, but your primary source should always be MetFlight GA.

“There are good products to indicate what heights the cloud is going to be at, and you can call people and ask what the local weather is like, or there are webcams to check.

“Don’t just accept it’s going to be ‘a nice day’. Check what’s going to happen throughout the day. Have a back-up plan should the weather change suddenly. You can pretty much land in a few minutes anywhere in New Zealand.

“Be ready to make a timely decision to avoid poor weather.

“And if you do experience un-forecast poor weather, close the loop and report it, so everyone can benefit from improved services.”

Riaan Botha, chief pilot with Auckland-based Heletranz Helicopters, agrees, saying weather doesn’t just ‘happen’.

“There’s usually a pretty good forecast. Even when you’re flying, conditions don’t change in the blink of an eye, so leave yourself with options.

// If you’re operating to the legal minimums, you’ve got plenty of scope to mess up... //



“You’ve always got an opportunity to plan, so plan. Always have a Plan B. And possibly a Plan C as well.”

The chairman of the New Zealand Helicopter Association, Scott McKenzie, says too few pilots train in bad weather.

“I’m surprised how few pilots have flown in poor weather during their training. They’ve not had to make weather decisions while under close supervision.

“Training organisations need to fly their students in poor weather to ensure that the student learns to make good weather decisions.”

Decision-making

Scott McKenzie says good judgement regarding weather comes down to experience, confidence, and good preflight planning.

“During one flight I was observing, the passenger almost talked the pilot into continuing when the weather was unsafe for the task – ‘it’ll probably clear up by...’.

“The pilot was going to continue, then knocked it on the head. The CRM with the client was really interesting.”

Scott says good decision-making competes with the pilot’s mindset that “an experienced, well-respected pilot gets the job done”.

“I’ve always been taught, and have taught, ‘if there’s any doubt, there’s no doubt’.

“The great benefit of helicopters is that you can land. The ‘land and live’ initiative by Helicopter International is great, although hard to do if you have the wrong mindset. Don’t be too proud to realise you’ve made the wrong decision and land or turn around.”

Scott says a preflight risk assessment can take less than two minutes, can set minimas appropriate for the task and assist CRM. It’s the start of a conversation to mitigate any highlighted risks.

“An option for regular clients is informing them of your minimums. For example, ‘we’ll maintain a cloud base greater than 1500 ft AGL, 5 NM visibility, fuel duration of two hours and minimum fuel of 100 lbs’. It really assists the good conduct of the flight and manages your overlapping duties.

“Then make decisions early. Fly 200-300 ft below the cloud base to increase forward visibility and situational awareness, and that will help you with making good decisions.

“If you need to slow down, be aware of the tendency to balloon and climb into the cloud, especially during a turn.”

Optical illusions

In 2009 CAA Flight Operations Inspector (helicopter) David Oliver faced an acute visibility issue while flying in Australia.

He was helping a more experienced pilot fly mine workers around the Outback.

“I hadn’t flown in that kind of dusty environment at that time, and I’d considered the ‘brownout’ a bit of a myth.

“I was following him in to land, and he must have gone over a little dustpan and landed on slightly rocky terrain. He kicked up a little bit but nothing too bad. And then I came in behind him intending to land on the point he’d indicated. »

» “But as I settled in the hover, and looked out, it was like a river of chocolate milk running over the skin. I couldn’t see my reference to the right and I had the illusion that I was going forward at about 20 knots.

“I was ready to pull backwards when suddenly there was a little gap in the ‘river’ and I saw a stationary rock. As soon as I saw that, I lowered the collective and bumped onto the ground.

“But had I not seen that rock, I would have definitely pulled backwards and probably ended up smashing the tail into the ground.”

In hindsight, David says he should have chosen a path where he could have gone around.

“Much like the pilot in front of me probably did. If you keep a little bit of airspeed, it only takes 15 or 20 knots to keep in front of that brownout, and that’s probably exactly what he did. So it wasn’t so bad for him. But I got to a point where I couldn’t do that because he was in front of me. I should have given myself more space so that I could abort and fly through.”

The lethality of calm water

Not all illusion situations end so well. The CAA investigated the circumstances of a fatal helicopter accident in Lake Sumner in 2012 (CAA occurrence 12/2242).

Safety Investigator Peter Stevenson-Wright found that the Hughes 369D flew into the lake, north-west of Christchurch, with “considerable force and forward speed”.

The helicopter wreckage was later found in the lake ‘on track’ to its next planned spray zone.

The report concluded the probable cause of the accident was controlled flight into terrain (the lake) due to spatial disorientation¹, specifically relating to somatogravic illusion and false horizons. They were exacerbated by the mirror-like quality of the lake’s calm surface.

“We believe the pilot unknowingly flew a shallow descending flight path,” says Peter Stevenson-Wright, “due to a lack of visual cues over the lake.”

Peter says pilots operating in conditions where there’s little definition because of featureless terrain, should be mindful of possible illusions.

“I would encourage pilots to read the ATSB article referred to, below, and get to know some of the ‘drawbacks’ of the human brain.”

Keep current on instruments

Another area ripe for optical illusions is VFR night flying. Riaan Botha, who frequently flies after dark – including turning away from the lights of Auckland and toward the ‘black hole’ of rural areas – says currency is the most important factor in night flying.

“We have about four pilots who are instrument-rated, but we keep all our VFR pilots current in night flying as well. It’s definitely a whole different ball game if you haven’t done it for a while.”

One of those things is being able to rely confidently on instruments.

1 Go to atsb.gov.au and search for report B2007/0063 "An overview of spatial disorientation as a factor in aviation accidents and incidents".



Photo from CAA occurrence report.

// The surface of Lake Sumner two hours after the accident.

“Night flying creates illusions. Your brain might tell you one thing, but your instruments will tell you something else, so you really have to trust your instruments.”

NVIS complacency

Over the last five years, a number of incidents have been reported relating to the inappropriate use of a night vision imaging system (NVIS).

Jason Frost-Evans believes the main risk comes from pilots thinking that NVIS is going to protect them from poor decisions to a far greater degree than it can.

“Like any other new system, it can lead to a false sense of security.

“For instance, flying with an NVIS sometimes encourages pilots to push the weather,” he says.

“Push it too far and you’re in a worse position than you would have been without NVIS.”

Jason also says appropriate and complete training in NVIS is crucial.

“Like other systems added to a basic aircraft to improve flying safety, NVIS is great unless it’s used incorrectly. Proper training is critical.

“In a modern air ambulance aircraft, for instance, you’ve got systems working together to reduce a pilot’s workload. But the pilot has to have a full understanding of exactly what the systems are doing, and what they’re indicating.

“If you start to get behind the systems, or don’t understand them correctly, it can actually add to the complexity of flying.”

Windscreens and glare

There have been a surprising number of occurrences due to a degraded windscreen including a dirty one.

The position and angle of the sun, and its associated glare, is a particular hazard for helicopters operating around wires.

Before any job involving flying near wires, the pilot should think about where the sun will be coming from and the possibility of glare hiding the presence of wires.

But sun glare can degrade vision in many other ways, including affecting a pilot’s judgement of height on final approach, difficulty in spotting other traffic, and making instruments, especially screens, impossible to read.

The problem is made far worse because of a simple, dirty windscreen.

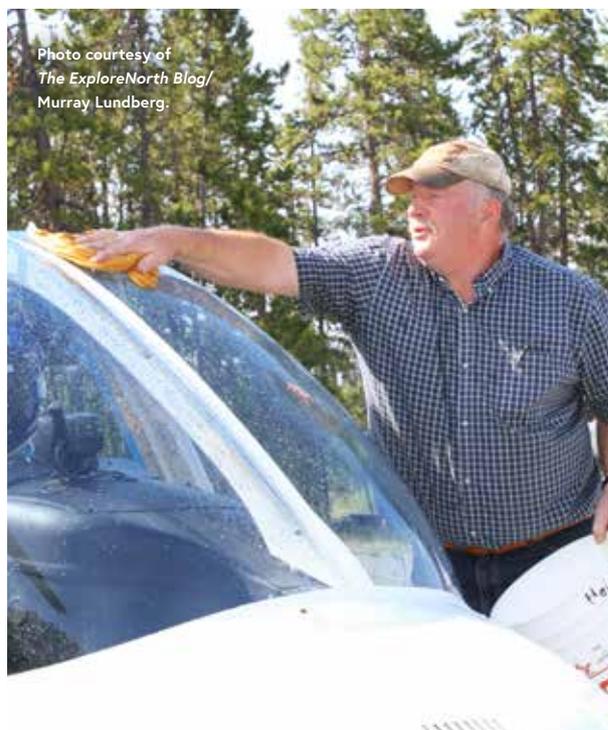


Photo courtesy of
The ExploreNorth Blog/
Murray Lundberg.

// Always carry clean fresh water and clean rags to wash the bubble. You won’t always be parked up near cleaning materials.

Riaan Botha has the following concrete advice:

“One of the ways to avoid windscreen damage, is to simply keep it clean. We’re flying in salty conditions most days and the build-up of salt can have quite an effect.

“That can be made even more dangerous if sun glare hits the salty windscreen. So we carry clean fresh water in all our aircraft and some clean rags, because you’re not always parked up where there are cleaning materials. Just give the bubble a bit of a rinse and wipe.”

It’s important to wipe up and down, rather than across or in circles, so any small scratches don’t exacerbate the effects of sun strike.

“Lots of helicopters sit in the sun for quite long periods. And as we know, the sun is pretty brutal in New Zealand,” says Riaan.

“Over time the ultraviolet light can have a chemical effect on the windscreen and haze it up.

“The answer is very simple. Keep the machine in a hangar as much as possible.”

Finally...

To get an idea of what can happen in inadvertent IMC, go to YouTube and search on “CASA 178 seconds to live”. 📺