November / December 2005

VECTOR

Pointing to Safer Aviation

Strike One – You're Out!

Need a Drink?

What are the Odds?

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CAA
CIVIL AVIATION AUTHORITY
OF NEW ZEALAND

VECTOR CAA NEWS

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The consequences of a rotor strike may not be immediately apparent. Unseen damage may manifest itself, possibly catastrophically, some time after the event.

Dehydration can impair a pilot's performance. This article discusses the importance of avoiding dehydration, and provides some tips on preventing dehydration while flying this summer.

Watch out for masts and other obstructions – they can be anywhere.

A proactive system health check is better than treating symptoms haphazardly or conducting a post-mortem.

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Cover: Helipro BK117 at Queen's Wharf, Wellington.

Strike One – You're Out!

No doubt many of us have read in *Chickenhawk* of Bob Mason's use of a Huey as a chopper – literally – as he blasted his way out of a confined area just a bit smaller than the Huey's rotor diameter. Bob's circumstances were extreme, it was a judgment call, and the machine was able to take the punishment and keep flying. However, the dents in the blades probably contributed little to the smoothness of the subsequent ride!

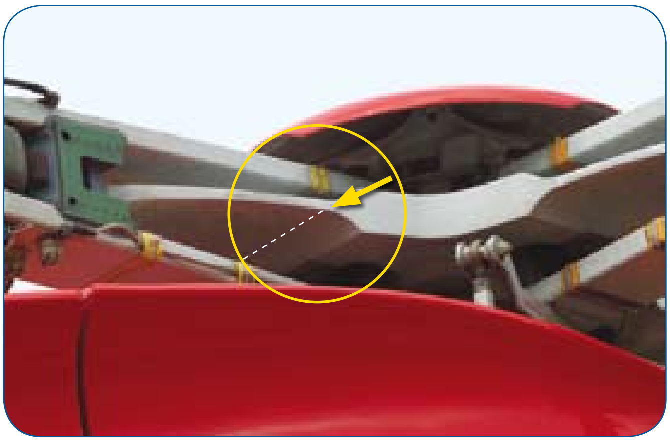
Rotor strikes, both main and tail, occur from time to time in helicopter operations in New Zealand. There are probably very few that are deliberate – but most could have been avoided, one way or another. Hindsight is a wonderful thing, but it won't undo the damage. It might, however, provoke some thought about future avoidance strategies and risk management.

Now you see it, now you don't

In some cases, the effects of the rotor strike were immediate and catastrophic. Three AS 350/355 accidents illustrate the point:

- An AS 350 engaged on a powerline survey collided with a main transmission line that crossed above the local line being surveyed. Initial impact was the striking of a conductor by one main rotor blade.
- Police AS 355 helicopter 'Eagle' collided with a PA-28 Cherokee over Auckland City. One main rotor blade struck and sliced off the left wingtip of the Cherokee, causing the wing to fail at the root.
- Returning to the loading point after a spray sortie, an AS 350 crashed after the main rotor was struck by a flailing strut that had come adrift from the spray gear.

The initial damage to the three helicopters was very similar – the shock of the strike (near the tip in each case) was transmitted to the Starflex™ head by a very long lever – the main rotor blade. The resulting moment was sufficient to tear the star arm completely through, along the line of the cross-section change (see picture). (A similar leverage mechanism caused the wing of the Cherokee to fail at the root, despite the strike in a relatively 'soft' area of the tip).



The line of cross-section change was the line of the impact failures.

This gave one blade unlimited freedom in the plane of rotation – with a major shift in the centre of gravity of the rotor system. The forces resulting from the imbalance were immense, as in all three cases the entire main rotor system **and transmission** were torn bodily from the airframe. Freeze-frame the imagination there if you like.

On a deer hunting sortie in recent years, a shooter disembarked from a Robinson R22 to pursue a wounded deer on a steep slip. The pilot had hovered the helicopter as close as he could to the face, and as the shooter dropped from the skid, he heard the unmistakable 'whack-whack' of a rotor strike above his head. The helicopter rolled some 200 metres down the slip, and the pilot did not survive the accident. The slip was so steep that a very experienced Hughes 500 pilot, seeking to drop off an accident investigator next day, could not repeat the exercise.

The accident files abound with reports involving rotor strikes – some catastrophic, some not, but in general, a severe strike will destroy the helicopter. As legend has it, one pilot back in the 'deer war' days was so good, according to his shooter that he "went through twenty-three sets of blades". Well, guess what got him in the end…

Now you don't see it, later you do

On a training autorotation, an air force Iroquois was over-flared prior to touchdown, and the tail rotor struck the ground. Normally, the tail 'stinger' would have provided some protection by bouncing the tail back into the air, but the airfield surface was soft, allowing the stinger to dig into the soft turf. There wasn't a great deal of visible damage to the tail rotor, if you stood back a bit, but its 'freewheeling' ability was a clue that all was not well. Lifting the tail rotor driveshaft cover revealed a spectacularly twisted driveshaft section and a pulled coupling.

A Hughes 500 suffered a tail rotor strike in a very remote location, incurring damage that required the machine to be lifted out. Subsequent repairs saw the helicopter back in service, and it was sold to another operator shortly thereafter. The new owner was sling-loading bales of seaweed from a beach, and while positioning from seaward for a pickup, felt a sudden kick-back through the yaw pedals, which was followed immediately by a severe pitch-down and a rapid rotation to the right. There was little he could do but hang on – it was a wild ride – but he managed to coax the helicopter towards the beach, where it touched down on some rocks and rolled over. Fortunately, a no-injury outcome, but the machine was a total loss. This was one occasion where the pilot's helmet paid for itself several times over.

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In this case, a tooth on one of the gears in the tail rotor gearbox had broken loose and become entrained in the gears, forcing them apart to the extent that the gearbox case ruptured, allowing the tail rotor, its driveshaft and the driven gear to depart. The failure occurred within 300 hours of the tail rotor strike, and according to an experienced operator, this was a known danger period – if the machine made it through this period, it was probably not going to suffer a subsequent failure.

Even a stationary rotor blade struck by a moving object can transmit invisible damage. Some years ago, a Hughes 500D operating in Antarctica had its rotor blades hit by flying objects in a storm (120-knot gusts); all five blades were destroyed. Only a few weeks later, on approach to the farthest (naturally!) field camp from the operating base, the pilot heard a loud bang from somewhere near his right ear, and noticed the main transmission chip detector light illuminate. After landing, he found the 'chip' to be a gear tooth! The return of the helicopter to the ship on which it was based was a two-day exercise, as the machine proved to be a very unstable load for the Sikorsky carrying it.

The seemingly minor dent on this Iroquois tail rotor blade was caused by a flailing longline that had been picked up by the main rotor.

The result of the strike was the departure of the tail rotor and 90-degree gearbox from the airframe.

Don't even think about it

There's no place for "she'll be right" in the case of actual or suspected rotor strikes. Err on the side of caution and have the appropriate checks done – even if it means flying engineers into the site, or in extreme cases, having the machine lifted out. While you are waiting, of course, you can inspect the helicopter to the limits of accessibility, looking for obvious (and not so obvious) telltale signs of damage.

Some of the areas have already been mentioned, such as the Starflex™ head, and tail rotor driveshafts. In the case of the AS 350/355 series of helicopters, it is imperative that the relevant star arm is closely examined for even the slightest damage. If there is any doubt whatever as to the permissible damage limits, refer to the manufacturer. ■

The best idea of all – **avoid rotor strikes at all costs!**

Duplicate Inspections

This article is in response to a Transport Accident Investigation Commission (TAIC) safety recommendation: "that the Director should critically examine the requirements for duplicate inspections of aircraft control systems, with a view to including helicopter tail rotor drive trains as part of the duplicate inspection regimes".

The existing requirements are found in rule 43.113 *Duplicate inspection of controls*, and comprise an inspection, by a person authorised under rule 43.101 *Persons to certify release to service*, after initial assembly, subsequent disturbance, or adjustment of any part of an aircraft control system or component control system; and a second inspection by another person meeting prescribed criteria.

After some deliberation, the CAA has not formulated a rule change, but rather, considers that the tail rotor drive is actually provided for in the existing rule.

The tail rotor is a control surface (think about it); in contrast to the main rotor it provides neither lift nor propulsion, and is the primary yaw control. Whereas a rudder on an aeroplane requires a control system only to deflect it one way or the other, the tail rotor requires two inputs: drive and pitch change, both equally important.

The CAA believes that any work on the tail rotor drive train does require a duplicate inspection, for the same reason as the pitch change control runs. While this may not necessarily have been standard practice in the past, the CAA believes that maintenance engineers and organisations should adopt this practice as mandatory, and, where applicable, incorporate suitable amendments in the appropriate maintenance documents.

The point has been raised about where to draw the line in duplicate inspections. "What about propellers then?" asks an engineer. What, indeed? Although propellers are outside the scope of rule 43.113, there is nothing to prevent an engineer or organisation putting more rigorous requirements in place. So, if Organisation X decided that a duplicate inspection was required for the installation of a propeller, that's fine – it is up to the organisation to administer that process, if they have made it a requirement in their maintenance exposition. Any requirement in excess of the rules leads logically to improved safety margins. ■

Need a Drink?

The Dangers of Dehydration

"I was having difficulty doing anything beyond simply flying the aircraft. Over the next 10 minutes, the situation deteriorated. I didn't realise it at first, but my peripheral vision was reducing quite quickly, almost as if two dark curtains were being drawn on each side of my head until I could only see straight ahead in a very limited arc".

Has this ever happened to you? The pilot concerned was on a cross-country flight when he realised that he was very hot, and sweating profusely. He consumed a litre of water and began to feel better after about five minutes. His peripheral vision returned, as did logical thinking.

This pilot was suffering from dehydration. It is an extreme example but all pilots need to be aware that it is easy to become dehydrated while flying, and that dehydration will impair performance.

The Effects of Dehydration

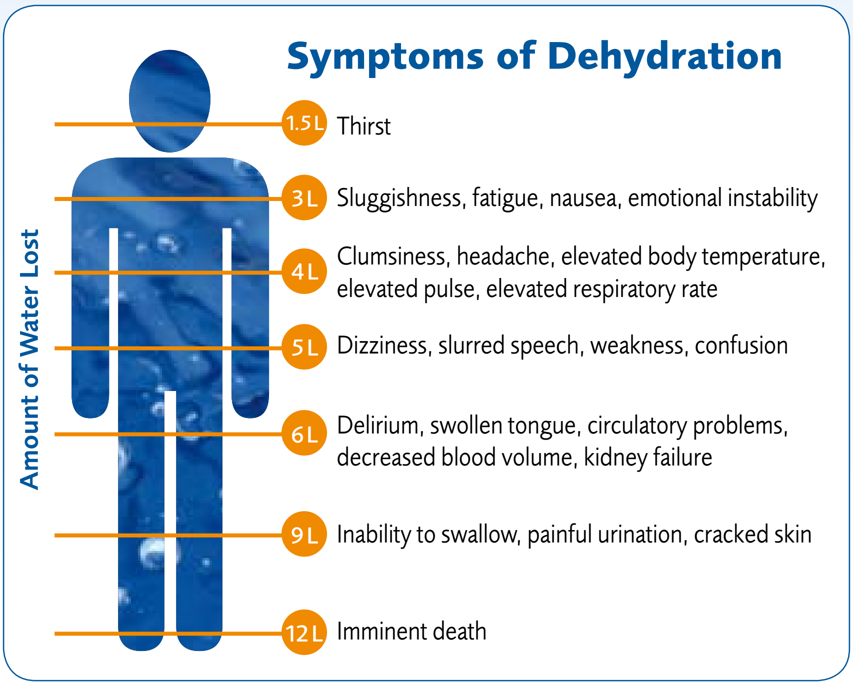
The human body is made up of about 70 percent water. For example, a person weighing 77 kilograms (170 pounds) has more than 40 litres of water in and around the cells and in the bloodstream. This water is used for virtually every function the human body performs – regulating temperature, eliminating waste, digestion, transporting nutrients, and it also has a role in neurological and cognitive functions.

Water enters our body through our gut when we eat and drink. It exits our body through our skin and breathing, sweating, urination, and faecal loss. Normally, these processes will result in the body losing around 2 to 2.5 litres of water in a 24-hour period, or about two to three percent of total body weight. Sweating can increase the amount of water lost from the body through evaporation on hot days, or after vigorous exercise, the loss can be substantial. If we are unwell, the loss of water from our bodies can be further increased through vomiting or diarrhoea.

When we are dehydrated through not drinking enough, the concentration of salt in the blood usually rises. We become thirsty and drink. If water consumption is not sufficient to offset water loss, the kidneys excrete less urine, and perspiration decreases. This is the first stage of dehydration. For most people we become thirsty when we have lost 1.5 litres of water (around 2 percent of body weight). This level of dehydration triggers the 'thirst mechanism' and is a signal that we need to drink about 600 to 900 ml of water (depending on body size) straight away. The problem is that the thirst mechanism can be turned off too easily. A small amount of fluid in the mouth will turn this mechanism off and the replacement of needed body fluid is delayed.

After 3 litres of water lost, we start getting sluggish, tired, irritable, and maybe nauseated. This is a very dangerous level for pilots. It is where your faculties start to become affected, and you may not be aware of the deteriorated performance, such as impaired decision making and in-flight monitoring. As dehydration worsens, symptoms may include headache, dizziness, slurred speech, weakness, delirium, and kidney failure. If dehydration continues to around 12 litres of water, then we will most likely die.

Urine is a good indicator of our state of hydration. Normally, it should be clear with a yellowish tint. Darker yellow is a signal that you need more water.



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This is often the first sign of dehydration – even before you get thirsty. The exception is when you have taken more vitamins than your body can process straight away (such as a "multi-vitamin" tablet), and the excess vitamin stream often has a tendency to make your urine a bright yellow. Use of diuretic substances (those which increase the production and excretion of urine) such as alcohol, caffeine, and soft drinks that contain caffeine, will increase the risk of dehydration. In this situation the urine may not appear dark in colour, but fluid levels are being significantly depleted.

If you are not aware of the environmental conditions and your own personal physiological status (eg, if you are prone to sweating heavily), you can progress to heat exhaustion even if you are regularly drinking water. This typically occurs while working in hotter environments, where the external fluid intake cannot keep up with the loss of fluid by the body. In the milder form (heat stress) a person will experience a reduction in performance, coordination, decision-making ability, caution and caring. In the more extreme stages (heat stroke), symptoms include: cramping, fatigue, vomiting, rapid breathing, mental confusion, and loss of consciousness. It is important, therefore, to keep fluid levels up. In these environments, a person may require up to 8 litres of water per day.

Be aware that dehydration can also occur in colder weather. Cold dry air causes water loss from transpiration without us realising it. Additionally, cold weather can have a paradoxical effect, as the peripheral blood vessels contract to help conserve heat and direct fluid towards the kidneys and make the body think it has too much fluid.

Remember, the amount of water you need to drink will depend on work level, temperature, and individual physiology.

Ensure your water bottles are safely stowed so they don't fall onto the cockpit floor and possibly interfere with the rudder pedals.

One serious episode, or several repeated moderate episodes of dehydration can result in kidney stones for some people. These are stone-like masses of mineral salts which can cause intense, incapacitating pain while passing through the urinary tract. Other symptoms are fever, chills, blood in the urine, nausea, and vomiting. Diagnosis of a kidney stone may affect pilot licence privileges. For most people, however, the formation of kidney stones can generally be prevented by drinking adequate amounts of water.

Preventing Dehydration

In most instances, regularly drinking water will prevent mild dehydration. It is, however, important to replace sodium as you may get salt depleted. This can be achieved by eating regularly as food contains salt and water and it will help to prevent fluid loss. In more extreme conditions, a suitable rehydration fluid that contains the correct mixture of water, salt and sugar (the sugar is required to help the body absorb the salt) will be needed. Be wary of some 'sports drinks' as they are not ideal for rehydration and some contain caffeine. Cordial drinks are also not ideal as they contain a high level of sugar and little salt.

The following are recommendations for preventing dehydration and other heat-related problems:

- Drink about 1.6 to 2 litres of water every 24 hours for normal activities. Drink before you become thirsty, and drink from a container that allows you to measure your daily water consumption. In extreme climates, you may require up to 8 litres of a suitable rehydration fluid over a 24-hour period.
- Limit consumption of diuretics such as alcohol and caffeine.
- Recognise environments where the risk of dehydration is increased. For example, in hot weather dehydration is associated with heat exhaustion. In cold, dry weather we can lose a lot of water through breathing (transpiration). This is an insidious form of dehydration, as we don't usually feel thirsty when it's cold.
- Do not rely on thirst to be the signal that you need water. By that time, you are already on your way to dehydration. Also, drinking only a small amount of water, insufficient to rehydrate, may fool the thirst mechanism.
- The body absorbs water more effectively if it is consumed regularly, rather than drinking a large quantity of water quickly.
- Remember that your body's adjustment to a major change in weather, such as the onset of hot weather, can take one to two weeks.
- Dress appropriately. It is advisable to wear cotton or other materials that allow body heat to dissipate easily.

Dehydration and Flying

Preventing dehydration is simple – you have to keep your body fluids up. In aviation, this is not always easy. It is, however, important to be aware that dehydration can affect your flying performance and should be avoided. Avoid being dehydrated before commencing a flight. Start by limiting the amount of diuretics you have the night before. Ensure you have a good hydration level and a good sleep, so that you wake up with a good chance of maintaining a balance during the day. Ideally, drink a reasonable amount (1 or 2 glasses) well before departure. On warm or hot days, ensure that you are adequately hydrated before flight, as you may quickly become dehydrated in a hot cabin environment.

When flying, the practicality of remaining sufficiently hydrated can be a juggling act between consuming an appropriate amount of fluid and the need to use a toilet. It is a good idea to have a contingency plan, as a full bladder on a long flight can be very painful and distracting, making it difficult to make decisions.

For short flights (under one to two hours) water will most likely be sufficient for preventing dehydration. If you are doing regular short flights during the day, then it is also important to eat regularly, as food enhances fluid retention and absorption. **If you are flying for a longer duration, or in more extreme climates, a suitable rehydration fluid will be required.** As an example, a proven fluid that Dr Dave Baldwin (the 'flying doctor') uses and recommends is a mixture of one-third "Just Juice" and two-thirds water.

It is very important to carry sufficient rehydration fluid in the cockpit and to drink regularly.

Remember that we should consume about two litres per day for normal activities (and greater amounts to cope with hot weather, high altitude, exercise, etc). If you are planning a long flight, work out how much fluid you need, and how you are going to store this. If you are flying in hot climates, then the amount of fluid required will be higher.

It can be difficult to carry water in aircraft with limited storage space. It may be possible to stow a water bladder with a straw, so that water can be consumed during flight. A water bladder commonly used by endurance athletes, obtainable from a sport shop may be suitable. Otherwise, carry a couple of bottles that allow you to monitor the amount of fluid you drink. Alternatively, consider planning your flight to incorporate stops where you can consume some fluid.


In some types of aircraft with limited storage space it may be difficult to stow water. It may be possible to use your flight bag.

To help prevent dehydration through sweating, keep the cabin well ventilated and dress appropriately for the cabin environment. Aircraft design will influence cabin temperature. In general, the cabin of a low-wing aircraft, especially one with a glass canopy, will be hotter than that of a high-wing aircraft. This problem can be compounded if the aircraft has poor ventilation. Be prepared to carry more water in low-wing aircraft, helicopters, or any aircraft with a large glass canopy, as the cockpit temperature may be 10 to 15 degrees higher than the outside air temperature (unless the aircraft has air-conditioning). The risk of dehydration will be increased, especially when flying on a hot day.

Dehydration can easily occur when flying long days on operations with little down time – on agricultural operations, for example.

At altitudes above 5000 feet amsl, the body experiences a higher loss of water through the surface area of the lungs than it does at sea level. This loss occurs because the percentage of water vapour in a given volume of air decreases with altitude. This water loss is not accompanied by a loss of salt (as occurs with sweating), so there is no accompanying sensation of thirst. For this reason, pilots who are making frequent flights above 5000 feet (such as parachute drop pilots, aerobatic pilots) should drink more water than their normal requirements, particularly during the summer.

If you are working night shifts, or on long-haul flights across different time zones, avoid using caffeinated drinks to keep you alert. These can make you dehydrated, and you will feel even more tired.

On long flights at higher altitudes, it is advisable to drink a suitable rehydration fluid every hour or so to replace the loss of body fluids. In a pressurised cockpit, the relative humidity of the atmosphere, which governs the available water vapour, can be as low as five percent. We 'operate' best in a relative humidity of 40 to 60 percent. In dry environments, we may not notice how much water we are losing from sweating, as it will very quickly evaporate from our skin. Be prepared to drink more than originally anticipated.

Remember, it can be easy to ignore the 'thirsty' signal, or to drink only a small amount of water that makes the thirst sensation go away.

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If you have done this, and you start to feel fatigued or develop a headache, then seriously consider landing so you can have a break and consume some water.

Don't forget to drink water after flying to assist in recovering from possible dehydration, especially if you have been flying on a long sortie, on a hot day, and you have minimised your fluid intake to avoid using the toilet. It is very important to hydrate after your flight especially if you are flying the next day, to minimise your chances of becoming dehydrated the following day.

Summary

Dehydration can have serious effects on flight safety and in most situations is an easily avoided problem.

To avoid dehydration, ensure you are hydrated before flight.

Take the time to ensure you carry an appropriate amount of water or other suitable rehydration fluid for the conditions (eg, weather, type of aircraft) and the type of flight (eg, cross country, night operations). During flight consume your fluid (avoid using diuretics) at regular intervals, and eat regularly.

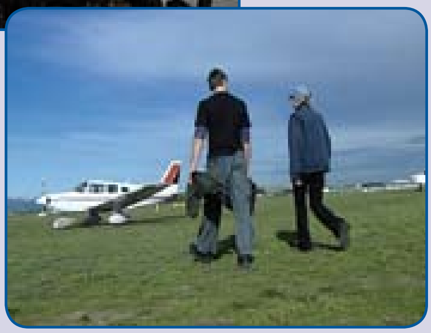
Don't forget to rehydrate after your flight. ■

New CAA Video

VFR in Controlled Airspace

This new production from Dove Video for the CAA aims to make pilots more comfortable with controlled airspace. While pilots taught at controlled aerodromes are probably very familiar with the airspace requirements, radio phraseology, and communicating with Air Traffic Controllers, many pilots taught at uncontrolled aerodromes fear dealing with Air Traffic Control (ATC).

This new video features two young pilots (played by Marion McCurdy and Cory Moir). One has more experience and is building flying hours toward her commercial licence, while the other has less experience and tends to avoid controlled airspace. The more-experienced pilot offers to take the other pilot along on a cross-country flight from Christchurch to Nelson so that the less-experienced pilot can become familiar with the requirements and radio calls.



They visit Airways' Christchurch Centre where an Air Traffic Controller (Clayton Lightfoot) discusses the flight plan and airspace en route. He then shows them a radar display and explains factors the controllers must take into account before giving a clearance.

After the flight, the less-experienced pilot feels much more confident with controlled airspace, saying, "I reckon it's worth a go".

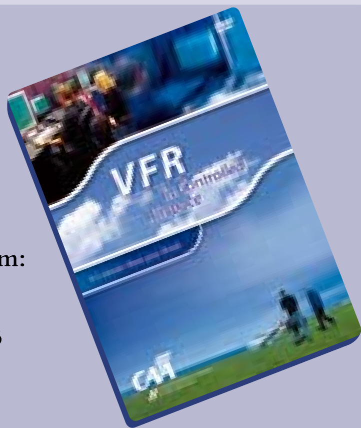
Obtaining a CVFR clearance through controlled airspace has a number of advantages and can make your flight easier. ATC, as the service agency, are there to help and will do so whenever possible – and remember, it is not necessary to be on a flight plan in order to request CVFR.

The video includes some of our regular reminders:

- Take the weather into account when planning your flight, and no less so because it may be CVFR.
- Time spent studying the airspace en route before takeoff can make things much easier on the flight.
- As pilot-in-command, it is your responsibility to amend your SARTIME or terminate your flight plan.

VFR in Controlled Airspace is the first CAA video to be produced solely in DVD format, as will all future productions. With computers having DVD players in them, and DVD players available for very little cost, it is expected that this will be more convenient for everyone. This title can be purchased from Dove Video for $18 (inc. GST) plus postage, or borrowed from the CAA (see information below).

The CAA has over 30 videos available for loan or purchase. See the complete list on the CAA web site, www.caa.govt.nz, under "Safety information – Videos". They can be borrowed by any CAA client within New Zealand. Just email info@caa.govt.nz with your name, client number, postal address, and the title of the video you would like to borrow. It is posted to you, and you are expected to return it within a week of receipt.



DOVE

You can purchase copies directly from:

Dove Video
P O Box 7413
Sydenham
Christchurch

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What Are the Odds?

One of the interesting things about human behaviour is our ability to conveniently ignore facts that don't fit our own perception of the world. For pilots of sport and general aviation aircraft, one of those unfortunate facts is the level of risk you accept by flying those aircraft. One of the sayings you may have heard (or even used yourself) is that *the most dangerous part of a flight is the drive to the airport*. If only that were true.

A few years ago an eminent German glider pilot wrote an article where he attacked this myth as it applied to gliding. He stated that, while he personally knew 27 pilots who had been killed in glider crashes, he only had one acquaintance that had been killed in a vehicle crash. That sample is undoubtedly skewed by the fact that this gentleman was heavily involved in the German gliding scene. But how different would the figures be for a typical pilot here in New Zealand? How many pilots do you know that have been killed in an accident? Compare that with the number of people you know personally who have died in a car crash.

> The safest mechanical transport system is the elevator.

Pilot Fatalities in New Zealand

Off the top of your head, what would you say would be the odds of a typical pilot being involved in a fatal accident (ie, you die) in a light aircraft?

There are currently around 9000 active Part 61 pilots in New Zealand (pilots that have a lifetime licence and a valid Class 1 or Class 2 medical certificate). There are another few thousand flying microlights and gliders. (Note that the data available does not show how many of the glider or microlight pilots also have a Part 61 licence, but there will be many pilots who fall in two or more groups, thus reducing the total number of pilots).

Light aircraft accidents kill between 20 and 25 persons per year in New Zealand. About half of these are pilots.

In very round figures, we can say there are about 10,000 pilots flying in New Zealand, and about 10 to 12 of those will die in any year. Your odds of being fatally injured are, therefore, of the order of magnitude of one in 1000 per year. If you fly for forty years (from say 20 until the age of 60) you have a cumulative chance of 1 in 25 of dying in an aircraft accident.

> The odds of winning Division One in Lotto are 1 in 3,838,380 per game line.

Note that these figures are very general, and the odds for a given individual can and will vary markedly depending on what type of aircraft they fly, the types of operation they engage in, and how often they fly. For instance, a number of the Part 61 licence holders might never fly anything smaller than a Boeing 737, and their chances of being involved in an accident are demonstrably much lower than their 'cousins' flying smaller aircraft. Flying in airliners is certainly one of the safest methods of transportation ever invented. Unfortunately the same is not the case for lighter aircraft, including general aviation, and sport and recreational flying.

The purpose of regurgitating these sobering statistics is not to put you off flying, far from it. The fact is that everything in life carries a risk with it. Consider the following.

The road toll remains between four and five hundred people per year in New Zealand. With a population of just over four million, and including visitor numbers who also potentially contribute to the accident pool, the odds of having a fatal road accident are in the order of one in 10,000 per year. (Again, this figure takes no account of the licence held, type of vehicles driven or amount of driving an individual does in a year.) Compare that with the one in 1000 raw numbers for pilots. In 2003, 14,371 road users (drivers, cyclists and pedestrians) were killed or seriously injured in road accidents in New Zealand – a ratio of one in every 278 people in the population.

Using data from Statistics New Zealand, for females in New Zealand of the following ages, your chances of dying from all causes in the next year are approximately:

Age	20	25	30	35	40	45	50	55	60
Odds	1 : 2451	1 : 1976	1 : 1445	1 : 1035	1 : 665	1 : 416	1 : 268	1 : 171	1 : 108

For males in New Zealand, the odds are somewhat worse, particularly for the younger age group compared with females of a similar age:

Age	20	25	30	35	40	45	50	55	60
Odds	1 : 977	1 : 931	1 : 816	1 : 639	1 : 452	1 : 297	1 : 192	1 : 119	1 : 72

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Once again these figures are very general, and they do not discriminate between the various socio-economic, occupational or ethnic groups – this is an average for all New Zealanders. It does, however, give us something to compare with our aircraft statistics. For a typical 40-year old male pilot, the chances of having an aircraft accident might (on average) be 1:1000, the chances of dying from all other causes put together is about double that, at 1: 452, per year.

Improving the Odds

It is not the role of *Vector* to advise you about your general lifestyle options, and what you might do to improve your overall odds for longevity.

What *Vector* can do is suggest ways that you might improve your personal odds when it comes to flying.

You will be well familiar with the oft-quoted statistic that 80 percent of aircraft accidents have human factors as a primary cause – and the sad fact is that most of the time it is the pilot who has done something wrong. To a very large extent, your safety is literally in your own hands.

In the USA, only 2 percent of aircraft fatalities are caused by engine failure.

One of the best ways to improve your odds is to remain current. A study by insurance companies in the United States showed that the odds of an accident diminished markedly for pilots flying more than 50 hours per year, or about one hour per week. It is admittedly very difficult for recreational pilots to be able to afford that level of flying, so what can you do if you are a typical PPL who only flies 10 to 20 hours per year? Here are some suggestions:

- Make the most of the flying you do get – practise things like circuits and forced landings at every opportunity.
- Don't be afraid to do more dual flying, particularly if you are not that current.
- Don't launch off on something you haven't done for a while without getting up to speed first – this particularly applies to cross-country flying.
- Even if you can't fly as much as you would like, look for other opportunities to keep your skills and knowledge alive – for instance, read as much as you can from various sources such as the AIP, web sites, aircraft flight manuals, and magazines (including *Vector*!).
- Ensure that you are fully prepared for any flight – weather, NOTAMs, flight planning, etc.
- Make sure you are personally ready for flight – I'M SAFE.

Summary

Everything in life carries with it attendant risks. Flying is no different, and demonstrably has a fairly significant level of risk compared with other common activities such as driving. If you are reading this article it is a fairly safe bet that you have decided that the risks inherent in flying are more than outweighed by the benefits you gain, whether that be fun, employment, the challenge, or whatever. The trick is to minimise the risk, both to yourself and others who might be flying with you. In the immortal words of the police sergeant from the TV series *Hill Street Blues*, "Let's be careful out there". ■

Mast Ha

A Close Encounter

Considerable concern has been expressed about temporary masts that power companies are erecting on tops of hills as they explore wind energy potential.

One such mast is situated on the west coast of the North Island, just 13 NM north of Raglan aerodrome and about 6 NM south of Limestone Downs aerodrome. We believe this is a corridor that many use for VFR transiting to and from the Auckland area.

On a recent occasion in the vicinity of this mast, because of deteriorating weather, a pilot turned inland in order to preserve his horizon. Because the mast was on top of a hill right on the coast, and reportedly reaching about 600 feet above sea level, he nearly collided with it. The pilot acknowledged that he probably infringed the 500-foot-agl rule.

From the photograph, it can be seen that this mast is very hard to see even in good weather. The ground at the site is approximately 300 feet **amsl** (100 metres), and the mast height is just under 200 feet **agl** (60 metres). If the pilot had been at 500 feet amsl over the sea, then the turn inland would indeed have been a hazardous manoeuvre. Now there's a lesson.

What the CAA Can Do

The temporary masts that power companies erect to explore wind farm sites are typically built to measure the wind at about 80 metres above the ground.

What can the CAA do about such a hazard?

The first thing the CAA needs is to be notified of a potential hazard to air navigation. Anyone can notify. The owners of the hazard are obliged to notify in certain circumstances. Power companies normally notify the CAA when planning to erect a mast.

zards

Having been notified, the CAA will then examine the hazard against the requirements of Civil Aviation Rule Part 77 *Objects and Activities Affecting Navigable Airspace*.

The accompanying table "Hazardous Structures" portrays in simplified form, the provisions of rule 77.19 *Standards for determining hazards* with respect to notification, marking, lighting, and charting. (Consult the rule itself for the specific requirements.)

Being under 60 metres (200 feet) high, our Raglan example mast would not require any notification. A typical taller 80-metre mast would require notification to CAA at least, and it may or may not be marked, lit, or charted, depending on its disposition with respect to adjacent aerodromes or low flying zones. The CAA cannot chart all obstructions below 200 feet, as this would mean hundreds of markings on the charts.

But, even if a reported hazard requires no rule 77.19 action, the CAA may pass it on by less formal means, for example through the Field Safety Adviser.

Hazardous Structures
(Source: rule 77.19)

Height agl, and conditions	Is the owner required to notify CAA?	Is the structure required to be marked or lit?	Is the structure required to be portrayed on charts?
Less than 60 m (**200** ft) – and not within a LFZ, – or within 4 km of an aerodrome	No	No	No
Between 60 m (**200** ft) and 120 m (**400** ft)	Yes	When determined, depending on size and location	When determined, depending on size and location
New structures greater than 120 m (**400** ft) – which are not within a Danger or Restricted Area.	Yes	Yes	Yes

What Pilots Can Do

Report Hazards

If you see what you believe to be a hazard to air navigation, report it to the CAA (email to aero@caa.govt.nz, or call Manager Aeronautical Services, 0–4–560 9429).

Don't Fly Below Minimum Safe Height

Rule 91.311 (a) is very specific about the minimum height for an aircraft operating en route under VFR, and every pilot should be thoroughly familiar with that detail. In **very simplified** form, the minimum height above the surface is 1000 feet over congested areas, 500 feet over other areas.

Some points to note:

- Beware of terrain changes below eating into that safety margin.
- The VFR minimum-safe-height rules are equally applicable to helicopters.
- There is no longer a rule allowing VFR flight below minimum safe height under "stress of weather"; even when there was, it was abused by those who believed it allowed them to 'press on' (it didn't).

If you're not permitted below minimum safe height due to weather, what happens if you're 'caught out'? The least result will be that you will be in breach of the Rule – the worst is that you're going to kill yourself.

You can't afford to be 'caught out'. You need to take alternative actions early enough to be effective. Turning back is often an option, so is diversion. If these are not options, then a precautionary landing is better than winding yourself around an unmarked 400-foot mast. ■

A Note on MEFs

Have you ever wondered what are those 2-figure (sometimes 3) numbers that appear in each grid rectangle on Visual Navigation Charts? They are called Maximum Elevation Figures, MEFs. The large figure(s) are thousands of feet of altitude, the smaller figure hundreds. For example, **12**^{5} means 12,500 feet amsl, and **9**^{4} means 9400 and **0**^{9} means 900.

Have you ever wondered how are they arrived at? For each rectangle, the altitude of the highest contour and the highest spot height are determined. To each of these is added 50 metres (164 feet) of allowances for mapping inaccuracies. The altitude of the top of the highest mast-like obstacle is also determined, but no allowances are added to this. The highest of these three altitudes is taken as the ruling altitude. This is converted from metres to feet, then rounded up to the nearest 100 feet to arrive at the MEF.

Have you ever wondered how to use them? Simple! If you flew at the MEF, your clearance from the highest obstacle in the rectangle would be anything between 1 foot and 264 feet – not good. **Treat MEFs as representing solid obstacles. Add your 500-foot (or 1000) safety margin to the MEF to determine a minimum safe altitude in the rectangle.**

LOSA

Line Operations Safety Audit

This is the first of two articles on LOSA: in this edition, the concept of LOSA is introduced and described, and the second article will discuss the progress made in New Zealand with its adoption, and what the future may hold. This article is adapted from ICAO Document 9803 Line Operations Safety Audit (LOSA) *and related literature.*

Line Operations Safety Audit (LOSA) is an organisational tool used to identify threats to aviation safety, minimise the risks such threats may generate, and implement measures to manage human error in operational contexts. LOSA uses expert, highly-trained observers to collect data on flight crew behaviour and situational factors on 'normal' flights, under strict no-jeopardy conditions. The observers record and code potential threats to safety; how these threats are addressed; how crews manage errors; and specific behaviours known to be associated with accidents and incidents.

LOSA is closely linked with Crew Resource Management (CRM) training. Data from LOSA form the basis for contemporary CRM training refocus and/or design known as Threat and Error Management (TEM) training. Also, a real-time picture of system operations is obtained, and this can guide operational, safety, and training strategies. In particular, examples of superior performance identified can be used as models for training.

LOSA is proactive, and the data can be used immediately to prevent adverse events.

These positive feedback mechanisms are a first in aviation, since industry has traditionally collected data on failed human performance, such as in accidents and incidents. LOSA is proactive, and the data can be used immediately to prevent adverse events.

Accident investigation, by definition, concentrates on failures, and provides only a tip-of-the-iceberg perspective. Incidents tell a more complete story about system safety than do accidents, because they signal weaknesses in the system before the system breaks down. Even so, there are limitations on the value of the information so obtained. For example, reports are submitted by the individuals involved and, because of biases, the reported processes or mechanisms underlying errors may not reflect reality.

Although digital flight data recorder (DFDR) and quick-access recorder (QAR) information from normal flights is a valuable diagnostic tool, there are limitations on the data so acquired. DFDR and QAR readouts give the frequency and locations of exceedances, but do not provide information on the human behaviours that were precursors of these events. Pilot reports are still necessary to provide context.

LOSA – a Proactive Strategy

Any typical routine flight involves inevitable, yet mostly inconsequential errors; eg, setting wrong frequencies or altitudes, or mishandling switches and levers. Some errors are due to flaws in human performance, while others are fostered by systemic shortcomings; most are a combination of both. Most of these errors have no negative consequences because crews employ successful coping strategies and system defences to contain them. To design remedial strategies, the aviation industry must learn about these strategies and defences, rather than continue to focus on failures.

To use a medical analogy, human error can be compared to a fever – a symptom of an illness but not the cause. It marks the beginning rather than the end of the diagnosis. Periodic monitoring of routine flights is thus like an annual medical check proactively checking health status to avoid sickness. It indirectly measures all aspects of the system, allowing identification of areas of strength and areas of potential risk.

On the other hand, incident investigation is like going to the doctor to fix symptoms, some serious, some not. For example, the doctor may set a broken bone, but may not consider the root cause(s) – weak bones, poor diet, high-risk lifestyle. Setting the fracture is no guarantee that the person will not turn up again the following month with another symptom of the same root cause.

Accident investigation is like a post-mortem the examination after death to determine its cause. It may reveal the nature of a particular pathology, but not the relevant circumstances.

Many accident investigations tend to look for a 'primary cause', most often 'pilot error' and fail to examine organisational and system factors that set the stage for the breakdown. Accident investigations are autopsies of the system, conducted after the point of no return of the system's health has been passed.

There is emerging consensus in the aviation industry about the need to adopt a positive stance and **anticipate**, rather than regret, the negative consequences of human error in system safety. One way to achieve this sensible objective is LOSA – an innovative approach that enables operators to assess their level of resilience to threats and errors.

Threats and Errors

A **threat** is defined as an event or error that occurs outside the influence of the flight crew (ie, not caused by the crew), increases the operational complexity of a flight, and requires crew attention and management if safety margins are to be maintained.

There are threats from the environment: adverse weather, airport conditions, traffic, ATC – and threats from within the airline: aircraft malfunctions and MEL (minimum equipment list) items, interruptions, and errors from dispatch, cabin, maintenance and the ramp. Threats may be anticipated by the crew, for example, by briefing for known weather in advance; or they may be unexpected and sudden, such as an aircraft malfunction. Some threats are easily resolved and quickly dismissed from the crew's workload, while others require greater attention and management.

Periodic monitoring of routine flights is thus like an annual medical check proactively checking health status to avoid sickness.

Crew **error** is defined as action or inaction that leads to a deviation from crew or organisational intentions or expectations. Errors in the operational context tend to reduce safety margins and increase the probability of adverse events. Broadly speaking, there are handling errors (flight controls, automation), procedural errors (checklists, briefings, callouts) and communication errors (ATC, ground, inter-pilot). A mismanaged error is one that is linked to, or induces, additional error or an undesired aircraft state.

An undesired aircraft state (UAS) is a position, condition or attitude of an aircraft that clearly reduces safety margins and is a result of actions by the flight crew. It is a safety-compromising state that results from ineffective error management. Examples include unstable approaches, lateral deviations and firm landings. As with errors, a UAS can be managed effectively, returning the aircraft to safe flight; or the crew action or inaction can induce an additional error, incident, or accident.

Brief History

LOSA was developed in 1991 by the University of Texas Human Factors Research Project (UTHF), in conjunction with the FAA. Initially, LOSA focused mainly on CRM, to see whether the practice matched the theory. After more than ten LOSA audits on airlines, it became evident that the actual practice of CRM was quite different from that depicted in the typical training department. The unique insights gathered from the LOSA approach not only advanced the concepts of CRM but also encouraged new ways of thinking about crew performance.

Continued over ...

The 10 Characteristics of LOSA

LOSA is defined by the following 10 operating characteristics that act to ensure the integrity of the LOSA methodology and data. Without these characteristics, it is not a LOSA.

1. **Jump-seat observations during normal flight operations.** LOSA observations are limited to scheduled flights. Checking and training flights are strictly off limits, because of the extra stresses upon pilots in these situations.
2. **Joint management/pilot sponsorship.** For LOSA to succeed as an effective safety project, there must be support from both management and the line pilots (through their professional association) in the form of a signed agreement.
3. **Voluntary crew participation.** A LOSA observer must first obtain the flight crew's permission to be observed, and the crew has the option to decline, no questions asked.
4. **De-identified, confidential and safety-minded data collection.** LOSA observers are asked not to record any information that could identify a crew. This offers a level of protection against disciplinary action. If a LOSA observation is ever used for disciplinary reasons, the acceptance of LOSA within the airline will probably be lost for ever.
5. **Targeted observation form.** The current data collection tool is the LOSA Observation Form, which, among other things, records flight and crew demographics, narratives of what the crew did well and did poorly, how they managed threats or errors for each phase of flight, and crew suggestions to improve safety, training and flight operations.
6. **Trusted, trained and calibrated observers.** Primarily, pilots conduct LOSA. It is critical to select observers who are trusted and respected within the airline to ensure line acceptance. After observers are selected, they are trained and calibrated in the LOSA methodology, including the use of the Observation Form, and particularly the concepts of threat and error management.
7. **Trusted data collection site.** To maintain confidentiality, airlines must have a trusted data repository. It can be in-house, or it can be external – initially all LOSA data went to UTHF. This acts as a safeguard against data being improperly disseminated within the airline.
8. **Data verification.** Data-driven programmes like LOSA require quality data management procedures and consistency checks. For LOSA, these are done at data verification roundtables, where the data is scanned for inaccuracies and anomalies deleted before any statistical analysis is performed.
9. **Data-derived targets for enhancement.** Patterns emerge – some errors occur more frequently than others, certain airports or events emerge as more problematic than others, and some SOPs are routinely ignored or modified. These patterns are identified as targets for enhancement. It is then up to the airline to develop change strategies based on these targets. A future LOSA would then show if the required change had been achieved.
10. **Feedback of results to line pilots.** On completion of a LOSA, the airline management and the pilot association have an obligation to communicate the results to the pilots, who will want to see not only the results but also the management plan for improvement. Results must be fed back in an appropriate fashion.

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A 1994 collaboration between Delta Air Lines and UTHF resulted in an audit successful on both the operational and research fronts. The resulting performance issues were presented to industry, and other airlines, including TWA, American Airlines, and Air New Zealand also conducted audits in conjunction with UTHF.

Continental Airlines conducted the first threat and error management LOSA in 1996, and this was deemed a success.

The two key elements … are the airline's views on confidentiality and no-jeopardy, and the observers themselves.

A second LOSA followed in 2000 to benchmark their safety improvements and this 'proof of concept' was recognised by the International Civil Aviation Organisation (ICAO). The Continental success story was made a central focus of ICAO's Flight Safety and Human Factors Programme, and is endorsed in ICAO Document 9803. Continental reported that the 2000 LOSA found: a 70% reduction in checklist errors; a 60% reduction in unstable approaches; an overall improvement in crew performance; but noted that there was still a need for improvement in leadership skills.

Since 1996, 25 airlines in 11 countries have participated in LOSA, accumulating a database of over 4500 observations.

Steps in Adopting LOSA

The first step in deciding if LOSA would be beneficial is to understand the LOSA process. First contact can be ICAO, UTHF or The LOSA Collaborative (TLC). TLC is a user network of researchers, safety professionals, pilots and airline representatives, and is formally linked to UTHF. It provides:

- Oversight and implementation of LOSA;
- A forum for information exchange regarding LOSA;
- Safety benchmarking of normal flight operations within and across airlines;
- Continuing development of threat and error management taking a proactive view of safety.

Additionally, other airlines that have adopted LOSA can be contacted to discuss the success of their LOSA programme.

It is advisable to gather together representatives from all departments that may be involved, and form a LOSA steering committee. As a minimum, the safety, flight operations, and training departments should be involved, along with the pilots' organisation. The committee should then determine what they would like to achieve from LOSA, and formulate an action plan.

Figure 1 shows a flow chart of the key steps to LOSA.

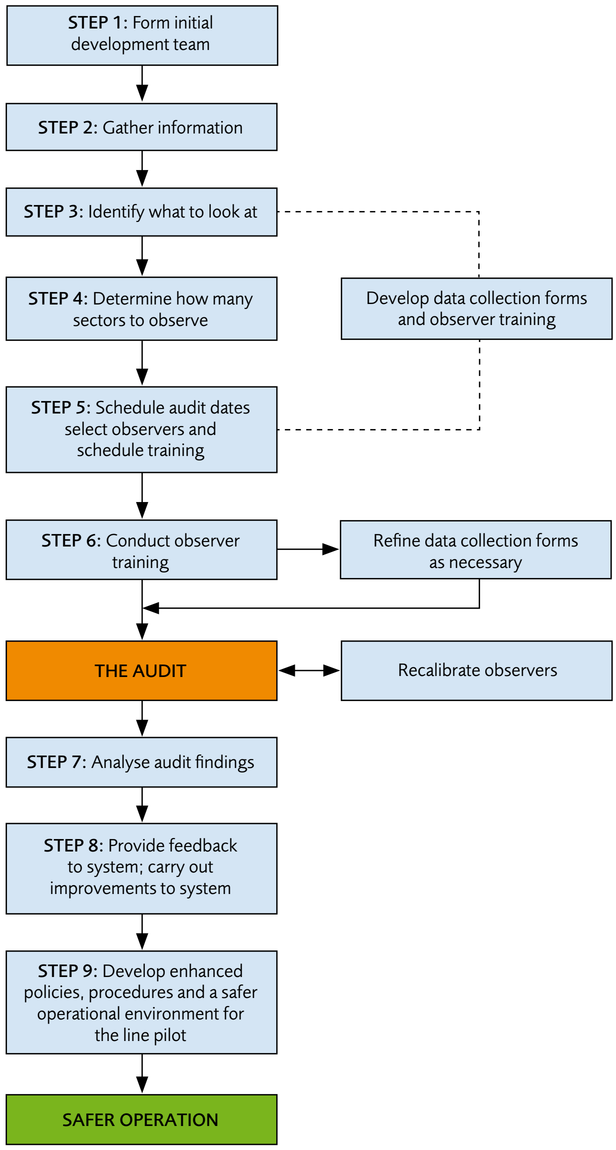


Figure 1: The key steps to LOSA

The Essentials

The two key elements that will determine the quality of the data obtained from a LOSA are the airline's views on confidentiality and no-jeopardy, and the observers themselves.

People behave differently when they know they are being evaluated, and although airlines have a lot of information on how crews perform on simulator and line checks, the idea of a LOSA is to capture data not otherwise obtainable. LOSA **must** be promoted as no-jeopardy; ie, data from LOSA observations will not be used to discipline crews. If an observer sees an unintentional deviation from an assigned altitude for instance, the observer will not use that observation to the detriment of the crew. The LOSA forms must not contain any information that could be traced to a specific flight.

The 'fly on the wall' analogy applies to LOSA observers, meaning that the observer will not interfere with the crew's performance. They should create an environment where the crews hardly realise they are being observed – it is imperative that the crews do not feel that they are on a check ride. A LOSA observer who normally acts as check pilots and instructors must consciously step out of their typical evaluator roles.

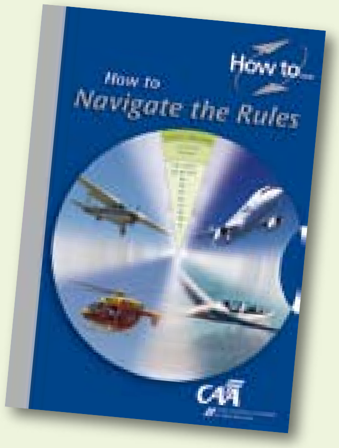
Promoting LOSA for Flight Crews

Promotion of LOSA is critical pilots must understand the concept fully before they will buy into it. The most effective tool in this regard is the signed agreement between the airline and the pilots' union or association.

Further Reading

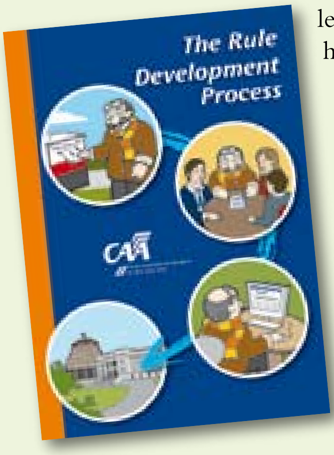
ICAO Document 9803 *Line Operations Safety Audit (LOSA)*
ICAO Journal Vol 57, No 4, 2002
ICAO web site www.icao.int/anb/humanfactors
The LOSA Collaborative web site www.losacollaborative.org (Note: site under development)
University of Texas Human Factors Project web site http://homepage.psy.utexas.edu/homepage/group/HelmreichLAB/Aviation/LOSA/LOSA.html

New Publications



How to Navigate the Rules

The *How to Navigate the Rules* booklet has been revised and updated. The Rules 'whizz wheel' in the front cover of the booklet gives aviation participants an idea of the Rules that apply to them, whether they be pilots, engineers, certificated operators, or training organisations, to name a few of the categories covered. The booklet gives an overview of the process for making Civil Aviation Rules, and explains what Emergency Rules, Airworthiness Directives, and Advisory Circulars are. It also lets people know how to obtain copies of the Rules, and how to keep up to date with changes to the Rules.



The Rule Development Process

This new booklet explains how the Rule Development Process works now that the Rules Review Implementation Project has been completed and the recommendations from the Scholtens Report have been implemented. The new four-phase process includes the Trigger Phase, Issue Assessment Phase, Rule Programme Development Phase, and the Rule Project Phase. The booklet also explains how aviation community members and the general public can be involved in the Rule making process.

Potential Weapon Poster

This new poster points out to travellers that any item that could be a weapon is prohibited in aircraft cabins, and that potential weapons must be placed in their checked-in luggage. This poster was released to coincide with a new Directive to search for prohibited items issued by the Director of Civil Aviation, effective 1 October 2005. Information on prohibited items is available on the CAA web site, www.caa.govt.nz, see "Passengers".

To obtain copies, contact either your local Field Safety Adviser (see below) or Email: info@caa.govt.nz.

Field Safety Advisers

Don Waters
(North Island, north of line, and including, New Plymouth-Taupo-East Cape)
Tel: 0–7–823 7471
Fax: 0–7–823 7481
Mobile: 027–485 2096
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Bob Jelley
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Fax: 0–3–322 6379
Mobile: 027–285 2022
Email: jelleyb@caa.govt.nz

Accident Notification

24-hour 7-day toll-free telephone

0508 ACCIDENT
(0508 222 433)

The Civil Aviation Act (1990) requires notification "as soon as practicable".

Aviation Safety Concerns

A monitored toll-free telephone system during normal office hours.
A voicemail message service outside office hours.

0508 4 SAFETY
(0508 472 338)

For all aviation-related safety concerns

OCCURRENCE BRIEFS

Lessons for Safer Aviation

The content of *Occurrence Briefs* comprises notified aircraft accidents, GA defect incidents, and sometimes selected foreign occurrences, which we believe will most benefit operators and engineers. Individual Accident Briefs, and GA Defect Incidents are now available on CAA's web site, www.caa.govt.nz. Accident briefs on the web comprise those for accidents that have been investigated since 1 January 1996 and have been published in *Occurrence Briefs*, plus any that have been recently released on the web but not yet published. Defects on the web comprise most of those that have been investigated since 1 January 2002, including all that have been published in *Occurrence Briefs*.

Accidents

The pilot-in-command of an aircraft involved in an accident is required by the Civil Aviation Act to notify the Civil Aviation Authority "as soon as practicable", unless prevented by injury, in which case responsibility falls on the aircraft operator. The CAA has a dedicated telephone number 0508 ACCIDENT (0508 222 433) for this purpose. Follow-up details of accidents should normally be submitted on Form CA005 to the CAA Safety Investigation Unit.

Some accidents are investigated by the Transport Accident Investigation Commission (TAIC), and it is the CAA's responsibility to notify TAIC of all accidents. The reports that follow are the results of either CAA or TAIC investigations. Full TAIC accident reports are available on the TAIC web site, www.taic.org.nz.

ZK-PPL, Ultravia Pelican PL, 18 May 03 at 11:15, Mangaweka. 1 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 69 yrs, flying hours 366 total, 216 on type, 24 in last 90 days.

On touchdown, the aircraft veered to the right and into a deer fence. Damage was limited to the nosegear, cowl area and to one wing.

Main sources of information: Accident details submitted by pilot plus further enquiries by CAA.

CAA Occurrence Ref 03/2106

ZK-STM, Boeing-Stearman A75N1, 18 Dec 03 at 14:30, Kaipara Flats. 2 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 39 yrs, flying hours 340 total, 173 on type, 7 in last 90 days.

The pilot experienced moderate turbulence while operating in the circuit. At the runway threshold he experienced windshear that resulted in a subsequent heavy landing. A groundloop to the left was initiated, but the right wing contacted a drainage embankment. The pilot stated that there was about 15 knots of crosswind at the time. There were no injuries, and the aircraft suffered moderate damage to the lower right wing.

Main sources of information: Accident details submitted by operator.

CAA Occurrence Ref 03/3803

ZK-CJN, Alpi Aviation Pioneer 300, 25 Dec 03 at 10:00, Masterton. 2 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence CPL (Aeroplane), age 37 yrs, flying hours unknown.

The pilot reported that the starboard main gear failed to lock in the down position. The microlight landed and settled on the starboard wing tip and came to rest against a fence, causing substantial damage.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 03/3801

ZK-HLD, Robinson R22 Beta, 17 May 04 at 17:00, Kereu River. 2 POB, injuries nil, damage substantial. Nature of flight, other aerial work. Pilot CAA licence CPL (Helicopter), age 43 yrs, flying hours 6497 total, 5000 on type, 168 in last 90 days.

The shooter exited the helicopter while in the hover, to recover two shot deer. The strop was under the seat of the helicopter, and as the shooter lifted the hinged seat, the strop or seat restricted the movement of the cyclic. This caused the aircraft to tip backwards and come to rest in a river bed. The helicopter was substantially damaged, but there were no injuries.

Main sources of information: Accident details submitted by pilot plus CAA engineering investigation.

CAA Occurrence Ref 04/1641

ZK-TIM, Europa Aircraft Europa Classic, 14 Jun 04 at 16:15, Wigram Ad. 1 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence ATPL (Aeroplane), age 46 yrs, flying hours 13500 total, 6 on type, 125 in last 90 days.

It was reported that on touchdown the undercarriage downlock latch opened and the gear collapsed, causing significant damage to the propeller and wing.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 04/2011

ZK-BQS, Piper PA-18, 22 Aug 04 at 08:15, Boyd Airstrip. 1 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 35 yrs, flying hours 471 total, 460 on type, 170 in last 90 days.

It was reported that the aircraft lost power after takeoff. The aircraft then landed in a soft area at a low speed and flipped over. Carburettor icing was suspected as the cause of the power loss.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 04/2690

ZK-FGE, Cessna 152, 24 Aug 04 at 14:00, Murchison. 1 POB, injuries nil, damage minor. Nature of flight, training solo. Pilot CAA licence nil, age 29 yrs, flying hours 171 total, 110 on type, 62 in last 90 days.

It was reported that the pilot made a precautionary landing into a field, after getting lost. During the landing roll the aircraft hit a wire fence, causing minor damage.

Main sources of information: Accident details submitted by operator.

CAA Occurrence Ref 04/2717

ZK-ZIP, Bede BD-5B, 8 Sep 04 at 14:20, Ardmore. 1 POB, injuries nil, damage substantial. Nature of flight, flight test. Pilot CAA licence CPL (Aeroplane), age 61 yrs, flying hours 3031 total, 0 on type, 2 in last 90 days.

The aircraft landed heavily short of the sealed runway threshold. The undercarriage collapsed, and the aircraft slid along the runway, coming to rest on the grass beside the runway. The pilot reported that he had selected full flap while he had a low power setting. He believed this, plus a slight windshear, may have led to a wing-drop stall, which he was unable to recover from before the aircraft hit the ground.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 04/2877

ZK-MAC, Rutan Quickie U/L, 7 Nov 04 at 18:20, Ladbrooks. 1 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence nil, age 44 yrs, flying hours 47 total, 22 on type, 3 in last 90 days.

It was reported that the aircraft may have experienced an engine failure during flight. The pilot made a forced landing into a paddock, where the aircraft turned upside down.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 04/3505

ZK-DWS, Cessna 172M, 12 Dec 04 at 12:00, Mount White Station. 2 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 63 yrs, flying hours 180 total, 11 on type, 11 in last 90 days.

It was reported that, while circling for a landing, the aircraft experienced considerable sink and failed to maintain height. A left turn was then carried out as the aircraft was going to be short of the runway. The aircraft hit the sloping ground below a terrace and came to a stop upside down. The pilot and passenger were uninjured.

Main sources of information: Accident details submitted by pilot plus further enquiries by CAA.

CAA Occurrence Ref 04/3930

ZK-CLO, Fletcher FU24A-950M, 24 Jan 05 at 13:00, Heriot, West Otago. 1 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence CPL (Aeroplane), age 36 yrs, flying hours 3900 total, 3300 on type, 124 in last 90 days.

It was reported that the aircraft veered off the runway during landing and crashed into some trees.

Main sources of information: Accident details submitted by pilot plus further enquiries by CAA.

CAA Occurrence Ref 05/138

ZK-JGR, Maranda AMF-S14 DIXW, 7 Feb 05 at 14:45, Lowburn Airstrip. 2 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 51 yrs, flying hours 606 total, 409 on type, 25 in last 90 days.

It was reported that the port wheel was lost upon landing. The aircraft then spun around on the ground, damaging the wing as it collided with a post.

Main sources of information: Accident details submitted by Rescue Coordination Centre.

CAA Occurrence Ref 05/263

ZK-RHK, Cessna 210, 8 Feb 05 at 13:00, Moana Private Airstrip. 1 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 40 yrs, flying hours 115 total, 52 on type, 32 in last 90 days.

It was reported that the aircraft drifted off the centreline and the nose wheel hit a bump which caused the nose leg to fold. The propeller struck the ground and was severely damaged.

Main sources of information: Accident details submitted by pilot plus CAA engineering investigation.

CAA Occurrence Ref 05/270

ZK-NAN, Cessna 152, 21 Feb 05 at 13:30, Spring Hill. 1 POB, injuries nil, damage minor. Nature of flight, training solo. Pilot CAA licence PPL (Aeroplane), age 23 yrs, flying hours 150 total, 120 on type, 60 in last 90 days.

The operator reported that during a touch-and-go, the engine coughed and spluttered. The pilot decided to abort the takeoff but was unable to stop the aircraft in the stopping distance available. The aircraft went through a fence and into a drain.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 05/414

ZK-CHT, Cessna 172F, 2 Mar 05 at 11:36, Bush Gully Airstrip. 3 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 54 yrs, flying hours 679 total, 679 on type, 8 in last 90 days.

The pilot attempted to take off from an airstrip that had long damp grass. The aircraft failed to get airborne and hit a fence at the end of the airstrip.

Main sources of information: Accident details submitted by Rescue Coordination Centre.

CAA Occurrence Ref 05/627

GA Defect Incidents

The reports and recommendations that follow are based on details submitted mainly by Licensed Aircraft Maintenance Engineers on behalf of operators, in accordance with Civil Aviation Rules, Part 12 *Accidents, Incidents, and Statistics*. They relate only to aircraft of maximum certificated takeoff weight of 9000 lb (4082 kg) or less. These and more reports are available on the CAA web site, www.caa.govt.nz. Details of defects should normally be submitted on Form CA005 or 005D to the CAA Safety Investigation Unit.

The CAA Occurrence Number at the end of each report should be quoted in any enquiries.

Key to abbreviations:

AD = Airworthiness Directive
NDT = non-destructive testing
P/N = part number
SB = Service Bulletin
TIS = time in service
TSI = time since installation
TSO = time since overhaul
TTIS = total time in service

Aero Commander 680-F
HSI drive belt

During the flight, the pilot noticed that the compass card was not turning in the HSI. There was an internal fault in the instrument. The drive belt was found to have failed, so a new belt assembly was fitted.

ATA 3400 — CAA Occurrence Ref 05/773

Cessna 152
Microswitch

During a go-around from a simulated engine failure after takeoff, the flaps jammed at 30 degrees and wouldn't retract. A successful precautionary landing was carried out. It was reported that the upper limit switch on the lever quadrant was sticking and the clevis on the follow-up cable was attached too tightly. The switch and the cable were cleaned and lubricated and the flap system tested serviceable.

ATA 2700 — CAA Occurrence Ref 05/840

Cessna R182
Magneto

The engine had been over-primed due to starting difficulties. A back-fire caused a small fire in the engine bay. The starting problem was caused by a faulty magneto, which was removed and sent to an overhaul agency for repair. All hoses and associated wiring were inspected and repaired. The repaired magneto was refitted, the engine ground run, and a satisfactory flight test carried out.

ATA 7410 — CAA Occurrence Ref 05/649

Cessna 180C
Right pilot's seat

When the pilot was adjusting the position of his seat on the rails prior to taxiing, the framework of the seat failed, and the back collapsed into the rear cabin. The engineer considered the seat frame was probably distorted, causing misalignment on the tracks and subsequent jamming. Robust attempts to move the seat when it jammed had caused the lightweight tubular frame to distort and fail.

ATA 2510 — CAA Occurrence Ref 04/3462

Cessna A185F
Vertical stabiliser spar

During maintenance a crack was found in the vertical stabiliser spar close to the area of the elevator torque tube. The crack was probably caused by engineers removing excessive material from the area while complying with the SB SEB 95-2. The manufacturer was advised and responded by stressing the need for good routine visual inspections in this area. The fin was replaced with a second-hand item, while the original spar was replaced via service kit SK185-25A. TTIS 5043 hours.

ATA 5300 — CAA Occurrence Ref 04/4254

Gippsland GA8
Alternator belt

When the aircraft was on approach to land, the engine rpm started to reduce, the alternator belt began squealing, and the alternator light flickered. Then the belt was heard flapping, and the alternator light remained on. A smell of burning rubber was also evident. Examination of the alternator drive belt disclosed it was incorrectly tensioned prior to failure, but the cause of the loss of tension was not established.

ATA 2410 — CAA Occurrence Ref 04/3480

Hughes 369D
Collective bungee bracket

The bungee bracket broke in half during flight, causing a loss in collective bias spring force and making the collective heavy to operate. No reason could be found for the failure, but the bracket may have suffered slight impact damage previously, which could have introduced cracking. TTIS 1541 hours.

ATA 6710 — CAA Occurrence Ref 05/2644

Hughes 369E
Number one bearing

During flight the aircraft developed noise in the engine. It was decided to descend when the compressor started stalling. The number one bearing had become starved of oil due to a recent unapproved repair at overhaul, resulting in damage to the compressor and subsequent stalling.

ATA 7230 — CAA Occurrence Ref 05/1555

Kawasaki-Hughes 369HS
Number five carbon seal

The helicopter was in the cruise when the oil pressure gauge came on for 15-20 seconds, with a flicker on the torque gauge. The oil pressure began to decrease into the yellow range, and the engine began to lose power. The aircraft was then landed with zero oil pressure being indicated. Upon inspection, no oil was found in the tank. The number 5 carbon seal had failed and allowed the oil to be dumped overboard. Without oil, the number 8 bearing failed. Without lubrication, the pressure elements of the oil pump had worn beyond limits. The engine was replaced.

ATA 7200 — CAA Occurrence Ref 05/1209

Nanchang CJ-6
Assembly

It was reported that the propeller was not operating correctly and was acting like a fixed-pitch propeller. Inadequate clearance between the blade sleeve and the blade retaining nut on both blades was causing excessive friction. The blade sleeve was reworked and the propeller reassembled, after which the propeller operation was satisfactory.

ATA 6100 CAA Occurrence Ref 05/2286

Pacific Aerospace Cresco 08-600
Longeron

During scheduled maintenance, which included an inspection per Service Bulletin PACSB/CR/040, a longeron was found cracked at the 1/4 inch bolt hole location for the engine mount strut. The longeron was renewed. TTIS 7947 hours.

ATA 5310 CAA Occurrence Ref 04/2144

Piper PA-34-200T
Number five cylinder push rod

The aircraft was being inspected for a rough running engine when a pushrod was found to be bent and protruding from the cylinder. The bent pushrod was caused by a sticking valve, possibly a result of the aircraft being stored for a length of time.

ATA 7200 CAA Occurrence Ref 05/537

Piper PA-32-260
Oil filter

Following routine maintenance, which included installation of a new engine oil filter, some oil was observed around the oil filter area, but it was assessed as being associated with the work done and was cleaned up. Subsequent engine running disclosed that the filter housing had not been tightened correctly. The manufacturer recommends tightening to 10 flats.

ATA 7920 CAA Occurrence Ref 05/635

Pitts S-2A
Tail support strut

During landing, when at the touchdown point. the pilot heard a loud bang. The landing roll appeared to be smooth, but there was difficulty when taxiing. On inspection, it was found that the tail was contacting the ground. The engineers found that one of the leaf springs on the tail wheel strut had failed.

ATA 3270 CAA Occurrence Ref 05/1351

Rans S-6ES Coyote II
Rotax wire

The engine was reported to be running roughly, and an ignition circuit was found to be dead. In trying to find the fault, the fuel was drained and replaced. The carburettor was stripped, cleaned, refitted and synchronised. A broken wire was found that feeds power to the module box; this was repaired. TTIS 512 hours.

ATA 7410 CAA Occurrence Ref 05/246

Robinson R22 Beta
Carburettor

The pilot was unable to control the rotor rpm by the throttle. The carburettor controls were found to be locked during the flight. It was found that a protective varnish had solidified on the carburettor, causing the accelerator pump to seize.

ATA 7300 CAA Occurrence Ref 04/4115

Robinson R22 Beta
Cyclic bungee

During a 100-hour inspection, it was found that the helicopter had a locally made cyclic bungee assembly installed, with unknown tension. It was not known from where the unapproved part originated.

ATA 6710 CAA Occurrence Ref 05/1385

Robinson R44 II
Fuel control unit

It was reported that water was found on the regulator cover of the fuel control unit. The brass plug was removed, and about three teaspoons of water came out of the plug-hole.

ATA 7320 CAA Occurrence Ref 04/4048

Shadow Series B-D
Vee belt

The aircraft was on a test flight after having flown 5 hours since a repair and rebuild that took several years. The pilot heard a rattling noise and noticed that the cylinder head temperature had increased and that power was being lost. He reduced power and decided to make a precautionary landing. The engine seized as the power was reduced to idle for landing. Investigation revealed that the vee-belt had shredded and the pistons seized from lack of cooling. The belt was checked before the flight and looked okay, but during the extended rebuild it had obviously hardened and then split in flight. Vee-belts should be replaced if they have been in storage for a long time.

ATA 8500 CAA Occurrence Ref 05/729

Tecnam P2002-JF
Rudder skin

During stalling practice the rudder control stick jammed. It was found that the lefthand rudder skin had deformed in the mid section, causing the rudder to contact the trailing edge of the vertical stabiliser. The manufacturer has issued SB P2002-002 modifying the rudder skin.

ATA 2720 CAA Occurrence Ref 05/861

Reminder from Licensing

If you are applying for the issue or amendment of CAA Licences, please get your applications in early if you require your licence before the Christmas/New Year holidays.

This is generally a very busy time for personnel licensing and everyone considers their applications urgent. They are dealt with on a first-in, first-processed basis.